Annexure

Minutes of the 4th Meeting of the Academic Council held on

31st May, 2022

ANURAG UNIVERSITY
Ghatkesar (M), Medchal-Malkajgiri (Dist), Hyderabad, Telangana 500088
www.anurag.edu.in

31st May, 2022

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Item 1:

Confirmation of the Minutes of the 3rd meeting of the Academic Council held on 03.07.2021

MINUTES OF THE THIRD MEETING OF THE ACADEMIC COUNCIL HELD ON 3RD JULY, 2021 AT 2 PM

Members Present / Absent

S. No	Name of the Member	Designation	Present/ Absent
1	Dr. S Ramachandram, Vice Chancellor	Chairperson	Present
2	Dr. V Vijaya Kumar, Dean, R& D and Chairperson, BoS, CSE	Member	Present
3	Dr. G Vishnu Murthy, Dean, School of Engineering	Member	Present
4	Dr. M Mutha Reddy, Dean, Examinations	Member	Present
5	Dr. PVN Prasad, Dean, Academic & Planning and Chairperson, BoS, EEE	Member	Present
6	Dr. Narayana Reddy, Dean and Professor, School of Agricultural Sciences	Member	Present
7	Dr. Vasudha Bakshi, Dean, School of Pharmacy and Chairperson, BoS, Pharmacy	Member	Present
8	Dr. AV Sita Rama Raju, Chairperson, BoS, Mechanical Engineering & Director, IQAC	Member	Present
9	Dr. S Madhu, Head, Department of Mechanical Engineering	Member	Present
10	Dr. S Sathees Kumaran, Head, Department of ECE	Member	Present
11	Dr. M Anil Kumar, Head, Department of EEE	Member	Present
12	Dr. KS Reddy, Head, Department of IT & Chairperson, BoS, IT	Member	Present
13	Dr. M Mukunda Vani, Head, Department of Chemical Engineering & Chairperson, BoS Chemical Engineering	Member	Present
14	Dr. K Ramachandra Reddy, Chairperson, BoS, Civil Engineering	Member	Present
15	Dr. B Narender, Head, Department of Civil Engineering	Member	Present
16	Dr. G Sabitha, Chairperson, BoS, Business Management	Member	Present
17	Dr. Vishnu Vandana, Head, Department of Business Management	Member	Present
18	Dr. G.V.S Ananta Lakshmi, Head, Department of English & Chairperson, BoS, English	Member	Present
19	Dr. V Srinivasa Rao, Chairperson, BoS, Mathematics	Member	Present

20	Dr. K Shiva Reddy, Head, Department of Mathematics	Member	Present
21	Dr. Savita Belwal, Head, Department of Chemistry & Chairperson, BoS Chemistry	Member	Present
22	Dr. M Srinivas Reddy, Head, Department of Physics &Chairperson, BoS Physics	Member	Present
Governing Body Nominees			
23	Dr. Shanta Thoutam, Innovation Director, T-Hub	Member	Present
24	Prof. E Sai Baba Reddy, Former Rector & Prof, Dept. of Civil Engineering, Jawaharlal Nehru Technological University, Hyderabad	Member	Present
25	Prof. BN Bhandari, Professor Dept. of ECE, Jawaharlal Nehru Technological University, Hyderabad	Member	Present
26	Dr. B Satyanarayana Reddy, MD, Nosch Labs, Hyderabad	Member	Present
Student Nominees			
27	Shri. Yeluri Kushal Vidya Mohanji, CSE III Year	Member	Present
28	Ms. B Sravanthi, ECE III year	Member	Absent
Sponsoring Body Nominees			
29	Dr. P Rajeshwar Reddy, Chairman, GECT	Member	Present
30	Mrs. S Neelima, Managing Trustee, GECT	Member	Present
31	Mr. Palla Anurag, Trustee, GECT	Member	Present
32	Dr. KS Rao, Director AGI & Chairperson, BoS ECE	Member	Present
33	Dr. M Srinivasa Rao, Associate Professor, English, AGI	Member	Present
Vice - Chancellor Nominees			
34	Dr. M Sikindar Baba, Associate Professor, Department of Mechanical Engineering & Controller of Examination	Member	Present
35	Dr. Lakshmi Ramana, Associate Professor, Department of English	Member	Present
Registrar			
36	Dr. S Sameen Fatima, Registrar and Head, Dept of AI and Chairperson, BoS, AI	Member Secretary/ Member	Present
Invited Members			
37	Dr. UB Desai, Chancellor, Anurag University	Invitee	Present
38	Dr. Anupama Ragireddy, Academic Coordinator, Anurag College of Engineering, Aushapur	Invitee	Present

On behalf of Anurag University, the Registrar welcomed all the members of the Academic Council and invitees to the third meeting of the Academic Council.

The Chairman, GECT, Dr.Palla Rajeshwar Reddy gave an overview of the accomplishments of Anurag University in the last academic year and thanked the teaching and non-teaching staff members for the same. He singled out three major achievements. One, merit-based appointment of faculty members done professionally by the university administration. Two, substantial increase in placements, recruiters, median and highest salary in the current academic year over the previous year. Three, despite the challenges created by the pandemic and increase in the admission of students, the university has successfully conducted online classes and examination, in the face of misgivings expressed by certain quarters, thanks to the adequate amount of infrastructure and quality human resources available in the university.

The Vice Chancellor presented the Annual Plan of AY 2020-21 and highlighted major achievements of the faculty and students. Subsequently, the agenda items were discussed. The decisions / resolutions made are given below.

Item 1: Confirmation of the minutes of the 2nd meeting of the Academic Council held on 10.05.2021

Resolution 1: It was resolved to confirm the minutes of the 2nd meeting of the Academic Council held on 10.05.2021

Item 2: Action taken on the decisions taken in the 2nd meeting of the Academic Council

The Council noted the details of the action taken on the decisions of the 2nd meeting of the Academic Council presented by the Vice Chancellor.

Item 3: New academic programs proposed to be offered in and revised intake for academic year 2021-22

Resolution 2: It was resolved to approve the new academic programs proposed to be offered in and revised intake (in existing programs) for academic year 2021-22. Further, the increased intake of B.Tech Program in Computer Science and Engineering specialisation to 420 from 360 for the AY 2020-21 was ratified. The details of approved programs along with intake for AY 2021-22 are given below.

Existing Courses and Additional Intake

1. School of Agriculture

Program Level	Program	Specialisation	Intake for 2020-21	Intake for 2021-22
UG	B.Sc / B.Sc Honors	Agriculture	60	360

2. School of Engineering

Program Level	Program	Specialization	Intake for 2020-21	Intake for 2021-22
UG (Engg & Tech)	B. Tech	Chemical Engineering	60	60
		Civil Engineering	180	180
		Computer Science and Engineering	360*	540
		Electrical and Electronics Engineering	120	120
		Electronics & Communication Engineering	240	240
		Information Technology	180	180
		Mechanical Engineering	240	240
		Artificial Intelligence	120	120
		Artificial Intelligence with Machine Learning	60	120
		Computer Science & Systems Engineering	60	60
		Construction Technology & Management	60	60
		Computer Science and Engineering with Data Science	60	120
		Computer Science and Engineering with Cyber Security	60	120
Total			**1800**	**2160**
Postgraduate (Engg & Tech)	M. Tech	Computer Science and Engineering	36	36
		Structural Engineering	36	36
		VLSI System Design	36	36
		Embedded Systems	24	24

		Power Electronics & Electrical Drives	36	36
		Electrical Power Systems	18	18
		Machine Design	24	24
Total			**210**	**210**
Research	Ph. D	Chemical Engineering	As per UGC norms	
		Civil Engineering		
		Computer Science and Engineering		
		Electrical & Electronics Engineering		
		Electronics and Communication Engg.		
		Information Technology		
		Mechanical Engineering		
		Mathematics		
		Physics		
		Chemistry		
		English		

* The intake increased to 420 from 360 for the AY 2020-21. The same has been ratified.

3. School of Liberal Arts

Program Level	Program	Specialization	Intake for 2020-21	Intake for 2021-22
UG	B.Com / B.Com Honors	Bachelor of Commerce	60	60
		Financial Technologies (FINTEC)	60	60
Total			**120**	**120**

4. School of Management

Program Level	Program	Specialization	Intake for 2020-21	Intake for 2021-22
Under Graduate	BBA	Digital Marketing	120	240
		Supply Chain		

		Management		
		Business Analytics		
		Fintech		
PG	MBA	**Existing Specialisations**	120	240
		Finance		
		Marketing		
		Human Resource Management		
		New Specialisations		
		Operations Management		
		Business Analytics		
Research	Ph.D	Management	As per UGC norms	

5. School of Pharmacy

Program Level	Program	Specialization	Intake for 2020-21	Intake for 2021-22
UG	B.Pharm	B. Pharmacy	**100**	**100**
PG	M.Pharm	Pharmacology	15	15
		Pharmaceutics	15	15
		Industrial Pharmacy	15	15
		Pharmaceutical Analysis	15	15
Total			**60**	**60**
UG	Pharma-D	Pharma-D	**30**	**30**
PG	Pharma-D (PB)	Pharma-D (PB)	**10**	**10**
Research	Ph.D	Pharmacy	As per UGC norms	

6. School of Sciences

Program Level	Program	Specialization	Intake for 2020-21	Intake for 2021-22
Under Graduate	B.Sc	Maths, Physics, Computer Science	60	60
	B.Sc	Maths, Physics,	60	60

		Chemistry		
	B.Sc	Maths, Statistics, Computer Science	60	60
Total			**180**	**180**

New Courses Proposed for 2021-22

Level	Programme	Specialization	Intake for 2021-22
School of Engineering			
PG (Engg & Tech)	M. Tech	Robotics and Automation	18
		Artificial Intelligence	18
		Cyber Security	18
		Data Science	18
		Digital Manufacturing	18
		Construction Technology & Management	18
		Total	**108**
Research	Ph.D	CSE with Specialization Artificial Intelligence	As per UGC norms
School of Liberal Arts			
UG	B.A. (Hons)	Mass Media & Communication	80
		Journalism & Mass Communication	80
		Total	**160**
UG	B.A / B.A (Hons)	Economics	160
		Business Economics	160
		Total	**320**
UG	B.Com. / B.Com. (Hons)	Computers	**280**
		Finance, Accounting and Taxation	
		Investment Management	
		Banking Financial Services	
		E Commerce	
		International Business	
		Business Analytics	
School of Pharmacy			
PG	M.Pharm.	Pharmaceutical Analysis & Regulatory	**15**
School of Engineering			
UG	B.Sc / B.Sc	Data Science	160

	Honors	Artificial Intelligence	160
		Total	**320**

Item 4: Presentation of the minutes of the Board of Studies (BoS), along with the course structure and syllabi of the programs to be offered by the School of Engineering from the academic year 2021-22 in: a) Artificial Intelligence; b) Chemical Engineering; c) Civil Engineering; d) Computer Science & Engineering; e) Electronics & Communication Engineering; f) Electrical & Electronics Engineering; g) Information Technology; and h) Mechanical Engineering

Resolution 3: Resolved to approve the minutes of the BoS, along with the course structure and syllabi of the programs to be offered by the various departments listed above under the School of Engineering from the academic year 2021-22, as presented in the agenda.

Item 5: Presentation of the minutes of the BoS in Pharmacy, along with the course structure and syllabi of the programs to be offered by the School of Pharmacy from the academic year 2021-22

Resolution 4: Resolved to approve the minutes of the BoS, along with the course structure and syllabi of the programs to be offered by the School of Pharmacy from the academic year 2021-22, as presented in the agenda.

Item 6: Presentation of the course structure of BBA Program of the Department of Management to be offered from the academic year 2021-22

Resolution 5: Resolved to approve the course structure of BBA Program of the Department of Management to be offered from the academic year 2021-22, as presented in the agenda.

Item 7: Presentation of the minutes of the BoS in Agricultural Sciences, along with the course structure and syllabi of the B.Sc (Hons) Agriculture program to be offered by the School of Agricultural Sciences from the academic year 2021-22

Resolution 6: Resolved to approve the minutes of the BoS in Agricultural Sciences, along with the course structure and syllabi of the B.Sc (Hons) Agriculture program to be

offered by the School of Agricultural Sciences from the academic year 2021-22, as presented in the agenda.

Item 8: Presentation of the minutes of the BoS in AI, including course structure and syllabi, for BSc Programs of the School of Sciences to be offered from the academic year 2021-22

Resolution 7: Resolved to approve the minutes of the BoS in AI, including course structure and syllabi, for BSc Programs of the School of Sciences to be offered from the academic year 2021-22, as presented in the agenda. As suggested by the Chancellor, it was also resolved to offer the BSc Programs under the School of Engineering.

Item 9: Presentation of the course structure of programs to be offered by the School of Liberal Arts from the academic year 2020-21

Resolution 8: Resolved to approve the course structure of programs to be offered by the School of Liberal Arts from the academic year 2020-21, as presented in the agenda.

Item 10: Presentation of the Amendments to the PhD Rules & Regulations by Dean, R&D

Resolution 9: It was resolved to approve the amendments to the PhD Rules & Regulations, as presented in the agenda.

Item 11: Approval of the Academic Regulations for B.Sc. / B.Com. / BA / BBA Programs with effect from the Academic Year 2021-22

Resolution 10: It was resolved to approve the Academic Regulations for B.Sc. / B.Com. / BA / BBA Programs with effect from the Academic Year 2021-22, as presented in the agenda.

The meeting ended with a vote of thanks by the Registrar.

Item 2:

Action taken on the decisions taken in the 3rd meeting of the Academic Council

Resolution 1: It was resolved to confirm the minutes of the 2nd meeting of the Academic Council held on 10.05.2021

Action Taken: No action required.

Resolution 2: It was resolved to approve the new academic programs proposed to be offered in and revised intake (in existing programs) for academic year 2021-22. Further, the increased intake of B.Tech Program in Computer Science and Engineering specialisation to 420 from 360 for the AY 2020-21 was ratified.

Action Taken: The same has been adopted into practice.

Resolution 3: Resolved to approve the minutes of the BoS, along with the course structure and syllabi of the programs to be offered by the various departments listed above under the School of Engineering from the academic year 2021-22, as presented in the agenda.

Action Taken: The same has been adopted into practice.

Resolution 4: Resolved to approve the minutes of the BoS, along with the course structure and syllabi of the programs to be offered by the School of Pharmacy from the academic year 2021-22, as presented in the agenda.

Action Taken: The same has been adopted into practice.

Resolution 5: Resolved to approve the course structure of BBA Program of the Department of Management to be offered from the academic year 2021-22, as presented in the agenda.

Action Taken: The same has been adopted into practice.

Resolution 6: Resolved to approve the minutes of the BoS in Agricultural Sciences, along with the course structure and syllabi of the B.Sc (Hons) Agriculture program to be offered by the School of Agricultural Sciences from the academic year 2021-22, as presented in the agenda.

Action Taken: The same has been adopted into practice.

Resolution 7: Resolved to approve the minutes of the BoS in AI, including course structure and syllabi, for BSc Programs of the School of Sciences to be offered from the academic year 2021-22, as presented in the agenda. As suggested by the Chancellor, it was also resolved to offer the BSc Programs under the School of Engineering.

Action Taken: The syallabus was approved.

Resolution 8: Resolved to approve the course structure of programs to be offered by the School of Liberal Arts from the academic year 2020-21, as presented in the agenda.

Action Taken: The program has not yet commenced.

Resolution 9: It was resolved to approve the amendments to the PhD Rules & Regulations, as presented in the agenda.

Action Taken: The same has been adopted into practice.

Resolution 10: It was resolved to approve the Academic Regulations for B.Sc. / B.Com. / BA / BBA Programs with effect from the Academic Year 2021-22, as presented in the agenda.

Action Taken: The programs have not yet commenced.

Item 3:

Academic Regulations of B. Tech (Hons./Minor) Program (R21)

ACADEMIC REGULATIONS (AU-R21)

For

B. Tech. (Hons. / Minor) Program

With effect from the Academic Year 2021-22

School of Engineering
ANURAG UNIVERSITY
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www.anurag.edu.in
January, 2022

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Academic Regulations for B. Tech (Hons. / Minor) Program

(With effect from the Academic Year 2021-22)

1. Preamble

1.1 **Honors**: To facilitate the students to choose additional courses by deep dive into emerging areas in their own discipline. The Honors program shall be offered by the parent/allied department. Artificial Intelligence, Computer Science & Engineering, and Information Technology are allied departments.

1.2 **Minor:** Students, who are desirous of pursuing their special interest areas other than their branch of engineering, may opt for additional courses in minor specialization offered by a department other than their parent department. Eligible students shall select the stream of courses offered by the respective departments and earn a Minor degree.

1.3 The objectives of the B. Tech. (Hons. / Minor) program are to:

- Deep dive into emerging / multidisciplinary approach for acquiring additional knowledge and skills
- Enhance the employability of undergraduate students with expanded knowledge and skills

1.4 The regulations governing the B. Tech. (Hons. / Minor) program have been framed in accordance with the AICTE Approval Process Handbook (APH) 2021-22, Model curriculum for undergraduate programs in Engineering and Technology, Vol. I & II, January, 2018.

1.5 These regulations come into force with effect from the academic year 2021-22 onwards.

2. Short Title and Duration of the Program

2.1 The B. Tech (Hons. / Minor) program shall be completed within the stipulated time period for regular B. Tech.

3. Eligibility Criteria for Registration

3.1 A student who intends to register for the B. Tech. (Hons. / Minor) program shall fulfill the following academic requirements:

a) B. Tech. (Hons. / Minor) programs are open to Engineering / Technology undergraduate students who have taken admission on or after the academic year 2020 – 21.

b) The registrants shall have obtained a CGPA of at least 7.5 at the end of the 2nd semester without any backlogs.

c) The lateral entry students shall have obtained a SGPA of at least 7.5 at the end of the 3rd semester without any backlogs.

d) The registrants shall not have secured F grade in any previous semester(s).

4. Registration Procedure

4.1 Any student meeting the eligibility criteria specified above in section 3, and intends to register for the B. Tech. (Hons. / Minor) program shall apply to the Dean, School of Engineering in the prescribed form along with the prescribed fee within the stipulated time as mentioned in the notification.

4.2 There shall be no limit on the intake of students for registration to the B. Tech. (Hons. / Minor) program.

4.3 The registration for B. Tech. (Hons. / Minor) program shall be allowed from the 3rd semester onwards.

4.4 For the lateral entry students, provisional registration for B. Tech. (Hons. / Minor) program shall be allowed from the 3rd semester onwards which enables them to attend the classes. However, their registration will be validated with the required SGPA (>=7.5) as mentioned in 3 (c). If he/she secures the required SGPA, they shall pay the fees to complete the registration process. If he/she fails to secure the required SGPA, their provisional registration stands cancelled.

4.5 A student is permitted to register for either B. Tech. (Hons.) or B. Tech. (Minor), but not both.

4.6 The students opting for B. Tech. (Hons. / Minor) program have to take the prescribed courses (online / offline) announced at the beginning of the semester through course registration.

5. Instruction

5.1 The instruction shall be either through physical class room teaching or on-line platforms like MOOCs / SWAYAM / NPTEL / any other on-line platforms or blended learning mode with the approval of the Board of Studies.

5.2 At the beginning of each semester (just before the commencement of class work), the list of courses offered shall be provided by the offering department.

5.3 Students shall register for the courses which they wish to take in that semester. It is suggested to consult the faculty advisor while registering for a course(s).

5.4 A student is allowed to register for a maximum of two courses (excluding laboratory courses) in a semester along with the regular B. Tech courses.

5.5 The Project Work (if any) as a part of B. Tech (Hons.) should be undertaken through a registration process at the beginning of the 5th semester and should be completed by the end of 6th semester.

5.6 A student is not permitted to register for a course which he/she has already undertaken as part of their B. Tech regular program.

6. Semester End Examinations (SEE)

6.1 The performance of a student in a course will be evaluated based on Semester End Examinations (SEE) for 100 marks.

6.2 All rules pertaining to conduct of SEE, valuation, revaluation, challenge valuation, etc., of regular B. Tech program are applicable to B. Tech. (Hons. / Minor).

6.2.1 Theory Courses:

For theory courses, the SEE will be conducted for 100 marks. The question paper will consist of two parts viz., i) Part-A for 30 marks, ii) Part-B for 70 marks.

a) Part-A consists of ten questions (numbered from 1 to 10), two questions from each unit carrying 3 marks each.

b) Part-B consists of five questions (numbered from 11 to 15), each question drawn from a separate unit of the syllabus and having an “either” / “or” choice (that means there will be two questions from each unit and the student shall have to answer any one of them carrying 14 marks each).

6.2.2 Practical Courses:

For practical courses, the SEE shall be conducted for 100 marks. Out of the 100 marks, the breakup shall be as follows:

- Preparation for the Laboratory – 20 marks
- Observation – 10 marks
- Successful completion of two experiments (30 marks each) – 60 marks
- Record – 10 marks

6.2.3 Project work:

The Project Work shall be evaluated for 100 marks as SEE. The SEE (viva-voce) shall be conducted by a committee consisting of (i) External examiner appointed by Dean (Examinations) on the recommendation of Chairperson, BOS, (ii) Supervisor of the project, and (iii) a senior faculty member of the department. The evaluation of project work shall be conducted at the end of the 6th semester.

7. Change of Specialization / Discipline

7.1 Student has a onetime chance to change from Hons. to Minor and vice-versa within one week of registration through the concerned Head of the Department and Dean of the respective school.

8. Transfer of Credits

8.1 The credits earned through B. Tech. (Hons.) / B. Tech. (Minor) / B. Tech., are not inter-changeable.

9. Eligibility for Award of the B. Tech. (Hons.) / B. Tech Minor Degree

9.1 A student shall be eligible for the award of B. Tech. (Hons. / Minor) degree, if he / she fulfills the following academic requirements:

a) Earns a regular B. Tech degree by fulfilling all the academic requirements
b) Acquires the prescribed credits for B. Tech. (Hons. / Minor)
c) He/she has no dues to the University, Hostels, Libraries, Sports, NCC / NSS etc.
d) No disciplinary action is pending against him/her.

10. Transcripts

10.1 After successful completion of the total program of study, a transcript containing performance of all academic years/semesters will be issued as a final record. Duplicate transcripts will also be issued if required on payment of the requisite fee.

11. Withdrawing

11.1 The student may withdraw from B. Tech. (Hons. / Minor) program at any time.

11.2 A student who has not acquired prescribed credits for B. Tech. (Hons. / Minor) program, he/she has an option to withdraw from B. Tech. (Hons. / Minor) program. In such case, if he/she has cleared any of the prescribed courses for B. Tech. (Hons. / Minor) program, they will be listed in the consolidated memorandum of marks (CMM).

11.3 The fee paid will not be refunded under any circumstances.

Item 4:

Academic Regulations of

M. Tech Program (R21)

ACADEMIC REGULATIONS (AU-R21)

For the

Master of Technology (M. Tech)

With effect from the Academic Year 2021-22

School of Engineering

ANURAG UNIVERSITY
Ghatkesar (M), Medchal-Malkajgiri (Dist), Hyderabad, Telangana 500088
www.anurag.edu.in
2021

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Academic Regulations for M. Tech. (Regular) with effect from the Academic Year 2021-22

1. Eligibility for Admissions

1.1 Admission to the M. Tech. program shall be made subject to eligibility, qualification and specialization as prescribed by the Anurag University (AU) from time to time.

1.2 Admissions shall be made on the basis of merit / rank obtained by the candidates at the qualifying Entrance Test conducted by the University or on the basis of any other order of merit as approved by the University, subject to reservations as prescribed by the Telangana State Private Universities Act (Establishment and Regulations) No.11 of 2018.

2. Courses of Study

The following specializations are offered for the M. Tech program of study:

1. Computer Science and Engineering
2. Artificial Intelligence
3. Cyber Security
4. Electrical Power Systems
5. Embedded Systems
6. Machine Design
7. Power Electronics and Electrical Drives
8. Structural Engineering
9. VLSI System Design
10. Robotics and Automation

3. Course Registration

3.1 Every student is required to be present and register online at the commencement of each semester on the day fixed for and notified in the academic calendar. The students will choose the courses for registration in consultation with the Faculty Advisor. The students may also consult the Head of the Department / Dean of the School.

3.2 The registration will be organized departmentally under the supervision of the Head of the Department in coordination with Faculty Advisor

3.3 A student, who does not register on the day announced, may be permitted to register, in consideration of any compelling reason, within the first week. Similarly, a student may be permitted to change the registration for a course within the first week only in consultation with respective faculty advisor. No late registration/change of registration shall be permitted after the first week from the scheduled date.

3.4 Only those students will be permitted to register who have: (a) cleared all University and Hostel dues of the previous semesters (b) paid all required fees for the current semester, and (c) not been debarred from registering for a specified period on disciplinary action or any other ground.

3.5 A candidate shall be given one chance to re-register and attend the classes for a maximum of two courses, if the Continuous Internal Evaluation (CIE) marks secured by a candidate are less than 50% and failed in those subjects but fulfilled the attendance requirement. A candidate must re-register for failed courses within four weeks of commencement of the class work and secure the required minimum attendance to appear for and the Semester End Examination (SEE). In the event of the student taking this chance, his CIE marks and SEE marks obtained in the previous attempt stand cancelled.

3.6 Dropping of courses: Within four weeks after the commencement of the semester, the student may, in consultation with the faculty advisor, drop one or more courses. The dropped courses shall be registered in the subsequent semesters as and when it is offered.

4. Attendance

4.1 The following Attendance in all classes (lectures/tutorials, laboratories etc.) is compulsory. A student will not be permitted to appear in the semester end examination on grounds of unsatisfactory attendance. Minimum required attendance in each theory / laboratory course is 75% (including the days of attendance in sports, games, and NCC and NSS activities) for appearing in the semester end examination. Students are advised to monitor the status of their attendance in the online system from time to time. Absence without obtaining sanction of leave will be considered as an act of indiscipline.

4.2 Condonation of shortage of attendance in each course up to 10% (65% and above and below 75%) in each semester shall be granted on genuine medical

grounds and valid reasons on representation by the candidate with supporting documentary evidence.

4.3 Shortage of attendance below 65% in each course shall not be condoned.

4.4 Students whose shortage of attendance is not condoned in any course are not eligible to appear for their semester end examination of that course and their registration shall stand cancelled.

4.5 However, in respect of women candidates who seek condonation of attendance due to pregnancy, the Vice-Chancellor may condone the deficiency in attendance to the extent of 15% (as against 10% condonation for others) on medical grounds subject to submission of medical certificate to this effect. Such condonation shall be availed only twice during the program of study.

4.6 A prescribed fee shall be payable towards condonation of shortage of attendance.

4.7 A candidate shall get minimum required attendance at least in three (3) theory courses in the present semester to get promoted to the next semester.

4.8 Promotion Rules:

4.9 A student shall be promoted from I Year to II Year only if he/she fulfils the academic requirements of securing 50% of average credits up to I Year II Semester, from all the examinations whether or not the candidate takes the examinations.

4.10 A student shall register and put up required attendance in all 68 credits and earn all 68 credits for the award of degree

4.11 Students, who fail to earn 68 credits as indicated in the course structure within four academic years from the year of their admission, shall forfeit their admission

4.12 When a student is detained due to shortage of attendance in any semester, no grade allotments or SGPA/CGPA calculations will be done for that entire semester in which he/she got detained

4.13 When a student is detained due to lack of credits in any year, he / she may be readmitted after fulfilment of the academic requirements, with the academic regulations of the batch into which he / she gets readmitted.

4.14 For readmitted candidates, if there are any professional electives / open electives, the same may also be re-registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the set of elective courses offered under that category.

5. Assessment of Academic Performance

5.1 The performance of a student in a semester shall be evaluated course-wise for a maximum of 100 marks in each theory and practical course. In addition, industry-oriented project, seminar, and project work shall be evaluated for 100 marks each. The distribution of marks for CIE and the SEE along with the minimum pass percentage shall be as follows:

Course	CIE	SEE	Minimum academic Requirements to Pass a Course	
			*Minimum Pass Percentage (SEE)	*Minimum Pass Percentage (CIE+SEE)
Theory	40	60	40	50
Laboratory / Practical	50	50	40	50
Seminars	100	0	-	50
Project Work	100	100	50	50

* Provided a relaxation of 10% of maximum marks shall be given to physically challenged students.

5.2 Each theory course in a semester is evaluated for 100 marks, out of which, there shall be CIE during a semester for 40 marks and SEE for 60 marks.

5.3 Continuous Internal Evaluation (CIE)

The CIE for Theory Courses has the following three components, comprising of 40 marks:

a. Midterm Examinations – 20 marks
b. Quizzes – 10 marks
c. Assignment / Seminars / Projects / Group Activities - 10 marks

a. Midterm Examinations:

There shall be two midterm examinations of 20 marks each. The average of the two examinations shall be taken as the marks secured by each candidate. Each midterm examination shall be conducted for the duration of 90 minutes and the question paper consists of Part-A (Short Answers for 5 marks) consists of 5 questions carrying 1 mark each, and Part-B (Long Answers for 15 marks) containing 5 questions of which student has to answer 3 questions; each question carrying 5 marks.

The First midterm examination shall be conducted for 2.5 units of syllabus at the end of 8 weeks of instruction and Second midterm examination shall be conducted for remaining 2.5 units at the end of 16 weeks of instruction.

In case any student has missed one of the two examinations, or wants to improve in one of the examinations, an optional third midterm examination will be conducted. This optional third midterm examination will be conducted during the preparation cum external practical examinations period subject to the following conditions:

i. Interested students have to register for the third mid examination by paying the prescribed registration fee.
ii. Third midterm examination covers entire semester syllabus carrying 20marks

b. Quizzes:

There shall be a total of five quizzes of 10 marks each, consists of 10 objective type questions, conducted for 15 minutes duration. The quiz has to be conducted at the end of each of the five units of instruction. The average of the five quizzes shall be taken as the final quiz marks secured by each candidate.

c. Assignment / Seminars / Projects / Group Activities:

The faculty will evaluate the students for 10 marks by conducting any of the following in two phases covering at least two units in each phase: Assignments / Seminars / Projects / Group Activities. This should be completed before the conduct of second mid-term examination.

5.4 Semester End Examination

a. The semester end examination will be conducted for 60 marks. The question paper will consist of two parts viz., i) Part-A for 20 marks, ii) Part –B for 40 marks.
b. Part-A is compulsory, which consists of ten questions (numbered from 1 to 10), two questions from each unit carrying 2 marks each.
c. Part-B consists of five questions (numbered from 11 to 15), each question drawn from a separate unit of the syllabus and having an “either”, “or” choice (that means there will be two questions from each unit and the student shall have to answer any one of them).

5.5 Practical Courses

- For practical courses, there shall be CIE during a semester for 50 marks and SEE for 50 marks.

a. Out of the 50 marks for CIE, the breakup shall be as follows:

i. Preparation for Lab – 10 marks

ii. Observation – 10 marks

iii. Completion of Experiment – 5 marks

iv. Record –5 marks

v. Skill Test – 20 Marks

b. Before the end of instruction, a Skill Test will be conducted for 20 marks.

- The practical SEE shall be conducted for 50 marks with an examiner along with the laboratory faculty member. The examiner shall be appointed by the Dean-Examinations of the University.

5.6 There shall be seminar presentations which will be evaluated under CIE for 100 marks. Students shall present a seminar before the faculty members assigned for the purpose.

5.7 Project Work

- There shall be a project work review I and review II in 2nd Year first and second semester respectively.
- Project work review-I will be evaluated for 50 marks as CIE. The CIE shall be based on two seminars given by each student on the topic of his/her project. The evaluation should be done by the Project Review Committee (PRC). There shall be no SEE marks for the Project work review-I.
- Project work review-II will be evaluated for 150 marks, out of which 50 marks as CIE and 100 marks as SEE. The CIE shall be based on two seminars given by each student on the topic of his/her project. The evaluation should be done by the PRC. The SEE (viva-voce) shall be conducted by the PRC consisting of (i) External examiner appointed by Dean (Examinations) on the recommendation of Chairperson, BOS, (ii) Head of the department, (iii) Supervisor of the project and (iv) a Senior faculty member of the department.

5.8 A candidate shall be given one chance to re-register for the courses if the internal marks secured by a candidate is less than 50% and failed in that course for maximum of two times. In the event of the student taking another chance, his / her CIE and SEE marks obtained in the previous attempt stands cancelled.

5.9 If there is a complaint in awarding the CIE marks, the University shall nominate a committee to look into the matter.

5.10 Candidates shall be permitted to apply for recounting/revaluation of SEE theory-scripts within the stipulated period with payment of prescribed fee.

5.11 Recounting: The totaling of the marks awarded shall be verified in the answer script and corrected if there is any mistake.

5.12 Revaluation:

a. The answer scripts of the candidate who applied for revaluation are evaluated by two subject experts independently other than the original evaluator.
b. If the difference of marks between these two valuations is 15% or more, it will be sent for third valuation to another subject expert.
c. Nearest of two valuations out of three will be considered and the average of these two will be taken as the final marks obtained.
d. If the difference of the final marks after revaluation is >=15% of maximum marks, then the revaluation marks are considered for declaring the result.
e. If the revaluation marks are less than the original marks, the original marks are retained and there is no change in the result.

5.13 Challenge Valuation:

The candidates who have applied for revaluation and are not satisfied with the result are only eligible to apply for challenge valuation by paying the prescribed fee in the form of DD payable to the Registrar, AU.

a. On receipt of the DD, a photocopy of the answer booklet shall be given to the student.
b. The paper will be evaluated in the presence of the student by a senior faculty member appointed by the University.
c. If there is any change in the marks >= 15% of the maximum marks, the new marks will be awarded to the student. Otherwise, there will be no change in original secured marks.
d. If the change in marks (equal or above 15% of the maximum marks) occurs, the amount paid towards challenge valuation will be refunded. Otherwise, the student will forfeit the total amount which he/she has paid.

6. The Grading System

6.1 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and Corresponding percentage of marks shall be followed:

% Of Marks Secured (Class Intervals)	Letter Grade (as per UGC Guidelines)	Grade Points
90% and above (≥ 90%, ≤ 100%)	**O (Outstanding)**	10
Below 90% but not less than 80% (≥ 80%, < 90%)	**A+ (Excellent)**	9
Below 80% but not less than 70% (≥ 70%, < 80%)	**A (Very Good)**	8
Below 70% but not less than 60% (≥ 60%, < 70%)	**B+(Good)**	7
Below 60% but not less than 50% (≥ 50%, < 60%)	**B (Above Average)**	6
Below 50% (< 50%)	**F (Fail)**	0
Absent	**AB**	0

6.2 In general, a student shall not be permitted to repeat any course(s) only for the sake of 'Grade Improvement' or 'SGPA/ CGPA improvement

6.3 The 'Credit Points' (CP) for a course, is computed by multiplying the Grade Point with Credits for that particular course.

Credit Points (CP) = Grade Point (GP) x Credits

6.4 The student passes the course only when he/she gets GP 6 (B Grade or above).

6.5 The Semester Grade Point Average (SGPA) is calculated as follows

$$SGPA = \frac{\{\sum_{i=1}^{N} \text{Ci Gi}\}}{\{\sum_{i=1}^{N} \text{Ci}\}}$$

where 'i' is the course indicator index (takes into account all courses in a semester), 'N' is the no. of courses registered for the Semester (as specifically required and listed under the Course Structure of the parent Department), C is the no. of Credits allotted to the i^{th} course, and G represents the Grade Points (GP) corresponding to the Letter Grade awarded for that course.

6.6 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all semesters considered for registration. The CGPA is calculated as follows:

$$CGPA = \frac{\{\sum_{j=1}^{M} CjGj\}}{\{\sum_{j=1}^{M} Cj\}}$$

Where 'M' is the total no. of courses (as specifically required and listed under the course Structure of the parent Department) the student has registered from the 1st Semester onwards up to and inclusive of the Semester S (obviously M > N), 'j' is the course indicator index (takes into account all courses from 1 to S Semesters), C is the no. of credits allotted to the j^{th} course, and G represents the Grade Points (GP) corresponding to the Letter Grade awarded for that j^{th} course. After registration and completion of I Year I Semester however, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

6.7 For CGPA and SGPA calculations performance in failed courses (securing F Grade) will also be taken into account, and the Credits of such courses will also be included in the multiplications and summations.

7. Passing Standards:

7.1 A student shall be declared successful or 'passed' in a Semester, only when he/she gets a SGPA ≥ 6.00 (at the end of that particular Semester); and a student shall be declared successful or 'passed' in the entire UGP, only when he/she gets a CGPA ≥ 6.00; subject to the condition that he/she secures a GP ≥ 6 (B Grade or above) in every registered course in each Semester

7.2 After the completion of each semester, a grade card or grade sheet (or transcript) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, No. of credits, grade earned etc.), credits earned, SGPA and CGPA.

8. Evaluation of Project/Dissertation Work

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

8.1 A Project Review Committee (PRC) shall be constituted with Head of the Department as Chairman, Project Supervisor and two senior faculty members

8.2 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses, both theory and practical.

8.3 After satisfying 8.2, a candidate has to submit, in consultation with his Project Supervisor, the title, objective and plan of action of his project work to the PRC for approval. Only after obtaining the approval of the PRC the student can initiate the Project work.

8.4 If a candidate wishes to change his supervisor or topic of the project, he/she can do so with the approval of the PRC. However, the PRC shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

8.5 A candidate shall submit his project status report in two stages at least with a gap of 3 months between them.

8.6 The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of all theory and practical courses with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. For the approval of PRC, the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.

8.7 Three copies of the Project Thesis certified by the supervisor shall be submitted to the University.

8.8 After approval from the PRC, a soft copy of the thesis should be submitted for PLAGIARISM check and the plagiarism report should be submitted to the examination branch and be included in the final thesis. The thesis will be accepted for submission, if the similarity index is less than 30%. If the similarity index has more than the required percentage, the student is advised to modify accordingly and re-submit the soft copy of the thesis after one month. The maximum number of re-submissions of thesis after plagiarism check is limited to TWO. The candidate has to register for the project work and work for two semesters. After two attempts, the admission is liable to be cancelled.

8.9 For Project Evaluation (Viva Voce) in II Year II Sem. there is an external mark of 100 and the same evaluated by the External examiner appointed by the Institution. The

candidate has to secure minimum of 50% marks in Project Evaluation (Viva-Voce) examination.

8.10 If he/she fails to fulfil the condition as specified in 8.9, he/she shall reappear for the Viva-Voce examination only after three months. In the reappeared examination also, fails to fulfil the above said condition, he/she will not be eligible for the award of the degree.

8.11 The thesis shall be adjudicated by one examiner appointed by the Dean-Examinations from the list of panel of examiners approved by the Vice- Chancellor. For this, Chairman, Board of Studies of the respective departments shall submit a panel of 3 examiners, who are eminent in that field with the help of the concerned guide and senior faculty of the department.

8.12 If the report of the examiner is unfavorable, the candidate shall revise and resubmit the Thesis. If the report of the examiner is unfavorable again, the thesis shall be summarily rejected.

8.13 If the report of the examiner is favorable, Project Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who adjudicated the Thesis.

8.14 The Head of the Department shall coordinate and make arrangements for the conduct of Project Viva-Voce examination.

9. Award of Degree and Class

9.1 A Student who registers for all the specified courses as listed in the course structure, satisfies all the course requirements, and passes the examinations prescribed in the entire PG Program (PGP), and secures the required number of 68 Credits (with CGPA ≥ 6.0), shall be declared to have “QUALIFIED” for the award of the M. Tech Degree in the chosen branch of Engineering and Technology with specialization as he/she admitted.

9.2 Award of Class

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M. Tech Degree, he/she shall be placed in one of the following three classes based on the CGPA:

CGPA	Class	Condition
≥8.00	First Class with Distinction	• Should have passed all the courses in 'first appearance' in a semester examination and should complete the program in 2 years of time. • Should not have been detained or prevented from writing the end semester examinations in any semester due to shortage of attendance or any other reason. • The students who secure CGPA≥8.00, but not fulfilling above conditions for "First Class with Distinction" shall be awarded "First Class" only.
≥6.75 - <8.00	First Class	
≥ 6.00 -< 6.75	Second class	

9.3 A student with final CGPA (at the end of the PGP) < 6.00 will not be eligible for the Award of Degree.

10. Withholding of Results

If the student has not paid the dues, if any, to the institution or if any case of indiscipline is pending against him/her, the result of the student will be withheld and he/she will not be allowed into the next semester. His/her degree will be withheld in such cases.

11. Transitory Regulations

11.1 Discontinued, detained or failed candidates are eligible for readmission / re-registration as and when offered next as per the University admission procedure.

11.2 The candidate who fails in any course has to complete the same course / equivalent course in the maximum stipulated time as per the Regulations in vogue.

12. Convocation

12.1 The University shall conduct convocation to confer the degree (s).

12.2 The University shall institute Prizes and Awards to meritorious students during convocation

13. Amendments

13.1 The regulations hereunder are subject to amendments as may be made by Academic Council from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already undergoing the program)

ANNEXURE – I: Disciplinary Action against Students – Provisions

A. Student's behavior and discipline will be assessed and will receive the same attention as the academic work. Discipline includes the observance of good conduct and orderly behavior by the students of the University;

B. All students pursuing a Program at the University shall observe code of conduct and maintain discipline and must consider it as a duty to behave decently at all places;

C. Every student shall always carry the Identity card issued by the university. Every student shall have to produce or surrender the identity card, as and when required by the proctorial staff, teaching and library staff and the officials of the university. The loss of the identity card, whenever it occurs, shall immediately be reported in writing to the Registrar.

D. Any violation of the code of conduct or breach of any rules and regulations of the university is construed as an act of indiscipline and shall make him/her liable for disciplinary action;

E. The following acts are treated as gross indiscipline:

- Disobeying the teacher/officials or misbehaving in the class;
- Quarrelling or fighting in the University campus, hostels amongst themselves, indulging in any activity which amounts to ragging or Harassment of other students;
- Quarrelling or fighting with a university employee(s) or any other public utility functionaries in the campus;
- Indecent behavior in the University campus or outside causing inconvenience to others;
- Visiting socially unacceptable websites, smoking or consuming liquor or banned substances like drugs etc.;
- Damage to the University property;
- Indulging in acts of theft, forgery, stealing and misappropriating;
- Any other activity that defames the University;
- Use of mobile in the class/academic area.
- Irregularity in attending classes, persistent idleness, negligence or indifference towards the work assigned;
- Any other conduct which is considered to be unbecoming of a student.

F. Rules for Students Conduct & Behavior in Campus and Outside;

G. The rules and regulations, academic calendar shall be provided to all the students

H. In general, Dean, Student Affairs will deal with the welfare and discipline of all students in the campus including Hostel and also outside the campus and will ensure maintenance of good conduct. He/ She will be assisted by other members of faculty/ staff/ wardens as nominated;

I. Conduct and Behavior:

i. Students should attend all their classes and strictly observe class timings. They should likewise carry out other out-door and extracurricular duties assigned to them. Their attendance and leave is governed by the regulations pertaining to them;

ii. Students must give their undivided attention to their academic work and must be respectful to their teachers and supervisors;

iii. Students must conduct themselves with due decorum in the classes, laboratories, Library etc. and move in an orderly and disciplined manner in the campus;

iv. Students should not indulge in abusive behavior/ violence of any kind with fellow students, teaching faculty and employees of the University within or outside the University. Violence by any student or group of students will lead to severe disciplinary action;

v. No meeting of the students other than those organized under the aegis of the various recognized students' activities shall be called without the prior permission in writing from the Dean, Student Affairs;

vi. Neither meetings/functions within the University campus shall be organized nor any outsider address the students without the prior permission in writing from the Registrar;

vii. No students shall use unfair means at any of the examinations and tests or attempt or threaten the staff to get undue advantage;

viii. Students must pay all fees and other dues on specified dates. If they do not do so, they render themselves liable to penalties as in force from time to time;

ix. Students must take good care of all University property. Any damage to university property shall be viewed as indiscipline. Such student(s), in addition to facing the disciplinary action, shall have to replace the damaged property and make good the losses caused due to their action. Students must use the furniture

and fittings with due care and must not deface buildings, roads, furniture and fittings etc. in any manner;

x. Students must handle the laboratory equipment, instruments and machinery with great care. Any damage or breakage of such equipment etc., due to improper use are negligent handling will have to be made good by the students concerned;

xi. Ragging in any form is unlawful and strictly prohibited. If a student found ragging shall be punished as per the Anti-Ragging Act;

xii. The University shall have a zero-tolerance policy towards Ragging and shall lay down strict guidelines on the same as per policies of the UGC in vogue and in compliance to directions of Hon'ble Supreme Court;

xiii. Mobile cellular phone may be carried by the students. However, they shall be kept in silent mode during the classes. Violation will lead to confiscation of the mobile phone;

xiv. All the students are required to observe the decorum in the dress code as prescribed by the University. Students not adhering to the prescribed dress code may be denied entry to the University campus;

xv. Smoking, consumption/possession of liquor, intoxicants, drugs, cigarettes, hookah etc., inside or outside the Campus is strictly prohibited. Any violation will invoke severe penalty including rustication from the Hostel/ University.

J. Policy to prevent Sexual Harassment:

i. The University shall be committed to treating every employee and student with dignity and respect. It shall seek to create a work environment that is free from sexual harassment of any kind, whether verbal, physical or visual;

ii. A policy shall be prescribed by the University to provide guidelines for prompt redressal of complaints related to sexual harassment which should be in full compliance with "The Sexual Harassment of Women at Workplace (Prevention, Prohibition & Redressal)" Act, 2013;

iii. All references / complaints and redressal mechanism pertaining to any matter will be handled within the ambit of the said Act and the Rules framed thereunder. The policy so prescribed shall be communicated to all employees and students.

K. Grievance and Redressal Mechanisms:

The University shall constitute various Grievance and Redressal committees and its guidelines as specified by the statutory authorities of the University.

ANNEXURE – II: Malpractice Rules

S. No	Nature of Malpractice (Improper conduct during examinations)	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he/she is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he/she will be handed over to the police and a case is registered against him/her.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate disappearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The hall ticket of the candidate is to be cancelled.

3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he/she will be handed over to the police and a case is registered against him/her.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination. Takes away answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all SEEs. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award	Cancellation of the performance in that subject.

	pass marks	
6.	Refuses to obey the orders of the Chief Superintendent / Assistant Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty inside or outside the examination hall or causing any injury to himself / herself or to any others or threatens whether by words, either spoken or written or by signs or by visible representation, assaults the officer in-charge, or any person on duty in or outside the examination hall or any others, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	They shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case will be registered against them.

7.	Leaves the exam hall taking away answer script or intentionally tears the script or any part-thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work & shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits these at.
9.	Who is not a candidate for the particular examination or any person not connected with the University indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the University will be handed over to police and, a police case will be registered against them.

10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Found copying, on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the malpractice committee for further action on suitable punishment as per rules	

ANNEXURE –III: Definitions

In these Regulations, unless the context otherwise requires:

a. Academic Year: Two consecutive (one odd + one even) semesters constitute one academic year
b. Choice Based Credit System (CBCS): The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses)
c. Course: Usually referred to, as a 'course' is a component of a program. All courses need not carry the same weightage. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/tutorials/laboratory work / field work / outreach activities / project work/vocational training / viva / seminars / term papers / assignments / presentations / self- study etc., or a combination of some of these
d. Credit Based Semester System (CBSS): Under the CBSS, the requirement for awarding a degree or diploma or certificate is prescribed in terms of number of credits to be completed by the students
e. Credit: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week
f. Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale
g. Credit Point: It is the product of grade point and number of credits for a course
h. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters i.e., O, A+, A, B+, B, C and F
i. Semester Grade Point Average (SGPA): It is a measure of academic performance in a semester. It is the ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places
j. Cumulative Grade Point Average (CGPA): It is a measure of overall cumulative performance of a student. The CGPA is the ratio of total credit points secured by a student in all semesters and the sum of the total credits. It shall be expressed up to two decimal places
k. Program: An academic program of the University
l. Semester: Each semester shall consist of 16 weeks of instruction.
m. Transcript or Grade Card or Certificate: Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will

display the course details (code, title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester

n. Types of courses: The courses in a program may be of three kinds: Core, Elective and Foundation
o. Core course: This is the course which is to be compulsorily studied by a student as a core requirement of a program in a branch of study
p. Elective course: This is the course to be chosen from a pool of courses. Elective course may be (a) Supportive to the branch of study (b) Providing an expanded scope (c) Enabling an exposure to some other branch/domain (d) Nurturing student's proficiency/skill
q. Foundation course: This course may be of two kinds, compulsory foundation and elective foundation
r. Compulsory Foundation courses: These are the courses based upon the content that leads to knowledge enhancement. They are mandatory for all disciplines
s. Elective Foundation courses: These are value-based and are aimed at man-making education
t. The academic regulations should be read as a whole for the purpose of any interpretation.
u. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chancellor is final.

Item 5:

School of Engineering:

Presentation of the minutes of the Board of Studies (BoS) including course structure and syllabi for the programs proposed to be offered from the Academic Year 2022-23.

Det. of Artificial Intelligence

ANURAG UNIVERSITY

Minutes of the Board of Studies (BoS) Meeting in Artificial Intelligence

held on Saturday, 5th March 2022 at 11:30am in Face-to-Face and On-Line Mode

Members Present:

1. Dr S Sameen Fatima, Head, Dept of AI & Registrar, AU, Chairperson
2. Dr MV Krishna Murthy, Managing Director, United Online Software Development, Hyderabad, Member
3. Dr VijayaKumari Gunta, Professor, JNTUH, Member
4. Dr P V Sudha, Professor and Head, Dept of CSE, UCE, OU, Member
5. Dr Salman A Moiz, Professor, SCIS, UoH, Member
6. Dr P Radha Krishna, Professor, NIT, Warangal, Member
7. Mr Bala Prasad Peddigari, Principal Consultant, Tata Consultancy Services Limited, Hyderabad, Member
8. Mr Samir Goswami, Director (MIS), DDUGKY Division, NIRDPR, Member
9. Mr Malladi Harikrishna, Associate Architect, Kore.ai, Hyderabad, Alumni,Member
10. Dr G Vishnu Murthy, Dean, School of Engineering, AU, Member
11. Dr Tilottama Goswami, Professor, Dept of AI, AU, Member
12. Dr Pardeep Kumar, Asst.Professor, Dept of AI, AU, Member
13. Mr M Hari Prasad, Asst.Professor, Dept of AI, AU, Member

Invitees Present:

1. Dr. S Ramachandram, Vice Chancellor, AU, Special Invitee
2. Dr. V Vijaya Kumar, Chairperson, BoS in Computer Science and Engg, AU
3. Dr. K Sudheer Reddy, Chairperson, BoS in IT, AU
4. Dr. G.V.S. Anantha Lakshmi, Chairperson, Dept. of English, AU
5. Dr. V. Vishnu Vandana, Head, Dept. of Business Management, AU
6. Dr. K. Mamatha, Placement Officer, AU, Invitee
7. Dr Tilottama Goswami, Professor, Department of AI
8. Dr Krishna Anand, Professor, Department of AI
9. Dr Abdul Ahad, Assoc Professor, Department of AI
10. Dr. Pardeep Kumar, Asst Professor, Department of AI
11. Dr. Manoranjan Dash, Asst Professor, Department of AI
12. Mr. M. Hari Prasad, Asst Professor, Department of AI
13. Ms. M. Madhavi, Asst Professor, Department of AI
14. Ms. S. Deepika, Asst Professor, Department of AI
15. Ms Madhuri, Asst Professor, Department of AI

Members Absent:

1. Mr Lingireddy Ramakrishna Reddy, President, Auropro Systems, Hyderabad, Member
2. Dr Sumohana S Channappayya, Associate Professor, IIT Hyderabad, Member

The Chairperson welcomed all the members and invitees and the following agenda items were taken up one by one for discussion:

1. **Approval of Department Vision, Mission and the Program Education Objectives, Program Outcomes and Program Specific Outcomes for the BTech (AI) and BTech (AIML) programs**

   The Department Vision and Mission aligned with the Institute Vision and Mission were presented. The statements were accepted. However, the Mission statements have been condensed further. Subsequently, the Program Educational Objectives (PEOs), Program Outcomes (POs) and Program Specific Outcomes (PSOs) were presented for the BTech (AI) and BTech (AIML) programs, which were also accepted. However, the PEO statements have been condensed further.

   The members resolved to approve the statements for the Department Vision, Mission and the Program Education Objectives, Program Outcomes and Program Specific Outcomes for the BTech (AI) and BTech (AIML) programs which are attached as Appendix A.

2. **Structure for BTech (AI) and BTech (AIML) for III and IV Year (I and II Semester)**

   The structure for BTech (AI) and BTech (AIML), III and IV Years was presented and discussed. The members suggested that the Open Elective Course “The Power of Data Story Telling” be renamed as “Data Story Telling” or “Business Data Story Telling”.

The members resolved to approve the Structure for BTech (AI) and BTech (AIML) III and IV Year, I and II Semester, incorporating the above suggestion. The same is attached as Appendix B.

3. **Approval of Syllabus for BTech(AI) and BTech(AIML) III Yr (I and II Semester)**

The syllabus for BTech (AI) and BTech (AIML), III Year (I and II Semesters) was presented and discussed. The gist is given below:

- **Syllabus for BTech (AI) and BTech (AIML) for III Year I Semester**
  - The Professional Core Course, "Computer Systems-II" covers fundamental concepts of “Operating Systems” and “Computer Networks”.
  - The Professional Core Course, “Web Technologies” was renamed as “Web Programming with MEAN” and the members suggested inclusion of the topics Angular.JS, Node.JS and Mongo DB in the syllabus. As a follow up the “Web Programming with MEAN Lab” was also to be redefined.

- **Syllabus for BTech (AI) and BTech (AIML) for III Year II Semester**
  - Regarding the syllabus for the Professional Core Course, “Automata Theory and Applications”, the members felt that the syllabus was vast and suggested a few changes in the syllabus.
  - Regarding the syllabus for the Professional Elective Course, “Unified Modeling Language”, the members suggested reordering of one of the topics and inclusion of case studies. It was also suggested to include the text book by Terry Quatrani.
  - Regarding the course “Internet of Things” the members suggested dropping the topic "Robotics" and making the course more practical. The same was incorporated.
  - The Vice Chancellor suggested reducing the number of experiments to 12 in the laboratories instead of 16. Further, each laboratory experiment could also be a mini project spanning two to three weeks.

The members resolved to approve the Syllabus for BTech (AI) and BTech (AIML) III Year, I and II Semester, incorporating the above suggestions. The same is attached as Appendix C

The meeting ended by the Chairperson thanking all the members and the invitees for their deliberations and contributions.

Appendix A

Department of Artificial Intelligence: Vision and Mission

Program Educational Objectives, Program Outcomes and Program Specific Outcomes for BTech(AI) and BTech(AIML)

Dept of AI Vision

To provide students with the knowledge and skills to pursue rewarding careers and to do good in a rapidly changing world.

Dept of AI Mission

M1: To empower students to solve problems through rigorous curriculum of theory and practice to succeed in a wide range of careers.
M2: To enable students to develop technical and professional skills by collaborating with professional societies, researchers and industry partners
M3: To enable students to become responsible citizens with high standards of ethics and tolerance towards diversity

Program Educational Objectives (PEOs) for BTech (AI) and BTech (AIML)

PEO 1: To produce graduates with strong theoretical and practical foundations in Computer Science and Artificial Intelligence
PEO 2: To produce professionals who can solve real life problems by applying AI for the betterment of society
PEO 3: To produce responsible innovators, job seekers, entrepreneurs, and teachers
PEO 4: To produce graduates who will be engaged in life-long learning and professional development, through pursuance of higher education and research

Program Outcomes for BTech (AI) and BTech(AIML)

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes for BTech (AI) and BTech(AIML)

1. To address the challenges in collecting, storing increasing amounts of data of all types for the purposes of prediction and decision making.
2. To train students to build AI systems to mimic human intelligence
3. To focus on the following areas of AI: Search, Machine Learning, Language Technologies and Computer Vision

Appendix B

Program Structure of
BTech (Artificial Intelligence)
(III & IV Years)

B.TECH (AI) III YEAR I SEM (4 T + 4 P + 1 M)

S.No	Category	Course Name	Hours per week			Credits
			L	T	P	
1	PCC	Essentials of Machine Learning	3	1	0	4
2	PCC	Computer Systems II	3	1	0	4
3	PCC	Web Programming with MEAN	3	0	0	3
4	OEC-I	1. Business Data Storytelling 2. Entrepreneurship Development 3. Intellectual Property Rights	3 2 2	0 1 1	0 0 0	3
5	PCC-Lab	Computer Systems Lab	0	0	3	1.5
6	PCC-Lab	Web Programming with MEAN Lab	0	0	3	1.5
7	PCC-Lab	Essentials of Machine Learning Lab	0	0	3	1.5
8	BSC-Lab	Quantitative Aptitude and Reasoning	0	0	3	1.5
9	MC	NSO/NSS	0	0	2	0
Total						20

ANURAG UNIVERSITY

B.TECH (AI) III YEAR II SEM (5 T + 2 P + 1 M)

S.No	Category	Course Name	Hours per week			Credits
			L	T	P	
1	PCC	Automata Theory and Applications	3	1	0	4
2	PCC	Information Retrieval Systems	3	0	0	3
3	PCC	Computer Vision and Image Processing	3	0	0	3
4	PEC-1	1. R Programming 2. Mobile Application Development 3. Internet of Things 4. Unified Modeling Language	2	0	0	2
5	PEC-II	1. Distributed Systems 2. Evolutionary Computing 3. Cryptography 4. Fundamentals of Image Data Mining	3	0	0	3
6	HSS&MC	Verbal Ability and Critical Reasoning	0	0	3	1.5
7	PCC Lab	Computer Vision and Information Retrieval Systems Lab	0	0	4	2
8	PEC-1-Lab	1. R Programming Lab 2. Mobile Application Development Lab 3. Internet of Things Lab 4. Unified Modeling Language Lab	0	0	3	1.5
Total						20

B.TECH (AI) IV YEAR I SEM **(5 T +2 L) + Mini project**

S.No	Category	Course Name	Hours per week			Credits
			L	T	P	
1	PCC	Natural Language Processing	3	0	0	3
2	PCC	Deep Learning	3	1	0	4
3	PEC-III	1. Big Data 2. Information Security 3. Computational Biology 4. Optimization	3	1	0	4
4	PEC - IV	1. Reinforcement Learning & Game Theory 2. Blockchain Technology 3. Cloud Computing 4. Introduction to Robotics	3	0	0	3
5	PEC-V	1. Applications of AI in GIS & Remote Sensing 2. Applications of AI in Healthcare 3. Applications of AI in Banking 4. Applications of AI in e-Governance	3	0	0	3
6	PCC Lab	Deep Learning and Natural Language Processing Lab	0	0	3	1.5
7	PEC-III LAB	1. Big Data Lab 2. Information Security Lab 3. Computational Biology Lab 4. Optimization Lab	0	0	3	1.5
8	PROJ	Mini Project	0	0	4	2
Total						**22**

B.TECH (AI) IV YEAR II SEM (2 T + 3 L/P)

S.No	Category	Course Name	Hours per week			Credits
			L	T	P	
1	OEC-II	1. Technical and Business Communication Skills 2. Language and life skills/ Digital media literacy 3. Managerial Economics and Financial Analysis	3	0	0	3
2	OEC-III	1. Negotiation Skills 2. Project Management 3. Value Engineering	3	0	0	3
3	PROJ	Seminar	0	0	4	2
4	PROJ	Comprehensive Viva-Voce	0	0	0	2
5	PROJ	Project	0	0	15	10
		Total				**20**

Program Structure of
BTech (Artificial Intelligence & Machine Learning)
(III & IV Years)

B.TECH (AIML) III YEAR I SEM (4 T + 4 P + 1 M)

S.No	Category	Course Name	Hours per week			Credits
			L	T	P	
1	PCC	Essentials of Machine Learning	3	1	0	4
2	PCC	Computer Systems II	3	1	0	4
3	PCC	Web Programming with MEAN	3	0	0	3
4	OEC-I	1. Business Data Storytelling 2. Entrepreneurship Development 3. Intellectual Property Rights	3 2 2	0 1 1	0 0 0	3
5	PCC-Lab	Computer Systems Lab	0	0	3	1.5
6	PCC-Lab	Web Programming with MEAN Lab	0	0	3	1.5
7	PCC-Lab	Essentials of Machine Learning Lab	0	0	3	1.5
8	BSC-Lab	Quantitative Aptitude and Reasoning	0	0	3	1.5
9	MC	NSO/NSS	0	0	2	0
Total						20

B.TECH (AIML) III YEAR II SEM (5 T + 2 P + 1 M)

S.No	Category	Course Name	Hours per week			Credits
			L	T	P	
1	PCC	Automata Theory and Applications	3	1	0	4
2	PCC	Web Data Mining	3	0	0	3
3	PCC	Computer Vision and Image Processing	3	0	0	3
4	PEC-1	1. R Programming 2. Mobile Application Development 3. Internet of Things 4. Unified Modeling Language	2	0	0	2
5	PEC-II	1. Distributed Systems 2. Evolutionary Computing 3. Cryptography 4. Fundamentals of Image Data Mining	3	0	0	3
6	HSS&MC	Verbal Ability and Critical Reasoning	0	0	3	1.5
7	PCC Lab	Computer Vision and Web Data Mining Lab	0	0	4	2
8	PEC-1-Lab	1. R Programming Lab 2. Mobile Application Development Lab 3. Internet of Things Lab 4. Unified Modeling Language Lab	0	0	3	1.5
Total						20

B.TECH (AIML) IV YEAR I SEM (5 T +2 L) + Mini project

S.No	Category	Course Name	Hours per week			Credits
			L	T	P	
1	PCC	Natural Language Processing	3	0	0	3
2	PCC	Deep Learning	3	1	0	4
3	PEC-III	1. Big Data 2. Information Security 3. Computational Biology 4. Optimization	3	1	0	4
4	PEC - IV	1. Reinforcement Learning & Game Theory 2. Blockchain Technology 3. Cloud Computing 4. Introduction to Robotics	3	0	0	3
5	PEC-V	1. Applications of AI in GIS & Remote Sensing 2. Applications of AI in Healthcare 3. Applications of AI in Banking 4. Applications of AI in e-Governance	3	0	0	3
6	PCC Lab	Deep Learning and Natural Language Processing Lab	0	0	3	1.5
7	PEC-III LAB	1. Big Data Lab 2. Information Security Lab 3. Computational Biology Lab 4. Optimization Lab	0	0	3	1.5
8	PROJ	Mini Project	0	0	4	2
Total						**22**

B.TECH (AIML) IV YEAR II SEM (2 T + 3 L/P)

S.No	Category	Course Name	Hours per week			Credits
			L	T	P	
1	OEC-II	1. Technical and Business Communication Skills 2. Language and life skills/ Digital media literacy 3. Managerial Economics and Financial Analysis	3	0	0	3
2	OEC-III	1. Negotiation Skills 2. Project Management 3. Value Engineering	3	0	0	3
3	PROJ	Seminar	0	0	4	2
4	PROJ	Comprehensive Viva-Voce	0	0	0	2
5	PROJ	Project	0	0	15	10
		Total				**20**

Appendix C

Program Structure and Syllabus

B. Tech (Artificial Intelligence)
III Year (I & II Semesters)

R20 Regulations

Department of Artificial Intelligence

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.),
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BTech (AI) III YEAR I SEMESTER [4 T + 4 P + 1 M]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PCC	Essentials of Machine Learning	3	1	0	4
2		PCC	Computer Systems II	3	1	0	4
3		PCC	Web Programming with MEAN	3	0	0	3
4		OEC-I	1. Business Data Storytelling 2. Entrepreneurship Development 3. Intellectual Property Rights	3 2 2	0 1 1	0 0 0	3
5		PCC-Lab	Computer Systems Lab	0	0	3	1.5
6		PCC-Lab	Web Programming with MEAN Lab	0	0	3	1.5
7		PCC-Lab	Essentials of Machine Learning Lab	0	0	3	1.5
8		BSC-Lab	Quantitative Aptitude and Reasoning	0	0	3	1.5
9		MC	NSO/NSS	0	0	2	0
			TOTAL	**12**	**3**	**14**	**20**

BTech (AI) III YEAR II SEMESTER [5 T + 2 P + 1 M]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PCC	Automata Theory and Applications	3	1	0	4
2		PCC	Information Retrieval Systems	3	0	0	3
3		PCC	Computer Vision and Image Processing	3	0	0	3
4		PEC-I	5. R Programming 6. Mobile Application Development 7. Internet of Things 8. Unified Modeling Language	2	0	0	2
5		PEC-II	5. Distributed Systems 6. Evolutionary Computing 7. Cryptography 8. Fundamentals of Image Data Mining	3	0	0	3
6		HSS&MC	Verbal Ability and Critical Reasoning	0	0	3	1.5
7		PCC Lab	Computer Vision and Information Retrieval Systems Lab	0	0	4	2
8		PEC-I Lab	5. R Programming Lab 6. Mobile Application Development Lab 7. Internet of Things Lab 8. Unified Modeling Language Lab	0	0	3	1.5
			TOTAL	14	1	10	20

*** L – Lecture, T – Tutorial, P - Practical**

ESSENTIALS OF MACHINE LEARNING

BTech (AI) III Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

1. Understand the basic concepts of feature engineering and machine learning systems
2. Apply and evaluate supervised machine learning algorithms for classification and regression tasks
3. Apply and evaluate unsupervised learning algorithms for clustering tasks.
4. Understand the Bayesian and Ensemble learning, apply and evaluate different types of these algorithms for better prediction.
5. Understand and Design Artificial Neural Networks computational model

Course Outcomes

At the end of this course, students will be able to:

1. Understand the essentials of feature engineering, state-of-art tools and concepts of machine learning
2. Design and evaluate different types of supervised learning algorithms for classification and regression tasks
3. Design and evaluate different types of unsupervised learning algorithms for clustering tasks
4. Design and evaluate strong learners for better real time prediction such as Bayesian and ensemble learning algorithms
5. Design Artificial neural networks computational model

UNIT-I

Machine Learning: Definition and Applications, Types of Machine Learning Models - Supervised, Unsupervised, Reinforcement learning, Challenges of Machine Learning, State-of-art Languages and Tools in Machine Learning, Preparing to Model - Model Representation - Overfitting and Underfitting, Bias–variance trade-off

Feature Engineering: Feature Transformation, Feature Extraction and Feature Selection Process

UNIT-II

Supervised Learning: Applications - Regression and Classification Tasks, Evaluating performance of regression and classification models, Regression Algorithms - Simple Linear Regression and Multiple Linear Regression, Classification Algorithms - Logistic Regression, k-Nearest Neighbor, Decision Tree

UNIT-III

Unsupervised Learning: Applications of Unsupervised Learning, Different types of Clustering techniques, K-Means Clustering, K-medoids, Agglomerative Hierarchical Clustering, Evaluating performance of clustering models.

UNIT-IV

Bayesian Learning: Bayesian Belief Networks, MAP hypothesis, Bayes Optimal Classifier, Gibbs Classifier, Naïve Bayes Classifier

Ensemble Learning: Bootstrap Aggregation (Bagging) - Random Forest, Boosting - AdaBoost and Gradient Boost.

UNIT-V

Artificial Neural Networks: Understanding the Biological Neuron, Exploring the Artificial Neuron, Types of Activation Functions, Early Implementations of ANN, and Architectures of Neural Network- Feed forward network and Recurrent network, Back propagation algorithm

Text Books

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, *Machine Learning*, 2019, Pearson
2. Tom M. Mitchell, —*Machine Learning*, McGraw-Hill Education (India) Private Limited, 2013

References

1 Andreas C. Müller, Sarah Guido, *Introduction to Machine Learning with Python*, O'Reilly Media, Inc, October 2016

2 Ethem Alpaydin — *Introduction to Machine Learning (Adaptive Computation and Machine Learning)*, The MIT Press 2004

3 Aurélien Géron, *Hands on Machine Learning with Scikit-Learn, Keras, and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems*, O'Reilly Media, Inc 2019

COMPUTER SYSTEMS II

BTech (AI) III Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

1 Understand the structure and functions of OS.
2 Learn about Processes, Threads and Scheduling algorithms and understand the principles of concurrency and Deadlocks.
3 Learn various memory management schemes
4 To understand the protocol layering and physical level communication.
5 To analyze the performance of a network.

Course Outcomes

At the end of this course, students will be able to:

1 Analyze various scheduling algorithms.
2 Understand deadlock, prevention and avoidance algorithms.
3 Compare and contrast various memory management schemes
4 Understand the basic layers and its functions in computer networks.
5 Evaluate the performance of a network

UNIT-I

Operating System Overview: Introduction, Barebones Computer System, Operating System Concept, Services and Facilities, Organization, Types of Computer Systems, Purpose of User Interface, Types of User Interface

UNIT-II

File Management: Introduction, Logical and Physical view of files, Role of file management system, Logical file access methods, Physical File storage, Directory Structure, Network File Access, File Protection

UNIT-III

Processor and Memory Management: Introduction, OS Requirements, Bootstrap, Process and Threads, Basic loading and execution operation, CPU Scheduling and Dispatching, Memory Management, Virtual Storage, Secondary storage scheduling, Network OS services, OS issues

UNIT-IV

Networks and Data Communication: Introduction, View of Data Communication, Data Communication Concepts, Network Topology, Types of Networks, Network Interconnection, Standards

UNIT-V

Ethernet and TCP/IP Networking: Introduction, TCP/IP, OSI and other Communication Protocol models, Physical and Data Link Layer, Network Layer, Transport Layer, IP Addresses, Domain Names and DNS Services, Quality of Service, Network Security, Alternative Protocols

Text Book

1. Irv Englander, *The Architecture of Computer Hardware, Software and Networking, An Information Technology Approach* , 5th Edition, Wiley Publication

References

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, *Operating System Concepts*, 10th Edition, John Wiley and Sons Inc., 2018.
2. Behrouz A. Forouzan, *Data Communications and Networking*, Fifth Edition TMH, 2013.
3. James F. Kurose, Keith W. Ross, *Computer Networking, A Top-Down Approach Featuring the Internet*, Sixth Edition, Pearson Education, 2013.

WEB PROGRAMMING WITH MEAN

BTech (AI) III Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To introduce Node.js for web server platform
2. To introduce Express for the framework
3. To introduce MongoDB for the Database
4. To introduce Mongoose for data modeling
5. To introduce Angular for front-end framework

Course Outcomes

At the end of this course, students will be able to:

1. Gain knowledge on client side scripting
2. understand server side scripting
3. understand MongoDB and create Database
4. understand Express frame work
5. create multi-tier architecture web application

UNIT-I

Architecture of WWW, HTTP, HTTPS, 2-Tier and multi-Tier web application architectures.

Introducing full-stack development

Introduction to the full-stack, history of web development, Introduction to MEAN stack. Node.js, Express, MongoDB and Angular, supporting cast

Designing a MEAN Stack Architecture

Common MEAN stack architecture, Beyond SPAs, Designing flexible MEAN architecture, planning a real application, breaking the development into stages, hardware architecture

UNIT-II

Building a Node Web Application

Creating and setting up a MEAN project: Creating an Express project, modifying Express for MVC, Importing Bootstrap for quick, responsive layouts, making it live on Heroku

Building a static site with Node and Express: Defining the routes in Express, building basic controllers, creating some views, adding the rest of the views, taking the data out of the views and making them smarter

UNIT-III

Building a data model with MongoDB and Mongoose: Connecting the Express application to MongoDB by using Mongoose, Benefits of modeling the data, defining simple mongoose schemas, using the MongoDB shell to create a MongoDB database and add data, getting database live

Writing a REST API: Exposing the MongoDB database to the application: The rules of a REST API, setting up the API in Express, GET methods: Reading data from MongoDB, POST methods: Adding data to MongoDB, PUT methods: Updating data in MongoDB, DELETE method: Deleting data from MongoDB

UNIT-IV

Adding Dynamic Front End with Angular

Creating an Angular application with Typescript: getting up and running with Angular, working with angular components, getting data from an API, putting and Angular application into production

Building a single-page application with Angular: Foundations: Adding navigation in an Angular SPA, building a modular app using multiple nested components, adding geo-location to find places near you, and safely binding HTML content.

UNIT-V

Managing Authentication and User Sessions

Using an authentication API in Angular applications: Creating an Angular authentication service, creating the Register and Login pages, working with authentication in the Angular app.

Text Book

1. Simon Holmes, Clive Harber, *Getting MEAN with Mongo, Express, Angular and Node*, Second Edition, Manning Publications Co., 2019

References

1. Adam Bretz & Colin J. Ihrig *Full Stack Javascript Development With Mean*
2. Amos Q. Haviv, *MEAN Web Development*, Second Edition, Packt Publishing, 2016

BUSINESS DATA STORYTELLING

BTech (AI) III Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	OEC-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Introduction

This course will cover the fundamentals of effective data-driven storytelling. Story telling can put a human perspective on the increasingly complex and rapidly changing world of the digital era. Students will learn how to interpret and analyse the data and will learn to articulate the stories with data sets and communicate data findings in visual, oral, and written contexts.

Course Objectives

The students will be able to

1. develop the skills necessary to be effective data storytellers.
2. locate relevant datasets, extract insights from that data and present their findings in myriad formats.
3. learn how to interpret data and to present it in different formatsto different audiences.

Course Outcomes

After the completion of the course, the students will be able to

1. identify the stories within datasets and extract insights from that data.
2. explain the importance of communication skills and competencies for individuals who serve as data storytellers.
3. act as a data-driven visual storyteller for optimal presentation of trends, patterns, and insights.
4. make effective client presentations of their work using infographic visualizations.
5. learn tools and concepts which can be put to immediate use to transform data into stories.

UNIT-I

Introduction: We are all storytellers- Stories Bring Data to Life- The Essence of Data Storytelling

UNIT-II

Dynamics of Data Storytelling: Getting to the Core- Planning is Everything- The Quick Fix- Application of Story elements

UNIT-III

Crafting the Data Story: The Psychology of Storytelling- The narrative Techniques - Making Good stories Great! – Writer to Storyteller

UNIT-IV

Data Visualization: Use Visuals to Advantage: Data Presentation Skills- Infographics Visualizations

UNIT-V

Anatomy of Data Story: Rudiments of Grammar - Parts of Speech - Concord Rules - Academic and Technical Vocabulary - Data Interpretation - Case Studies

Text Book

1. Vora , Sejal (2019).*The Power of Data Storytelling*, Sage Publications India pvt Ltd.

References

1. Dykes, Brent (2020). *Effective Data Storytelling*: New Jersey, Wiley.
2. Knaflic, Cole Nussbaumer (2015).*Storytelling with Data: A Data Visualization Guide for Business Professionals,*https://www.amazon.com/Storytelling-Data-Visualization-Business-Professionals/dp/1119002257/
3. Morrow, Jordon (2021), *Be Data Literate- The Data Literacy Skills Everyone Needs to Succeed*, UK: Kogan Page Ltd.
4. Taylor, Scott (2021). *Telling your Data Story: Data storytelling for Time Management*, New Jersey: Technics Publications LLC.
5. https://www.amazon.com/Tableau-Your-Data-Analysis-Software/dp/1119001196/

ENTREPRENEURSHIP DEVELOPMENT

BTech (AI) III Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	OEC-I	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

The objective of this course is to familiarize the student with entrepreneurship, the issues involved in it, the potential of entrepreneurship and intrapreneurship, the legal environment and statutory issues and explore various funding opportunities.

Course Outcomes

After the completion of the course, the students will be able to,

1. Interpret the concepts of Entrepreneurship and Intrapreneurship.
2. Apply the opportunity identification techniques
3. Differentiate needs of different segments and their
4. Develop business model and MVP
5. Recognize organizational forms, IPR concerns and funding opportunities for startups.

UNIT-I

Introduction to Entrepreneurship: Entrepreneurship and Intrapreneurship, Business Incubators, Rural entrepreneurship, Social Entrepreneurship, women entrepreneurs, Role of entrepreneurs in economic development, Types of entrepreneurs. Entrepreneurial mind set and stress, Causes of failure.

UNIT-II

Opportunity identification: Myths and realities of entrepreneurship, Opportunity identification, Problem worth solving, idea generation techniques, Design thinking.

UNIT-III

Customer analysis: Market segmentation, consumer persona, Product market fit, Unique Value proposition.

UNIT-IV

Business model and MVP: Business model canvas, MVP, Risks and assumptions, Importance of financial planning.

UNIT-V

Organizational forms Funding Opportunities: Organizational forms - Partnership, Sole proprietorship, Corporation. Intellectual Property Rights- Copyrights, Trademarks, Patents. Law Vs. Ethics, Informal capital- Friends and Family, Angels, Venture Capitalists, Idea/ Patent, Growth strategies

Text Books

1. Vasant Desai, YayatiNayak, *Entrerpreneurship*, Himalaya Publishing House,2018
2. D.F.Kuratko and T.V.Rao *Entrepreneurship- Cengage Learning*,2012

References

1. Rajeev Roy, *Entrepreneurship*, Oxford University Press, 2/e, 2012
2. Dhruv Nath, Sushanto Mitra, *Funding Your Startup: And Other Nightmares*, 2020
3. V Srinivasa Rao, *Lean Digital Thinking: Digitalizing Businesses in a New World Order*, Bloomsbury India, 2021
4. S.K.Mohanty, *Fundamentals of Entrepreneurship*, PHI, 1/e,2005
5. MOOCS by Wadhwani Foundation

INTELLECTUAL PROPERTY RIGHTS

BTech (AI) III Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	OEC-I	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

The course aims to help the student understand the concept of Intellectual Property Rights and helps the student to appreciate the purpose and function of a trademark and the process involved in getting copyright, patent and related issues. The student is introduced to the importance of trade Secret and Geographical Indications.

Course Outcomes

At the end of this course, students will be able to:

1. Explain the concepts of intellectual property rights and related agencies.
2. Describe the purpose and functions of a trademark in a competitive environment.
3. Analyze the process of copyright and procedure.
4. Understand the process of patent and patent issues.
5. Explore the trade secret and geographical indications of its protection from unfair practices.

UNIT-I

Introduction to IPR: Concept of intellectual property rights, importance of intellectual property rights. Types of intellectual property, international agencies, and treaties.

UNIT-II

Trademarks: Concept of trademarks, purpose, and function of trademarks. Acquisition of trademark rights, protectable matter, selecting and evaluating trademark, trademark registration processes.

UNIT-III

Law of copyrights: Concept of copyright right, fundamentals of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration.

UNIT-IV

Law of patents: Introduction to patent, foundation of patent law, patent searching process, ownership rights and transfer.

UNIT-V

Trade Secrets & Geographical Indication: Law pertaining to trade secrets, determination of trade secrets. Trade secret litigation. Unfair competitions. Geographical Indication, concept of geographical indication, importance of geographical indication, new development of intellectual property rights.

Text Book

1. Deborah. E. Bouchoux, *Intellectual property right,* 5/e, 2018, cengage learning.
2. Neeraj Pandey, *Intellectual property right*, PHI, 2019.

References

1. Ramakrishna Chintakunta and M. Geethavani, Kindle e 2021
2. Prabuddha Ganguli, *Intellectual Property Right: Unleashing the Knowledge Economy*, 2/e, 2017 Tata Mc Graw Hill Publishing company Ltd.

COMPUTER SYSTEMS LAB

BTech (AI) III Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC-Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

List of Programs

1. Program for
   a. Simulating CPU scheduling algorithms (Round Robin, Priority, FCFS, SJF)
   b. using system calls: fork, exit
2. Program for implementing the following problem using shared memory and semaphores
   a. Producer-Consumer problem
   b. Readers-writers problem
   c. Dining philosopher problem
3. Program using multithreading (pthreads)
4. Create a client-server application using any programming language
5. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool
6. Configuring network chord, switch and router
7. Usage of packet tracer software

WEB PROGRAMMING WITH MEAN LAB

BTech (AI) III Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC-Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

The following tasks have to be performed week wise

Week 1:
Identification of the problem

Week 2:
a. Requirement specification
b. Architecture design

Week 3, 4 & 5:
Development of the front end.

Week 6, 7 & 8:
Development of backend

Week 9, 10 & 11:
Creation of Database

Week 12:
Integration and Testing

Week 13:
Presentation

Week 14:
Documentation and Submission

ESSENTIALS OF MACHINE LEARNING LAB

BTech (AI) III Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC-Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Objectives

1. Installation of Python and libraries, and implement feature engineering
2. Apply and evaluate supervised machine learning algorithms for classification and regression tasks
3. Apply and evaluate unsupervised learning algorithms for clustering tasks.
4. Understand the Bayesian and Ensemble learning, apply and evaluate different type of these algorithms for better prediction.
5. Understand and Design Artificial Neural Networks computational model

Course Outcomes

1. Knowledge of Installation of Python libraries, and implement feature engineering
2. Design and evaluate different types of supervised learning algorithms for classification and regression tasks
3. Design and evaluate different types of unsupervised learning algorithms for clustering tasks
4. Design and evaluate strong learners for better real time prediction such as Bayesian and ensemble learning algorithms
5. Design Artificial neural networks computational model

Week 1

Get familiar with Python, NumPy and Pandas

Week 2

Perform Feature Engineering for a given dataset

Week 3

Implement linear and multiple regression algorithms on a given dataset

Week 4

Implement Binary Classification using ID3 Decision Tree Algorithm- Medical Application Domain - Diabetes Dataset or any standard dataset

Week 5

Implement logistic regression algorithm for stock prices prediction

Week 6

Write a program to implement k-Nearest Neighbor algorithm to classify the iris dataset. Print both correct and wrong predictions

Week 7

Implementation of decision tree based ID3 algorithm and use an appropriate dataset

Week 8

Implement K- means clustering algorithm for identifying cancerous data

Week 9

Implementation of Agglomerative Clustering algorithm to cluster a set of data stored in a CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering

Week 10

Implementation of naïve Bayesian classifier for a sample training data set stored as a CSV file. Compute the accuracy of the classifier, considering few test data sets

Week 11

Implementation of Boosting-Ada Boost and Gradient Boost to convert weak learner to strong learners

Week 12

Develop a predictive model for predicting house prices using random forest Artificial Neural Network (ANN) for Diabetes Classification

Week 13

Perform Data Analysis - Data Cleaning, Feature Engineering, Data Visualization and Binary Classification for Census Income Dataset

Week 14

Project: Employ all the classification algorithms for Diabetes dataset, IRIS dataset and any dataset of your choice report the best result for each dataset.

Week 15

Project: Employ all the regression algorithms for house sales prediction dataset, of any dataset of your choice. Report the best result.

Week 16

Project: Employ all the clustering algorithms for an appropriate dataset of your choice. Report the best result.

NOTE: Datasets for the above exercises available in Kaggle and UCI repository mentioned below

1. https://www.kaggle.com
2. http://archive.ics.uci.edu/ml/datasets.html

QUANTITATIVE APTITUDE AND REASONING

BTech (AI) III Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	BSC-Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

UNIT-I

Number System: Speed Math's, Numbers, Factors, Prime and co-primes, LCM & HCF, Divisibility rules, Finding the unit digit and applications, remainder theory.

Ratio and Proportion with Ages: Definition of ratio and Proportion, Finding the resultant ratio. Problems based on Ratios and ages.

Percentages: Introduction to percentages, Percentage Increase /Decrease, Results on Population, Results on Depreciation, Variations, Applications of Percentage

Profit and Loss: Classification of Profit and Loss, Profit/ Loss Percentages, Successive Discount.

UNIT-II

Time and Distance: Difference between the average, Relative and Effective speed, reaching the destination late and early, stoppage time per hour, problems based on Trains and problems based on Boats.

Time and Work: Calculating Efficiency, alternate days concept, work and wages, Chain rule, problems based on Pipes and cisterns.

Simple and Compound Interest: Simple interest, Principle, Rate, Amount, Applications of Simple interest, Compound interest, Compounded annually, Compounded Half yearly, Compounded Quarterly, Difference between simple and compound interest

UNIT-III

Permutations and Combinations: Fundamental rules, Problems on Permutations and Combinations

Probability: Definition, Notations and Problems based on Probability.

Mean, Median and Mode: Introduction and problems on mean, median and mode

Partnership: Relation between Partners, Period of Investments and Shares

Averages: Average of different groups, change in average by adding, deleting and replacement of objects

Flow Chart: Introduction of symbols and problems on flow charts.

UNIT-IV

Seating Arrangement: Circular, Row, Column, Square and Double row arrangement

Puzzles: Paragraph, incomplete puzzles and problems on them.

Number Series: Number, Alphabet and Letter Series.
Analogy: Simple, Double, Word and Number Analogy
Coding and Decoding: Classifications and Problems on Coding and Decoding.

UNIT-V

Clocks: Relation between minute and hour hand, angle between hands of a clock, exceptional cases in clocks. Gaining and loosing of time.
Calendars: Classification of years, finding the day of any random calendar date, repetition of calendar years.
Direction Sense Test: Sort of directions in puzzle distance between two points, Problems on shadows.
Blood Relations: Defining the various relations among the members of a family, Solving blood relation puzzles by using symbols and notations. Problems on coded relations.

Text Book

3. R.S Agarwal, *Verbal and Non Verbal Reasoning* –New Edition -2020, S. Chand.
4. R.S Agarwal, *Quantitative Aptitude* –New Edition- 2020, S. Chand.

References

5. Abhijeet Guha, *Quantitative Aptitude*: New Edition-2020, Mc Graw Hill.

NATIONAL SPORTS ORGANIZATION (NSO) / NATIONAL SERVICE SCHEME (NSS)

BTech (AI) III Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	MC	L	T	P	C	CIE	SEE	Total
		0	0	2	0	0	100	100

UNIT-I

Health and Wellness

Dimensions of Health: Physical, Mental and Social. Objectives of Health Education. Definition and Dimensions of Wellness – Physical, Emotional, Social, Spiritual, Intellectual and Environmental Wellness. Achieving Wellness.

Practical: Basketball, Cricket, Kho-Kho (Any Two) & Badminton (Mandatory)
Layout of Courts / Fields, Skills, Rules & Lead-up Games.

UNIT-II

Fitness and Body Composition

Physical Fitness Components: Body Composition, Muscular Endurance, Strength, Cardiovascular Fitness and Flexibility, Importance of Cardio-Respiratory Endurance. Obesity and Health Risk Factors. Body Composition Indicators and Measurements.

Practical: Football, Kabaddi, Volleyball (Any Two) & Table Tennis (Mandatory)
Layout of Courts / Fields, Skills, Rules & Lead-up Games.

UNIT-III

Introduction and Basic Concepts of NSS: History, Philosophy, Aims & Objectives of NSS. Emblem, Flag, Motto, Song, Badge, Organizational Structure, Roles and Responsibilities of Various NSS functionaries. NSS Programmes and Activities, Volunteerism and Shramdan.

UNIT-IV

Personality Development Through Community Service: Importance and Role of Youth Leadership, Life Competencies, Social Harmony and National Integration, Youth Development Programmes in India, Citizenship, Health, Hygiene and Sanitation, Environment Issues, Disaster Management, Life Skills.

UNIT-V

Vocational And Entrepreneurship Skills Development: Definition and meaning of Entrepreneurship, Qualities of good entrepreneur, Steps /ways in operating an Enterprise and role of financial and support service Institutions. Project Cycle Management, Resource Mobilisation and Documentation and Reporting.

Project work/ Practical: Conducting Surveys on Special Theme, Involving in Shramadan, Swachh Bharat, Blood Donation, Tree Plantation, Awareness Programmes, Identify the Community Problems and List out the all Possible Solutions, Educate the Villagers on Health, Hygiene, Sanitation and Environment Protection. Self-Review of the Students on their Improvements by Participating in the Community Service Programmes.

References

1. Rajiv Parti, *The Soul of Wellness: 12 holistic principles for achieving a healthy body, mind, heart and spirit*, Select book incorporation, New York.
2. H. & Walter, H., (1976). *Turners School Health Education*. Saint Louis: The C.Y. Mosby Company.
3. Nemir, A. (n.d.). *The School Health Education*. New York: Harber and Brothers.
4. Edward T Howley, *Health Fitness Instructors Handbook*, Human Kinetics, USA.
5. **About NSS:** National Service Scheme Manual by Government of India Ministry of Youth Affairs & Sports, New Delhi.
6. Robert N Lussier, *Management Fundamentals - Concepts, Applications, Skill Development*, Cengage Leaning, First Edition, 2012.
7. Mroczex & Little, *Handbook of Personality Development* –(eds).2006.
8. Richard Blundel, *Exploring Entrepreneurship Practices and Perspectives*, Oxford, 2011.

AUTOMATA THEORY AND APPLICATIONS

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

1. Introduce concepts in automata theory
2. Identify different formal language classes and their relationships
3. Design grammars and recognizers for different formal languages
4. Identify undecidable problems
5. Introduce various applications of Automata Theory

Course Outcomes

At the end of this course, students will be able to:

1. Understand the core concepts in automata theory and formal languages
2. Design of NFA and DFA for a given Regular Language
3. Design of PDA for the given CFG
4. Design Turing Machine to solve computing Problems
5. Understand the role of Automata theory in different Applications like Compiler, Natural Language Processing and Artificial Intelligence

UNIT-I

Language Fundamental: Strings, Languages, Language Recognition, A machine based hierarchy of language classes, A Tractability hierarchy of language classes.

Finite State Machine: Deterministic Finite State Machine, the Regular Languages, Designing Deterministic and Nondeterministic Finite State Machine, Simulators for FSMs, Minimizing FSMs.

UNIT-II

Regular Expressions and Regular Grammars: Regular Expression, Kleene Theorem, Applications of Regular Expressions, Regular Grammar, Regular Grammar and Regular Languages.

Regular and Non-regular Languages: Classifications of Regular Languages, Showing that Languages is Regular, Closure Properties of Regular Languages, Showing that Languages is not Regular.

UNIT-III

Context Free Grammars: Rewrite systems and Grammar, Context Free Grammars and Languages, Designing and Simplifying Context Free Grammar, Derivations and Parse Trees, Ambiguity.

Normal Forms: Normal Forms for Grammar, Converting to a Normal Form, Converting to Chomsky Normal Form and Greibach Normal Forms

UNIT-IV

Pushdown Automata: Definition of (Nondeterministic) PDA, Deterministic and Nondeterministic PDAs, Equivalence of CFGs and PDAs, Nondeterminism and Halting.

Turing Machines: Definition, Notation, computing with Turing Machine, Adding Multiple Tapes and Nondeterministic, Simulating a "Real" Computer

UNIT-V

Unrestricted Grammars: Definition, Equivalence of Unrestricted Grammars and Turing Machines, Grammars Compute Functions, Undecidable Problems about Unrestricted Grammars.

Compilers: Defining Syntax of Programming Languages, Context Free Grammar and Programming Languages, Designing Programming Languages and Their Grammar, Compilers for Programming Languages

Text Book

1. Elaine A. Rich, *Automata, Computability and Complexity: Theory and Applications*, Pearson Education, Inc.

References

1. John E.Hopcroft, Rajeev Motwani, Jeffrey D.Ullman, *Introduction to Automata Theory, Languages and Computation*, Third Edition, Pearson, 2013.
2. Daniel I.A.Cohen, *Introduction to Computer Theory*, Second Edition, John Wiley.
3. Vivek Kulakarni, *Theory of Computation*, Oxford University press 2013, Second Edition, 2014

INFORMATION RETRIEVAL SYSTEMS

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisite:

Data structures and algorithms, linear algebra, probability theory

Course Objectives

1. To understand indexing and querying in information retrieval systems
2. To learn the different models for information retrieval
3. To expose the students to text classification and clustering
4. To learn about web searching

Course Outcomes

At the end of the course the student will be able to:

1. understand basic issues in Boolean information retrieval
2. construct and compress indices and build a Vector Space Model using term weighing
3. assess similarity, evaluate the performance and improvise queries using relevance feedback
4. understand the basic language model, classify and cluster texts
5. understand web search, web crawling and web page ranking

UNIT-I

Boolean retrieval: An example information, Building an inverted index, Processing Boolean queries, The extended Boolean model versus ranked retrieval.

The term vocabulary and postings lists: Document delineation and character sequence decoding, Determining the vocabulary of terms, Faster postings list intersection via skip pointers, Positional postings and phrase queries.

Dictionaries and tolerant retrieval: Search structures for dictionaries, Wildcard queries, spelling correction.

UNIT-II

Index construction: Hardware basics, Blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, Dynamic indexing, Other types of indexes.

Index compression: Statistical properties of terms in information retrieval, Dictionary compression, Postings file compression.

Scoring, term weighting and the vector space model: Parametric and zone indexes, Term frequency and weighting, The vector space model for scoring, Variant tf-idf functions.

UNIT-III

Computing scores in a complete search system: Efficient scoring and ranking, Components of an information retrieval system, Vector space scoring and query operator interaction.

Evaluation in information retrieval: Information retrieval system evaluation, Standard test collections, Evaluation of unranked retrieval sets, Evaluation of ranked retrieval results, Assessing relevance.

Relevance feedback and query expansion: Relevance feedback and pseudo relevance feedback, Global methods for query reformulation.

UNIT-IV

Language models for information retrieval: Language models, Using query likelihood models in IR.

Text classification and Naive Bayes: The text classification problem, Naive Bayes text classification, The Bernoulli model

Support Vector Machines and Machine Learning on Documents: The Linearly Separable Case, Non-Linear support vector machines

Hierarchical clustering: Hierarchical agglomerative clustering, Single-link and complete-link clustering, Group-average agglomerative clustering, Centroid clustering, Divisive clustering.

UNIT-V

Web search basics: Background and history, Web characteristics, The search user experience, Index size and estimation, Near-duplicates and shingling.

Web crawling and indexes: Overview, Crawling, Distributing indexes, Connectivity servers.

Link analysis: The Web as a graph, PageRank, Hubs and Authorities.

Text Book

1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, *An Introduction to Information Retrieval*, Cambridge University Press, Cambridge, England, 2008

References

1. David A. Grossman, Ophir Frieder, *Information Retrieval – Algorithms and Heuristics*, Springer, 2nd Edition (Distributed by Universities Press), 2004.
2. ChengXiang Zhai, Sean Massung, *Text Data Management and Analysis: A Practical Introduction to Information Retrieval and Text Mining*, Association for Computing Machinery and Morgan & Claypool Publishers, 2016
3. Michael McCandless, Erik Hatcher, and Otis Gospodneti, *Lucene in Action*, Manning Publication, 2010.

COMPUTER VISION AND IMAGE PROCESSING

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. Analyze general terminology of digital image processing.
2. Understand the image noise models and enhancement methods.
3. Evaluate the image segmentation methodologies.
4. Understand the image compression and color image processing techniques.
5. Apply image processing algorithms in practical applications.

Course Outcomes

At the end of this course, students will be able to:

1. Understand the fundamental concepts of digital image processing systems.
2. Understand the image noise models and enhancement techniques
3. Comprehension of different image segmentation and restoration methodologies
4. Analyze the concepts of image compression and color image processing.
5. Acquire the knowledge of morphological operations and image processing related areas.

UNIT-I

Introduction to Computer Vision and Basic Concepts of Image Formation: Introduction and Goals of Computer Vision and Image Processing, Image Formation Concepts.

Fundamental Concepts of Image Formation: Radiometry, Geometric Transformations, Geometric Camera Models. Fundamental steps in image processing, image processing applications

UNIT-II

Digital Image Processing Operations: Basic relationships and distance metrics, Classification of image processing operations- Arithmetic operations, Logical operations.

Image Enhancement: Image quality and need for image enhancement, image enhancement point operations-piecewise linear functions, Histogram based techniques, Spatial filtering concepts.

UNIT-III

Image Restoration: Categories of image degradations- noise modeling, image restoration in the presence of noise only- Mean filters, order statistics filters.

Image Segmentation: Detection of discontinuities, types of edge detectors, First-order edge detection operators, and second-order derivatives filters.

UNIT-IV

Image Compression: Compression model, Lossless and Lossy Compression and Coding techniques for image compression.

Color Image Processing: Introduction, color monitors, color image storage -and processing, color models-RGB Colour Model, HSI Colour Models, HSV Colour Model, HLS Colour Models, TV Color Models.

UNIT-V

Image Morphology: Need for morphological processing, morphological operators, Hit-or-Miss transform, Basic morphological algorithms, and Gray-scale morphology.

Image Descriptors and Features: Texture Descriptors, Colour Features, Object Boundary and Shape Representations

Text Books

1. S. Sridhar, *Digital Image Processing*, Oxford University Press
2. D. and J. Ponce, *Computer Vision: A Modern Approach,* Prentice Hall, 2nd ed., 2015

References

1. Gonzalez R.C., Woods R.E, *Digital Image Processing,* 3rd Edition, Pearson, Prentice-Hall of India Pvt. Ltd. New Delhi.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, *Image Processing, Analysis and Machine Vision*
3. Anil K. Jain, *Fundamentals of Digital Image Processing,* Prentice- Hall of India Pvt. Ltd, New Delhi.

R PROGRAMMING

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Course Objectives

1. To make students exercise the fundamentals of statistical analysis in R environment.
2. To analyze data for the purpose of exploration using Descriptive and Inferential Statistics.

Course Outcomes

1. Demonstrate vector and matrix operations using R.
2. Apply various operators on data frames and list.
3. Write functions using iterative programming
4. Analyze the data using R
5. Describe linear and multiple regression models for time series data & web data

UNIT-I

Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types.

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector Subsetting.

Matrices: Creating and Naming Matrices, Matrix Subsetting.

Arrays, Class.

UNIT-II

Factors and Data Frames: Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, Subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.

Lists: Introduction, Creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors.

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

UNIT-III

Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List.

Functions in R: Introduction, Writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R, Cumulative Sums and Products, Calculus in R, Input and Output Operations.

UNIT-IV

Apply Family in R: Introduction, Using Apply in R, Using Lapply in R, Using Sapply, Using Tapply in R: Split Function, Using Mapply in R.

Charts and Graphs: Introduction, Pie Chart: Chart Legend, 3D Pie Chart, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.

UNIT-V

Data Interfaces: Introduction, CSV Files: Syntax, Importing a CSV File, Excel Files: Syntax, Importing an Excel file, Binary Files: Syntax, XML Files, Web Data, Databases.

Statistical Applications: Introduction, Basic Statistical Operations, Linear Regression Analysis, Chi-Squared Goodness of Fit Test, Chi-Squared Test of Independence, Multiple Regression, Time Series Analysis.

Text Book

1. K G Srinivas, G M Siddesh, *Statistical programming in R*, Oxford Publications.

References

1. Mark Gardener, *Beginning R: The Statistical Programming Language,* Wrox.
2. Y. Anchang Zhao, *R and Data Mining: Examples and Case Studies* Elsevier in December 2012.
3. Avril Coghlan, *A Little Book of R For Time Series*, Release 0.2.

MOBILE APPLICATION DEVELOPMENT

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Course Objectives

1. Outline the usage of Android development framework.
2. Understand the main components of an Android application and its entire life Cycle.
3. Develop database programming using SQLite.
4. Identify the use of location-based service in android applications.
5. Build SMS and MMS applications using Intents

Course Outcomes

At the end of this course, students will be able to:

1. Analyze the architecture of android and current trends in mobile operating systems.
2. Apply suitable software tools and APIs for the design of User Interfaces to a particular mobile application
3. Design applications for mobile devices using SQLite Database
4. Apply the location-based services in android applications.
5. Summarize the Monitoring changes to the phone, network, data connectivity and SIM states.

UNIT-I

Introduction to Android: Features of Android, The development framework: Understanding the Android Software Stack, Android Application Architecture; the Dalvik Virtual Machine, Creating First Android Application, Types of Android Applications, Android Development Tools: The Android Virtual Device Manager, Android Emulator, The Dalvik Debug Monitor Service.[TB1-chapter 1,2]

UNIT-II

Creating applications and Activities: Introduction to the application Manifest File, Using the Manifest Editor, Externalizing Resources: Creating Resources - Simple Values, Drawable, Layouts, Menus, Animations. The Android Activity Life cycle. **Building User Interfaces:** Fundamental Android UI design, Introducing Layouts: Defining Layouts, Using Layouts to Create Device Independent User Interfaces, Optimizing Layouts.[TB1-Chapter 3,4]

UNIT-III

Databases and Content Providers: Introduction to Android Databases, Introducing SQLite, Content Values and Cursors, working with SQLite Databases - Introducing the

SQLiteOpenHelper, querying a Database, Extracting Values from a Cursor, Adding, Updating, and Removing Rows, Creating Content Providers, Using Content Providers - Introducing the Content Resolver, Querying Content Providers, Adding, Deleting, and Updating Content.[TB1-chapter 8]

UNIT-IV

Maps and Location based services: Using the location-based services, selecting a Location Provider, selecting a Location provider, and finding current location;

Creating Map-Based Activities: Introducing Map View and Map Activity, Creating a Map-Based Activity, Maps and Fragments.[TB1-chapter 13]

UNIT-V

Telephony and SMS: Using telephony - Initiating Phone Calls, Accessing Telephony Properties and Phone State, Monitoring Changes in Phone State Using the Phone State Listener.

Introducing SMS and MMS: Using SMS and MMS in Your Application, Sending SMS and MMS from Your Application Using Intents, Sending SMS Messages Using the SMS Manager. [TB1-chapter 17]

Text Book

1. Reto Meier, *Professional Android 4 Application Development*, First Edition, Wrox Press, Wiley Publishing, 2014

References

1. Pradeep Kothari, *Android Application Development (with Kitkat Support), Black Book*, 2014, Dreamtech Press publisher, Kogent Learning Inc., 2014
2. Erik Hellman, *Android Programming: Pushing the Limits*, First Edition, Wiley Publications, 2014
3. Mike Wolfson, *Android Developer Tools Essentials,* O'Reilly Edition, First Edition, 2013

INTERNET OF THINGS

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Course Objectives

1. Differentiate Physical and Logical Design of IoT
2. Categorize pin configuration of Arduino Uno Board
3. Demonstrate Code in Node-RED
4. Identify communication between M2M
5. Develop an IoT Applications using Raspberry Pi board

Course Outcomes

At the end of this course students will be able to:

1. Identify physical and logical design of IoT
2. Understand Arduino Uno Board
3. Implement code in Node-RED
4. Develop an IoT Application using Arduino Uno board
5. Develop an IoT Applications using Raspberry Pi board

UNIT-I

Introduction to IoT: Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs.

Domain specific applications of IoT: Home automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and lifestyle.

UNIT-II

Arduino Basics: Hardware Requirements, Software Requirements, Arduino Programming Language References

Internet Connectivity: Arduino Uno Wired Connectivity (Ethernet), Arduino Uno Wireless Connectivity (Wifi)

UNIT-III

Communication Protocols: HTTP, MQTT (3 hours)(T2, Chapter3)

Complex Flows: Node-RED: Hardware and Software Required, Circuit, Node-RED Flow, code (Arduino)

UNIT-IV

Prototypes

IoT Patterns: Real-time Clients, Remote Control, On-Demand Clients, Web Apps, Location Aware, Machine to Human, Machine to Machine.

UNIT-V

Using IOT for RFID and MQTT and the Raspberry Pi: Introduction to Raspberry Pi, RFID Technology, IoTRFID Hardware and Software, Building an MQTT Server on a Raspberry Pi, the Software on the Raspberry Pi, Building the IOTRFID Project

Text Books

1. Arshdeep Bahga and Vijay Madisetti, *Internet of Things - A Hands-on Approach*, Universities Press, 2015
2. Adeel Javed, *Building Arduino Projects for the Internet of Things Experiments with Real-World Applications*, Apress, 2016
3. John C. Shovic , *Raspberry Pi IoT Projects, Prototyping Experiments for Makers*, Apress, 2016

References

1. Pethuru Raj and Anupama C. Raman, *The Internet of Things: Enabling Technologies, Platforms, and Use Cases*, (CRC Press)
2. Matt Richardson & Shawn Wallace, *Getting Started with Raspberry Pi*, O'Reilly (SPD), 2014
3. R.K.Mittal and I J Nagrath, *Robotics and Control*, TMH, 2003

UNIFIED MODELING LANGUAGE

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Course Objectives

1. The importance of modeling in the software development life cycle
2. The UML notation and symbols
3. The object-oriented approach to analyzing and designing systems and software solutions
4. How to Employ the UML notation to create effective and efficient system designs

Course Outcomes

At the end of this course, students will be able to:

1. Ability to abstract object-based views for generic software systems.
2. Ability to analyze and model software specifications.
3. Ability to abstract behavioral model software specifications.
4. Ability to deliver robust software components.
5. Ability to inculcate necessary skills to handle complexity in software design.

UNIT-I

Introduction to UML: Importance of modeling, Principles of modeling, Object oriented modeling, Conceptual model of the UML.

UNIT-II

Use cases, Use case diagrams

Basic Structural Modeling: Classes, Relationships, Modeling Techniques for Class diagrams.

Object Diagrams: Concepts, Modeling Techniques for Object diagrams.

UNIT-III

Advanced Structural Modeling: Advanced Classes, Advanced Relationships, Interfaces, Packages.

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

UNIT-IV

Basic Behavioral Modeling: Activity diagrams, Interaction diagrams, Sequence diagrams

UNIT-V

Advanced Behavioral Modeling: Collaboration diagrams, State chart diagrams

Case Study: The unified Chatbot Application

Text Books

1. Grady Booch, James Rumbaugh, Ivar Jacobson: *The Unified Modeling Language User Guide,* Pearson Education 2nd Edition.
2. Terry Quatrani, *Modeling with Rational Rose 2000 and UML /.Rose* 2000 ed.

References

1. Meilir Page-Jones, *Fundamentals of Object Oriented Design in UML*, Pearson Education.
2. Martina Seidl,Marion Scholz, Christian Huemer, Gerti Kappel, *UML @ Classroom: An Introduction to Object-Oriented Modeling*, Springer International Publishing
3. Atul Kahate, *Object Oriented Analysis & Design*, The McGraw-Hill Companies.
4. Mark Priestley, *Practical Object-Oriented Design with UML*, TMH.
5. Craig Larman, *Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process*, Pearson Education.

DISTRIBUTED SYSTEMS

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To acquire an understanding of the issues in distributed systems
2. To study architectures and working of distributed file systems
3. To expose the students to distributed transaction management, security issues and replication

Course Outcomes

At the end of this course, students will be able to:

1. Students would be able to describe the problems and challenges associated with principles of distributed systems.
2. Students will be able to evaluate the effectiveness and shortcomings of different solutions.
3. Students can implement small scale distributed systems and can actually learn the solutions by doing.

UNIT-I

Introduction: Goals and Types of Distributed Systems

Architectures: Architectural Styles, System Architectures, Architectures versus Middleware, and Self-Management in Distributed Systems.

Processes: Threads, Virtualization, Clients, Servers, and Code Migration.

Communication: Fundamentals, Remote Procedure Call, Message-Oriented Communication, Stream-Oriented Communication, and Multicast Communication.

UNIT-II

Naming: Names, Identifiers and Addresses, Flat Naming, Structured Naming, and Attribute-Based Naming.

Synchronization: Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning of Nodes, and Election Algorithms.

Consistency and Replication: Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Replica Management, and Consistency Protocols.

UNIT-III

Fault Tolerance: Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, and Recovery.

Distributed Object-Based Systems: Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

UNIT-IV

Distributed File Systems: Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

Distributed Web-Based Systems: Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

UNIT-V

Distributed Coordination-Based Systems: Introduction to Coordination Models, Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

Map-Reduce: Example, Scaling, programming model, Apache Hadoop, Amazon Elastic Map Reduce, Mapreduce.net, Pig and Hive.

Text Book

1. Andrew S. Tanenbaum and Maarten Van Steen, *Distributed Systems*, PHI 2nd Edition, 2009.

References

1. R.Hill, L.Hirsch, P.Lake, S.Moshiri, *Guide to Cloud Computing, Principles and Practice*, Springer, 2013.
2. R.Buyya, J.Borberg, A.Goscinski, *Cloud Computing-Principles and Paradigms*, Wiley 2013.

EVOLUTIONARY COMPUTING

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. About the basic concepts of evolution and the manner of operation of an evolutionary algorithm
2. About evolutionary strategies
3. About parameter control evolutionary algorithms and multi modal problems and spatial distribution
4. Optimize different types of functions. Will also be able to describe about schema theorem, statistical mechanics.
5. About constraint handling. Including interactive and non-stationary aspects.

Course Outcomes

At the end of this course, students will be able to:

1. Formulate solutions for problems involving evolutionary aspects
2. Perform fitness, mutation and recombination operations on chromosomes using a wide range of methods.
3. Perform classification with a wide range of data using genetic programming
4. Solve problems using Memetic algorithms and also decide on the appropriateness of Lamarckian and Baldwinian methods.
5. Solve Problems involving multiple objectives and constraints and demonstrate the special forms of evolution and working with evolutionary algorithms with examples

UNIT-I

Evolutionary Algorithms: Need for Evolutionary Computing, Basic Definition, Components of Evolutionary algorithms, Evolutionary Cycle, The Operation of an Evolutionary Algorithm, Natural Versus Artificial Evolution, Evolutionary Computing, Global Optimization and Other Search Algorithms

UNIT-II

Representation, Mutation, Recombination, Fitness and Selection: Binary Representation, Integer Representation, Real valued representation, Population Management Models, Parent Selection, Survivor selection, Selection Pressure

UNIT-III

Evolutionary Algorithm Variants: Genetic Algorithms, Evolution Strategies, Evolutionary Programming, Genetic Programming, Learning Classifier Systems, Differential Evolution, Particle Swarm Optimization

Parameter Control: Introduction, Examples of changing parameters, Classification of control techniques, Examples of varying EA parameters

UNIT-IV

Hybridization: Lamarckianism and the Baldwin Effect, Structure of a Memetic Algorithm, Adaptive Memetic Algorithms, Design Issues for Memetic Algorithms

Multiobjective Evolutionary Algorithms: Multiobjective Optimization, Dominance and Pareto Optimality, EA Approaches to Multiobjective Optimization Schema Theorem, Dynamical systems, Markov Chains, Penalty methods, Repair methods, Analysis, Some examples,, algorithms.

UNIT-V

Constraint Handling: Types, Approaches to Handling Constraints

Co-evolutionary Systems: Cooperative and Competitive Coevolution, Schema Theorem, Dynamical Systems, Markov Chain Analysis

Working with Evolutionary Algorithms: Performance measures, Test problems, Examples

Text Book

1. A.E. Eiben, J.E. Smith, *Introduction to Evolutionary Computing*, Natural Computing Series, Springer-Verilag, ISBN : 978, 3- 662-44873-1, 2nd Edition, 2015

References

1. Thomas Back, David B Fogel and Zbigniew Michalewicz, *Evolutionary Computation Basic Algorithms and Operators*, IOP Publishing Ltd, 2000
2. Goldberg and David E, *Genetic Algorithms in Search. Optimization and Machine Learning*, Pearson Education, New Delhi, 2006
3. Dan Simon, *Evolutionary Optimization Algorithms*, Wiley, 2013
4. Kalyamoy Deb, *Multiobjective Optimization using Evolutionary Algorithms*, John Wiley & Sons, First Edition, USA, 2003.
5. Koza, John, Wolfgang Banzhaf, Kumar Chellapilla, Kalyanmoy Deb, Marco Dorigo, David Fogel, Max Garzon, David Goldberg, Hitoshi Iba, and Rick Riolo(Eds.), *Genetic Programming*, Academic Press. Morgan Kaufmann, USA, 1998.

CRYPTOGRAPHY

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1 Summarize the concepts of cryptography and its applications.
2 Compare and analyze encryption Algorithms
3 Differentiate Authentication Functionalities of MAC and Hash
4 Analyze security aspects of various web Applications
5 Analyze different network protocols

References

At the end of this course, students will be able to:

1. Outline fundamentals of cryptography and its applications.
2. Differentiate Symmetric and Asymmetric Algorithms
3. Compare MAC and Hash Authentication Algorithms
4. Classify different network protocols.
5. Analyze security aspects of various web Applications

UNIT-I

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security

Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks. [TB1-chapter 1,2]

UNIT-II

Symmetric key Ciphers: Block Cipher principles, AES, Blowfish, Block cipher operation, Stream ciphers, RC4. [TB1-chapter 3,5,7]

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.[TB1-Chapter 9,10]

UNIT-III

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Digital Signature Scheme. [TB1-Chapter 11, 13]

Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure, protocol building blocks [TB1-Chapter 14, 15]

UNIT-IV

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer, Security, HTTPS, Secure Shell (SSH)-[TB1-Chapter 17]

Wireless Network Security: Wireless Security, Mobile Device Security, Wireless LAN, Wireless LAN Security [TB1-Chapter 18]

UNIT-V

E-Mail Security: Pretty Good Privacy, IP Security: IP Security overview, IP Security Architecture, Authentication Header, encapsulating security payload, combining security associations, Internet Key Exchange [TB1-Chapter 19]

Text Books

1. William Stallings, *Cryptography and Network Security - Principles and Practice,* Pearson Education, 6th Edition
2. Bruce schneier, *Applied Cryptography: Protocols, Algorithms, and Source Code in C*, Wiley, 2nd Edition

References

1. Forouzan Mukhopadhyay, *Cryptography and Network Security*, McGraw Hill, 3rd Edition
2. WM. Arthur Conklin, Greg White, *Principles of Computer Security,* TMH
3. Bernard Menezes, *Network Security and Cryptography*, Cengage Learning
4. C K Shyamala, N Harini, Dr T R Padmanabhan, *Cryptography and Network Security,* Wiley India, 1st Edition.

FUNDAMENTALS OF IMAGE DATA MINING

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. Describe the essential tools for image mining, such as Fourier transforms, Gabor filters, and contemporary wavelet transforms.
2. Review a varied range of state-of-the-art models, algorithms, and procedures for image mining.
3. Emphasize on real image data for practical image mining.
4. Extraction of features like color, texture, and shape from images for image representation.
5. Presents powerful approaches for classifying image data.

Course Outcomes

At the end of this course, students will be able to:

1. Understand the essential tools for image mining, such as Fourier transforms, Gabor filters, and contemporary wavelet transforms.
2. Understand the varied range of state-of-the-art models, algorithms, and procedures for image mining.
3. Highlight the real image data for practical image mining
4. Analyze the features like color, texture, and shape from images for image representation
5. Implementation of powerful approaches for classifying image data

UNIT-I

Fourier Transform: Introduction, Fourier series, Discrete Fourier Transform, 2D Fourier Transform and its Properties.

Windowed Fourier Transform: Introduction, Short term Fourier Transform and Gabor Filters.

Wavelet Transform: Discrete wavelet Transform, Multiresolution Analysis and Fast Wavelet Transform.

UNIT-II

Color Feature Extraction: Color Histogram, Color Structure Descriptor, Dominant Color Descriptor, Color Coherence Vector and Color Layout Descriptor.

Texture Feature Extraction: Spatial Texture Feature Extraction Methods, Spectral Texture Feature Methods Using Gabor Filters and Wavelet Transform.

UNIT-III

Contour Based Shape Methods: Shape Signatures, Shape Context, Boundary Moments and Fourier Descriptor.

Region Based Shape Feature Extraction: Geometric Moments, Generic Fourier Descriptor, Shape Matrix and Shape Profiles.

UNIT-IV

Image Classification: Introduction, Image Classification using Bayesian Classifier, Support Vector Machine, Decision Tree and Artificial Neural Network.

Image Annotation: Introduction, Image annotation with decision tree-Splitting criterion.

UNIT-V

Image Indexing and Ranking: Numerical Indexing, Inverted File Indexing, Similarity Measures and Performance Measures.

Image Presentation: Caption Browsing, Category Browsing and Context Browsing.

Text Book

1 Dengsheng Zhang, *Fundamentals Of Image Data Mining, Analysis, Features, Classification And Retrieval* Springer International Publishing, 2019

References

1. Gonzalez R.C., Woods R.E, *Digital Image Processing*, 3rd Edition, Pearson, Prentice-Hall of India Pvt.Ltd. New Delhi.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, *Image Processing, Analysis and Machine Vision*

VERBAL ABILITY AND CRITICAL REASONING

BTech (AI) III Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	HSS&MC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

UNIT-I

Data Interpretation: Tabular, Pie-charts, Bar and line graphs and Problems on all models.

Data Sufficiency: Introduction and Problems based on all Quant and logical topics.

Allegations and Mixtures: Allegation rule, mean value of the mixture, Replacement of equal quantity of mixtures.

UNIT-II

Geometry: Line, line segment, angle, Triangles and Polygons with their Properties.

Mensuration: Area and perimeter of Triangle, Rectangle, Square, Parallelogram, Trapezium, Surface area & Volume of 3D figures.

Logarithms: Formulas and Problems based on Logarithms.

Progressions and Quadratic Equations: Arithmetic, Geometric and Harmonic Progressions and their relations. General forms of Quadratic equations and finding the roots and their nature.

UNIT-III

Syllogisms: Statements and Conclusions by using vein diagrams.

Odd One Out: Classification and problems based of Odd one out.

Cubes and Dice: Types of cubes and dice with Examples.

Statement and Conclusions: Introduction, Types of conclusions and different cases.

UNIT-IV

Tenses: Types, usage, question solving.

Vocabulary: Types, usage and error spotting.

Inference: conclusion reached on the basis of evidence and reasoning, question solving.

Para Jumbles: Arranging the jumbled sentence by using the strategies.

Sentence Completion: Completing a sentence by filling the gaps by understanding & analyzing the meaning of the sentence along with the approaches.

UNIT-V

Subject Verb Agreement: Rules and examples for finding the right subject and verb.
Sentence Correction: Error spotting and correcting the sentence.
Reading Comprehension: Understanding Meaning, Understanding the meaning of a text means figuring out what the passage is trying to tell you. Drawing Connections. Summarizing and Synthesizing.
Direct & Indirect Speeches: What is Direct & Indirect Speech? , reporting the message of the speaker in the exact words as spoken by the speaker and examples.
Active Voice & Passive Voice: Types of active and passive voice, rules and examples

Text Books

1. R.S Agarwal, *Verbal and Non Verbal Reasoning*, New Edition -2020, S. Chand.
2. R.S Agarwal, *Quantitative Aptitude*, New Edition- 2020, S. Chand.

References

1. Abhijeet Guha, *Quantitative Aptitude*, New Edition-2020, Mc Graw Hill

COMPUTER VISION AND INFORMATION RETRIEVAL SYSTEMS LAB

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC Lab	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

PART-A

1. Installation of SCI lab and basic commands
2. Write the programs for vector and matrix operations
3. a. Write a program for displaying an image, printing of its properties and manipulations, arithmetic operation on images?
   b. Write a program for displaying histogram and histogram equalization?
4. a. Write a program for adding different types of noises with different percentages?
   b. Write a program for application of following mask
      i. Sobel ii. Prewitt iii. Robert iv. Canny v. Laplacian vi. LOG
5. Write a program for color image conversion models?
6. a. Write a program for reading RGB image and segmentation using threshold method?
   b. Write a program for color image histogram manipulations?
7. a. Write a Program for following morphology operations
      i. Dilation ii. Erosion iii. Open iv. Close v. Hit-or-Miss transform
   b. Write a program for rotating the image into different angles?

PART-B

1. Apply Naive Bayes Classification algorithm for a given textual dataset (1 week)
2. Apply SVM algorithm for a given dataset (2 weeks)
3. Apply Hierarchical Clustering for a given textual dataset. Experiment with different distance metrics (2 weeks)
4. Implement the distance functions for assessing similarity between documents while taking care of standardizing the attributes (1 week)
5. Apply text preprocessing methods to extract relevant text: Stop Word Removal, Stemming, Frequency Analysis for unigrams, bigrams and trigrams (2 weeks)

   Note: Lucene/Weka/ MeTA/Python can be used for conducting the lab

R PROGRAMMING LAB

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

1. Explore R environment
2. Visualize data insights using charts and graphs
3. Analysis data with linear regression model

Week 1
Installation and Environment set up R and Rstudio
Week 2
Experiments on Vector Arithmetic operations
Week 3
Experiments on Matrices operations
Week 4
Experiments on Arrays functions
Week 5
Experiments on Factors
Week 6
Experiments on Data Frames
Week 7
Experiments on List operations
Week 8
Write R scripts which demonstrate logical operations and Conditional Statements
Week 9
Write R scripts which demonstrate Looping over List
Week 10
Write R scripts which demonstrate Nested Functions and Function Scoping
Week 11
Experiments on Mathematical Functions in R
Week 12
Experiments on Calculus in R
Week 13
Experiments on Lapply, Sapply and Apply functions

Week 14

Generate different Charts and Graphs using R

Week 15

Experiments on data interfaces

Week 16

Analysis of data with linear regression model

MOBILE APPLICATION DEVELOPMENT LAB

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

At the end of this course, students will be able to

1. Develop user interfaces for the Android platform
2. Implement various mobile applications using Emulators
3. Create a database for mobile applications using SQLite Database
4. Perform location-based services in android applications
5. Create telephony and SMS for android applications

List of Experiments

1. Develop an application that Uses GUI Components, Font and Colors.
3. Develop an application that Uses Layout Managers and Event Listeners.
4. Develop a Native Calculator Application.
5. Write an application that Draws Basic Graphical Primitives on The Screen.
6. Develop an application that Makes Use of databases.
7. Develop a Native application that Uses GPS Location Information.
8. Implement an application that Writes Data to The SD Card.
9. Implement an application that Creates an Alert Upon Receiving A Message.
10. Write a Mobile application that Creates Alarm Clock.

INTERNET OF THINGS LAB

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Week 1:

1. Study and Install IDE of Arduino and different types of Arduinos.
2. Write program using Arduino IDE for Blink LED.
3. Write Program for RGB LED using Arduino.

Week 2:

4. Write program for buzzer using Arduino.
5. Write program for LDR using Arduino.
6. Write program for IR Sensor using Arduino.

Week 3:

7. Study the Temperature sensor and Write Program for monitor temperature using Arduino.

Week 4:

8. Study and Implement RFID, NFC using Arduino.

Week 5:

9. Study and implement MQTT protocol using Arduino.

Week 6:

10. Study and Implement Arduino Uno with Ethernet Connection to Send data to a Cloud

Week 7:

11. Study and Implement Arduino Uno with ESP 32 Connection to Send data to a Cloud

Week 8:

12. Study and Configure Raspberry Pi.
13. Write program for LED blink using Raspberry Pi
14. Write program for RGB LED using Raspberry Pi

Week 9:

15. Implement Raspberry Pi based Automated Street Lighting System.
16. Write an Arduino program for Distance Measurement Using Ultrasonic Sensor and displaying on LCD.

Week 10:

17. Write program for Buzzer using Raspberry Pi
18. Write program for LDR using Raspberry Pi
19. Write program for IR Sensor using Raspberry Pi

Week 11:

20. Implement IoT based weather monitoring system using Raspberry Pi.

Week 12:

21. Study and Implement RFID, NFC using Raspberry Pi.

Week 13:

22. Study and Implement Raspberry Pi with Ethernet Connection to Send data to a Cloud

Week 14:

23. Study and Implement Raspberry Pi with Wifi Connection to Send data to a Cloud

Week 15:

24. Study and Implement Zigbee Protocol using Arduino.

Week 16:

25. Study and Implement Zigbee Protocol using Raspberry Pi.

UNIFIED MODELING LANGUAGE LAB

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

List of tasks to be performed week wise

1. Creation and implement of Class diagrams in UML for any application.
2. Creation and implement of Component diagrams in UML for any application.
3. Creation and implement of Deployment diagrams in UML for any application.
4. Creation and implement of Object diagrams in UML for any application.
5. Creation and implement of Package diagrams in UML for any application.
6. Create and implement of Use Case diagrams in UML for any application.
7. Creation and implement of Activity diagrams in UML for any application.
8. Creation and implement of State Chart diagrams in UML for any application.
9. Creation and implement of Sequence diagrams in UML for any application.
10. Creation and implement of Collaboration diagrams in UML for any application.
11. Creation and implement of Interaction diagrams in UML for any application.
12. Case Study on UML diagrams for Google Apps.

Program Structure and Syllabus

B Tech (Artificial Intelligence and Machine Learning) III Year (I & II Semesters)

R20 Regulations

Department of Artificial Intelligence

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ANURAG UNIVERSITY

BTech (AIML) III YEAR I SEMESTER [4 T + 4 P + 1 M]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PCC	Essentials of Machine Learning	3	1	0	4
2		PCC	Computer Systems II	3	1	0	4
3		PCC	Web Programming with MEAN	3	0	0	3
4		OEC-I	1. Business Data Storytelling 2. Entrepreneurship Development 3. Intellectual Property Rights	3 2 2	0 1 1	0 0 0	3
5		PCC-Lab	Computer Systems Lab	0	0	3	1.5
6		PCC-Lab	Web Programming with MEAN Lab	0	0	3	1.5
7		PCC-Lab	Essentials of Machine Learning Lab	0	0	3	1.5
8		BSC-Lab	Quantitative Aptitude and Reasoning	0	0	3	1.5
9		MC	NSO/NSS	0	0	2	0
			TOTAL	**12**	**3**	**14**	**20**

BTech (AIML) III YEAR II SEMESTER [5 T + 2 P + 1 M]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PCC	Automata Theory and Applications	3	1	0	4
2		PCC	Web Data Mining	3	0	0	3
3		PCC	Computer Vision and Image Processing	3	0	0	3
4		PEC-I	9. R Programming 10. Mobile Application Development 11. Internet of Things 12. Unified Modeling Language	2	0	0	2
5		PEC-II	9. Distributed Systems 10. Evolutionary Computing 11. Cryptography 12. Fundamentals of Image Data Mining	3	0	0	3
6		HSS&MC	Verbal Ability and Critical Reasoning	0	0	3	1.5
7		PCC Lab	Computer Vision and Web Data Mining Lab	0	0	4	2
8		PEC-I Lab	9. R Programming Lab 10. Mobile Application Development Lab 11. Internet of Things Lab 12. Unified Modeling Language Lab	0	0	3	1.5
TOTAL				14	1	10	20

*** L – Lecture, T – Tutorial, P - Practical**

ESSENTIALS OF MACHINE LEARNING

BTech (AIML) III Year I Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

1. Understand the basic concepts of feature engineering and machine learning systems
2. Apply and evaluate supervised machine learning algorithms for classification and regression tasks
3. Apply and evaluate unsupervised learning algorithms for clustering tasks.
4. Understand the Bayesian and Ensemble learning, apply and evaluate different types of these algorithms for better prediction.
5. Understand and Design Artificial Neural Networks computational model

Course Outcomes

At the end of this course, students will be able to:

1. Understand the essentials of feature engineering, state-of-art tools and concepts of machine learning
2. Design and evaluate different types of supervised learning algorithms for classification and regression tasks
3. Design and evaluate different types of unsupervised learning algorithms for clustering tasks
4. Design and evaluate strong learners for better real time prediction such as Bayesian and ensemble learning algorithms
5. Design Artificial neural networks computational model

UNIT-I

Machine Learning: Definition and Applications, Types of Machine Learning Models - Supervised, Unsupervised, Reinforcement learning, Challenges of Machine Learning, State-of-art Languages and Tools in Machine Learning, Preparing to Model - Model Representation - Overfitting and Underfitting, Bias–variance trade-off

Feature Engineering: Feature Transformation, Feature Extraction and Feature Selection Process

UNIT-II

Supervised Learning: Applications - Regression and Classification Tasks, Evaluating performance of regression and classification models, Regression Algorithms - Simple Linear Regression and Multiple Linear Regression, Classification Algorithms - Logistic Regression, k-Nearest Neighbor, Decision Tree

UNIT-III

Unsupervised Learning: Applications of Unsupervised Learning, Different types of Clustering techniques, K-Means Clustering, K-medoids, Agglomerative Hierarchical Clustering, Evaluating performance of clustering models.

UNIT-IV

Bayesian Learning: Bayesian Belief Networks, MAP hypothesis, Bayes Optimal Classifier, Gibbs Classifier, Naïve Bayes Classifier

Ensemble Learning: Bootstrap Aggregation (Bagging) - Random Forest, Boosting - AdaBoost and Gradient Boost.

UNIT-V

Artificial Neural Networks: Understanding the Biological Neuron, Exploring the Artificial Neuron, Types of Activation Functions, Early Implementations of ANN, and Architectures of Neural Network- Feed forward network and Recurrent network, Back propagation algorithm

Text Books

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, *Machine Learning*, 2019, Pearson
2. Tom M. Mitchell, —*Machine Learning*, McGraw-Hill Education (India) Private Limited, 2013

References

1. Andreas C. Müller, Sarah Guido, *Introduction to Machine Learning with Python*, O'Reilly Media, Inc, October 2016
2. Ethem Alpaydin — *Introduction to Machine Learning (Adaptive Computation and Machine Learning)*, The MIT Press 2004
3. Aurélien Géron, *Hands on Machine Learning with Scikit-Learn, Keras, and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems*, O'Reilly Media, Inc 2019

COMPUTER SYSTEMS II

BTech (AIML) III Year I Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

1. Understand the structure and functions of OS.
2. Learn about Processes, Threads and Scheduling algorithms and understand the principles of concurrency and Deadlocks.
3. Learn various memory management schemes
4. To understand the protocol layering and physical level communication.
5. To analyze the performance of a network.

Course Outcomes

At the end of this course, students will be able to:

1. Analyze various scheduling algorithms.
2. Understand deadlock, prevention and avoidance algorithms.
3. Compare and contrast various memory management schemes
4. Understand the basic layers and its functions in computer networks.
5. Evaluate the performance of a network

UNIT-I

Operating System Overview: Introduction, Barebones Computer System, Operating System Concept, Services and Facilities, Organization, Types of Computer Systems, Purpose of User Interface, Types of User Interface

UNIT-II

File Management: Introduction, Logical and Physical view of files, Role of file management system, Logical file access methods, Physical File storage, Directory Structure, Network File Access, File Protection

UNIT-III

Processor and Memory Management: Introduction, OS Requirements, Bootstrap, Process and Threads, Basic loading and execution operation, CPU Scheduling and Dispatching, Memory Management, Virtual Storage, Secondary storage scheduling, Network OS services, OS issues

UNIT-IV

Networks and Data Communication: Introduction, View of Data Communication, Data Communication Concepts, Network Topology, Types of Networks, Network Interconnection, Standards

UNIT-V

Ethernet and TCP/IP Networking: Introduction, TCP/IP, OSI and other Communication Protocol models, Physical and Data Link Layer, Network Layer, Transport Layer, IP Addresses, Domain Names and DNS Services, Quality of Service, Network Security, Alternative Protocols

Text Book

1. Irv Englander, *The Architecture of Computer Hardware, Software and Networking, An Information Technology Approach* , 5th Edition, Wiley Publication

References

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, *Operating System Concepts*, 10th Edition, John Wiley and Sons Inc., 2018.
2. Behrouz A. Forouzan, *Data Communications and Networking*, Fifth Edition TMH, 2013.
3. James F. Kurose, Keith W. Ross, *Computer Networking, A Top-Down Approach Featuring the Internet*, Sixth Edition, Pearson Education, 2013.

WEB PROGRAMMING WITH MEAN

BTech (AIML) III Year I Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To introduce Node.js for web server platform
2. To introduce Express for the framework
3. To introduce MongoDB for the Database
4. To introduce Mongoose for data modeling
5. To introduce Angular for front-end framework

Course Outcomes

At the end of this course, students will be able to:

1. Gain knowledge on client side scripting
2. understand server side scripting
3. understand MongoDB and create Database
4. understand Express frame work
5. create multi-tier architecture web application

UNIT-I

Architecture of WWW, HTTP, HTTPS, 2-Tier and multi-Tier web application architectures.

Introducing full-stack development

Introduction to the full-stack, history of web development, Introduction to MEAN stack. Node.js, Express, MongoDB and Angular, supporting cast

Designing a MEAN Stack Architecture

Common MEAN stack architecture, Beyond SPAs, Designing flexible MEAN architecture, planning a real application, breaking the development into stages, hardware architecture

UNIT-II

Building a Node Web Application

Creating and setting up a MEAN project: Creating an Express project, modifying Express for MVC, Importing Bootstrap for quick, responsive layouts, making it live on Heroku

Building a static site with Node and Express: Defining the routes in Express, building basic controllers, creating some views, adding the rest of the views, taking the data out of the views and making them smarter

UNIT-III

Building a data model with MongoDB and Mongoose: Connecting the Express application to MongoDB by using Mongoose, Benefits of modeling the data, defining simple mongoose schemas, using the MongoDB shell to create a MongoDB database and add data, getting database live

Writing a REST API: Exposing the MongoDB database to the application: The rules of a REST API, setting up the API in Express, GET methods: Reading data from MongoDB, POST methods: Adding data to MongoDB, PUT methods: Updating data in MongoDB, DELETE method: Deleting data from MongoDB

UNIT-IV

Adding Dynamic Front End with Angular

Creating an Angular application with Typescript: getting up and running with Angular, working with angular components, getting data from an API, putting and Angular application into production

Building a single-page application with Angular: Foundations: Adding navigation in an Angular SPA, building a modular app using multiple nested components, adding geo-location to find places near you, and safely binding HTML content.

UNIT-V

Managing Authentication and User Sessions

Using an authentication API in Angular applications: Creating an Angular authentication service, creating the Register and Login pages, working with authentication in the Angular app.

Text Book

1. Simon Holmes, Clive Harber, *Getting MEAN with Mongo, Express, Angular and Node*, Second Edition, Manning Publications Co., 2019

References

1. Adam Bretz & Colin J. Ihrig *Full Stack Javascript Development With Mean*
2. Amos Q. Haviv, *MEAN Web Development*, Second Edition, Packt Publishing, 2016

BUSINESS DATA STORYTELLING

BTech (AIML) III Year I Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	OEC-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Introduction

This course will cover the fundamentals of effective data-driven storytelling. Story telling can put a human perspective on the increasingly complex and rapidly changing world of the digital era. Students will learn how to interpret and analyse the data and will learn to articulate the stories with data sets and communicate data findings in visual, oral, and written contexts.

Course Objectives

The students will be able to

1. develop the skills necessary to be effective data storytellers.
2. locate relevant datasets, extract insights from that data and present their findings in myriad formats.
3. learn how to interpret data and to present it in different formatsto different audiences.

Course Outcomes

After the completion of the course, the students will be able to

1. identify the stories within datasets and extract insights from that data.
2. explain the importance of communication skills and competencies for individuals who serve as data storytellers.
3. act as a data-driven visual storyteller for optimal presentation of trends, patterns, and insights.
4. make effective client presentations of their work using infographic visualizations.
5. learn tools and concepts which can be put to immediate use to transform data into stories.

UNIT-I

Introduction: We are all storytellers- Stories Bring Data to Life- The Essence of Data Storytelling

UNIT-II

Dynamics of Data Storytelling: Getting to the Core- Planning is Everything- The Quick Fix- Application of Story elements

UNIT-III

Crafting the Data Story: The Psychology of Storytelling- The narrative Techniques - Making Good stories Great! – Writer to Storyteller

UNIT-IV

Data Visualization: Use Visuals to Advantage: Data Presentation Skills- Infographics Visualizations

UNIT-V

Anatomy of Data Story: Rudiments of Grammar - Parts of Speech - Concord Rules - Academic and Technical Vocabulary - Data Interpretation - Case Studies

Text Book

1. Vora , Sejal (2019).*The Power of Data Storytelling*, Sage Publications India pvt Ltd.

References

1. Dykes, Brent (2020). *Effective Data Storytelling*: New Jersey, Wiley.
2. Knaflic, Cole Nussbaumer (2015).*Storytelling with Data: A Data Visualization Guide for Business Professionals,*https://www.amazon.com/Storytelling-Data-Visualization-Business-Professionals/dp/1119002257/
3. Morrow, Jordon (2021), *Be Data Literate- The Data Literacy Skills Everyone Needs to Succeed*, UK: Kogan Page Ltd.
4. Taylor, Scott (2021). *Telling your Data Story: Data storytelling for Time Management*, New Jersey: Technics Publications LLC.
5. https://www.amazon.com/Tableau-Your-Data-Analysis-Software/dp/1119001196/

ENTREPRENEURSHIP DEVELOPMENT

BTech (AIML) III Year I Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	OEC-I	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

The objective of this course is to familiarize the student with entrepreneurship, the issues involved in it, the potential of entrepreneurship and intrapreneurship, the legal environment and statutory issues and explore various funding opportunities.

Course Outcomes

After the completion of the course, the students will be able to,

1. Interpret the concepts of Entrepreneurship and Intrapreneurship.
2. Apply the opportunity identification techniques
3. Differentiate needs of different segments and their
4. Develop business model and MVP
5. Recognize organizational forms, IPR concerns and funding opportunities for startups.

UNIT-I

Introduction to Entrepreneurship: Entrepreneurship and Intrapreneurship, Business Incubators, Rural entrepreneurship, Social Entrepreneurship, women entrepreneurs, Role of entrepreneurs in economic development, Types of entrepreneurs. Entrepreneurial mind set and stress, Causes of failure.

UNIT-II

Opportunity identification: Myths and realities of entrepreneurship, Opportunity identification, Problem worth solving, idea generation techniques, Design thinking.

UNIT-III

Customer analysis: Market segmentation, consumer persona, Product market fit, Unique Value proposition.

UNIT-IV

Business model and MVP: Business model canvas, MVP, Risks and assumptions, Importance of financial planning.

UNIT-V

Organizational forms Funding Opportunities: Organizational forms - Partnership, Sole proprietorship, Corporation. Intellectual Property Rights- Copyrights, Trademarks, Patents. Law Vs. Ethics, Informal capital- Friends and Family, Angels, Venture Capitalists, Idea/ Patent, Growth strategies

Text Books

1. Vasant Desai, YayatiNayak, *Entrerpreneurship*, Himalaya Publishing House,2018
2. D.F.Kuratko and T.V.Rao *Entrepreneurship- Cengage Learning*,2012

References

1. Rajeev Roy, *Entrepreneurship*, Oxford University Press, 2/e, 2012
2. Dhruv Nath, Sushanto Mitra, *Funding Your Startup: And Other Nightmares*, 2020
3. V Srinivasa Rao, *Lean Digital Thinking: Digitalizing Businesses in a New World Order*, Bloomsbury India, 2021
4. S.K.Mohanty, *Fundamentals of Entrepreneurship*, PHI, 1/e,2005
5. MOOCS by Wadhwani Foundation

INTELLECTUAL PROPERTY RIGHTS

BTech (AIML) III Year I Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	OEC-I	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

The course aims to help the student understand the concept of Intellectual Property Rights and helps the student to appreciate the purpose and function of a trademark and the process involved in getting copyright, patent and related issues. The student is introduced to the importance of trade Secret and Geographical Indications.

Course Outcomes

At the end of this course, students will be able to:

1. Explain the concepts of intellectual property rights and related agencies.
2. Describe the purpose and functions of a trademark in a competitive environment.
3. Analyze the process of copyright and procedure.
4. Understand the process of patent and patent issues.
5. Explore the trade secret and geographical indications of its protection from unfair practices.

UNIT-I

Introduction to IPR: Concept of intellectual property rights, importance of intellectual property rights. Types of intellectual property, international agencies, and treaties.

UNIT-II

Trademarks: Concept of trademarks, purpose, and function of trademarks. Acquisition of trademark rights, protectable matter, selecting and evaluating trademark, trademark registration processes.

UNIT-III

Law of copyrights: Concept of copyright right, fundamentals of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration.

UNIT-IV

Law of patents: Introduction to patent, foundation of patent law, patent searching process, ownership rights and transfer.

UNIT-V

Trade Secrets & Geographical Indication: Law pertaining to trade secrets, determination of trade secrets. Trade secret litigation. Unfair competitions. Geographical Indication, concept of geographical indication, importance of geographical indication, new development of intellectual property rights.

Text Book

1. Deborah. E. Bouchoux, *Intellectual property right,* 5/e, 2018, cengage learning.
2. Neeraj Pandey, *Intellectual property right*, PHI, 2019.

References

1. Ramakrishna Chintakunta and M. Geethavani, Kindle e 2021
2. Prabuddha Ganguli, *Intellectual Property Right: Unleashing the Knowledge Economy*, 2/e, 2017 Tata Mc Graw Hill Publishing company Ltd.

COMPUTER SYSTEMS LAB

BTech (AIML) III Year I Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PCC-Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

List of Programs

1. Program for
   a. Simulating CPU scheduling algorithms (Round Robin, Priority, FCFS, SJF)
   b. using system calls: fork, exit
2. Program for implementing the following problem using shared memory and semaphores
   a. Producer-Consumer problem
   b. Readers-writers problem
   c. Dining philosopher problem
3. Program using multithreading (pthreads)
4. Create a client-server application using any programming language
5. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool
6. Configuring network chord, switch and router
7. Usage of packet tracer software

WEB PROGRAMMING WITH MEAN LAB

BTech (AIML) III Year I Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PCC-Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

The following tasks have to be performed week wise

Week 1:
Identification of the problem

Week 2:
c. Requirement specification
d. Architecture design

Week 3, 4 & 5:
Development of the front end.

Week 6, 7 & 8:
Development of backend

Week 9, 10 & 11:
Creation of Database

Week 12:
Integration and Testing

Week 13:
Presentation

Week 14:
Documentation and Submission

ESSENTIALS OF MACHINE LEARNING LAB

BTech (AIML) III Year I Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PCC-Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Objectives

1. Installation of Python and libraries, and implement feature engineering
2. Apply and evaluate supervised machine learning algorithms for classification and regression tasks
3. Apply and evaluate unsupervised learning algorithms for clustering tasks.
4. Understand the Bayesian and Ensemble learning, apply and evaluate different type of these algorithms for better prediction.
5. Understand and Design Artificial Neural Networks computational model

Course Outcomes

1. Knowledge of Installation of Python libraries, and implement feature engineering
2. Design and evaluate different types of supervised learning algorithms for classification and regression tasks
3. Design and evaluate different types of unsupervised learning algorithms for clustering tasks
4. Design and evaluate strong learners for better real time prediction such as Bayesian and ensemble learning algorithms
5. Design Artificial neural networks computational model

Week 1

Get familiar with Python, NumPy and Pandas

Week 2

Perform Feature Engineering for a given dataset

Week 3

Implement linear and multiple regression algorithms on a given dataset

Week 4

Implement Binary Classification using ID3 Decision Tree Algorithm- Medical Application Domain - Diabetes Dataset or any standard dataset

Week 5

Implement logistic regression algorithm for stock prices prediction

Week 6

Write a program to implement k-Nearest Neighbor algorithm to classify the iris dataset. Print both correct and wrong predictions

Week 7

Implementation of decision tree based ID3 algorithm and use an appropriate dataset

Week 8

Implement K- means clustering algorithm for identifying cancerous data

Week 9

Implementation of Agglomerative Clustering algorithm to cluster a set of data stored in a CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering

Week 10

Implementation of naïve Bayesian classifier for a sample training data set stored as a CSV file. Compute the accuracy of the classifier, considering few test data sets

Week 11

Implementation of Boosting-Ada Boost and Gradient Boost to convert weak learner to strong learners

Week 12

Develop a predictive model for predicting house prices using random forest Artificial Neural Network (ANN) for Diabetes Classification

Week 13

Perform Data Analysis - Data Cleaning, Feature Engineering, Data Visualization and Binary Classification for Census Income Dataset

Week 14

Project: Employ all the classification algorithms for Diabetes dataset, IRIS dataset and any dataset of your choice report the best result for each dataset.

Week 15

Project: Employ all the regression algorithms for house sales prediction dataset, of any dataset of your choice. Report the best result.

Week 16

Project: Employ all the clustering algorithms for an appropriate dataset of your choice. Report the best result.

NOTE: Datasets for the above exercises available in Kaggle and UCI repository mentioned below

1. https://www.kaggle.com
2. http://archive.ics.uci.edu/ml/datasets.html

QUANTITATIVE APTITUDE AND REASONING

BTech (AIML) III Year I Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	BSC-Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

UNIT-I

Number System: Speed Math's, Numbers, Factors, Prime and co-primes, LCM & HCF, Divisibility rules, Finding the unit digit and applications, remainder theory.

Ratio and Proportion with Ages: Definition of ratio and Proportion, Finding the resultant ratio. Problems based on Ratios and ages.

Percentages: Introduction to percentages, Percentage Increase /Decrease, Results on Population, Results on Depreciation, Variations, Applications of Percentage

Profit and Loss: Classification of Profit and Loss, Profit/ Loss Percentages, Successive Discount.

UNIT-II

Time and Distance: Difference between the average, Relative and Effective speed, reaching the destination late and early, stoppage time per hour, problems based on Trains and problems based on Boats.

Time and Work: Calculating Efficiency, alternate days concept, work and wages, Chain rule, problems based on Pipes and cisterns.

Simple and Compound Interest: Simple interest, Principle, Rate, Amount, Applications of Simple interest, Compound interest, Compounded annually, Compounded Half yearly, Compounded Quarterly, Difference between simple and compound interest

UNIT-III

Permutations and Combinations: Fundamental rules, Problems on Permutations and Combinations

Probability: Definition, Notations and Problems based on Probability.

Mean, Median and Mode: Introduction and problems on mean, median and mode

Partnership: Relation between Partners, Period of Investments and Shares

Averages: Average of different groups, change in average by adding, deleting and replacement of objects

Flow Chart: Introduction of symbols and problems on flow charts.

UNIT-IV

Seating Arrangement: Circular, Row, Column, Square and Double row arrangement

Puzzles: Paragraph, incomplete puzzles and problems on them.

Number Series: Number, Alphabet and Letter Series.
Analogy: Simple, Double, Word and Number Analogy
Coding and Decoding: Classifications and Problems on Coding and Decoding.

UNIT-V

Clocks: Relation between minute and hour hand, angle between hands of a clock, exceptional cases in clocks. Gaining and loosing of time.
Calendars: Classification of years, finding the day of any random calendar date, repetition of calendar years.
Direction Sense Test: Sort of directions in puzzle distance between two points, Problems on shadows.
Blood Relations: Defining the various relations among the members of a family, Solving blood relation puzzles by using symbols and notations. Problems on coded relations.

Text Book

1. R.S Agarwal, *Verbal and Non Verbal Reasoning* –New Edition -2020, S. Chand.
2. R.S Agarwal, *Quantitative Aptitude* –New Edition- 2020, S. Chand.

References

1. Abhijeet Guha, *Quantitative Aptitude*: New Edition-2020, Mc Graw Hill.

NATIONAL SPORTS ORGANIZATION (NSO) / NATIONAL SERVICE SCHEME (NSS)

BTech (AIML) III Year I Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	MC	L	T	P	C	CIE	SEE	Total
		0	0	2	0	0	100	100

UNIT-I

Health and Wellness

Dimensions of Health: Physical, Mental and Social. Objectives of Health Education. Definition and Dimensions of Wellness – Physical, Emotional, Social, Spiritual, Intellectual and Environmental Wellness. Achieving Wellness.

Practical: Basketball, Cricket, Kho-Kho (Any Two) & Badminton (Mandatory)

Layout of Courts / Fields, Skills, Rules & Lead-up Games.

UNIT-II

Fitness and Body Composition

Physical Fitness Components: Body Composition, Muscular Endurance, Strength, Cardiovascular Fitness and Flexibility, Importance of Cardio-Respiratory Endurance. Obesity and Health Risk Factors. Body Composition Indicators and Measurements.

Practical: Football, Kabaddi, Volleyball (Any Two) & Table Tennis (Mandatory)

Layout of Courts / Fields, Skills, Rules & Lead-up Games.

UNIT-III

Introduction and Basic Concepts of NSS: History, Philosophy, Aims & Objectives of NSS. Emblem, Flag, Motto, Song, Badge, Organizational Structure, Roles and Responsibilities of Various NSS functionaries. NSS Programmes and Activities, Volunteerism and Shramdan.

UNIT-IV

Personality Development Through Community Service: Importance and Role of Youth Leadership, Life Competencies, Social Harmony and National Integration, Youth Development Programmes in India, Citizenship, Health, Hygiene and Sanitation, Environment Issues, Disaster Management, Life Skills.

UNIT-V

Vocational And Entrepreneurship Skills Development: Definition and meaning of Entrepreneurship, Qualities of good entrepreneur, Steps /ways in operating an Enterprise and role of financial and support service Institutions. Project Cycle Management, Resource Mobilisation and Documentation and Reporting.

Project work/ Practical: Conducting Surveys on Special Theme, Involving in Shramadan, Swachh Bharat, Blood Donation, Tree Plantation, Awareness Programmes, Identify the Community Problems and List out the all Possible Solutions, Educate the Villagers on Health, Hygiene, Sanitation and Environment Protection. Self-Review of the Students on their Improvements by Participating in the Community Service Programmes.

References

1. Rajiv Parti, *The Soul of Wellness: 12 holistic principles for achieving a healthy body, mind, heart and spirit*, Select book incorporation, New York.
2. H. & Walter, H., (1976). *Turners School Health Education*. Saint Louis: The C.Y. Mosby Company.
3. Nemir, A. (n.d.). *The School Health Education*. New York: Harber and Brothers.
4. Edward T Howley, *Health Fitness Instructors Handbook*, Human Kinetics, USA.
5. **About NSS:** National Service Scheme Manual by Government of India Ministry of Youth Affairs & Sports, New Delhi.
6. Robert N Lussier, *Management Fundamentals - Concepts, Applications, Skill Development*, Cengage Leaning, First Edition, 2012.
7. Mroczex & Little, *Handbook of Personality Development* –(eds).2006.
8. Richard Blundel, *Exploring Entrepreneurship Practices and Perspectives*, Oxford, 2011.

AUTOMATA THEORY AND APPLICATIONS

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

1. Introduce concepts in automata theory
2. Identify different formal language classes and their relationships
3. Design grammars and recognizers for different formal languages
4. Identify undecidable problems
5. Introduce various applications of Automata Theory

Course Outcomes

At the end of this course, students will be able to:

1. Understand the core concepts in automata theory and formal languages
2. Design of NFA and DFA for a given Regular Language
3. Design of PDA for the given CFG
4. Design Turing Machine to solve computing Problems
5. Understand the role of Automata theory in different Applications like Compiler, Natural Language Processing and Artificial Intelligence

UNIT-I

Language Fundamental: Strings, Languages, Language Recognition, A machine based hierarchy of language classes, A Tractability hierarchy of language classes.

Finite State Machine: Deterministic Finite State Machine, the Regular Languages, Designing Deterministic and Nondeterministic Finite State Machine, Simulators for FSMs, Minimizing FSMs.

UNIT-II

Regular Expressions and Regular Grammars: Regular Expression, Kleene Theorem, Applications of Regular Expressions, Regular Grammar, Regular Grammar and Regular Languages.

Regular and Non-regular Languages: Classifications of Regular Languages, Showing that Languages is Regular, Closure Properties of Regular Languages, Showing that Languages is not Regular.

UNIT-III

Context Free Grammars: Rewrite systems and Grammar, Context Free Grammars and Languages, Designing and Simplifying Context Free Grammar, Derivations and Parse Trees, Ambiguity.

Normal Forms: Normal Forms for Grammar, Converting to a Normal Form, Converting to Chomsky Normal Form and Greibach Normal Forms

UNIT-IV

Pushdown Automata: Definition of (Nondeterministic) PDA, Deterministic and Nondeterministic PDAs, Equivalence of CFGs and PDAs, Nondeterminism and Halting.

Turing Machines: Definition, Notation, computing with Turing Machine, Adding Multiple Tapes and Nondeterministic, Simulating a "Real" Computer

UNIT-V

Unrestricted Grammars: Definition, Equivalence of Unrestricted Grammars and Turing Machines, Grammars Compute Functions, Undecidable Problems about Unrestricted Grammars.

Compilers: Defining Syntax of Programming Languages, Context Free Grammar and Programming Languages, Designing Programming Languages and Their Grammar, Compilers for Programming Languages

Text Book

1. Elaine A. Rich, *Automata, Computability and Complexity: Theory and Applications*, Pearson Education, Inc.

References

1. John E.Hopcroft, Rajeev Motwani, Jeffrey D.Ullman, *Introduction to Automata Theory, Languages and Computation*, Third Edition, Pearson, 2013.
2. Daniel I.A.Cohen, *Introduction to Computer Theory*, Second Edition, John Wiley.
3. Vivek Kulakarni, *Theory of Computation*, Oxford University press 2013, Second Edition, 2014

WEB DATA MINING

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To have an idea of data mining and web mining, concepts of association rules in Mining
2. To understand supervised classification algorithms based on associations, Bayesian learning and SVM
3. To understand unsupervised hierarchical clustering, distance functions, handling standardized data
4. To expose the students to basic concepts of information retrieval and web page preprocessing
5. To understand web page ranking algorithms and social network analysis

Course Outcomes

At the end of this course, students will be able to:

1. Understand the concept of Data Mining and Web Mining and Association rules
2. Learn to apply Naïve Bayes and SVM algorithms for classification task
3. Learn to apply data standardization methods and handle mixed attribute data types, and also perform hierarchical clustering
4. Understand basic concepts of information retrieval methods and web page preprocessing steps
5. Learn the web page ranking algorithms in web mining

UNIT-I

The World Wide Web, History of the Web and the Internet, Data Mining, Web Mining Basic Concepts of Association Rules, Apriori Algorithm – Frequent Itemset Generation, Association Rule Generation, Data Formats for Association Rule Mining, Mining with Multiple Minimum Supports – Extended Model, Mining Algorithm, Rule Generation

UNIT-II

Classification based on Associations, Naïve Bayesian Text Classification, Support Vector Machines – Linear SVM Separable and Non Separable cases, Non Linear SVM Kernel functions

UNIT-III

Representation of Clusters, Hierarchical Clustering – Single Link, Complete Link and Average Link Method, Strength and Weaknesses, Distance Functions – Numeric, Binary and Nominal Attributes and Text Documents, Data Standardization, Handling of Mixed Attributes

UNIT-IV

Basic Concepts of Information Retrieval, IR Methods – Boolean Model, Vector Space Model, Statistical Language Model, Relevance Feedback, Evaluation Measures, Text and Web Page Pre-Processing- Stopword Removal, Stemming, Web page preprocessing, Duplicate Detection

UNIT-V

Web Search, Meta-Search: Combining Multiple Rankings – Similarity Score and Rank Positions, Web Spamming – Content and Link Spamming, Hiding Techniques, Combatting Spam

Link Analysis - Social Network Analysis, PageRank Algorithm, HITS Algorithm

Text Book

1. Bing Liu , *Web Data Mining*, Springer India, 2010

References

1. Soumen Chakrabarti, *Mining the Web*, Morgan-Kaufmann Publishers, Elseiver, 2002
2. Manu Konchady, *Text Mining Application Programming*, Cengage Learning, 2006

COMPUTER VISION AND IMAGE PROCESSING

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. Analyze general terminology of digital image processing.
2. Understand the image noise models and enhancement methods.
3. Evaluate the image segmentation methodologies.
4. Understand the image compression and color image processing techniques.
5. Apply image processing algorithms in practical applications.

Course Outcomes

At the end of this course, students will be able to:

1. Understand the fundamental concepts of digital image processing systems.
2. Understand the image noise models and enhancement techniques
3. Comprehension of different image segmentation and restoration methodologies
4. Analyze the concepts of image compression and color image processing.
5. Acquire the knowledge of morphological operations and image processing related areas.

UNIT-I

Introduction to Computer Vision and Basic Concepts of Image Formation: Introduction and Goals of Computer Vision and Image Processing, Image Formation Concepts.

Fundamental Concepts of Image Formation: Radiometry, Geometric Transformations, Geometric Camera Models. Fundamental steps in image processing, image processing applications

UNIT-II

Digital Image Processing Operations: Basic relationships and distance metrics, Classification of image processing operations- Arithmetic operations, Logical operations.

Image Enhancement: Image quality and need for image enhancement, image enhancement point operations-piecewise linear functions, Histogram based techniques, Spatial filtering concepts.

UNIT-III

Image Restoration: Categories of image degradations- noise modeling, image restoration in the presence of noise only- Mean filters, order statistics filters.

Image Segmentation: Detection of discontinuities, types of edge detectors, First-order edge detection operators, and second-order derivatives filters.

UNIT-IV

Image Compression: Compression model, Lossless and Lossy Compression and Coding techniques for image compression.

Color Image Processing: Introduction, color monitors, color image storage -and processing, color models-RGB Colour Model, HSI Colour Models, HSV Colour Model, HLS Colour Models, TV Color Models.

UNIT-V

Image Morphology: Need for morphological processing, morphological operators, Hit-or-Miss transform, Basic morphological algorithms, and Gray-scale morphology.

Image Descriptors and Features: Texture Descriptors, Colour Features, Object Boundary and Shape Representations

Text Books

1. S. Sridhar, *Digital Image Processing*, Oxford University Press
2. D. and J. Ponce, *Computer Vision: A Modern Approach,* Prentice Hall, 2nd ed., 2015

References

1. Gonzalez R.C., Woods R.E, *Digital Image Processing,* 3rd Edition, Pearson, Prentice-Hall of India Pvt. Ltd. New Delhi.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, *Image Processing, Analysis and Machine Vision*
3. Anil K. Jain, *Fundamentals of Digital Image Processing,* Prentice- Hall of India Pvt. Ltd, New Delhi.

R PROGRAMMING

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Course Objectives

1. To make students exercise the fundamentals of statistical analysis in R environment.
2. To analyze data for the purpose of exploration using Descriptive and Inferential Statistics.

Course Outcomes

1. Demonstrate vector and matrix operations using R.
2. Apply various operators on data frames and list.
3. Write functions using iterative programming
4. Analyze the data using R
5. Describe linear and multiple regression models for time series data & web data

UNIT-I

Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types.

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector Subsetting.

Matrices: Creating and Naming Matrices, Matrix Subsetting.

Arrays, Class.

UNIT-II

Factors and Data Frames: Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, Subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.

Lists: Introduction, Creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors.

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

UNIT-III

Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List.

Functions in R: Introduction, Writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R, Cumulative Sums and Products, Calculus in R, Input and Output Operations.

UNIT-IV

Apply Family in R: Introduction, Using Apply in R, Using Lapply in R, Using Sapply, Using Tapply in R: Split Function, Using Mapply in R.

Charts and Graphs: Introduction, Pie Chart: Chart Legend, 3D Pie Chart, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.

UNIT-V

Data Interfaces: Introduction, CSV Files: Syntax, Importing a CSV File, Excel Files: Syntax, Importing an Excel file, Binary Files: Syntax, XML Files, Web Data, Databases.

Statistical Applications: Introduction, Basic Statistical Operations, Linear Regression Analysis, Chi-Squared Goodness of Fit Test, Chi-Squared Test of Independence, Multiple Regression, Time Series Analysis.

Text Book

1. K G Srinivas, G M Siddesh, *Statistical programming in R*, Oxford Publications.

References

1. Mark Gardener, *Beginning R: The Statistical Programming Language,* Wrox.
2. Y. Anchang Zhao, *R and Data Mining: Examples and Case Studies* Elsevier in December 2012.
3. Avril Coghlan, *A Little Book of R For Time Series*, Release 0.2.

MOBILE APPLICATION DEVELOPMENT

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Course Objectives

1. Outline the usage of Android development framework.
2. Understand the main components of an Android application and its entire life Cycle.
3. Develop database programming using SQLite.
4. Identify the use of location-based service in android applications.
5. Build SMS and MMS applications using Intents

Course Outcomes

At the end of this course, students will be able to:

1. Analyze the architecture of android and current trends in mobile operating systems.
2. Apply suitable software tools and APIs for the design of User Interfaces to a particular mobile application
3. Design applications for mobile devices using SQLite Database
4. Apply the location-based services in android applications.
5. Summarize the Monitoring changes to the phone, network, data connectivity and SIM states.

UNIT-I

Introduction to Android: Features of Android, The development framework: Understanding the Android Software Stack, Android Application Architecture; the Dalvik Virtual Machine, Creating First Android Application, Types of Android Applications, Android Development Tools: The Android Virtual Device Manager, Android Emulator, The Dalvik Debug Monitor Service.[TB1-chapter 1,2]

UNIT-II

Creating applications and Activities: Introduction to the application Manifest File, Using the Manifest Editor, Externalizing Resources: Creating Resources - Simple Values, Drawable, Layouts, Menus, Animations. The Android Activity Life cycle. **Building User Interfaces:** Fundamental Android UI design, Introducing Layouts: Defining Layouts, Using Layouts to Create Device Independent User Interfaces, Optimizing Layouts.[TB1-Chapter 3,4]

UNIT-III

Databases and Content Providers: Introduction to Android Databases, Introducing SQLite, Content Values and Cursors, working with SQLite Databases - Introducing the SQLiteOpenHelper, querying a Database, Extracting Values from a Cursor, Adding, Updating, and Removing Rows, Creating Content Providers, Using Content Providers - Introducing the Content Resolver, Querying Content Providers, Adding, Deleting, and Updating Content.[TB1-chapter 8]

UNIT-IV

Maps and Location based services: Using the location-based services, selecting a Location Provider, selecting a Location provider, and finding current location;

Creating Map-Based Activities: Introducing Map View and Map Activity, Creating a Map-Based Activity, Maps and Fragments.[TB1-chapter 13]

UNIT-V

Telephony and SMS: Using telephony - Initiating Phone Calls, Accessing Telephony Properties and Phone State, Monitoring Changes in Phone State Using the Phone State Listener.

Introducing SMS and MMS: Using SMS and MMS in Your Application, Sending SMS and MMS from Your Application Using Intents, Sending SMS Messages Using the SMS Manager. [TB1-chapter 17]

Text Book

1. Reto Meier, *Professional Android 4 Application Development*, First Edition, Wrox Press, Wiley Publishing, 2014

References

1. Pradeep Kothari, *Android Application Development (with Kitkat Support), Black Book*, 2014, Dreamtech Press publisher, Kogent Learning Inc., 2014
2. Erik Hellman, *Android Programming: Pushing the Limits*, First Edition, Wiley Publications, 2014
3. Mike Wolfson, *Android Developer Tools Essentials,* O'Reilly Edition, First Edition, 2013

INTERNET OF THINGS

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Course Objectives

1. Differentiate Physical and Logical Design of IoT
2. Categorize pin configuration of Arduino Uno Board
3. Demonstrate Code in Node-RED
4. Identify communication between M2M
5. Develop an IoT Applications using Raspberry Pi board

Course Outcomes

At the end of this course students will be able to:

1. Identify physical and logical design of IoT
2. Understand Arduino Uno Board
3. Implement code in Node-RED
4. Develop an IoT Application using Arduino Uno board
5. Develop an IoT Applications using Raspberry Pi board

UNIT-I

Introduction to IoT: Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs.

Domain specific applications of IoT: Home automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and lifestyle.

UNIT-II

Arduino Basics: Hardware Requirements, Software Requirements, Arduino Programming Language References

Internet Connectivity: Arduino Uno Wired Connectivity (Ethernet), Arduino Uno Wireless Connectivity (Wifi)

UNIT-III

Communication Protocols: HTTP, MQTT (3 hours)(T2, Chapter3)

Complex Flows: Node-RED: Hardware and Software Required, Circuit, Node-RED Flow, code (Arduino)

UNIT-IV

Prototypes

IoT Patterns: Real-time Clients, Remote Control, On-Demand Clients, Web Apps, Location Aware, Machine to Human, Machine to Machine.

UNIT-V

Using IOT for RFID and MQTT and the Raspberry Pi: Introduction to Raspberry Pi, RFID Technology, IoTRFID Hardware and Software, Building an MQTT Server on a Raspberry Pi, the Software on the Raspberry Pi, Building the IOTRFID Project

Text Books

1. Arshdeep Bahga and Vijay Madisetti, *Internet of Things - A Hands-on Approach*, Universities Press, 2015
2. Adeel Javed, *Building Arduino Projects for the Internet of Things Experiments with Real-World Applications*, Apress, 2016
3. John C. Shovic , *Raspberry Pi IoT Projects, Prototyping Experiments for Makers*, Apress, 2016

References

1. Pethuru Raj and Anupama C. Raman, *The Internet of Things: Enabling Technologies, Platforms, and Use Cases*, (CRC Press)
2. Matt Richardson & Shawn Wallace, *Getting Started with Raspberry Pi*, O'Reilly (SPD), 2014
3. R.K.Mittal and I J Nagrath, *Robotics and Control*, TMH, 2003

UNIFIED MODELING LANGUAGE

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Course Objectives

1. The importance of modeling in the software development life cycle
2. The UML notation and symbols
3. The object-oriented approach to analyzing and designing systems and software solutions
4. How to Employ the UML notation to create effective and efficient system designs

Course Outcomes

At the end of this course, students will be able to:

1. Ability to abstract object-based views for generic software systems.
2. Ability to analyze and model software specifications.
3. Ability to abstract behavioral model software specifications.
4. Ability to deliver robust software components.
5. Ability to inculcate necessary skills to handle complexity in software design.

UNIT-I

Introduction to UML: Importance of modeling, Principles of modeling, Object oriented modeling, Conceptual model of the UML.

UNIT-II

Use cases, Use case diagrams

Basic Structural Modeling: Classes, Relationships, Modeling Techniques for Class diagrams.

Object Diagrams: Concepts, Modeling Techniques for Object diagrams.

UNIT-III

Advanced Structural Modeling: Advanced Classes, Advanced Relationships, Interfaces, Packages.

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

UNIT-IV

Basic Behavioral Modeling: Activity diagrams, Interaction diagrams, Sequence diagrams

UNIT-V

Advanced Behavioral Modeling: Collaboration diagrams, State chart diagrams

Case Study: The unified Chatbot Application

Text Books

1. Grady Booch, James Rumbaugh, Ivar Jacobson: *The Unified Modeling Language User Guide,* Pearson Education 2nd Edition.
2. Terry Quatrani, *Modeling with Rational Rose 2000 and UML /.Rose* 2000 ed.

References

1. Meilir Page-Jones, *Fundamentals of Object Oriented Design in UML*, Pearson Education.
2. Martina Seidl,Marion Scholz, Christian Huemer, Gerti Kappel, *UML @ Classroom: An Introduction to Object-Oriented Modeling*, Springer International Publishing
3. Atul Kahate, *Object Oriented Analysis & Design*, The McGraw-Hill Companies.
4. Mark Priestley, *Practical Object-Oriented Design with UML*, TMH.
5. Craig Larman, *Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process*, Pearson Education.

DISTRIBUTED SYSTEMS

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To acquire an understanding of the issues in distributed systems
2. To study architectures and working of distributed file systems
3. To expose the students to distributed transaction management, security issues and replication

Course Outcomes

At the end of this course, students will be able to:

1. Students would be able to describe the problems and challenges associated with principles of distributed systems.
2. Students will be able to evaluate the effectiveness and shortcomings of different solutions.
3. Students can implement small scale distributed systems and can actually learn the solutions by doing.

UNIT-I

Introduction: Goals and Types of Distributed Systems

Architectures: Architectural Styles, System Architectures, Architectures versus Middleware, and Self-Management in Distributed Systems.

Processes: Threads, Virtualization, Clients, Servers, and Code Migration.

Communication: Fundamentals, Remote Procedure Call, Message-Oriented Communication, Stream-Oriented Communication, and Multicast Communication.

UNIT-II

Naming: Names, Identifiers and Addresses, Flat Naming, Structured Naming, and Attribute-Based Naming.

Synchronization: Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning of Nodes, and Election Algorithms.

Consistency and Replication: Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Replica Management, and Consistency Protocols.

UNIT-III

Fault Tolerance: Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, and Recovery.

Distributed Object-Based Systems: Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

UNIT-IV

Distributed File Systems: Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

Distributed Web-Based Systems: Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

UNIT-V

Distributed Coordination-Based Systems: Introduction to Coordination Models, Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

Map-Reduce: Example, Scaling, programming model, Apache Hadoop, Amazon Elastic Map Reduce, Mapreduce.net, Pig and Hive.

Text Book

1. Andrew S. Tanenbaum and Maarten Van Steen, *Distributed Systems*, PHI 2nd Edition, 2009.

References

1. R.Hill, L.Hirsch, P.Lake, S.Moshiri, *Guide to Cloud Computing, Principles and Practice*, Springer, 2013.
2. R.Buyya, J.Borberg, A.Goscinski, *Cloud Computing-Principles and Paradigms*, Wiley 2013.

EVOLUTIONARY COMPUTING

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. About the basic concepts of evolution and the manner of operation of an evolutionary algorithm
2. About evolutionary strategies
3. About parameter control evolutionary algorithms and multi modal problems and spatial distribution
4. Optimize different types of functions. Will also be able to describe about schema theorem, statistical mechanics.
5. About constraint handling. Including interactive and non-stationary aspects.

Course Outcomes

At the end of this course, students will be able to:

1. Formulate solutions for problems involving evolutionary aspects
2. Perform fitness, mutation and recombination operations on chromosomes using a wide range of methods.
3. Perform classification with a wide range of data using genetic programming
4. Solve problems using Memetic algorithms and also decide on the appropriateness of Lamarckian and Baldwinian methods.
5. Solve Problems involving multiple objectives and constraints and demonstrate the special forms of evolution and working with evolutionary algorithms with examples

UNIT-I

Evolutionary Algorithms: Need for Evolutionary Computing, Basic Definition, Components of Evolutionary algorithms, Evolutionary Cycle, The Operation of an Evolutionary Algorithm, Natural Versus Artificial Evolution, Evolutionary Computing, Global Optimization and Other Search Algorithms

UNIT-II

Representation, Mutation, Recombination, Fitness and Selection: Binary Representation, Integer Representation, Real valued representation, Population Management Models, Parent Selection, Survivor selection, Selection Pressure

UNIT-III

Evolutionary Algorithm Variants: Genetic Algorithms, Evolution Strategies, Evolutionary Programming, Genetic Programming, Learning Classifier Systems, Differential Evolution, Particle Swarm Optimization

Parameter Control: Introduction, Examples of changing parameters, Classification of control techniques, Examples of varying EA parameters

UNIT-IV

Hybridization: Lamarckianism and the Baldwin Effect, Structure of a Memetic Algorithm, Adaptive Memetic Algorithms, Design Issues for Memetic Algorithms

Multiobjective Evolutionary Algorithms: Multiobjective Optimization, Dominance and Pareto Optimality, EA Approaches to Multiobjective Optimization Schema Theorem, Dynamical systems, Markov Chains, Penalty methods, Repair methods, Analysis, Some examples,, algorithms.

UNIT-V

Constraint Handling: Types, Approaches to Handling Constraints

Co-evolutionary Systems: Cooperative and Competitive Coevolution, Schema Theorem, Dynamical Systems, Markov Chain Analysis

Working with Evolutionary Algorithms: Performance measures, Test problems, Examples

Text Book

1. A.E. Eiben, J.E. Smith, *Introduction to Evolutionary Computing*, Natural Computing Series, Springer-Verilag, ISBN : 978, 3- 662-44873-1, 2nd Edition, 2015

References

1. Thomas Back, David B Fogel and Zbigniew Michalewicz, *Evolutionary Computation Basic Algorithms and Operators*, IOP Publishing Ltd, 2000
2. Goldberg and David E, *Genetic Algorithms in Search. Optimization and Machine Learning*, Pearson Education, New Delhi, 2006
3. Dan Simon, *Evolutionary Optimization Algorithms*, Wiley, 2013
4. Kalyamoy Deb, *Multiobjective Optimization using Evolutionary Algorithms*, John Wiley & Sons, First Edition, USA, 2003.
5. Koza, John, Wolfgang Banzhaf, Kumar Chellapilla, Kalyanmoy Deb, Marco Dorigo, David Fogel, Max Garzon, David Goldberg, Hitoshi Iba, and Rick Riolo(Eds.), *Genetic Programming*, Academic Press. Morgan Kaufmann, USA, 1998.

CRYPTOGRAPHY

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. Summarize the concepts of cryptography and its applications.
2. Compare and analyze encryption Algorithms
3. Differentiate Authentication Functionalities of MAC and Hash
4. Analyze security aspects of various web Applications
5. Analyze different network protocols

References

At the end of this course, students will be able to:

1. Outline fundamentals of cryptography and its applications.
2. Differentiate Symmetric and Asymmetric Algorithms
3. Compare MAC and Hash Authentication Algorithms
4. Classify different network protocols.
5. Analyze security aspects of various web Applications

UNIT-I

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security

Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks. [TB1-chapter 1,2]

UNIT-II

Symmetric key Ciphers: Block Cipher principles, AES, Blowfish, Block cipher operation, Stream ciphers, RC4. [TB1-chapter 3,5,7]

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.[TB1-Chapter 9,10]

UNIT-III

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Digital Signature Scheme. [TB1-Chapter 11, 13]

Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure, protocol building blocks [TB1-Chapter 14, 15]

UNIT-IV

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer, Security, HTTPS, Secure Shell (SSH)-[TB1-Chapter 17]

Wireless Network Security: Wireless Security, Mobile Device Security, Wireless LAN, Wireless LAN Security [TB1-Chapter 18]

UNIT-V

E-Mail Security: Pretty Good Privacy, IP Security: IP Security overview, IP Security Architecture, Authentication Header, encapsulating security payload, combining security associations, Internet Key Exchange [TB1-Chapter 19]

Text Books

1. William Stallings, *Cryptography and Network Security - Principles and Practice,* Pearson Education, 6th Edition
2. Bruce schneier, *Applied Cryptography: Protocols, Algorithms, and Source Code in C*, Wiley, 2nd Edition

References

1. Forouzan Mukhopadhyay, *Cryptography and Network Security*, McGraw Hill, 3rd Edition
2. WM. Arthur Conklin, Greg White, *Principles of Computer Security,* TMH
3. Bernard Menezes, *Network Security and Cryptography*, Cengage Learning
4. C K Shyamala, N Harini, Dr T R Padmanabhan, *Cryptography and Network Security,* Wiley India, 1st Edition.

FUNDAMENTALS OF IMAGE DATA MINING

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. Describe the essential tools for image mining, such as Fourier transforms, Gabor filters, and contemporary wavelet transforms.
2. Review a varied range of state-of-the-art models, algorithms, and procedures for image mining.
3. Emphasize on real image data for practical image mining.
4. Extraction of features like color, texture, and shape from images for image representation.
5. Presents powerful approaches for classifying image data.

Course Outcomes

At the end of this course, students will be able to:

1. Understand the essential tools for image mining, such as Fourier transforms, Gabor filters, and contemporary wavelet transforms.
2. Understand the varied range of state-of-the-art models, algorithms, and procedures for image mining.
3. Highlight the real image data for practical image mining
4. Analyze the features like color, texture, and shape from images for image representation
5. Implementation of powerful approaches for classifying image data

UNIT-I

Fourier Transform: Introduction, Fourier series, Discrete Fourier Transform, 2D Fourier Transform and its Properties.

Windowed Fourier Transform: Introduction, Short term Fourier Transform and Gabor Filters.

Wavelet Transform: Discrete wavelet Transform, Multiresolution Analysis and Fast Wavelet Transform.

UNIT-II

Color Feature Extraction: Color Histogram, Color Structure Descriptor, Dominant Color Descriptor, Color Coherence Vector and Color Layout Descriptor.

Texture Feature Extraction: Spatial Texture Feature Extraction Methods, Spectral Texture Feature Methods Using Gabor Filters and Wavelet Transform.

UNIT-III

Contour Based Shape Methods: Shape Signatures, Shape Context, Boundary Moments and Fourier Descriptor.

Region Based Shape Feature Extraction: Geometric Moments, Generic Fourier Descriptor, Shape Matrix and Shape Profiles.

UNIT-IV

Image Classification: Introduction, Image Classification using Bayesian Classifier, Support Vector Machine, Decision Tree and Artificial Neural Network.

Image Annotation: Introduction, Image annotation with decision tree-Splitting criterion.

UNIT-V

Image Indexing and Ranking: Numerical Indexing, Inverted File Indexing, Similarity Measures and Performance Measures.

Image Presentation: Caption Browsing, Category Browsing and Context Browsing.

Text Book

1. Dengsheng Zhang, *Fundamentals Of Image Data Mining, Analysis, Features, Classification And Retrieval* Springer International Publishing, 2019

References

1. Gonzalez R.C., Woods R.E, *Digital Image Processing*, 3rd Edition, Pearson, Prentice-Hall of India Pvt.Ltd. New Delhi.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, *Image Processing, Analysis and Machine Vision*

VERBAL ABILITY AND CRITICAL REASONING

BTech (AIML) III Year I Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	HSS&MC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

UNIT-I

Data Interpretation: Tabular, Pie-charts, Bar and line graphs and Problems on all models.

Data Sufficiency: Introduction and Problems based on all Quant and logical topics.

Allegations and Mixtures: Allegation rule, mean value of the mixture, Replacement of equal quantity of mixtures.

UNIT-II

Geometry: Line, line segment, angle, Triangles and Polygons with their Properties.

Mensuration: Area and perimeter of Triangle, Rectangle, Square, Parallelogram, Trapezium, Surface area & Volume of 3D figures.

Logarithms: Formulas and Problems based on Logarithms.

Progressions and Quadratic Equations: Arithmetic, Geometric and Harmonic Progressions and their relations. General forms of Quadratic equations and finding the roots and their nature.

UNIT-III

Syllogisms: Statements and Conclusions by using vein diagrams.

Odd One Out: Classification and problems based of Odd one out.

Cubes and Dice: Types of cubes and dice with Examples.

Statement and Conclusions: Introduction, Types of conclusions and different cases.

UNIT-IV

Tenses: Types, usage, question solving.

Vocabulary: Types, usage and error spotting.

Inference: conclusion reached on the basis of evidence and reasoning, question solving.

Para Jumbles: Arranging the jumbled sentence by using the strategies.

Sentence Completion: Completing a sentence by filling the gaps by understanding & analyzing the meaning of the sentence along with the approaches.

UNIT-V

Subject Verb Agreement: Rules and examples for finding the right subject and verb.
Sentence Correction: Error spotting and correcting the sentence.
Reading Comprehension: Understanding Meaning, Understanding the meaning of a text means figuring out what the passage is trying to tell you. Drawing Connections. Summarizing and Synthesizing.
Direct & Indirect Speeches: What is Direct & Indirect Speech? , reporting the message of the speaker in the exact words as spoken by the speaker and examples.
Active Voice & Passive Voice: Types of active and passive voice, rules and examples

Text Books

1. R.S Agarwal, *Verbal and Non Verbal Reasoning*, New Edition -2020, S. Chand.
2. R.S Agarwal, *Quantitative Aptitude*, New Edition- 2020, S. Chand.

References

1. Abhijeet Guha, *Quantitative Aptitude*, New Edition-2020, Mc Graw Hill

COMPUTER VISION AND WEB DATA MINING LAB

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PCC Lab	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

PART-A

1. Installation of SCI lab and basic commands
2. Write the programs for vector and matrix operations
3. a. Write a program for displaying an image, printing of its properties and manipulations, arithmetic operation on images?
   b. Write a program for displaying histogram and histogram equalization?
4. a. Write a program for adding different types of noises with different percentages?
   b. Write a program for application of following mask
   i. Sobel ii. Prewitt iii. Robert iv. Canny v. Laplacian vi. LOG
5. Write a program for color image conversion models?
6. a. Write a program for reading RGB image and segmentation using threshold method?
   b. Write a program for color image histogram manipulations?
7. a. Write a Program for following morphology operations
   i. Dilation ii. Erosion iii. Open iv. Close v. Hit-or-Miss transform
   b. Write a program for rotating the image into different angles?

PART-B

1. Apply Naive Bayes Classification algorithm for a given textual dataset (1 week)
2. Apply SVM algorithm for a given dataset (2 weeks)
3. Apply Hierarchical Clustering for a given textual dataset. Experiment with different distance metrics (2 weeks)
4. Implement the distance functions for assessing similarity between documents while taking care of standardizing the attributes (1 week)
5. Apply text preprocessing methods to extract relevant text: Stop Word Removal, Stemming, Frequency Analysis for unigrams, bigrams and trigrams (2 weeks)

   Note: Lucene/Weka/ MeTA/Python can be used for conducting the lab

R PROGRAMMING LAB

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PEC-I Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

1. Explore R environment
2. Visualize data insights using charts and graphs
3. Analysis data with linear regression model

Week 1
Installation and Environment set up R and Rstudio
Week 2
Experiments on Vector Arithmetic operations
Week 3
Experiments on Matrices operations
Week 4
Experiments on Arrays functions
Week 5
Experiments on Factors
Week 6
Experiments on Data Frames
Week 7
Experiments on List operations
Week 8
Write R scripts which demonstrate logical operations and Conditional Statements
Week 9
Write R scripts which demonstrate Looping over List
Week 10
Write R scripts which demonstrate Nested Functions and Function Scoping
Week 11
Experiments on Mathematical Functions in R
Week 12
Experiments on Calculus in R
Week 13
Experiments on Lapply, Sapply and Apply functions

Week 14

Generate different Charts and Graphs using R

Week 15

Experiments on data interfaces

Week 16

Analysis of data with linear regression model

MOBILE APPLICATION DEVELOPMENT LAB

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PEC-I Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

At the end of this course, students will be able to

1. Develop user interfaces for the Android platform
2. Implement various mobile applications using Emulators
3. Create a database for mobile applications using SQLite Database
4. Perform location-based services in android applications
5. Create telephony and SMS for android applications

List of Experiments

1. Develop an application that Uses GUI Components, Font and Colors.
2. Develop an application that Uses Layout Managers and Event Listeners.
3. Develop a Native Calculator Application.
4. Write an application that Draws Basic Graphical Primitives on The Screen.
5. Develop an application that Makes Use of databases.
6. Develop a Native application that Uses GPS Location Information.
7. Implement an application that Writes Data to The SD Card.
8. Implement an application that Creates an Alert Upon Receiving A Message.
9. Write a Mobile application that Creates Alarm Clock.

INTERNET OF THINGS LAB

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PEC-I Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Week 1:

1. Study and Install IDE of Arduino and different types of Arduinos.
2. Write program using Arduino IDE for Blink LED.
3. Write Program for RGB LED using Arduino.

Week 2:

4. Write program for buzzer using Arduino.
5. Write program for LDR using Arduino.
6. Write program for IR Sensor using Arduino.

Week 3:

7. Study the Temperature sensor and Write Program for monitor temperature using Arduino.

Week 4:

8. Study and Implement RFID, NFC using Arduino.

Week 5:

9. Study and implement MQTT protocol using Arduino.

Week 6:

10. Study and Implement Arduino Uno with Ethernet Connection to Send data to a Cloud

Week 7:

11. Study and Implement Arduino Uno with ESP 32 Connection to Send data to a Cloud

Week 8:

12. Study and Configure Raspberry Pi.
13. Write program for LED blink using Raspberry Pi
14. Write program for RGB LED using Raspberry Pi

Week 9:

15. Implement Raspberry Pi based Automated Street Lighting System.
16. Write an Arduino program for Distance Measurement Using Ultrasonic Sensor and displaying on LCD.

Week 10:

17. Write program for Buzzer using Raspberry Pi
18. Write program for LDR using Raspberry Pi
19. Write program for IR Sensor using Raspberry Pi

Week 11:

20. Implement IoT based weather monitoring system using Raspberry Pi.

Week 12:

21. Study and Implement RFID, NFC using Raspberry Pi.

Week 13:

22. Study and Implement Raspberry Pi with Ethernet Connection to Send data to a Cloud

Week 14:

23. Study and Implement Raspberry Pi with Wifi Connection to Send data to a Cloud

Week 15:

24. Study and Implement Zigbee Protocol using Arduino.

Week 16:

25. Study and Implement Zigbee Protocol using Raspberry Pi.

UNIFIED MODELING LANGUAGE LAB

BTech (AIML) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
	PEC-I Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

List of tasks to be performed week wise

1. Creation and implement of Class diagrams in UML for any application.
2. Creation and implement of Component diagrams in UML for any application.
3. Creation and implement of Deployment diagrams in UML for any application.
4. Creation and implement of Object diagrams in UML for any application.
5. Creation and implement of Package diagrams in UML for any application.
6. Create and implement of Use Case diagrams in UML for any application.
7. Creation and implement of Activity diagrams in UML for any application.
8. Creation and implement of State Chart diagrams in UML for any application.
9. Creation and implement of Sequence diagrams in UML for any application.
10. Creation and implement of Collaboration diagrams in UML for any application.
11. Creation and implement of Interaction diagrams in UML for any application.
12. Case Study on UML diagrams for Google Apps.

Program Structure of
BTech (Artificial Intelligence)
(III & IV Years)

Department of Artificial Intelligence
ANURAG UNIVERSITY
Hyderabad, Medchal (Dist),
Telangana– 500 088
www.anurag.edu.in | hodai@anurag.edu.in

B.TECH (AI) III YEAR I SEM (4 T + 4 P + 1 M)

S.No	Category	Course Name	Hours per week			Credits
			L	T	P	
1	PCC	Essentials of Machine Learning	3	1	0	4
2	PCC	Computer Systems II	3	1	0	4
3	PCC	Web Programming with MEAN	3	0	0	3
4	OEC-I	1. Business Data Storytelling 2. Entrepreneurship Development 3. Intellectual Property Rights	3 3 2	0 0 1	0 0 0	3
5	PCC-Lab	Computer Systems Lab	0	0	3	1.5
6	PCC-Lab	Web Programming with MEAN Lab	0	0	3	1.5
7	PCC-Lab	Essentials of Machine Learning Lab	0	0	3	1.5
8	BSC-Lab	Quantitative Aptitude and Reasoning	0	0	3	1.5
9	MC	NSO/NSS	0	0	2	0
Total						20

B.TECH (AI) III YEAR II SEM (5 T + 2 P + 1 M)

S.No	Category	Course Name	Hours per week			Credits
			L	T	P	
1	PCC	Automata Theory and Applications	3	1	0	4
2	PCC	Information Retrieval Systems	3	0	0	3
3	PCC	Computer Vision and Image Processing	3	0	0	3
4	PEC-1	1. R Programming 2. Mobile Application Development 3. Internet of Things 4. Unified Modeling Language	2	0	0	2
5	PEC-II	1. Distributed Systems 2. Evolutionary Computing 3. Cryptography 4. Fundamentals of Image Data Mining	3	0	0	3
6	HSS&MC	Verbal Ability and Critical Reasoning	0	0	3	1.5
7	PCC Lab	Computer Vision and Information Retrieval Systems Lab	0	0	4	2
8	PEC-1-Lab	1. R Programming Lab 2. Mobile Application Development Lab 3. Internet of Things Lab 4. Unified Modeling Language Lab	0	0	3	1.5
Total						20

B.TECH (AI) IV YEAR I SEM **(5 T +2 L) + Mini project**

S.No	Category	Course Name	Hours per week			Credits
			L	T	P	
1	PCC	Natural Language Processing	3	0	0	3
2	PCC	Deep Learning	3	1	0	4
3	PEC-III	1. Big Data 2. Information Security 3. Computational Biology 4. Optimization	3	1	0	4
4	PEC - IV	1. Reinforcement Learning & Game Theory 2. Blockchain Technology 3. Cloud Computing 4. Introduction to Robotics	3	0	0	3
5	PEC-V	1. Applications of AI in GIS & Remote Sensing 2. Applications of AI in Healthcare 3. Applications of AI in Banking 4. Applications of AI in e-Governance	3	0	0	3
6	PCC Lab	Deep Learning and Natural Language Processing Lab	0	0	3	1.5
7	PEC-III LAB	1. Big Data Lab 2. Information Security Lab 3. Computational Biology Lab 4. Optimization Lab	0	0	3	1.5
8	PROJ	Mini Project	0	0	4	2
Total						**22**

B.TECH (AI) IV YEAR II SEM **(2 T + 3 L/P)**

S.No	Category	Course Name	Hours per week			Credits
			L	T	P	
1	OEC-II	1. Technical and Business Communication Skills 2. Language and life skills/ Digital media literacy 3. Managerial Economics and Financial Analysis	3	0	0	3
2	OEC-III	1. Negotiation Skills 2. Project Management 3. Value Engineering	3	0	0	3
3	PROJ	Seminar	0	0	4	2
4	PROJ	Comprehensive Viva-Voce	0	0	0	2
5	PROJ	Project	0	0	15	10
		Total				**20**

Dept. of CIVIL ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING

5th Board of Studies Meeting

Held on 29th March 2022

Minutes of Meeting

The 5th Board of Studies (BOS) meeting of Civil Engineering was held on Tuesday, 29th March 2022 at 2:30 PM in the conference hall of C-block. The following members were present.

S. No.	Name of Members	Position
1	Dr. K. R. C. Reddy, Professor, CE	Chairman
2	Dr. B. Narender, Assoc. Professor & Head, CE	Member
3	Dr. R. Pradeep Kumar, Professor, IIIT Hyd.	Member
4	Dr. K. Srinivasa Raju, Professor BITS Pilani-Hyd.	Member
5	Dr. P. Rajasekhar, Professor, OU, Hyd.	Member
6	Dr. G. Venkat Rao, Professor, CE	Member
7	Dr. K. Madhusudan Reddy, Assoc. Professor, CE	Member
8	Dr. P. Pradeep Kumar, Assoc. Professor, CE	Member
9	Mr. Ravikanth Chittiprolu, Entrepreneur, Hyd.	Member
10	Mr. K. Saibaba, Assoc. Professor, CE	Member
11	Dr. K. J. N. Sai Nitesh, Asst. Professor, CE	Member
12	Dr. Sambit Kumar Beura, Asst. Professor, CE	Member
13	Mr. D. Rahul, Alumni, 2014 passed out	Member

The chairman has welcomed the members and presented the outline of the agenda of the meeting as given below.

1. To review the course structure of B. Tech. III year and IV year.
2. To approve the syllabus of III year B. Tech. Civil Engineering.
3. To review the Department Vision. Mission, PEOs, PSOs and POs.

As per the agenda, the draft copies were presented for the discussion, the comments were noted and the 'minutes of the meeting' are presented below.

Item-1: Review of course structure of B. Tech. III year and IV year

The course structure which has been approved in the previous (3rd) BOS meeting has been reviewed and approved as it is.

Item-2: Approve the syllabus of III year B. Tech. Civil Engineering

The draft copy of the syllabus which was prepared by the expert committee of the Department based on the previous syllabus with minor changes has been presented to the BOS members for the comments and corrections. The members have accepted the draft copy with minor changes in few courses. The suggested changes have been incorporated in the final copy.

Item-3: Review of Department Vision, Mission, PEOs, PSOs and POs.

The draft copy of the vision, mission, PEOs, PSOs, and POs are being presented to the members for corrections if any. The members have expressed satisfaction with the draft copy but they have suggested little correction in the Vision of the department to suit to the vision of the Institution. The suggested correction has been incorporated and finalized the 'vision'.

Corrected version of vision is, 'To produce globally competent and qualified Civil Engineers with innovative ideas for the betterment of society'

Instead of 'To produce globally competent and qualitative professionals with innovative ideas in Civil Engineering

The discussions have taken place on the remaining topics, 'Mission', PEOs, PSOs, and POs, finally all the members have agreed upon to carry the same as that of the old one. In view of the PSOs, one of the members Prof. Srinivas Raju suggested compressing them from four to two numbers but the final consensus is arrived to retain them as it is.

Dr. K. R. C. Reddy
Chiarman BoS

Enclosure:

1. Course Structure of all four years of B. Tech. Civil Engineering
2. Syllabus of III B. Tech. Civil Engineering
3. Finalized copy of Department Vision, Mission, PEOs, PSOs and POs

ANURAG UNIVERSITY
Department of Civil Engineering

1. Department Vision

To produce globally competent and qualified Civil Engineers with innovative ideas for the betterment of society'

2. Department Mission

To offer quality education to promote research culture, professional consultancy and man power training as well as leadership in Civil Engineering.
M1: Quality education
M2: Research culture
M3: Professional consultancy
M4: Manpower training
M5: Leadership qualities

3. Program Educational Objectives (PEOs)

PEO 1: To enable the graduates employable as Civil Engineering professionals in all sectors.
PEO 2: To produce engineers to achieve the professional expertise in latest technologies to excel in the analysis and design of various components and structures.
PEO 3: To produce graduates to work in multidisciplinary teams with effective communication and team work skills with high regard to legal and ethical responsibilities.
PEO 4: To prepare the graduates to adopt the latest trends in Civil Engineering by engaging themselves in lifelong learning.

4. Program Specific Outcomes (PSOs)

PSO 1: Work in the domain of planning, analysis and design of civil structures by utilizing advanced technologies.
PSO 2: Plan and design the transportation network as per the requirement of society
PSO 3: Apply the theory to know the behavior of the geotechnical aspects and their improvement
PSO 4: Apply the knowledge of behavior of the water and environment to design the related structures for the benefit of society.

5. Program Outcomes (POS)

1. Able to apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization for the solution of complex engineering problems,
2. Able to analyze complex engineering problems using first principles of mathematics, natural sciences, and engineering sciences.

3. Able to design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health, safety, cultural, societal, and environmental considerations.
4. Able to use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid solutions.
5. Able to create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling to complex engineering activities.
6. Able to apply the contextual knowledge to assess social, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.
7. Able to understand the impact of the professional engineering solutions in social and environmental contexts.
8. Able to apply ethical principles and commitment to professional ethics and responsibilities and norms of the engineering practice.
9. Able to function effectively as an individual, a member or a leader in diverse teams and in multidisciplinary settings.
10. Able to communicate effectively, comprehend and write effective reports, design documentation and make effective presentations.
11. Able to demonstrate knowledge and understanding of the engineering and management principles to manage projects as a member and leader in a team in multidisciplinary environments.
12. Able to engage self and life-long learning.

ANURAG UNIVERSITY

DEPARTMENT OF CIVIL ENGINEERING

B. TECH. CIVIL ENGINEERING
COURSE STRUCTURE

R20 Regulations

B. Tech. III Year I-Semester (5th Semester) 5T+3L+1MC

S. No.	Category	Course Title	Hours per week			Credits
			L	T	P/D	
1	PCC	Design of Reinforced Concrete Structures	3	1	0	4
2	PCC	Structural Analysis	3	0	0	3
3	PCC	Transportation Engineering	3	0	0	3
4	PCC	Hydrology and Water Resources Engineering	3	0	0	3
5	OEC	**Open Elective-I** 1. English for Professionals 2. Essential English and Employability Skills 3. Entrepreneurship Development	3	0	0	3
6	PCC	Transportation Engineering Laboratory	0	0	2	1
7	ESC	Computer Aided Drafting of Building	0	0	3	1.5
8	BSC	Quantitative Aptitude and Reasoning Laboratory	0	0	3	1.5
9	MC	NSS and Sports	0	0	3	0
TOTAL						**20**

B. Tech. III Year II-Semester (6th Semester) 5T+3L+1MC

S. No.	Category	Course Title	Hours per week			Credits
			L	T	P/D	
1	PCC	Design of Steel Structures	3	1	0	4
2	PCC	Environmental Engineering	3	0	0	3
3	PEC	**Professional Elective-I** 1. Advanced Structural Analysis 2. Irrigation Engineering 3. Foundation Engineering	3	0	0	3
4	PEC	**Professional Elective-II** 1. Traffic Engineering and Management 2. Elements of Earthquake Engineering 3. Rehabilitation and Retrofitting of Structures	3	0	0	3
5	PEC	**Professional Elective-III** 1. Construction Technology and Project Management 2. Pavement Analysis and Design 3. Disaster Preparedness and Planning	3	0	0	3
6	PCC	Environmental Engineering Laboratory	0	0	2	1
7	PCC	Structural Analysis and Design Laboratory	0	0	3	1.5
8	HSS&MC	Verbal Ability and Critical Reasoning	0	0	3	1.5
9	MC	Gender Sensitization	3	0	0	0
TOTAL						**20**

B. Tech. IV Year I-Semester (7th Semester) 6T+2L+1 PROJ

S. No.	Category	Course Title	Hours per week			Credits
			L	T	P/D	
1	PCC	Estimation and Costing	3	0	0	3
2	ESC	Geospatial Technology	3	0	0	3
3	HSS&MC	Engineering Economics	3	0	0	3
4	PEC	**Professional Elective-IV** 1. Advanced Structural Design 2. Air Pollution and Control 3. Railways and Airport Engineering	3	0	0	3
5	PEC	**Professional Elective-V** 1. Prestressed Concrete Structures 2. Ground Improvement Techniques 3. Water Distribution Systems	3	0	0	3
6	PEC	**Professional Elective-VI** 1. Earth Retaining Structures 2. Ground Water Development and Mgmt. 3. Industrial Waste Water and Management	3	0	0	3
7	ESC	Geospatial Technology Laboratory	0	0	2	1
8	ESC	Computer Applications in Civil Engineering Lab	0	0	2	1
9	PROJ	Industry Oriented Mini Project	0	0	4	2
TOTAL						**22**

B. Tech. IV Year II-Semester (8th Semester) 2T+ 3 PROJ

S. No.	Category	Course Title	Hours per week			Credits
			L	T	P/D	
1	OEC	**Open Elective-II** 1. Technical and Business Communication Skills 2. Intellectual Property Rights 3. Introduction to Artificial Intelligent	3	0	0	3
2	OEC	**Open Elective-III** 1. Instrumentation and Sensors 2. Negotiation Skills 3. Introduction to Machine Learning	3	0	0	3
3	PROJ	Seminar	0	0	0	2
4	PROJ	Comprehensive Viva	0	0	0	2
5	PROJ	Project Work	0	0	20	10
TOTAL						**20**

Design of Reinforced Concrete Structures

B. Tech III Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A55001	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

1. To impart the knowledge of materials and methods designs
2. To understand the design of beams and effect of shear
3. To obtain the knowledge of limit state of serviceability conditions
4. To provide the knowledge of the design of slabs and staircases
5. To impart the knowledge of design of columns and footings.

Course Outcomes

At the end of the course the students will be able to

CO 1: Identify the materials and method of design of RC structural elements
CO 2: Illustrate the methods of design of RC beams
CO 3: Distinguish the serviceability requirement of RC structural elements
Co 4: Evaluate the design of one and two way slabs
CO 5: Design the columns and footings for various loading effects.

UNIT-I

Materials in RCC, reinforcing materials, types of loads, design philosophies, Limit State method of design characteristic values, design values
Limit state of collapse in flexure: assumptions, stress-strain relationship for concrete and steel, analysis of singly reinforced beams.

UNIT-II

Limit state of collapse in shear and bond: shear stress in RCC beams, effect of shear-diagonal tension, types of shear reinforcement, IS code recommendations, design of shear reinforcement, bond and development length
Design of singly and doubly reinforced beams: IS code provisions, analysis and design, types of problems.

UNIT-III

Design of T-beams: IS code provisions, analysis and design of singly reinforced T-beams
Limit state of collapse in torsion: IS code approach, design of L-beams.

Limit state of serviceability: Limit state of **deflection**, IS code recommendations, short and long term deflections, limit state of **cracking**, calculation of crack width

UINIT-IV

One way slabs: load distribution in slabs, classification, IS code recommendations, design of simply supported and continuous slabs.
Two way slabs: types, IS code method of design
Staircase: terminology, proportioning and structural behavior, IS code provisions.

UNIT-V

Columns: classification, effective length, reinforcement in column, IS code specifications.
Limit state of collapse in compression: assumptions, design of short rectangular and circular columns, design of column with uniaxial and biaxial bending using design aids, design of long column.
Foundations: classifications, codal provisions, design of footings for square and rectangular columns, necessity of combined footings.

Textbooks

1. N. Subramanyan, 'Design of Reinforced Concrete Structures', OXFORD University Press, Published by OUP India, 2014
2. S Unnikrishna Pillai and Devdas Menon, 'Reinforced Concrete Design', 4th Edition, 2021

References

1. Neelam Sharma, 'Reinforced Cement Concrete Design', S. K. Kataria & Sons publishers, 2nd Edition, 2020
2. Ashok K. Jain, 'Reinforced Concrete: Limit State Method', 7th Edition, 2012
3. P. C. Varghese, 'Limit State Design of Reinforced Concrete' 2nd Edition, PHI Learning Pvt. Ltd., 2014
4. P. C. Virghese, 'Advanced Reinforced Concrete Design', 2nd Edition, PHI Learning Pvt. Ltd., 2011
5. S. N. Sinha, 'Reinforced Concrete Design', 3rd Edition, McGraw Hill Education (India) Pvt. Ltd., 2018
6. N. C. Sinha, S. K. Roy, 'Fundamentals of Reinforced Concrete', S. Chand and Company Ltd., 2018
7. David Darwin, Charles W. Dolan, Arthur H. Nilson, 15th Edition, McGraw Hill Education (India) Pvt. Ltd., 2016
8. H. J. Shah, 'Reinforced Concrete', Vol. I & II, Charotar Publishing House Pvt. Ltd. 6th Edition, 2012.

IS Codes

1. IS 456: 2000, ‘Indian Standard Plain and Reinforced Concrete – Code of Practice’ 4th Revision, Bureau of Indian Standards.
2. SP 16: Design Aids for Reinforced Concrete to IS 456, Bureau of Indian Standards.
3. IS 875: 1987, ‘Code of Practice for Design Loads’, Bureau of Indian Standards.

Structural Analysis

B. Tech III Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A55002	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To understand the indeterminacy of structures
2. To know the application of strain energy method for redundant trusses and frames
3. To impart the knowledge of analysis of two and three hinged arches
4. To know the analysis of redundant structures by moment distribution method.
5. To evaluate the behavior of cables and suspension bridges for various loads.

Course Outcomes

At the end of the course the students will be able to

CO 1: Identify the indeterminacy of structures

CO 2: Implement the strain energy method for the analysis of redundant trusses.

CO 3: Analyze the two and three hinged arches

CO 4: Evaluate the behavior of beams and frames by moment distribution method.

CO 5: Investigate the behavior of cable and suspension bridges for various loads.

UNIT-I

Indeterminacy Structures: Classification of structures, equations of static equilibrium, internal forces, free body diagrams, external and internal indeterminacy, degree of static indeterminacy of pin jointed and rigid jointed plane and space structures, degree of kinematic indeterminacy of pin jointed and rigid jointed plane and space structures.
Truss Analysis: Application of method of joints and method of sections to simple determinate trusses.
Springs: Types, deflection closely coiled helical springs under axial pull and axial couple, springs in series and parallel.

UNIT-II

Strain energy method: Strain energy stored due to axial load and bending, resilience, strain energy stored due to gradual, sudden and impact loading, second theorem of Castigliano, redundant trusses with one internal redundant member, externally redundant trusses, portal frames, principle of least work.
Plastic theory: Stress-strain diagram for mild steel, assumptions, plastic bending of beams, plastic hinge, plastic modulus, plastic moment, shape factor, relation between load factor and factor of safety.

UNIT-III

Three hinged arches: Analysis, temperature effects on parabolic arch, normal thrust and radial shear
Two hinged arches: Semicircular arch, parabolic arch, reaction locus, for semicircular and parabolic arch, temperature effects on parabolic arch, normal thrust and radial shear, linear arch/line of thrust.

UNIT-IV

Moment distribution method: Basic proportions, distribution theorem, relative stiffness, application to continuous beams, sinking of support, portal fames, horizontal thrust and vertical reaction of portal frames, application to non-sway types of frames, frames with inclined legs.
Approximate methods: Method of substitute frames, portal method and cantilever method

UNIT V

Slope deflection method: Sign convention, slope deflection equations, application to continuous beams and portal frames of non-sway type.
Cables: equilibrium of loaded cord, cable carrying udl, cable passed over a guide pulley, cable clamped to saddle carried on smooth roller, temperature stresses.
Suspension bridges: Suspension bridge with three hinged stiffening girder, cable with two hinged stiffening girder, temperature stresses.

Textbooks

1. S. Ramamrutham, R. Narayanan, 'Theory of Structure', 5th Edition, Dhanpat Rai Publishing Company, 2018.
2. R. C. Hibler, 'Structural Analysis', 6th Edition, Pearson Education, 2008.
3. Devdas Menon, 'Structural Analysis', Narosa Publishing House, 2016

References

1. Ashok K. Jain, 'Advanced Structural Analysis', 2nd Edition, Nemchand & Bros., 2009
2. D. S. Prakash rao, 'Structural Analysis – A Unified Approach', University Press (India) Pvt. Ltd., 2009.
3. C. S. Reddy, 'Basic Structural Analysis', 3rd Edition, Tat McGraw Hill Edn. Pvt. Ltd., 2011.
4. G. S. Pandit, S. P. Guptha, R. Guptha, 'Theory of Structures' Vol. I & II McGraw Hill Edn. (India) Pvt. Ltd., 2016
5. M. L. Gambhir, 'Fundamentals of Structural Mechanics and Analysis, PHI Learning Pvt. Ltd., 2011.

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Transportation Engineering

B. Tech III Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A55003	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisite

Surveying

Course objectives

1. To understand the fundamentals of highway planning, highway alignment and surveys
2. To build knowledge on various geometric design standards of highways
3. To impart knowledge in traffic engineering studies and traffic measurement procedures
4. To study the desirable properties of pavement materials and their characterization
5. To build basic knowledge on railways, airports and water transportation systems

Course outcomes

On completion of the course, the students will be able to:

CO 1: conduct surveys involved in planning and highway alignment
CO 2: design the geometric elements of highway facilities
CO 3: carry out traffic studies and analyze traffic data
CO 4: characterize pavement materials, and
CO 5: design the layouts of railways, airports and marine structures

UNIT-I

Highway Development and Planning: Role of Transportation, Different Modes of Transportation, Characteristics of Road Transport, Classification of Roads, Development of Road Construction, Modern Road Development in India, Road Patterns; Highway Alignment and Surveys - Requirements of Ideal Alignment, Factors Controlling Alignment, Alignment in Hilly Areas, Engineering Surveys for Highway Location, Drawings and Reports, Highway Project Preparation.

UNIT-II

Geometric Design of Highways: Design Control and Criteria, Highway Cross-Section Elements; Sight Distance - Stopping Sight Distance, Overtaking Sight Distance, Intermediate Sight Distance, Sight Distance at Intersection; Necessity and Types of Curves, Factors Affecting Curve Design; Design of Horizontal Alignment - Design Elements, Stability Analysis without Super-elevation, Impact Factor, Design and

Attainment of Super-elevation, Radius at Horizontal Curves, Extra Widening, Necessity and Types of Transition Curve; Design of Vertical Alignment - Analysis of Summit and Valley Curves.

UNIT-III

Traffic Engineering: Scope of Traffic Engineering, Traffic Characteristics, Fundamental Parameters and their Interrelationships; Traffic Volume Studies - Objectives, Methods of Volume Count, Presentation of Volume Data, Peak Hour Factor, PCU Concept; Spot Speed Studies - Objectives, Measurement of Spot Speeds, Presentation of Spot Speed Data; Speed and Delay Studies; Origin and Destination Studies; Design of Parking Facilities.

UNIT-IV

Highway Materials: Materials Used in Highway Construction; Evaluation of Soil Strength - Plate Bearing Test, California Bearing Ratio Test; Desirable Properties of Road Aggregates and Tests; Types and Characteristics of Bituminous Binders, Tests on Bitumen, Grading of Bitumen; Bitumen Emulsion and Cutbacks; Concepts of Modified Binders; Requirement of Bituminous Mixes, Bituminous Mix Design by Marshall Method; Portland Cement and Cement Concrete.

UNIT-V

Introduction to Railway, Airport and Marine Transportation: Railway Track - Permanent Way, Functions and Requirements of Rails, Sleepers, Ballast; Gauges in Railway Track; Airport Layout Components, Configuration of Runways, Runway Orientation, Taxiways, Apron and Hanger; Definitions and Classifications of Harbour, Port and Dock; Harbour Layout; Transit Sheds and Warehouses.

Textbooks

1. Khanna, S.K., Justo, C.E.G, and Veeraragavan, A. Highway Engineering, Revised 10th Edition, Nem Chand & Bros, 2015.
2. Venkatramaiah, C. Transportation Engineering, Vol. 2: Railways, Airports, Docks and Harbours, Bridges and Tunnels, University Press, 2016.

References

1. Kadiyali, L. R., and Lal, N. B. Principles and Practices of Highway Engineering (Including Expressways and Airport Engineering), Khanna Publications, 2019.
2. Kadiyali, L. R. Traffic Engineering and Transportation Planning, 9th Edition, Khanna Publishers, New Delhi, 2018.
3. Chakroborty, P., and Das, A. Principles of Transportation Engineering, PHI Learning, 2nd edition, 2018.

4. Mannering, F. L. and Washburn, S. S., Principles of Highway Engineering and Traffic Analysis, 7th Edition, John Wiley & Sons, 2019.
5. Srinivasa, R. K., Textbook of Highway Engineering, Universities Press, 2011.
6. Srinivasan, R. Harbour, Dock and Tunnel Engineering, Charotar Publishing House Pvt. Ltd., 27th edition, 2015.
7. Wright, P. H., and Dixon, K. K. Highway Engineering, 7th Edition, John Wiley & Sons, 2003.

NPTEL

1. https://nptel.ac.in/courses/105/101/105101087/
2. https://nptel.ac.in/courses/114/106/114106025/

Hydrology and Water Resources

B. Tech III Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A55004	PCC	3	0	0	3	40	60	100

Course Objectives

1. To provide the knowledge of hydrology and hydrologic cycle and its applications.
2. To impart the knowledge of hydrograph, unit hydrograph, s-curve technic and synthetic hydrograph.
3. To provide the knowledge of ground water occurrence and the importance of irrigation.
4. To impart the knowledge of agriculture and water requirements of crops.
5. To impart the knowledge of design of irrigation canals.

Course Outcomes

At the end of the course the students will be able to

CO 1: Understand various processes in the hydrologic cycle and precipitation measurement
CO 2: Design procedures for safe and effective passage of flood flows of hydraulic structures
CO 3: Understand the basic aquifer parameters and estimate groundwater resources for different hydro-geological boundary conditions
CO 4: Calculate water requirements for crops and methods of irrigation
CO 5: Design of irrigation canals , Lining of canals and Water logging effects

UNIT-I

Introduction to Hydrology: Hydrologic cycle, water-budget equation, hydrology history, world water balance, applications in engineering. Precipitation-forms of precipitation, characteristics of precipitation in India, precipitation measurement, rain gauge network, mean precipitation over an area, depth-area-duration, maximum intensity/depth-duration- frequency.

UNIT-II

Precipitation, Evaporation and Infiltration: Abstractions of precipitation-evaporation process, evaporimeters, Water budget method of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations, infiltration, infiltration capacity,
measurement of infiltration, infiltration indices.

UNIT-III

Hydrograph: Definition, factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph and S-Hydrograph
Ground water and well hydrology- forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: equilibrium equations for confined and unconfined aquifers.

UNIT-IV

Soil-water-plant relationships: Water withdrawals and uses– water for energy production, water for agriculture, water for hydroelectric generation; flood control, Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Soil-water-plant relationships; Methods of applying water to the fields.

UNIT-V

Canal distribution systems: Canal systems, alignment of canals, canal losses, estimation of design discharge, alluvial channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals, types of lining.

Textbooks

1. Engineering Hydrology by K Subramanya, Mc-GrawHill(New edition,Jul 2017)
2. Irrigation Engineering and Hydraulic Structures Vol I and II by S.K. Garg, 2017, KhannaPublishers.

References

1. A text book of hydrology by Dr. P. Jaya rami reddy , 2012
2. Irrigation Water Resources and Water Power Engineering by P.N. Modi, KhannaPublishers, 9th , year 2014

NPTEL

1. https://nptel.ac.in/courses/105104103

English for Professionals
Open Elective I

B. Tech III Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A5500x	OE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objective

To prepare the students to use the language effectively in all professional pursuits

Course Outcomes

At the end of the course the students will be able to

CO 1: Analyze the language use in communicative process
CO 2: Describe the process and product
CO 3: Interpret the ideas in group activities
CO 4: Apply different approaches to comprehend the written text
CO 5: Write any technical and official correspondence within the framework

UNIT-I

Essentials of Communication: Essentials of Grammar **-** Rudiments of Communications Skills (Listening, Speaking, Reading, and Writing) - Applied Grammar and Usage - Non-Verbal Communication

UNIT-II

Listening Skills: Art of Listening - Developing Effective Listening Skills - Process of Listening, Intensive & Extensive Listening
Podcasts, Vodcasts (ICT enabled) - Five steps to Active Listening - Effective and Ineffective Listening Skills - Listening & Note-taking

UNIT-III

Speaking Skills: Dynamics of Effective Speaking - Group Discussion - Simulated Presentations, Process & Product Descriptions - Proxemics, Paralinguistic Features

UNIT-IV

Reading Skills: The Art of Effective Reading - Basic steps to Effective Reading - Extensive and Intensive Reading - Approaches to Efficient Reading - Reading Comprehension

UNIT-V

Writing Skills: Art of Condensation - Descriptive Writing Techniques -Writing & Answering Memos, Circulars - Inter & Intra Official Communication - Writing Minutes of Meeting - Netiquette - E-mail & Blog Writing - Note-making

Textbooks

1. Kumar, Sanjay and Pushp Lata, *Communication Skills*. Second edition, Oxford University Press, 2015

References

1. Adair, John. *The Effective Communicator.* Jaico Publishing House. 1995.
2. Adler, B. Ronald. *Communicating at Work*. (Seventh edition.) McGraw Hill. 2004.
3. Aruna, Koneru. *Professional Communication.* McGraw Hill. 2017.
4. Ibbotson, Mark. *Cambridge English for Engineering Professionals.* Cambridge University. 2008.
5. *Oxford English for Careers.* Oxford University Press.

Essential English and Employability Skills
Open Elective I

B. Tech III Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A5500x	OE	3	0	0	3	40	60	100

Course Objective

1. To enable students to develop their personality, infuse confidence and increase employability skills in any chosen career
2. To provide the students hands-on experience to cope with the demands of the world of recruiters
3. To help the students acquire the job skills essential for employment

Course Outcomes

At the end of the course the students will be able to

CO 1: Enhance employability skills and professional etiquette to work in the corporate world
CO 2: Develop leadership, interpersonal and decision-making skills
CO 3: Acquire productive knowledge, competent learning, and innovative thinking skills from specifically selected lessons
CO 4: Analyse the importance of tackling various job interviews
CO 5: Provide insights to implement verbal and non-verbal communication competencies in workplace

UNIT-I

Six Sigma: Dabbawala from English for Employability
Personality Development: A Must for Leadership and Career Growth from Personality Development and Soft Skills
Introduction - Learning about Personality Development from 3 Cases - Personality Analysis - Freudian analysis of Personality Development - Swami Vivekananda's Concept of Personality Development - Personality Begets Leadership Qualities

UNIT-II

Yet I am not defeated! from English for Employability
Interpersonal skills from Personality Development and Soft Skills
The Personality Attribute of Taking Bold Decisions - Personality Types and Leadership Qualities - Personality Tests

UNIT-III

Patricia Narayanan: An Entrepreneur by accident, from English for Employability
Soft Skills: Demanded by Every Employer from Personality Development and Soft Skills
Introduction to Soft Skills - Lessons from the 3 Case Studies - Change in Today's Workplace - Soft Skills as a Competitive Weapon - Antiquity of Soft Skills - Classification of Soft Skills

UNIT-IV

Satya Nadella: CEO of Microsoft from English for Employability
Interview Skills from Personality Development and Soft Skills

UNIT-V

Body Language Reveals Your Inner self and Personality from Personality Development and Soft Skills
Introduction - Emotions Displayed by Body Language – Handshake -The Most Common Body Language - Eyes - A Powerful Reflection of One's Inner self - Entry to My Space - Personal Zones may vary - Body Language exhibited during different Professional Interactions.

Textbooks

1: Purushotham, K. *English for Employability.* Orient Black Swan, Hyderabad.
2: Mitra, K. Barun. *Personality Development and Soft Skills*. Oxford University Press.

References

1. Enhancing English and Employability Skills. State Board of Technical Education and Training. Hyderabad: Orient Black swan Private Limited, 2012.
2. Rao, M. S. Soft Skills Enhancing Employability. New Delhi: I. K. Publishing House, 2010.
3. Rao, Nageshwar. Communication Skills. New Delhi: Himalaya Publishing House Pvt. Ltd, 2008.
4. Sharma, T. K. Enhancing Employability in Education. India: Patridge Publishing House. 2015.
5. Yadav, Shalini. Communication Technique. New Delhi: University Science Press, 2010.

Entrepreneurship Development
Open Elective

B. Tech III Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A5500x	OE	3	0	0	3	40	60	100

Course Objectives

The objective of this course is to familiarize the student with entrepreneurship, the issues involved in it, the potential of entrepreneurship and intrapreneurship, the legal environment and statutory issues and explore various funding opportunities.

Course Outcomes

At the end of the course the student will be able to

CO 1: Interpret the concepts of Entrepreneurship and Intrapreneurship.
CO 2: Apply the opportunity identification techniques
CO 3: Differentiate needs of different segments
CO 4: Develop business model and MVP
CO 5: Designing organizational forms, IPR concerns and funding opportunities.

UNIT – I

Introduction to Entrepreneurship: Entrepreneurship and Intrapreneurship, Business Incubators, Rural entrepreneurship, Social Entrepreneurship, women entrepreneurs, Role of entrepreneurs in economic development, Types of entrepreneurs. Entrepreneurial mind set and stress, Causes of failure.

UNIT – II

Opportunity identification: Myths and realities of entrepreneurship, Opportunity identification, Problem worth solving, idea generation techniques, Design thinking.

UNIT – III

Customer analysis: Market segmentation, consumer persona, Product market fit, Unique Value proposition.

UNIT – IV

Business model and MVP: Business model canvas, MVP, Risks and assumptions, Importance of financial planning.

UNIT – V

Organizational forms Funding Opportunities: Organizational forms - Partnership, Sole proprietorship, Corporation. Intellectual Property Rights - Copyrights, Trademarks, Patents, Law Vs. Ethics, Informal capital- Friends and Family, Angels, Venture Capitalists, Idea/ Patent, Growth strategies,

Textbooks

6. Vasant Desai, YayatiNayak, Entrerpreneurship, Himalaya Publishing House,2018
7. D.F.Kuratko and T.V.Rao Entrepreneurship- Cengage Learning,2012

References

1. Dhruv Nath, Sushanto Mitra, Funding Your Startup: And Other Nightmares, 2020
2. Rajeev Roy, Entrepreneurship, Oxford University Press, 2/e, 2012
3. V Srinivasa Rao, Lean Digital Thinking: Digitalizing Businesses in a New World Order, Bloomsbury India, 2021
4. S.K.Mohanty, Fundamentals of Entrepreneurship, PHI, 1/e,2005
5. MOOCS by Wadhwani Foundation

Transportation Engineering Laboratory

B. Tech III Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A55201	PCC	0	0	2	1	40	60	100

Prerequisite

Transportation Engineering.

Course Objectives:

1. To gain knowledge on the desirable properties of road aggregates and carry out required tests
2. To gain knowledge on the desirable properties of bitumen and carry out required tests
3. To build knowledge on bituminous mix design
4. To impart knowledge on the traffic volume and speed studies
5. To build knowledge on parking surveys

Course Outcomes:

At the end of the course the students will be able to

CO 1: Determine the characteristics of stone aggregates for road construction
CO 2: Determine the characteristics of bitumen for pavement design
CO 3: Carry out bituminous mix design by Marshall method
CO 4: Conduct traffic volume and speed surveys, and examine traffic characteristics
CO 5: Analyze parking survey data and recommend fare

LIST OF EXPERIMENTS

I. TESTS ON ROAD AGGREGATES

1. Aggregate crushing value test
2. Aggregate impact value test
3. Specific gravity and water absorption test
4. Los Angeles abrasion test
5. Attrition test
6. Shape tests: (a) Elongation index (b) Flakiness index

II. TESTS ON BITUMEN

1. Penetration test
2. Softening point test

3. Ductility test
4. Viscosity test
5. Bitumen extraction test
6. Flash and fire point test

III. TESTS ON BITUMEN PAVING MIXES

1. Bituminous mix design by Marshall method

IV. TRAFFIC STUDIES

1. Traffic volume studies
2. Spot speed studies
3. Parking studies

Computer Aided Drafting of Buildings

B. Tech III Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A55202	ESC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	40	60	100

Prerequisite

BMCP, RCC

Course Objectives

1. To describe the commands to draw building drawings.
2. To employ the various building plans and elevations
3. To examine the structural detailing of detailing of buildings
4. To develop building working drawings for constructions

Course Outcomes

At the end of the course the students will be able to
CO 1: Describe the commands to draw building drawings.
CO 2: Employ the various building plans and elevations
CO 3: Examine the structural detailing of detailing of buildings
CO 4: Develop building working drawings for constructions

EXERCISES

1. Introduction to computer aided drafting
2. Introduction to basic commands to draw building plans, elevations and structural detailing.
3. Introduction to Layers, Hatch, Properties and isometric views.
4. Practice exercises on CAD software.
5. Drawing of building plane of a) Single storied buildings b) multi storied buildings
6. Developing sections and elevations of buildings with a) Single storied buildings b) multi storied buildings
7. Development of Building Components like Doors, Windows and furniture arrangements in the residential buildings.
8. Central line diagram and column positioning of single storied building
9. Detailing of singly reinforced beam and doubly reinforced beam
10. Detailing of axially loaded, uni-axial and bi-axial columns
11. One way and two way slab detailing
12. Exercises on Development of building working drawing.

References

1. B.P. Verma, Civil Engineering Drawing & house plan Khanna Publishers
2. Dr. Sadhu Singh, Computer aided design katson Books publishing house
3. autocad lab manual pdf - Search (bing.com) web links

Quantitative Aptitude and Reasoning Laboratory

B. Tech III Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A55203	BSC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	40	60	100

Course Objectives

1. Enhance the problem solving ability with focusing on basic concepts of speed math.
2. Demonstrate various principles involved in solving mathematical problems.
3. Calculate *speed*, *distance* and *time* using the speed equation.
4. Quick decision making and exploring possibilities.
5. Enhance the adequate problem solving and analytical skills.

Course Outcomes

At the end of the course the students will be able to

CO 1: Formulate the problems quantitatively.
CO 2: Demonstrate various principles involved in solving mathematical problems.
CO 3: Identify the work rate formula and apply it to solve real-life problems.
CO 4: Critically evaluate various real life problems.
CO 5: Solve the blood relation puzzles by using symbols and notations

UNIT – I

Number System: Speed Math's, Numbers, Factors, Prime and co primes, LCM & HCF, Divisibility rules, Finding the unit digit and applications, remainder theory.
Ratio and Proportion with Ages: Definition of ratio and Proportion, Finding the resultant ratio. Problems based on Ratios and ages.
Percentages: Introduction to percentages, Percentage Increase /Decrease, Results on Population, Results on Depreciation, Variations, Applications of Percentage
Profit and Loss: Classification of Profit and Loss, Profit/ Loss Percentages, Successive Discount.

UNIT –II

Time and Distance: Difference between the average, Relative and Effective speed, reaching the destination late and early, stoppage time per hour, problems based on Trains and problems based on Boats.
Time and Work: Calculating Efficiency, alternate days concept, work and wages, Chain rule, problems based on Pipes and cisterns.
Simple and Compound Interest: Simple interest, Principle, Rate, Amount, Applications of Simple interest, Compound interest, compounded annually, Compounded Half yearly, Compounded Quarterly, Difference between simple and compound interest.

UNIT – III

Permutations and Combinations: Fundamental rules, Problems on Permutations and Combinations
Probability: Definition, Notations and Problems based on Probability.
Mean, Median and Mode: Introduction and problems on mean, median and mode
Partnership: Relation between Partners, Period of Investments and Shares
Averages: Average of different groups, change in average by adding, deleting and replacement of objects
Flow Chart: Introduction of symbols and problems on flow charts.

UNIT –IV

Seating Arrangement: Circular, Row, Column, Square and Double row arrangement
Puzzles: Paragraph, incomplete puzzles and problems on them.
Number Series: Number, Alphabet and Letter Series.
Analogy: Simple, Double, Word and Number Analogy
Coding and Decoding: Classifications and Problems on Coding and Decoding.

UNIT –V

Clocks: Relation between minute and hour hand, angle between hands of a clock, exceptional cases in clocks. Gaining and loosing of time.
Calendars: Classification of years, finding the day of any random calendar date, repetition of calendar years.
Direction Sense Test: Sort of directions in puzzle, distance between two points, Problems on shadows.
Blood Relations: Defining the various relations among the members of a family, solving blood relation puzzles by using symbols and notations. Problems on coded relations.

Textbooks

1. Verbal and Non-Verbal Reasoning – R.S Agarwal, New Edition -2020, S. Chand.
2. Quantitative Aptitude – R.S Agarwal, New Edition- 2020, S. Chand.

References

1. Quantitative Aptitude: Abhijeet Guha, New Edition-2020, Mc Graw Hill.

NSS AND SPORTS
Mandatory Course

B. Tech III Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A55204	MC	0	0	3	0	40	60	100

Course Objectives

1. To provide an over view of health dimensions and education
2. To understand fitness and body composition
3. To provide an overview of NSS and to know Volunteerism.
4. To understand personality development by doing community service model
5. To study the entrepreneurship and its implementation process and develop a project on their learned skills

Course Outcomes

At the end of the course the students will be able to

COP 1: Understand the physical, mental and social health dimension.
CO 2: Analyze body fitness and body composition.
CO 3: To develop a broad understanding of NSS and Volunteerism for more involvement.
CO 4: To understand the working of community service model.
CO 5: To understand the entrepreneurship to solve the community identified problems.

National Sports Organization (NSO)

UNIT-I

Health And Wellness: Dimensions of Health: Physical, Mental and Social. Objectives of Health Education. Definition and Dimensions of Wellness – Physical, Emotional, Social, Spiritual, Intellectual and Environmental Wellness. Achieving Wellness.

Practical: Basketball, Cricket, Kho-Kho (Any Two) & Badminton (Mandatory)
Layout of Courts / Fields, Skills, Rules & Lead-up Games.

UNIT-II

Fitness And Body Composition: Physical Fitness Components: Body Composition, Muscular Endurance, Strength, Cardiovascular Fitness and Flexibility, Importance of Cardio-Respiratory Endurance. Obesity and Health Risk Factors. Body Composition Indicators and Measurements.

Practical: Football, Kabaddi, Volleyball (Any Two) & Table Tennis (Mandatory)
Layout of Courts / Fields, Skills, Rules & Lead-up Games.

National Service Scheme (NSS)

UNIT-III

Introduction and Basic Concepts of NSS: History, Philosophy, Aims & Objectives of NSS. Emblem, Flag, Motto, Song, Badge, Organizational Structure, Roles and Responsibilities of Various NSS functionaries. NSS Programmes and Activities, Volunteerism and Shramdan.

UNIT-IV

Personality Development Through Community Service: Importance and Role of Youth Leadership, Life Competencies, Social Harmony and National Integration, Youth Development Programmes in India, Citizenship, Health, Hygiene and Sanitation, Environment Issues, Disaster Management, Life Skills.

UNIT-V

Vocational And Entrepreneurship Skills Development: Definition and meaning of Entrepreneurship, Qualities of good entrepreneur, Steps/ways in operating an Enterprise and role of financial and support service Institutions. Project Cycle Management, Resource Mobilization and Documentation and Reporting.

Project work/ Practical: Conducting Surveys on Special Theme, Involving in Shramadan, Swachh Bharat, Blood Donation, Tree Plantation, Awareness Programmes, Identify the Community Problems and List out the all-Possible Solutions, Educate the Villagers on Health, Hygiene, Sanitation and Environment Protection. Self-Review of the Students on their Improvements by Participating in the Community Service Programmes.

References: NSO

1. **The Soul of Wellness:** 12 holistic principles for achieving a healthy body, mind, heart and spirit, Rajiv Parti, Select book incorporation, New York.
2. H. & Walter, H., (1976). **Turners School Health Education.** Saint Louis: The C.Y. Mosby Company.
3. Nemir, A. (n.d.). **The School Health Education**. New York: Harber and Brothers.

4. **Health Fitness Instructors Handbook**, Edward T Howley, Human Kinetics, USA.

References: NSS

1. ***About NSS:*** National Service Scheme Manual by Government of India Ministry of Youth Affairs & Sports, New Delhi.
2. Robert N Lussier, Management Fundamentals - Concepts, Applications, Skill Development, Cengage Leaning, First Edition, 2012.
3. Handbook of Personality Development – Mroczex & Little (eds).2006.
4. Richard Blundel" Exploring Entrepreneurship Practices and Perspectives, Oxford, 2011.

Design of Steel Structures

B. Tech. III Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A56001	PCC	3	1	0	4	40	60	100

Course Objectives

1. To impart the knowledge of materials and connections in structural elements.
2. To understand the design of tension and compression members.
3. To know the design of beams and their connections.
4. To provide the knowledge of design of columns and their base plates.
5. To know the design of plate girder and their elements.

Course Outcomes

At the end of the course the students will be able to

CO 1: Identify the suitable connection for structural elements.
CO 2: Illustrate the design of tension and compression members.
CO 3: Evaluate the design of beams and their connections
CO 4: Select the suitable section for columns and their bases
CO 5: Design the plate girder for given spans

UNIT-I

Materials: Structural steel, rolled steel sections, convention for members axes, loads, behavior of beams in flexure, Plastic moment of section, classifications of cross sections
Bolted connections: Types of bolts, types of joints, failure of bolted joints, specifications, bearing type connections, efficiency of joints, slip-critical connections and prying action.
Welded connection: Types, design of fillet weld, design of groove weld, specifications, fillet weld for truss members.

UNIT-II

Design of tension members: Net sectional area, effective net area, types of failures, design strength, design of tension members, lug angles, splices.
Design of Compression members: effective length, slenderness ratio, types of sections, classifications of cross sections, column formulae, design strength, design of single angle and double angle sections.

UNIT-III

Design of Beams: Types of sections, classifications of sections, lateral stability, bending strength of laterally supported and unsupported beams, shear strength, web buckling and crippling, specifications, design of laterally supported, unsupported and built-up beam
Beam connections: Bolted farmed connections, bolted seated and unstiffened seated connections

UNIT-IV

Design of Columns: design of rolled steel column, built up laced column, specification, design of battened columns.
Column Bases: Types, design of slab base and gusseted base.

UNIT-V

Design of welded plate girder: Elements, general considerations, proportioning of web and flanges, flexural strength, shear strength, stiffeners, specifications, design of plate girder including stiffeners.

Textbooks

1. S. K. Duggal, 'Limit State Design of Steel Structures', 2nd Edition, McGraw Hill Education (India) Pvt. Ltd, 2014
2. N. Subramanian, 'Design of Steel Structures', Oxford university press

References

1. Ramchandra, 'Design of Steel Structures', Vol. I, Standard Book House, 2016.
2. Anand S. Arya Awadhesh Kumar, J. L. Ajmani, ' Design of Steel Structures', 6th Edition, Nem Chand & Bros., Roorkee, 2014.
3. Edwin H. Gaylard, Jr., Charles N. Gaylard, James E. Stallmeyer, 'Design of Steel Structures', 3rd Edition, Tata McGraw Hill Edn Pvt. Ltd., 2010.
4. P. dayaratnam, 'Design of Steel Structures', S. Chand & Company Pvt. Ltd., 2013.

IS Codes

1. IS 800: 2007, 'General Construction in Steel - Code of Practice', 3rd Edition, Bureau of Indian Standards.
2. SP 6, Handbook for Structural Engineers, Part-I: Structural Steel Sections', Bureau of Indian Standards, 2003.
3. IS 875: 1987, 'Code of Practice for Design Loads', Bureau of Indian Standards.

Environmental Engineering

B. Tech. III Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A56002	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisite-

Environmental Studies, Fluid Mechanics

Course Objectives

1. To understand various population forecasting methods.
2. To design various components of water treatment plants.
3. To examine various characteristics of sewage.
4. To understand and design various sewage treatment processes.
5. To mitigate air and noise pollution

Course Outcomes

At the end of the course the students will be able to

CO 1: Forecast population by different methods.
CO 2: Develop a water treatment facility for a community, town, or a city.
CO 3: Analyze the characteristics of any sewage effluents.
CO 4: Provide a suitable solution for sewage treatment before disposal.
CO 5: Apply the knowledge of controlling measures in mitigating air and noise pollution.

UNIT-I

Introduction: Water Pollution-Global & Indian Scenario, Necessity of planned water supplies, Wholesome water; Water demands- quantification, types, factors affecting Per Capita Demand, Variation in demand, Fire Demand, Coincidental Draft, Components of water supply scheme-Design periods; Population Forecast-Arithmetic, Geometric, Incremental increase method.
Sources of water: Types, factor governing selection of a water source, Infiltration Galleries-Flow Pattern, Infiltration Wells-Ranney wells. Characteristics of water: BIS Drinking Water Standards.

UNIT-II

Water Treatment: Sequential Layout of water treatment; Sedimentation-Theory of sedimentation, Types of settling, Sedimentation tanks; Coagulation and Flocculation-Theory, Coagulants; Filtration: Theory, Slow and Rapid sand filter-Design, Disinfection-Concept, Various disinfection Techniques, Chlorination- Chemical Reactions, Residual chlorine, Break point chlorination, Double chlorination, Super-chlorination.
Distribution systems: Requirement of a good distribution system, Layout of distribution networks, Methods of distributions, Water Meter, Sluice valves, Poppet type Air Valves, Scour Valves, Reflux Valves.

UNIT-III

System of Sanitation: Conservancy and water carriage system; Sewerage System; Dry weather flow, Wet weather flow, Time of Concentration, Per capita sewage; Sewer's shape and materials; Sewer Appurtenances-Manholes, Inverted siphon, catch basins, Flushing tanks; Necessity of pumping sewage, Pumping Stations. Traps, One pipe and Two pipe systems of plumbing.
Decomposition of Sewage: Types, Cycles of decay-nitrogen, carbon, and sulphur cycle; Sewage characteristics- Colour, Odour, Turbidity, Temperature, DO, COD, BOD Concept, First stage BOD equation, Deoxygenation constant.

UNIT-IV

Treatment of Sewage: Classification**,** Flow diagram of sewage treatment plant; Primary Treatment, Screening, Grit Chamber**,** Skimming Tanks; Continuous flow sedimentation tank- construction, working and design. Biological Treatment- Trickling Filters-construction and design, Stabilisation Ponds-types Concept and Design; Septic tank – working principles and design. Septic tank effluent disposal- Soil absorption System; Theory of Sludge Digestion.

UNIT-V

Air Pollution: Definition, Natural and Anthropogenic Sources, Air Pollutants- Primary and Secondary, SPM, Photochemical Smog, Acid Rain; Harmful Effect of Air Pollution, Lapse rate and Plume behaviours from stack. Air Pollution control devices- Cyclone Precipitator, Electrostatic precipitator, Catalytic Converter. Air Pollution Standards.
Noise Pollution: Definition, Effect of noise pollution, Levels of Noise-Addition, Average, Equivalent level; Control methods. Noise Pollution Standards.

Textbooks

1. Garg, Santosh Kumar. Environmental Engineering (Vol. I) Water Supply Engineering. 33rd Edition, Khanna Publishers, 2019.
2. Garg, Santosh Kumar. Environmental Engineering (Vol. II) Sewage Waste Disposal and Air Pollution Engineering. 41st Edition, Khanna Publishers, 2021.

References

1. Birdie, J. S. and Birdie. G. S. Water Supply & Sanitary Engineering - Including Environmental Engineering & Pollution Control Act's 9th Edition, 2014.

NPTEL

1. https://nptel.ac.in/courses/105106119

Advanced Structural Analysis
Professional Elective I

B. Tech. III Year II Semester					Structural Engineering			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A311201	PE	3	0	0	3	40	60	100

Course Objectives

1. To use the matrix algebra for the analysis of simple structures.
2. To provide the knowledge of analysis of indeterminate trusses.
3. To explain the analysis of indeterminate beams
4. To provide the knowledge of analysis of frames and grids
5. To provide the knowledge of advanced topics in the analysis

Course Outcomes

At the end of the course the students will be able to

CO 1: Explain the application of the matrix methods for spring and bar systems
CO 2: Employ the matrix methods for the analysis of plane truss structures
CO 3: Examine the stiffness method for the analysis of beams
CO 4: Evaluate the analysis of framed and grid structures by stiffness method
CO 5: Develop method of analysis of critical elements of a structure

UNIT-I

Analysis of springs and bar systems: Degree of indeterminacy of plane & space structures (static and kinematics), stiffness matrix of a spring element, analysis of spring systems, discretization, assembly of global stiffness matrix, stiffness matrix of a bar element, analysis of bar systems, discretization and analysis of tapered bar structures.

UNIT-II

Analysis of plane trusses: Global local coordinate systems, stiffness matrix of a truss element in local axis, transformation matrix, stiffness matrix in global axis, forces in the members, steps in the analysis, application to plane trusses with not more than 3 DOF

UNIT-III

Analysis of beams: Stiffness matrix of a beam element equivalent nodal load vector due to point load, udl and a couple, steps in the analysis, application to the problems with not more than three DOF

UNIT-IV

Analysis of plane frames: Stiffness matrix of a plane frame element in local axis, steps in the analysis, transformation matrix, stiffness matrix of a plane frame element in global axis, application to frames with not more than three DOF.

UNIT-V

Advanced topics: Use of symmetry and anti-symmetry, analysis of trusses with inclined supports, beams with shear deformations, beams with hinged ends. Banded matrix, semi band width, band minimization techniques

Textbooks

1. P.N. Godbole, R.S. Sonparote, S.U. Dhote, 'Matrix Methods of Structural Analysis, PHI Learning Pvt. Ltd., 2014.
2. William Weaver, J. R. and James M. Gere, 'Matrix Analysis of Framed Structures', CBS Publishers and Distributors.
3. J. L. Meek, 'Matrix Structural Analysis', McGraw Hill Edn. (India) Pvt. Ltd.

References

1. G. S. Pandit, S. P. Gupta, 'Structural Analysis – A Matrix Approach', 2nd Edition, Tata McGraw Hill Publishing Company Ltd., 2008
2. T. R. Chandrupatla, A.D. Belegundu, 'Introduction to Finite Elements in Engineering', Prentice Hall.
3. M. B. Kanchi, 'Matrix Methods of Structural Analysis, Wiley Eastern Limited.
4. S. S. Bhavikatti, 'Matrix Method of Structures Analysis', Wiley Publishrs, 2019
5. C. Natarajan, R. Revathi, 'Matrix Method of Structures Analysis', PHI Learning Pvt. Ltd., 2014.

Irrigation Engineering
Professional Elective-I

B. Tech. III Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A56004	PE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites
Fluid Mechanics, Hydraulic Engineering

Course Objectives

1. To enable the students study the various types reservoirs and dams
2. To understand various forces acting on gravity dam and its failure
3. To enable the students understand types of earth dams and causes of failures of earth dams
4. To enable the students understanding the types of diversion head works and failures of the diversion head works.
5. To understand s the various types of canal falls and cross drainage works

Course Outcomes
At the end of the course, the student will be able to

CO 1: Plan the storage head works like reservoirs and dams
CO 2: Analyze and design gravity dams
CO 3: Analyze earth dams construction
CO 4: Plan and design diversion head works like barrages
CO 5: Design irrigation canal structures and spillways and energy dissipations works

UNIT-I

Storage Head Works-Reservoirs - Types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve, Life of Reservoir. Types of dams, factors affecting selection of type of dam, factors governing selection of site for dams.

UNIT-II

Storage Head Works-Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile, and practical profile of a gravity dam, Factors of Safety
- Stability Analysis, Foundation for a Gravity Dam, drainage and inspection galleries.

UNIT-III

Storage Head Works-Earth dams: Types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam, measures for control of seepage. Spillways: types of spillways. Energy Dissipaters and Stilling Basins Significance of Jump Height Curve and Tail Water Rating Curve - USBR and Indian types of Stilling Basins.

UNIT-IV

Diversion Head works: Types of Diversion head works- weirs and barrages, layout of diversion head work - components. Causes and failure of Weirs and Barrages on permeable foundations,-Silt Ejectors and Silt Excluders.
Weirs on Permeable Foundations – Creep Theories - Bligh's, Lane's and Khosla's theories, Determination of uplift pressure- Various Correction Factors – Design principles of weirs on permeable foundations using Creep theories.

UNIT-V

Canal Falls - Types of falls and their location, Design principles of Sarada type Fall. Canal regulation works, design principles of distributor and head regulators, Canal Cross Regulators -canal outlets, types of canal modules. **Cross Drainage works**: types, selection of site, Design principles of Aqueduct.

Textbooks

1. Irrigation Engineering and Hydraulic Structuresby S.K. Garg, KhannaPublishers,2017.
2. Irrigation and Water Power Engineering B.C. Punmia, B.Pande and BLal, Standard BookHouse,2016.

References

1. Irrigation and Water Power Engineering by P. N. Modi, KhannaPublishers,2016.
2. Irrigation Water Power and Water Resources Engineering by Standard Publishers, 2014.

NPTEL

1. https://nptel.ac.in/courses/105104103

Foundation Engineering
Professional Elective-I

B. Tech. III Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A56005	PE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisite
Geotechnical Engineering, Engineering Mechanics

Course Objectives

1. To provide the knowledge of various methods of slope stability
2. To provide the knowledge of earth pressure distribution in soils, methods of finding the earth pressure on retaining walls and check the stability of retaining walls.
3. To impart knowledge on Soil Exploration.
4. To impart the knowledge of bearing capacity theories and how to calculate bearing capacity of foundations.
5. To impart knowledge on deep foundations and Well foundations.

Course Outcomes
At the end of the course the students will be able to

CO 1: Know how to determine slope stability by different methods
CO 2: Know the knowledge of earth pressure theories and retaining walls and its effect on stability of retaining walls.
CO 3: Know how different methods can be in soil exploration.
CO 4: Calculate the bearing capacity of soils for shallow foundations using different methods.
CO 5: Calculate the bearing capacity of soils for pile foundations using different methods and well foundations.

UNIT-I
Slope Stability: Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices, Bishop's simplified method – Taylor's stability number – stability slopes of earth dams under different conditions

UNIT-II

Earth Pressure Theories: Lateral Earth pressure, earth pressure at rest, earth pressure theories, Rankine's theory of earth pressure, coulomb's earth pressure theory, Culmann's graphical method.
Retaining Walls: Type of Retaining walls, stability of retaining walls against overturning, Sliding, bearing capacity and drainage from backfill.

UNIT-III

Soil Exploration: Sub Surface Investigations-scope, Drilling bore holes, Disturbed and Undisturbed Sampling, Standard penetration test, Cone penetrations test, Pressure meter test

UNIT-IV

Shallow Foundations: Karlvon Terzaghi's equation for bearing capacity in soils – it's modification for continuous, square, rectangular and circular footings, general and local shear failure conditions. Meyerhof, Skempton IS methods. Plate load test as per IS specification. Allowable bearing capacity. Proportioning of footings and rafts, allowable settlements of structures.

UNIT-V

Pile Foundation: Types of piles – load carrying capacity of piles based on static pile formulae – Dynamic pile formula –pile load tests- load carrying capacity of pile groups in sands and clays – Settlement of pile groups.
Introduction to Well Foundations: Types- different shapes of wells-components of wells-functions, Sinking of Wells-tilts and shifts.

Textbooks

1. Soil Mechanics And Foundation Engineering by K R Arora, Standard Publishers New Delhi-2009
2. Principles of Geotechnical Engineering by B.M.Das, Cengage Learning-2013

References

1. Basics and Applied Soil Mechanics by GopalRanjanand ASR Rao, New Age International Pvt. Ltd, Publishers, 2002.
2. Geotechnical Engineering by Manoj Dutta and Gulati S K, Tata McGrawhill Publishers, New Delhi
3. Geotechnical Engineering by C. Venkataramaiah, New Age International,2006

NPTEL

1. https://nptel.ac.in/downloads/105101083/

Traffic Engineering and Management
Professional Elective-II

B. Tech. III Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A56006	PE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisite

Transportation Engineering

Course Objectives

1. To gain knowledge on traffic flow characteristics and measurement procedures
2. To impart knowledge in highway capacity, level of service and parking studies
3. To gain knowledge on signal design and traffic regulation measures
4. To build knowledge on the measures for road safety and accident issues
5. To gain knowledge on various detrimental effects of traffic on the environment

Course Outcomes

At the end of the course the students will be able to:

CO 1: Conduct traffic surveys and analyze traffic data

CO 2: Estimate highway capacity and level of service, and design parking facilities

CO 3: Design traffic control devices and intersections

CO 4: Analyze accident data and recommend road safety measures

CO 5: Recommend preventive measures for the environmental damages caused by vehicular traffic

UNIT-I

Traffic Characteristics and Measurement:

Uninterrupted and Interrupted Flow Facilities, Microscopic and Macroscopic Parameters of Traffic Flow; Fundamental Diagrams, Fundamental Equation; Methods of Traffic Volume Studies, Presentation of Traffic Volume Data, PCU Concept, Peak Hour Factor; Methods of Speed Studies, Presentation and Analysis of Speed Data, Procedure for Delay Studies; Origin & Destination Studies.

UNIT-II

Highway Capacity, Level of Service and Parking Studies:

Importance of Capacity, Early Capacity Studies, Types of Capacity, Level of Service Concept, Factors affecting Capacity and Level of Service, Service Volume; Parking Studies: On-street and Off-street Parking Facilities - Types and Design Standards, Parking Inventory Study, Parking Surveys, Analysis of Parking Data.

UNIT-III

Traffic Control, Regulation and Signal Design

Importance of Traffic Control and Regulation; Types and Specifications of Traffic Signs - Regulatory, Warning and Informative Signs; Classification and Specifications of Road Markings - Longitudinal, Transverse and Object Markings; Traffic Signals - Design Elements, Signal Design by Webster and IRC Methods, Intersection: Types, Conflict Points, Concept of Channelization; Traffic Rotaries - Design Elements, Capacity.

UNIT-IV

Traffic Safety

Collection of Accident Data - Collision and Condition Diagrams; Statistical Methods for Accident Data Analysis - Regression Methods, Poisson Distribution, Chi-squared Test; Causes of Road Accidents; Safety Measures - Legislation, Engineering, Enforcement, Education and Propaganda; Road Safety Audit.

UNIT-V

Traffic and Environment

Detrimental Effects of Traffic; Noise - Effect of Noise, Generation of Traffic Noise, Measurement of Noise Levels, Control of Traffic Noise; Air Pollution - Major Pollutants, Effect of Pollutants, Measures to Control Air Pollution; Vibration - Levels of Vibration Associated with Road Traffic, Ameliorative Measures; Visual Intrusion and Degrading the Aesthetics; Situation in India.

Text Books

1. Kadiyali, L. R. Traffic Engineering and Transportation Planning, 9th Edition, Khanna Publishers, New Delhi, 2018.
2. Khanna, S. K., Justo, C. E. G., and Veeraragavan, A. Highway Engineering, Revised 10th Edition, Nem Chand & Bros, 2015.

References

1. Chakroborty, P., and Das, A. Principles of Transportation Engineering, 2nd Edition, PHI Learning, 2018.
2. Garber, N. J. Hoel, L. A. Traffic and Highway Engineering, 5th Edition, Cengage Learning, United States, 2014.
3. TRB. Highway Capacity Manual, Transportation Research Board, National Research Council, Washington, D.C., 2010.
4. Saxena, S. C. Highway and Traffic Engineering, 2nd Edition, CBS Publishers and Distributers Pvt. Ltd., 2017.

NPTEL

1. https://nptel.ac.in/courses/105101008
2. https://onlinecourses.nptel.ac.in/noc22_ce41/course

Elements of Earthquake Engineering

Professional Elective II

B. Tech. III Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A56007	PE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. Learn the basic concepts of engineering seismology.
2. To introduce basic principles and importance of structural vibrations systems.
3. To acquire knowledge of the seismic ground motion sensors.
4. To know the preventive measures for seismic resistantance of buildings.
5. To acquire knowledge on building protection techniques and process.

Course Outcomes

At the end of the course the students will be able to

CO 1: To know the sources and effects of earthquakes on structures.
CO 2: Derive the equation of motion of the SDF system and evaluate dynamic properties.
CO 3: To discuss the working principles of accelerometer and data processing.
CO 4: Discuss the methodology to be applied to the architectural design of the buildings.
CO 5: Discuss the base isolation and retrofitting techniques of buildings.

UNIT-I

Elements of Seismology: Causes of Earthquake – Geological faults - Tectonic plate theory - Elastic rebound – Epicentre; Hypocentre- Primary, shear and Raleigh waves - Seismogram - Magnitude and intensity of earthquakes- Magnitude and IntensityScales- Seismic Zone map of India. Case studies of few destructive earthquakes in country in the past.
Earthquake Ground Motions: Introduction, Strong-motion measurement, Characteristics of Earthquake Ground motions, Estimation of Ground motion parameters, Soils effects and liquefaction.

UNIT-II

Single Degree of Freedom System: Definition of degree of freedom – Idealization of structure as SDOF system – Formulation of equation of motion for various SDOF system –Effect of damping – Free and forced vibration of damped and undamped structures – Response to harmonic forces.

UNIT-III

Measurement of SGM: Principle and theory of Pick up: seismometers-accelerometer, forced balanced accelerometer, seism scope and structural response recorder; Construction and working of analog and digital accelerographs; Seismic alarm/circuit tripping and control devices. Processing and Interpretation of Accelerogram: Digitization of accelerogram.

UNIT-IV

Seismic Resistant Building Architecture: Introduction, Lateral load resisting system, Building configuration-Building Characteristics-Quality of Construction and Materials.
Improving seismic behavior of buildings: Reinforced Concrete building-reinforcement detailing of beam, column and beam-columns joints, Masonry buildings-Detailing of horizontal and vertical reinforcement and Lintel bands and Steel Structures-Join connections.

UNIT-V

Earthquake Protections of Buildings: Introduction, Base isolation and energy dissipation devices-Tuned mass damper.
Seismic retrofitting: Repair, rehabilitation and retrofitting, retrofitting strategies – Methodology for seismic retrofitting of reinforced concrete and brick Masonry Building-Failure modes of Masonry Buildings- Case studies on Reinforced concrete and Brick masonry buildings.

Textbooks

1. Agarwal.P and Shrikhande.M., Earthquake Resistant Design of Structures, Prentice Hall of India Pvt. Ltd. 2007.
2. Victor Gioncu and Federico M.Mazzolani, Earthquake Engineering for Structural Design, Spon Press, An imprint of Landon and New York, 2011.

References

1. Anil K Chopra, Dynamics of structures – Theory and applications to Earthquake Engineering, Prentice Hall Inc., 2001.
2. Minoru Wakabayashi, Design of Earthquake Resistant Buildings, McGraw – Hill Book Company, 1986.
3. AmrS.Elnashai and Luigi Di Sarno, Fundamentals of Earthquake Engineering for Structural Design, John Wiley and Sons, Ltd. Publications, 2008.
4. C.V.R. Moorthy, Earthquake Tips, NICEE, IIT Kanpur.

NPTEL

1. https://nptel.ac.in/courses/105108204
2. https://nptel.ac.in/courses/105101006/

Rehabilitation of and Retrofitting of Structures
Professional Elective-II

B. Tech. III Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A56008	PE	3	0	0	3	40	60	100

Pre-requisites: Concrete Technology.

Course Objectives

1. To understand the causes for distress and deterioration of structures.
2. To evaluate the condition assessment of structures
3. To judge the repair material and retrofitting strategy suitable for distress
4. To formulate the guide lines for repair management of deteriorated structures.
5. To identify the repair material and retrofitting techniques suitable for distress.

Course Outcomes

At the end of the course the students will be able to
CO 1: Estimate the causes for distress and deterioration of structures.
CO 2: Apply the NDT instruments for damage assessment of structures.
CO 3: Select repair material and retrofitting strategy suitable for distress.
CO 4: Formulate guidelines for repair management of deteriorated structures.
CO 5: Identify the repair material and retrofitting techniques.

UNIT-I

Introduction - present repair practices, distress identification and repair management - Causes of distress in concrete structures-Holistic Models for deterioration of concrete, Permeability of concrete, aggressive chemical agents, durability aspects -Condition Survey- objectives, different stages-Preliminary inspection, planning stage, visual inspection, field laboratory testing stage, consideration for repair strategy.

UNIT-II

Non-Destructive evaluation tests- Rebound hammer test-Ultrasonic pulse velocity tests, penetration resistance, pull out tests, core sampling and testing -Chemical Tests-Carbonation tests and chloride content, Corrosion potential assessment-cover meter survey, half-cell potentiometer test, resistivity measurement.

UNIT-III

Case studies of RCC buildings subjected to distress-Identification and estimation of damage - Fire damage assessment, structural integrity and soundness assessment, interpretation and evaluation of results.
Evaluation of reserve strength of existing structures, active and passive repairs, modeling of repaired composite structures - Selection of repair materials for concrete-Essential parameters for repair materials-Strength and durability aspects, cost and suitability aspects.

UNIT-IV

Materials for repair-Premixed cement concrete and mortars, polymer modified mortars and concrete, epoxy and epoxy systems, polyester resins, coatings - Rehabilitation and retrofitting methods-repair options, performance requirements of repair systems, important factors to be considered for selection of repair method-
Identifying a suitable repair option for certain damage in a structure - Repair stages, Repair methods-guniting, shortcreting, polymer concrete system, reinforcement replacement, strengthening concrete by surface impregnation, polymer and epoxy overlays.

UNIT-V

Repair methods- Resin/polymer modified slurry injection, plate bonding technique, ferrocement jacketing, RCC jacketing, propping and supporting - Repair methods-fiber wrap technique, foundation rehabilitation methods, chemical and electrochemical method of repair.
Repair/Rehabilitation strategies- Stress reduction technique, repair and strengthening of columns and beams - Rehabilitation Strategies-Compressive strength of concrete, cracks/joints, masonry, foundation, base isolation.

Textbooks

1. R.N. Raikar, “Learning from failures - Deficiencies in Design, Construction and Service”Rand Centre (SDCPL), Aikar Bhavan, Bombay, 1987.
2. Santhakumar A.R., “Concrete Technology” Oxford University Press, New Delhi, 2007.
3. “CPWD Handbook on Repair and Rehabilitation of RCC buildings”, Govt of India Press,New Delhi, 2014.
4. ACI Handbook on Repair and Rehabilitation of RCC buildings
5. ICI Handbook on Repair and Rehabilitation of RCC buildings

NPTEL

1. https://www.youtube.com/playlist?list=PLNRGMg8U7bLdPXyggUHSzjL58kH3urQN

Construction Technology and Project Management
Professional Elective-III

B. Tech. III Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A56009	PE	3	0	0	3	40	60	100

Course Objectives

To make them understand how to Project Monitoring and Control
To provide an understanding of Planning, Scheduling, Time estimates, etc.
To impart the knowledge of Construction equipment
To provide knowledge about Construction Management and quality control.
To provide knowledge about construction Management, Contract Management

Course Outcomes

At the end of the course the students will be able to

CO 1: Able to plan, control and monitor construction projects concerning time.
CO 2: Understanding how structures are built and projects are developed.
CO 3: Apply the techniques about how to optimize construction projects.
CO 4: understanding of how construction projects are administered concerning contract structures.
CO 5: Gain knowledge of various contract types and dispute resolution methods.

UNIT-I

Construction Planning- Construction projects- types and features, phases of a project, construction project planning- Stages of project planning: pre-tender planning, pre-construction planning, the role of client and contractor, work break-down structure, Techniques of planning- Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical paths.

UNIT-II

Construction Costs and Construction methods: Classification of costs, the time-cost trade-off in construction projects. Types of foundations and construction methods, Common building construction methods, Modular construction methods, Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures; Basics of construction methods for Bridges; Introduction to current LEED for New Construction rating system.

UNIT-III

Construction Equipment: Conventional construction methods Vs Mechanized methods and advantages; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting, and placing; Cranes, Hoists, and other equipment for lifting; Equipment for transportation of materials. Planning and organizing construction site and resources- Documentation at the site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement, and inventory control.

UNIT-IV

Project Monitoring and Control: Supervision, record keeping, periodic progress reports, and periodical progress meetings. Updating of plans: purpose, frequency, and methods of updating, Common causes of time and cost overruns, and corrective measures. Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modeling (BIM) in project management; Quality control: the concept of quality, use of manuals and checklists for quality control, Safety, Health, and Environment on project sites: accidents; their causes, effects, and preventive measures.

UNIT-V

Contracts Management: Types of Contracts, Parties to a Contract; Contract Formation, Common contract clauses: Notice to proceed, rights and duties of various parties, notices to be given, Contract duration and price. Performance parameters; Delays, penalties, and liquidated damages; Suspension and Termination. Conventional and Alternative Dispute Resolution methods, Legal Aspects in Contract Management.

Textbooks

1. 'Construction Project Management – Theory and Practice', Niraj Jha, Pearson Education, 2nd Edition, 2015
2. 'Building Construction', Varghese, P.C., Prentice Hall India, 2007.

References

1. Chudley, R., Construction Technology, ELBS Publishers, 2007.
2. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
3. Nunnally, S.W. Construction Methods and Management, Prentice-Hall, 2006
4. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi

NPTEL

1. https://nptel.ac.in/cosurses/105103093/

Pavement Analysis and Design
Professional Elective-III

B. Tech. III Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A56010	PE	3	0	0	3	40	60	100

Prerequisite
Highway Engineering

Course Objectives

1. To characterize pavement materials and understand various mix design methods.
2. To build knowledge on pavement analysis procedures.
3. To gain knowledge on the design procedures of flexible and rigid pavements.
4. To build knowledge on the construction, distress and maintenance of pavements.
5. To gain knowledge on the overlay design.

Course Outcomes
At the end of the course the students will be able to

CO 1: Carry out bitumen mix design for road constructions.
CO 2: Analyze various properties of highway pavement.
CO 3: Design flexible and rigid highway pavements.
CO 4: Construct highway pavements, recognize type of destress, and apply proper maintenance technique.
CO 5: Interpret the design of overlays.

UNIT-I

Pavement Material Characterization: Objectives of Mix Design, Types of Mix, Bituminous Mix Volumetrics, Mechanical Properties: Resilient Modulus, Dynamic modulus and Fatigue Characteristics; Marshall Mix Design, Modified Hubbard-Field Method, Hveem Method; Weathering and Durability of Bituminous Materials and Mixes; Performance-based Bitumen Specifications.

UNIT-II

Pavement Analysis: Pavement Composition; Inputs for Pavement Analysis; Analysis of Bituminous Pavement Structures: Elastic Half-Space Solution, Layered Elastic Solution - Burmister's Two-Layer and Three-Layer Theories; Analysis of Concrete Pavement Structures: Slab on Elastic Foundation; Stresses in Concrete Pavements - Wheel Load Stresses, Warping Stresses, Frictional Stresses, Combined Stresses.

UNIT-III

Pavement Design: Design Parameters: Material Properties, Traffic & Environmental Characteristics, Design life; Pavement Design - CBR Method, Hveem Method, Bearing Capacity Approach, Limiting Deflection Method, Regression Method, Mechanistic Empirical Method; Design of Flexible Pavements as per IRC; Rigid Pavement Design - Types of Joints and their Functions, Design of CC Pavement and Joints as per IRC.

UNIT-IV

Highway Construction and Maintenance: Equipment Used for Construction; Stages of Construction, Earthwork; Soil Stabilized Pavement Layers; Bituminous Pavement Construction; Cement Concrete Pavement Construction; Flexible Pavement Failures, Rigid Pavement Failures - Maintenance and Rehabilitation Techniques.

UNIT-V

Overlay Design: Basic Principles of Deflection Method; Procedure for Deflection Survey - Deflection Measurements, Correction for Temperature and Seasonal Variations; Traffic Growth Rate, Computation of Design Traffic; Analysis of Data for Overlay Design; Design of Overlay as per IRC.

Textbooks

1. Khanna, S.K., Justo, C.E.G, and Veeraragavan, A. Highway Engineering, Revised 10th Edition, Nem Chand & Bros, 2015.
2. Chakroborty, P., and Das, A. Principles of Transportation Engineering, PHI Learning, 2nd edition, 2018.

References

1. Kadiyali, L. R., and Lal, N. B. Principles and Practices of Highway Engineering (Including Expressways and Airport Engineering), Khanna Publications, 2019.
2. IRC: 37, 2018. Guidelines for the design of flexible pavements, 4th revision, Indian Roads Congress, New Delhi, India.
3. IRC: 58, 2015. Guidelines for the design of plain jointed rigid pavements for highways, 4th revision, Indian Roads Congress, New Delhi, India.
4. IRC: 81, 1997. Guidelines for Strengthening of Flexible Road Pavements using Benkelman Beam Deflection Technique, 1st revision, Indian Roads Congress, New Delhi, India.
5. Yoder, E. J., and Witczak, M. W. Principles of Pavement Design, 2nd Edition, Wiley India Pvt Ltd, 2011.
6. Huang, Y. H. Pavement Analysis and Design, 2nd Edition, Pearson Education, 2003.

NPTEL

1. https://nptel.ac.in/courses/105/101/105101087/

Disaster Preparedness and Planning
Professional Elective III

B. Tech. III Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A56011	PE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To know the concept, definition and terminology of the Disaster Management.
2. To know the classification and occurrence of disasters in India and elsewhere.
3. To know and analyse the socio-economic, environmental aspects of disasters impacts.
4. To know the pre, post and emergency management mitigation strategies.
5. To know the environment of vulnerable disaster areas

Course Outcomes

At the end of the course the students will be able to

CO 1: To acquire knowledge of disaster Management.
CO 2: To acquaint with different disasters in India and other parts of the world.
CO 3: To classify, assess the magnitude and intensity of various impacts of disasters.
CO 4: To learn the management methods.
CO 5: Learn effective sustainable environmental modification techniques.

UNIT-I

Introduction: Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation.

UNIT-II

Disasters: Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest

fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility

UNIT-III

Disaster Impacts:
Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate-change and urban disasters.

UNIT-IV

Disaster Risk Reduction (DRR):
Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT-V

Disasters, Environment And Development
Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Textbooks

1. H.K. Gupta,Disaster Management - - University Press, India, 2003.
2. Singh B.K, Handbook of Disaster Management: techniques and Guidelines -., Rajat, Publications, 2008

References

1. PardeepSahni, Disaster Mitigation: Experiences and Reflections -
2. PradeepSahni,Disaster Risk Reduction in South Asia, Prentice Hall, 2004.

NPTEL

1. https://nptel.ac.in/courses/105104183/

Environmental Engineering Laboratory

B. Tech. III Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A56201	PCC	0	0	2	1	40	60	100

Prerequisite

Environmental Engineering, Engineering Chemistry Laboratory

Course Objectives

1. To estimate various water quality parameters.
2. To perform JAR Test for optimum coagulant dosage.
3. To analyze various chemical species such as chlorides, iron, nitrates etc. in water.
4. To investigate the chlorine demand for proper disinfection of water.
5. To monitor the change in quality of Air due to pollution.

Course Outcomes

At the end of the course the students will be able to

CO 1: Asses different water quality parameters.
CO 2: Provide the optimum dosage of coagulant for the treatment of water
CO 3: Analyze the characteristics of any sewage effluents.
CO 4: Ensure pathogen free water supply to a community, town, or city.
CO 5: Describe the Air quality of place or region.

List of Experiments

1. Determination of pH & Threshold odour number (TON) of given water sample.
2. Determination of Conductivity and TDS of a given water sample.
3. Determination of Alkalinity/Acidity of given water sample.
4. Determination of Total Hardness of given water sample.
5. Determination of Dissolved Oxygen of a given water sample.
6. Determination of Biochemical Oxygen Demand (BOD) of given wastewater sample.
7. Determination of Chemical Oxygen Demand (COD) of given wastewater sample.
8. Determination of Turbidity of a given water sample by Turbidimeter.
9. Determination of optimum dosage of coagulant for a given water sample by JAR TEST.
10. Determination of Chlorine Demand of a given water sample by Titration Method.

11. Determination of Iron, Nitrates, Phosphorous using Spectrophotometer/Titration method.
12. Determination of Chloride of a given water sample by Titration Method.
13. Ambient Air Quality monitoring/Ambient Noise measurement.

References

1. AWWA, WEF, APHA, 1998, Standard Methods for the Examination of Water and Wastewater.
2. AWWA, WEF, APHA, 2017, Standard Methods for the Examination of Water and Wastewater, 23rd Edition.
3. Sawyer, C.N., McCarty, P.L., and Parkin, 2017. Chemistry For Environmental Engineering and Science. McGraw Hill Education.

Structural Analysis and Design Laboratory

B. Tech. III Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A56202	PCC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	40	60	100

Course Objectives

1. To provide the knowledge of software tools commends.
2. To impart the knowledge of using software to define different types of loads, Material properties, Geometry and Boundary conditions.
3. To impart the knowledge of using the software to analyze the Structures.
4. To impart the knowledge of using the software to design of Structures.

Course Outcomes

At the end of the course the students will be able to

CO 1: Prepare the one, two and three dimensional building model and able to shows
CO 2: loading diagram, Geometry, Material property and Boundary conditions
CO 3: Analyze the various structures by using the any software.
CO 4: Model, analyze and design the structures by any software.
CO 5: Shows and read the output each numerical model by any software.

List of Experiments

A. Analysis: Analyze the following problems by using scientific calculator and compare the results obtained by STAAD Pro/ E-Tabs Software.

1. Analysis of continuous beam
2. Analysis of plane truss
3. Analysis of plane frame

B. Analysis and design by STAAD Pro/E-Tabs software

1. Modeling, analysis and design of multi storied symmetrical building-Gravity loads.
2. Modeling, analysis and design of multi storied symmetrical building-Gravity loads and Wind Loads.
3. Modeling, analysis and design of multi storied symmetrical building-Gravity loads and Earthquake Loads.
4. Modeling, analysis and design of multi storied unsymmetrical building-Gravity and Wind Loads.

5. Modeling, analysis and design of multi storied unsymmetrical building-Gravity and earthquake Loads.
6. Modeling, analysis and design of Water Tanks-Gravity, Wind loads and earthquakeLoads.
7. Modeling, analysis and design of Bridges-Gravity, Wind loads and earthquakeLoads.
8. Modeling, analysis and design of Truss-Gravity, Wind loads and earthquakeLoads.
9. Modeling, analysis and design of Stair case- Gravity loads.

References

1. Any Software manual.
2. IS code books-IS875-Part-1, 2 & 3 - IS 1893-2016- IS 456

Verbal Ability and Critical Reasoning

B. Tech. III Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A56203	HSS & MC	0	0	3	1.5	40	60	100

Course Objectives

1. Compare data sets and solve real-world problems.
2. Demonstrate various principles involved in solving mathematical problems.
3. Exposure to different kinds of logics and improving accuracy in detecting logics.
4. Provide students with skills/opportunities to learn words independently.
5. Learn to identify proper and improper subject/verb agreement in peer writing.

Course Outcomes

At the end of the course the students will be able to

CO 1: Interpret quantitative information and draw implications from them.
CO 2: Formulate the problem quantitatively and use appropriate arithmetical and statistical methods to solve the problem
CO 3: Critically evaluate various real life situations by resorting to analysis of key issues and factors
CO 4: Learn new vocabulary words, use them correctly in a sentence, and understand their meaning in the text.
CO 5: Identify and write complete sentences using dialogue and correct subject/verb agreement.

UNIT-I

Data Interpretation: Tabular, Pie-charts, Bar and line graphs and Problems on all models.
Data Sufficiency: Introduction and Problems based on all Quant and logical topics.
Allegations and Mixtures: Allegation rule, mean value of the mixture, Replacement of equal quantity of mixtures.

UNIT –II

Geometry: Line, line segment, angle, Triangles and Polygons with their Properties.

Mensuration: Area and perimeter of Triangle, Rectangle, Square, Parallelogram, Trapezium, Surface area & Volume of 3D figures.
Logarithms: Formulas and Problems based on Logarithms.
Progressions and Quadratic Equations: Arithmetic, Geometric and Harmonic Progressions and their relations. General forms of Quadratic equations and finding the roots and their nature.

UNIT –III

Syllogisms: Statements and Conclusions by using vein diagrams.
Odd One Out: Classification and problems based of Odd one out.
Cubes and Dice: Types of cubes and dice with Examples.
Statement and Conclusions: Introduction, Types of conclusions and different cases.

UNIT –IV

Tenses: Types, usage, question solving.
Vocabulary: Types, usage and error spotting.
Inference: conclusion reached on the basis of evidence and reasoning, question solving.
Para Jumbles: Arranging the jumbled sentence by using the strategies.
Sentence Completion: Completing a sentence by filling the gaps by understanding & analyzing the meaning of the sentence along with the approaches.

UNIT –V

Subject Verb Agreement: Rules and examples for finding the right subject and verb.
Sentence Correction: Error spotting and correcting the sentence.
Reading Comprehension: Understanding Meaning, Understanding the meaning of a text means figuring out what the passage is trying to tell you. ...Drawing Connections. ...Summarizing and Synthesizing.
Direct & Indirect Speeches: What is **Direct & Indirect Speech**? , reporting the message of the speaker in the exact words as spoken by the speaker and examples.
Active Voice & Passive Voice: Types of active and passive voice, rules and examples

Text Books

1. Verbal and Non Verbal Reasoning – R.S Agarwal, New Edition -2020, S. Chand.
2. Quantitative Aptitude – R.S Agarwal, New Edition- 2020, S. Chand.

References

1. Quantitative Aptitude: Abhijeet Guha, New Edition-2020, Mc Graw Hill.

Gender Sensitization
Mandatory Course

B. Tech. III Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A56204	MC	3	0	0	0	40	60	100

Course Objectives

1. To develop students sensibility with regard to issues of gender
2. To provide a critical perspective on the socialization of men and women.
3. To introduce the information about key biological aspects of genders
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.

Course Outcomes

At the end of the course the students will be able to

CO 1: Develop a better understanding of important issues related to gender.
CO 2: Identify the basic dimensions of the biological, sociological aspects of gender.
CO 3: Analyze a finer grasp of gender discrimination works in our society.
CO 4: Acquire insight into the gendered division of labour and its relation.
CO 5: Men and women will be better equipped to work and live together as equals.

UNIT-I

Understanding Gender: Gender: Why should we study it? (Towards a world of equals: Unit-1) Socialization: Making Women, Making Men (Towards a world of equals: Unit-2) Introduction, Preparing for womanhood. Growing up male. First lesson in caste. Different Masculinities. Just Relationships: Being Together as Equals (Towards a world of equals: Unit-12) Mary Kom and Onler. Love and acid just do not mix. Love Letters. Mothers and Fathers. Further reading: Rosa Parks-The Brae Heart.

UNIT-II

Gender And Biology: Missing Women: Sex Selection and its Consequences (Towards a world of equals: Unit-4) Declining Sex Ration. Demographic Consequences. Gender Spectrum: Beyond The Binary (Towards a world of equals: Unit-10) Two or many? Struggles with Discrimination. Additional Reading: Our Bodies, Our Health (Towards a world of equals: Unit-13)

UNIT-III

Gender and Labour: Housework: The invisible Labour (Towards a world of equals: Unit-3) “May Mother doesn’t work”. “Share the Load”. Women’s work: its politics and economics (Towards a world of equals: Unit-7) Fact and Fiction. Unrecognized and unaccounted work. Further Reading: Wages and Conditions of Work.

UNIT-IV

Issues Of Violence: Sexual Harassment: Say No! (Towards a world of equals: Unit-6), Sexual Harassment, not Eve-teasing-coping with everyday Harassment-Further Reading: “Chupulu”. Domestic Violence: Speaking out (Towards a world of equals: Unit-8) Is Home a Safe Place? – When Women Unite [Film]. Rebuilding Lives. Further Reading: New Forums for Justice. Thinking about sexual Violence (Towards a world of equals: Unit-11) Blaming the Victim- “I Fought for my life…..” – Further reading: The Caste Face of Violence.

UNIT-V

Gender Studies: Knowledge: Through the lens of gender (Towards a world of equals: Unit-5) Point of View. Gender and the Structure of Knowledge. Further Reading: unacknowledged Women artists of Telangana. Whose History? Questions for Historians and others (Towards a world of equals: Unit-9) Reclaiming a past. Writing other Histories. Further Reading: Missing Pages from Modern Telangana History.

Textbooks

1. ‘Towards a world of Equals; A Bilingual Textbook on Gender’, written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasantha, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deep Sreenivas and Susie Tharu.
2. Sen, Amartya, ‘More than one million Women are Missing’, New York review of books 37.20 (20 December 1990). Print. ‘ We Were Making History….’ Life Stories of Women in the Telangana People’s Struggle. New Delhi: Kali for Women 1989.

References

1. Tripti Lahari. “By the numbers: Where Indian Women Work. “Women’s studies journal (14 November 2012)
2. K. Satyanarayana & Susie Tharu (ed.) Steel are sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada hhtp://herpercollins.co.in/Bookdetail.asp? Book _code = 3732.
3. Monon, Nivedita, Seeing like a Feminist, New Delhi: Zubaan-Penguin Bokks, 2012.
4. Virginia Woolf: A Room of One’s Own. Oxford: Black swan. 1992.

Dept. of Chemical Engineering

Department of Chemical Engineering

Minutes of Board of Studies Meeting

The second Board of studies of the Department of Chemical Engineering, Anurag University, was conducted online through google meet on 18th March 2021 during which the approval for the scheme and syllabi of II, III and IV year was taken. The scheme and syllabi of III year BTech Chemical Engineering R 20 curriculum was once again circulated through email and approval for the same was received by 22nd March 2022.

The following are the members:

S. No.	Name & Details of Members	Designation
1	Dr. M. Mukunda Vani, HOD, Chemical Engineering, AU	Chairperson of BOS
2	Dr. Narasimha Mangadoddy, Professor, Dept. of Chemical Engineering, IITH	Member - Outside Subject Expert
3	Dr. G. Prabhakar Reddy, Professor, OUCT, Hyderabad	Member - Outside Subject Expert
4	Dr. A. Ramesh Babu, Assoc. Professor, BITS Pilani Hyderabad Campus	Member - Outside Subject Expert
5	Dr. S. Sridhar, Senior Principal Scientist, CSIR-Indian Institute of Chemical Technology	Member – Industry Expert
6	Dr. Ravi K Gujjula, Chief General Manager – Technical, Andhra Pradesh State Skill Development Corporation	Member – Industry Expert
7	Dr. N. Anil, Assoc. Prof, Dept. of Chemical Engineering	Member
8	Dr. M. B. Venkataramana Reddy, Asst. Prof, Dept. of Chemical Engineering, AU	Member
9	Mrs. M. Shireesha, Asst. Prof, Dept. of Chemical Engineering, AU	Member
10	Dr. P. Nagarjuna Reddy, Managing Director, REVIN LABS Pvt Ltd	Member

Vision of the Department

To be a center of excellence for academic and research, foster entrepreneurship and train students to meet the challenging needs of chemical & allied industries and society.

Mission of the Department

1. To provide quality education empowered with excellent technical skills in emerging areas of chemical engineering.
2. Enhancing research & development in chemical engineering & allied fields.
3. To provide training by fostering the alliance with the industry and academia and to develop entrepreneurship.

PROGRAMME OBJECTIVES (POs)

PO1	The students shall be able to solve problems in mathematics through differential equations, calculus-based physics, chemistry, and one additional area of science.
PO2	The student shall be able to design an innovative chemical engineering experiment to meet a need; conduct the experiment, and analyze and interpret the resulting data.
PO3	The students shall be able to Design a complex system or process to meet desired needs, within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
PO4	The students shall be able to analyze a complex situation involving multiple conflicting professional and ethical interests, to determine an appropriate course of action.
PO5	The students shall be able to apply relevant techniques, skills, and modern engineering tools to solve a simple problem
PO6	The students shall be able to focus on entrepreneurship, global, economic, environmental, and societal impacts of a specific, relatively constrained engineering solutions for betterment of society.

PO7	The students shall be able to understand the impact of environment and shall be able to demonstrate the knowledge and need for sustainable development.
PO8	The students shall be able to apply the ethical principles and commit to professional ethics and responsibilities and norms of the engineering Practice.
PO9	The students shall be able to function effectively as a member of a multi-disciplinary team and shall be able to demonstrate the ability to learn on their own, without the aid of formal instruction.
PO10	The students shall be able to organize and deliver effective verbal, written, and graphical communications.
PO11	The students shall be able to solve well-defined engineering problems in core technical areas appropriate to chemical engineering and shall be able to manage and shall be able to study the financial or the economic feasibility of the process.
PO12	The students shall be able to gain strong foundation in the basics of the subjects so that they can cope up in the broadest context of technological changes.

Programme Specific Outcomes (PSOs)

PSO1	Ability to apply knowledge of Chemical engineering principles to real world problems
PSO2	Ability to design innovative processes and equipment suitable to the contemporary needs of the chemical industry and to promote the qualities of leadership, entrepreneurship and employability and be able to work in multidisciplinary teams supported by continuous Industry – Institution interaction.
PSO3	Ability to meet specified objectives within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability in the field of chemical engineering..

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1	Acquire strong foundation in basic sciences and chemical engineering with modern experimental and computational tools.
PEO2	Adapt to the developing technologies through quality research and stay in-tune with current needs of the society.
PEO3	Inculcate professional excellence and ethical attitude, effective communication skills and entrepreneurial practices for overall development.
PEO4	Exhibit leadership qualities to serve organization and society as adaptable engineers through lifelong learning.

Program Structure and Syllabus of

B. Tech III Year

(I & II Semesters)

Chemical Engineering

R20 Regulation

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.), Hyderabad, Telangana, INDIA

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B. TECH III YEAR I

SEMESTER [5T+3L +1 MC]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PCC	Chemical Reaction Engineering- I	3	-	-	3.0
2		PCC	Mass Transfer Operations-I	3	-	-	3.0
3		PCC	Chemical Engineering Thermodynamics-II	3	-	-	3.0
4		HSS&MC	Entrepreneurship Development	3	-	-	3.0
5		OEC-I	1.Project Management 2.Managerial Economics and Financial Analysis 3. Intellectual Property Rights	3	-	-	3.0
6		PCC-Lab	Computational Methods in Chemical Engineering Lab	-	-	4	2.0
7		HSS&MC -Lab	Quantitative Aptitude and reasoning	-	-	3	1.5
8		HSS&MC -Lab	Verbal Ability & Critical Reasoning	-	-	3	1.5
9		MC	Gender Sensitization	2	-	-	0
			TOTAL	17	0	10	20

B. TECH III YEAR II SEMESTER [6T+2L]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PCC	Chemical Reaction Engineering-II	3	-	-	3.0
2		PCC	Mass Transfer Operations –II	3	-	-	3.0
3		PCC	Plant Design & Economics	2	-	-	2.0
4		PCC	Bio Chemical Engineering	3	-	-	3.0
5		PEC-II	1. Industrial Safety and Hazard Management 2. Petroleum and Petrochemical Technology 3. Environmental Pollution and control	3	-	-	3.0
6		PEC-III	1. Nano science and Nano Technology 2. Process Intensification 3. Membrane Technology	3	-	-	3.0
7		PCC-Lab	Chemical Reaction Engineering Lab	-	-	3	1.5
8		PCC-Lab	Mass Transfer Operations Lab	-	-	3	1.5
			TOTAL	17	0	6	20

ANURAG UNIVERSITY

CHEMICAL REACTION ENGINEERING-I

B. Tech III Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Material & Energy Balance Computations, Engineering Chemistry, Mathematics-I, II.

Course Objectives

By studying this subject student will learn about

1. To understand design of Reactor.
2. To Identity type of reactor by using chemical kinetics and using Information from Thermodynamics
3. Applications of Heat transfer and Mass Transfer with chemical reactions.
4. To study and Identify type of reaction.
5. To Study and understand effect of Temperature and pressure in Chemical reaction.

Course Outcomes

The student will be able to:

1. Describe the algorithm that allows the student to solve chemical reaction engineering problems through logic rather than memorization.
2. Determine the reaction order and specific reaction rate from experimental data and describe the steps in a catalytic mechanism and how one goes about deriving a rate law, mechanism, and rate-limiting step that are Consistent with experimental data.
3. Work together to solve both open-ended and closed-ended reaction engineering problems.
4. Use relevant theory to describe the molecular basis for elementary chemical reaction rates.
5. Understand the temperature and pressure effects on chemical reactions

UNIT I

Overview of chemical reaction engineering - classification of reactions, variables affecting the rate of reaction, definition of reaction rate, kinetics of homogeneous reactions-concentration dependent term of rate equation, temperature dependent term of rate equation, searching for mechanism, predictability of reaction rate from theory.

UNIT II

Interpretation of batch reactor data-constant volume batch reactor-Analysis of total pressure data obtained in a constant-volume system, the conversion, Integral method of analysis of data-general procedure, irreversible uni-molecular type first order reaction,

irreversible bimolecular type second order reaction, irreversible tri molecular type third order reactions, empirical reactions of nth order, zero order reaction, overall order of irreversible reaction from half-life, fractional life method, irreversible reaction in parallel, homogeneous catalysed reaction, autocatalytic reactions, irreversible reaction in series.

UNIT III

Constant volume batch reactor-first order reversible reaction, second order reversible reactions, reversible reaction in general, reactions of shifting order, Differential method of analysis of data, Varying volume batch reactor-differential method of analysis, integral method of analysis, zero order, first order, second order, nth order reactions, temperature and reaction rate, the search for a rate equation.

Introduction to reactor design - general discussion. Relationship between C_A and X_A, Ideal reactors for a single reaction-ideal batch reactor, Steady-state mixed flow reactor, Steady-state plug flow reactor.

UNIT IV

Design for single reactions-Size comparison of single reactors, multiple reactor systems, recycle reactor, Autocatalytic reactions. Design for parallel reactions-Introduction to multiple reactions, qualitative discussion about product distribution, quantitative discussion about product distribution and of reactor size.

UNIT V

Series Reactions - Irreversible first order reactions in series, quantitative discussion about product distribution, quantitative treatment, plug flow or batch reactor, quantitative treatment, mixed flow reactor, first order followed by zero-order reaction, zero order followed by first order reaction.

Temperature and pressure effects-single reactions-heats of reaction from thermodynamics, heats of reaction and temperature, equilibrium constant from thermodynamics, equilibrium conversion, general graphical design procedure, optimum temperature progression, heat effects, endothermic reaction in mixed flow reactors-A special problem, multiple reactions, adiabatic operation, non-adiabatic operation comment and extension.

Text Books

1. Chemical reaction engineering by Octave Levenspiel, 3rd ed. John Wiley and Sons, 1990.

Reference Books

1. Elements of Chemical reaction engineering by H.S. Fogler, 2nd ed.PHI, 1992.
2. Chemical engineering Kinetics by J.M. Smith, 3rd ed. Mc Graw Hill, 1981.

MASS TRANSFER OPERATIONS-I

B. Tech III Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Fluid Mechanics, Chemical Process Calculations

Course Objectives

By studying this subject student will learn about

1. To discuss the fundamental concepts of mass transfer principles and to apply those concepts to real engineering problems.
2. To impart the basic concepts of molecular diffusion, mass transfer coefficients and analysis of different mass transfer processes.
3. Applies the concepts of diffusion mass transfer, mass transfer coefficients, convective mass transfer, inter-phase mass transfer, equipment for gas-liquid operations.
4. To provide theoretical/analytical back ground to understand mass transfer operations like to tackle the complex problems
5. Design aspects of the equipment's utilized for absorption, humidification and drying operations.

Course Outcomes

The student will be able to:

1. Estimate diffusion coefficients, Solve unsteady state diffusion problems.
2. Determine convective mass transfer rates & mass transfer coefficients and related mass transfer theories.
3. Perform material and energy balance calculations in mass transfer operations humidification, drying, and absorption operations.
4. Able to select and design the equipment's for humidification, drying and absorption operations.
5. Determine the number of transfer units and height requirements for a packed column.

UNIT I

The Mass Transfer Operations: Classification of the Mass-Transfer Operations, Choice of Separation Method, Methods of Conducting the Mass-Transfer Operations, Design Principles, Molecular Diffusion In Fluids: Molecular Diffusion, Equation of Continuity,

binary solutions, Steady State Molecular Diffusion in Fluids at Rest and in Laminar Flow, estimation of diffusivity of gases and liquids, Momentum and Heat Transfer in Laminar flow Diffusion Diffusion in Solids, Fick's law Diffusion, Types of Solid Diffusion.

UNIT II

Mass Transfer Coefficients: Mass Transfer Coefficients, Mass Transfer Coefficients in Laminar Flow (Explanation of equations only and no derivation), Mass Transfer Coefficients in Turbulent Flow, eddy diffusion, theories of mass transfer and their applications, Mass, Heat and Momentum Transfer Analogies, Inter phase Mass Transfer: Concept of Equilibrium, Diffusion between Phases, Material Balances in steady co-current and counter current stage processes, Stages, Cascades.

UNIT III

Equipment For Gas-Liquid Operations: Gas Dispersed, Sparged vessels (Bubble Columns), Mechanical agitated equipment's (Brief description), Tray towers, General characteristics, Different types of Tray Efficiencies, Liquid Dispersed venturi Scrubbers, Wetted-Wall Towers, Packed Towers, Tray tower vs Packed towers.

Absorption and Stripping: Absorption equilibrium, ideal and non-ideal solutions, selection of a solvent for absorption, one component transferred: material balances. Counter current multi stage operations, Determination of number of Plates, Absorption Factors, estimation of number of plates by Kremser Brown equation, Continuous contact equipment; HETP, Absorption of one component, Determination of number of Transfer Units and Height of the Continuous Absorber, overall coefficients and transfer units, dilute solutions.

UNIT IV

Humidification Operations: Vapor-Pressure Curve, Definitions, Psychometric Charts, Enthalpy of gas-vapor Mixtures, Humidification and Dehumidification, Operating lines and Design of Packed Humidifiers, Dehumidifiers and Cooling towers, Spray Chambers

UNIT V

Drying: Equilibrium, Definitions, Drying Conditions- Rate of Batch Drying under constant drying conditions, Mechanisms of batch drying, Drying time Through Circulation Drying, Classification of Drying Operations: Batch and Continuous Drying Equipment, Material and Energy Balances of Continuous Driers.

Text Books

1. Mass transfer operations by R.E. Treybal, 3rd ed. Mc Graw Hill, 1980.
2. McCabe, W.L., Smith, J.C., and Harriot, P., "Unit Operations in Chemical Engineering", McGraw-Hill VII Edn., 2004.

Reference Books

1. Diffusion: mass transfer in fluid system by E. L. Cussler, 2nd Ed, 1997.
2. Transport processes and Separation Process Principles 4th Ed., by Christie J. Geankoplis, PHI Learning Pvt. Ltd., New Delhi, 2009
3. Principles of Mass Transfer Operations and Separation Processes, B.K.Dutta, PHI,2007.
4. Principles of mass transfer and separation processes, Binay .K. Dutta, PHI Learning Pvt Ltd, India, 2007
5. S. Foust, Principles of Unit Operations, 2nd Edition, Wiley, New York, 1980

CHEMICAL ENGINEERING THERMODYNAMICS-II

B. Tech III Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Chemical Engineering Thermodynamics-I, Mathematics-I & II

Course Objectives

By studying this subject student will learn about

1. Calculate the heat effects of Industrial Reactions.
2. Familiarity with basic concepts in solution thermodynamics.
3. Solve problems involving Vapor Liquid Equilibrium.
4. Explain the underlying principles of phase equilibrium in two-component and multi-component systems
5. Determine equilibrium compositions for chemical reactions.

Course Outcomes

The student will be able to:

1. Analyze the heat effects involved in Industrial Chemical Processes.
2. Determine the thermodynamic properties of mixtures of gases, liquids and solids.
3. Calculate vapor-liquid equilibrium (VLE) composition for ideal and non-ideal systems
4. Determine the equilibrium states of a wide range of systems, ranging from mixtures of gases, liquids, and solids that can each include multiple components.
5. Solve problems dealing with multi-phase chemical systems and reactive systems.

UNIT I

Heat effects: Sensible heat effects; Latent heats of pure substances; Standard heat of reaction; Standard heat of formation; Standard heat of combustion; temperature dependence of heat of reaction; heat effects of industrial reactions.

UNIT II

Solution thermodynamics: Theory; Fundamental property relation; chemical potential as a criterion for phase equilibrium; partial properties; ideal gas mixture model; fugacity and fugacity coefficient for pure species; Fugacity and fugacity coefficient for species in

solutions; generalized correlations for Fugacity coefficient; the ideal solution model; excess properties.

Solution thermodynamics: applications; the liquid phase properties from VLE data; models for the excess Gibbs energy; property changes of mixing; heat effects of mixing processes.

UNIT III

VLE at low to moderate pressures: The nature of equilibrium; the phase rule - Duhem's theorem; VLE: Qualitative behaviour; Simple models for vapour liquid equilibrium; Vapor liquid equilibrium by Modified Raoult's law; VLE from K-Value Correlations, Local Composition Models: UNIFAC and UNIQUAC models.

The gamma /Phi formulation of VLE; Dew point and bubble point calculations; flash calculations; solute (1)/sol vent (2) systems.

UNIT IV

Thermodynamic properties and VLE from equations of state: VLE from cubic equations of state.

Topics in phase Equilibria: Equilibrium and stability; liquid-liquid equilibrium (LLE); vapor- liquid–liquid equilibrium (VLLE); solid-liquid equilibrium (SLE); solid vapor equilibrium (SVE); equilibrium absorption of gases on solids.

UNIT V

Chemical reaction equilibria: The reaction coordinate; application of equilibrium criteria to chemical reactions; the standard Gibb's energy change and the equilibrium constant; effect of temperature on equilibrium constant; relation of equilibrium constants to composition; equilibrium conversion for single reactions; Phase rule and Duhem's theorem for reacting systems, Multi reaction Equilibria.

Introduction to molecular thermodynamics: Molecular theory of fluids; Internal energy of ideal gases: microscopic view.

Text Books

1. Smith , J.M., Van Ness, H.C. and Abbott.M.M., " Introduction to Chemical Engineering Thermodynamics ", 7th ed, Mc Graw Hill, 2005.

Reference Books

1. S.Sandler, "Chemical, Biochemical and Engineering Thermodynamics", 4th Ed, Wiley, India.
2. Kyle, B.G., "Chemical and Process Thermodynamics 3rd edn. ", Pearson, Prentice Hall of India Pvt.Ltd., 1999.
3. Y.V.C. Rao, Chemical Engineering Thermodynamics, University Press Pvt Ltd, 2004.

4. K.V. Narayanan, “A Text Book Chemical Engineering Thermodynamics”, PHI Learning Pvt Ltd., New Delhi, 2001.

ENTREPRENEURSHIP DEVELOPMENT

B. Tech II Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	HSS&MC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Nil

Course Objectives

The objective of this course is to familiarize the student with entrepreneurship, the issues involved in it, the potential of entrepreneurship and intrapreneurship, the legal environment and statutory issues and explore various funding opportunities.

Course Outcomes

The student will be able to:

1.Interpret the concepts of Entrepreneurship and Intrapreneurship.
2.Apply the opportunity identification techniques
3. Differentiate needs of different segments
4. Develop business model and MVP
5. Recognize organizational forms, IPR concerns and funding opportunities for startups.

UNIT I: Introduction to Entrepreneurship:

Entrepreneurship and Intrapreneurship, Business Incubators, Rural Entrepreneurship, Social Entrepreneurship, women entrepreneurs, Role of entrepreneurs in economic development, Types of entrepreneurs. Entrepreneurial mindset and stress, Causes of failure.

UNIT II: Opportunity Identification:

Myths and realities of entrepreneurship, Opportunity identification, Problem worth solving, idea generation techniques, Design thinking.

UNIT III: Customer Analysis:

Market segmentation, consumer persona, Product-market fit, Unique Value proposition.

UNIT IV: Business model and MVP:

Business model canvas, MVP, Risks and assumptions, Importance of financial planning.

UNIT V: Organizational forms Funding Opportunities:

Organizational forms - Partnership, Sole proprietorship, Corporation. Intellectual Property Rights- Copyrights, Trademarks, Patents. Law Vs. Ethics, Informal capital- Friends and Family, Angels, Venture Capitalists, Idea/ Patent, Growth strategies,

Reference Books

1.Vasant Desai, YayatiNayak, Entrepreneurship, Himalaya Publishing House,2018

2.Rajeev Roy, Entrepreneurship, Oxford University Press, 2/e, 2012

3.D.F. Kuratko and T.V.Rao Entrepreneurship- Cengage Learning,2012

4.Dhruv Nath, Sushanto Mitra, Funding Your Startup: And Other Nightmares, 2020

5.V Srinivasa Rao, Lean Digital Thinking: Digitalizing Businesses in a New World Order, Bloomsbury India, 2021

6.S.K.Mohanty, Fundamentals of Entrepreneurship, PHI, 1/e,2005

PROJECT MANAGEMENT

B. Tech II Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	OEC-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Nil

Course Objectives

By studying this subject student will learn about:
The course is designed to help the student understand the concepts of project management, explain how to identify the projects and planning, analyze how to execute the projects, assess how to lead the team and evaluation of projects and to explain the Performance Measurement and Evaluation of the projects.

Course Outcomes

The student will be able to:

1. Explain the phases of project life cycle.
2. Identify the projects and planning the projects
3. Evaluate to control the project execution.
4. Analyze how to lead the project team
5. Discuss the recent trends in project management.

UNIT I: Introduction:

Introduction to project management, need for project management, project management principles. Project lifecycle, project management phases in lifecycle, project management research in brief, project management today, organization structure, stake holder management, creating a culture for project management.

UNIT II: Project Identification and Planning

Project identification process, defining the project, approaches to project screening and selection, project planning, work breakdown structure, financial module, getting

approval and compiling a project charter, setting up a monitoring and controlling process.

UNIT III: Project Execution

Initiating the project, controlling and reporting project objectives, conducting project evaluation, risk, role of risk management, project management, risk management an integrated approach, cost management, creating a project budget.

UNIT IV: Leading Project Teams

Building a project team, characteristics of an effective project team. Achieving cross-functional co-operation, virtual project teams, conflict management, negotiations.

UNIT V: Performance Measurement and Evaluation

Monitoring project performances, Project control cycles, Earned Value management, Human factors in project evaluation and control. Project termination, types of project terminations, project follow-up. Current and future trends in project management.

Text Books

1. Jeffery K. Pinto, Project Management, Pearson Education,2015

Reference Books

1. Gray, Larson, Project Management, Tata McGraw Hill,2015
2. Enzo Frigenti, Project Management, Kogan, 2015
3. R. Panneerselvam & P. Senthilkumar, Project Management, PHI, 2015
4. Thomas M.Cappels, Financially Focused Project Management, SPD,2008.
5. Guide to Project Management Body of Knowledge (PMBOK® Guide) of Project Management Institute, USA.

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

B. Tech III Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	OEC-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Nil

Course Objectives

By studying this subject student will learn about

1. To understand the basic concepts of managerial economics
2. To study the production and cost concepts
3. To develop the awareness of pricing strategies in the markets
4. To explain the methods of capital budgeting concepts
5. To understand the steps in preparation of final accounts

Course Outcomes

The student will be able to:

1. To Describe the concept of demand and its determinants in managerial decisions.
2. To Analyze the cost concepts and breakeven analysis in production.
3. To Evaluate the market structures and different pricing strategies.
4. To Apply the capital budgeting techniques in financial decisions.
5. To Application of Ratios in solving of business problems and taking correct decisions.

UNIT I

Introduction to Managerial Economics: Definition, Nature and scope of Managerial Economics, Demand Analysis- Demand Determinants, Law of Demand and its exceptions.

Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Methods of Demand Forecasting (Survey Methods, Statistical Methods, Expert Opinion Method, Test Marketing, Controlled Experiments, Judgmental Approach to Demand Forecasting)

UNIT II

Theory of Production and Cost Analysis: Production Function – Isoquants and Iso costs, MRTS, Least Cost Combination of Inputs.

Cost Analysis: Cost concepts, Opportunity Cost, Out of Pocket Costs vs. Imputed Costs. Breakeven Analysis (BEA) – Determination of Breakeven Point (simple problems), Managerial Significance and limitations of BEA.

UNIT III

Market Structures and Pricing Policies:

Market structures: Types of Competition, Features of Perfect Competition, Monopoly and Monopolistic Competition, Price - Output determination in Perfect Competition

Objectives and Policies of Pricing: Objectives of pricing**,** Methods of Pricing - Cost Plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two - Part Pricing, Block Pricing, Peak Load Pricing, Cross Subsidization.

UNIT IV

Capital and Capital Budgeting: Capital and its significance. Types of Capital. Estimation of Fixed and working capital requirements. Methods and sources of raising finance.

Nature and scope of capital budgeting, features of capital budgeting proposals. Methods of capital Budgeting: Payback Method. Accounting Rate of Return (ARR) and Net Present Value Method (simple problems).

UNIT V

Introduction to Financial Accounting& Ratio Analysis:

Introduction to Financial Accounting: Definition of Accounting**,** Double-Entry Book Keeping, Journal, Ledger, and Trial Balance, Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

Ratio Analysis: Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and Quick Ratio), Activity Ratios (Inventory Turnover Ratio and Debtor Turnover Ratio), Capital Structure Ratios (Debt – Equity, Interest Coverage Ratio), and Profitability Ratios (Gross Profit Ratio, Net Profit Ratio, Operating Profit Ratio, P/E Ratio and EPS).

Text Books

1. Arya Sri: Managerial Economics and Financial Analysis, TMH,2009
2. Varshney&Maheswari: Managerial Economics, Sultan Chand,2009

Reference Books

1. R. K. Sharma & Shashi K Gupta, Financial and Management Accounting, Sultan Chand.

2. V. Rajasekaran & R. Lalitha, Financial Accounting, Pearson Education, New Delhi.
3. Domnick Salvatore, Managerial Economics in a Global Economy, Cengage Learning.
4. Subhash Sharma & M. P. Vittal, Financial Accounting for Management, Text & Cases, Machmillan.
5. S. N. Maheshwari& S. K. Maheshwari, Financial Accounting, Vikas Publications

INTELLECTUAL PROPERTY RIGHTS

B. Tech III Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	OEC-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Nil

Course Objectives

The course aims to help the student understand the concept of Intellectual Property Rights and helps the student to appreciate the purpose and function of a trademark and the process involved in getting copyright, patent and related issues. The student is introduced to the importance of trade Secret and Geographical Indications.

Course Outcomes

At the end of the course student will be able to

1. Explain the concepts of intellectual property rights and related agencies.
2. Describe the purpose and functions of a trademark in a competitive environment.
3. Analyze the process of copyright and procedure.
4. Understand the process of patent and patent issues.
5. Explore the trade secret and geographical indications of its protection from unfair practices.

UNIT I: Introduction to IPR:

Concept of intellectual property rights, importance of intellectual property rights. Types of intellectual property, international agencies, and treaties.

UNIT II: Trademarks:

Concept of trademarks, purpose, and function of trademarks. Acquisition of trademark rights, protectable matter, selecting and evaluating trademark, trademark registration processes.

UNIT III: Law of copyrights:

Concept of copyright right, fundamentals of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration.

UNIT IV: Law of patents:

Introduction to patent, foundation of patent law, patent searching process, ownership rights and transfer.

UNIT V: Trade Secrets & Geographical Indication:

Law pertaining to trade secrets, determination of trade secrets. Trade secret litigation. Unfair competitions. Geographical Indication, concept of geographical indication, importance of geographical indication, new development of intellectual property rights.

Text Books

1. Deborah. E. Bouchoux, Intellectual property right, 5/e,2018,cengage learning.
2. Neeraj Pandey, Intellectual property right, PHI, 2019.

Reference Books

1.Ramakrishna Chintakunta and M. Geethavani, Kindle e 2021
2.Prabuddha Ganguli,Intellectual Property Right:Unleashing the Knowledge Economy, 2/e, 2017 Tata Mc Graw Hill Publishing company Ltd.

COMPUTATIONAL METHODS IN CHEMICAL ENGINEERING LAB

B. Tech III Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC-Lab	L	T	P	C	CIE	SEE	Total
		0	0	4	2.0	50	50	100

Course Objectives

By studying this subject student will learn about

1. The basics MATLAB coding
2. Various numerical schemes to chemical engineering processes
3. Solution methods of linear and no-linear algebraic equations
4. Numerical methods to solve ordinary and partial differential equations
5. Finite different schemes

Course Outcomes

Students will able to

1. Explore the basic knowledge on computational techniques.
2. Apply the computational techniques to solve linear algebraic equations.
3. Realize the use of computational techniques to solve linear algebraic equations.
4. Perform numerical integration using computational techniques.
5. Solve ODEs using simple numerical methods

(At least TEN experiments out of the following THIRTEEN experiments should be performed)

1.Solution of linear algebraic equations using Gauss Elimination Method

Learn the algorithm of Gauss Elimination method and apply it to solve system of linear equations using MATLAB software.

2. Solution of linear algebraic equations using Gauss-Siedel method

Learn the algorithm of Gauss-Siedel method and apply it to solve system of linear equations using MATLAB software.

3. Solution of non-linear equations using Newton-Raphson method

Learn the algorithm of Newton-Raphson method and apply it to solve non-linear algebraic equations using MATLAB software.

4. Exercises involving Interpolation and Approximation.

Learn the algorithm of Newton's forward interpolation method and apply it to find the intermediate value in a given set of data using MATLAB software.

5. Temperature distributions in rectangular bar using explicit method

Learn the algorithm of explicit method and apply it to calculate the temperature distribution in rectangular bar using MATLAB software

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6. Numerical Integration

Learn the algorithm of Numerical Integration method and apply it to solve definite integrals using MATLAB software.

7. Solving simultaneous differential equations

Learn the algorithm of Modified Euler's method and apply it to solve ordinary differential equations using MATLAB software.

8. Solution of ODEs using Euler method

Learn the algorithm of Euler's method and apply it to solve ordinary differential equations using MATLAB software.

9. Solution of ODEs using Runge-Kutta methods

Learn the algorithm of Runge-Kutta method and apply it to solve ordinary differential equations using MATLAB software.

10. Solution of simple Partial Differential Equations

Learn the algorithm of implicit method and apply it to solve Partial Differential Equations using MATLAB software.

11. Dew Point and Bubble point Calculations

Learn about Dew point and bubble point and calculate both using bisection algorithm with the help of MATLAB software.

12. Vander-waals equation of state

Learn about Vander-Waals equation of state and estimate the volume using secant method algorithm with the help of MATLAB software.

13. Ideal Gas Equation

Learn about Ideal-Gas equation and estimate the volume of gas using MATLAB software.

Text Books

1. Chapra, S. C. (2008). Applied numerical methods with MATLAB for engineers and scientists (pp. 335-359). McGraw-Hill Higher Education.

Quantitative Aptitude and Reasoning

B. Tech III Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	HSS&MC -Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

UNIT I

Number System: Speed Math's, Numbers, Factors, Prime and co primes, LCM & HCF Divisibility rules, Finding the unit digit and applications, remainder theory.
Ratio and Proportion with Ages: Definition of ratio and Proportion, Finding the resultant ratio. Problems based on Ratios and ages.

Percentages: Introduction to percentages, Percentage Increase /Decrease, Results on Population, Results on Depreciation, Variations, Applications of Percentage

Profit and Loss: Classification of Profit and Loss, Profit/ Loss Percentages, Successive Discount.

UNIT II

Time and Distance: Difference between the average, Relative and Effective speed, reaching the destination late and early, stoppage time per hour, problems based on Trains and problems based on Boats.
Time and Work: Calculating Efficiency, alternate days concept, work and wages, Chain rule , problems based on Pipes and cisterns .
Simple and Compound Interest: Simple interest, Principle, Rate, Amount, Applications of Simple interest , Compound interest , Compounded annually , Compounded Half yearly , Compounded Quarterly , Difference between simple and compound interest .

UNIT III

Permutations and Combinations: Fundamental rules, Problems on Permutations and Combinations
Probability: Definition, Notations and Problems based on Probability.
Mean, Median and Mode : Introduction and problems on mean, median and mode
Partnership: Relation between Partners, Period of Investments and Shares
Averages: Average of different groups, change in average by adding, deleting and replacement of objects
Flow Chart : Introduction of symbols and problems on flow charts.

UNIT IV

Seating Arrangement: Circular, Row, Column, Square and Double row arrangement
Puzzles : Paragraph, incomplete puzzles and problems on them.
Number Series: Number, Alphabet and Letter Series.
Analogy: Simple, Double, Word and Number Analogy
Coding and Decoding: Classifications and Problems on Coding and Decoding.

UNIT V

Clocks: Relation between minute and hour hand, angle between hands of a clock, exceptional cases in clocks. Gaining and loosing of time.
Calendars: Classification of years, finding the day of any random calendar date, repetition of calendar years.
Direction Sense Test: Sort of directions in puzzle, distance between two points, Problems on shadows.
Blood Relations: Defining the various relations among the members of a family, Solving blood relation puzzles by using symbols and notations. Problems on coded relations.

Text Books

1. Verbal and Non Verbal Reasoning – R.S Agarwal, New Edition -2020, S. Chand.
2. Quantitative Aptitude – R.S Agarwal, New Edition- 2020, S. Chand.

Reference Books

1. Quantitative Aptitude: Abhijeet Guha, New Edition-2020, Mc Graw Hill.

VERBAL ABILITY & CRITICAL REASONING

B. Tech II Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	HSS&MC -Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

UNIT I

Data Interpretation: Tabular, Pie-charts, Bar and line graphs and Problems on all models.
Data Sufficiency: Introduction and Problems based on all Quant and logical topics.
Allegations and Mixtures: Allegation rule, mean value of the mixture, Replacement of equal quantity of mixtures.

UNIT II

Geometry: Line, line segment, angle, Triangles and Polygons with their Properties.
Mensuration: Area and perimeter of Triangle, Rectangle, Square, Parallelogram, Trapezium, Surface area & Volume of 3D figures.
Logarithms: Formulas and Problems based on Logarithms.
Progressions and Quadratic Equations: Arithmetic, Geometric and Harmonic Progressions and their relations. General forms of Quadratic equations and finding the roots and their nature.

UNIT III

Syllogisms: Statements and Conclusions by using vein diagrams.
Odd One Out: Classification and problems based of Odd one out.
Cubes and Dice: Types of cubes and dice with Examples.
Statement and Conclusions: Introduction, Types of conclusions and different cases.

UNIT IV

Tenses: Types, usage ,question solving.
Vocabulary: Types, usage and error spotting.
Inference: conclusion reached on the basis of evidence and reasoning, question solving.
Para Jumbles: Arranging the jumbled sentence by using the strategies.

Sentence Completion: Completing a sentence by filling the gaps by understanding & analyzing the meaning of the sentence along with the approaches.

UNIT V

Subject Verb Agreement: Rules and examples for finding the right subject and verb.

Sentence Correction : Error spotting and correcting the sentence.

Reading Comprehension: Understanding Meaning, Understanding the meaning of a text means figuring out what the passage is trying to tell you. ...Drawing Connections. ...Summarizing and Synthesizing.

Direct & Indirect Speeches: What is **Direct & Indirect Speech**? , reporting the message of the speaker in the exact words as spoken by the speaker and examples.

Active Voice & Passive Voice: Types of active and passive voice, rules and examples**.**

Text Books

1. Verbal and Non-Verbal Reasoning – R.S Agarwal, New Edition -2020, S. Chand.
2. Quantitative Aptitude – R.S Agarwal, New Edition- 2020, S. Chand.

Reference Books

1. Quantitative Aptitude: Abhijeet Guha, New Edition-2020, Mc Graw Hill.

GENDER SENSITIZATION

B. Tech II Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	MC	L	T	P	C	CIE	SEE	Total
		2	0	0	0	---	---	---

Course Objectives

By studying this subject student will learn about

1. To develop students' sensibility with regard to issue of gender in contemporary India.
2. To provide a critical perceptive on the socialization of men and women
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of the work.
5. To expose students to more egalitarian interactions between men and women.

UNIT I

Understanding Gender:
Gender: why should we study it? (Towards a world of equals: (Unit-1)
Socialization: Making women, making men towards a world of equals: (Unit-2)
Introduction. Preparing for womanhood. Growing up male. First lessons in caste. Different masculinities.
Just relationships: Being together equals (towards a world of equals: (Unit-3).
Mary kom and onler .love and acid just do not mix. Love letters mothers and fathers. Further reading: Rosa parks-the brave heart.

UNIT II

Gender and Biology:
Missing women: sex selection and its consequences towards a world of equals: (Unit-4)
Declining sex ratio. Demographic consequences. Gender spectrum: Beyond the (towards a world of equals: (Unit-10)
Too or many? Struggles with discrimination .additional reading: our bodies our health (towards a world of equals: (Unit-13)

UNIT III

Gender and Labor: Housework: the invisible labor (towards a world of equals: (Unit-3)
"My mother doesn't work ", "share the load".
Women's work: its politics and economics (towards a world of equals: (Unit-7)
Fact and Fiction: unrecognized and unaccounted work. Further reading: wages and conditions of work.

UNIT IV

Issues of the violence: Sexual harassment: say no! (Towards a world of equals: (Unit-6), sexual; harassment, not eve-teasing-couping with every day harassment-Further reading: “chupulu”
Domestic violence: speaking out (towards a world of equals: (Unit-8)
Is home a safe place? When women unite [film].rebuilding lives. Further reading: New forums for justice.
Thinking for sexual violence (towards a world of equals: (Unit-11)
Blaming the victim-I fought for my life …..” Further reading: the caste face of violence.

UNIT V

Gender Studies:
Knowledge: through the lens of gender (towards a world of equals: (Unit-5).point of view. Gender and the structure of knowledge: Further reading: unacknowledged women artists of Telangana.
Whose history? Questions for historians and others (towards a world of equals: (Unit-9)
Reclaiming a past. Writing other histories. Further reading: missing pages from modern Telangana History.
Essential Reading: All the units in the textbook, “Towards a world of equals: A bilingual Textbook on Gender” written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasantha, Ramamelkote, Vasuda Nagaraj, Asman Raseed, Gogu Shyamala, Deepa Srinivas, Susietharu
Note: Since it is interdisciplinary course resources persons can be drawn in the field of English literature or sociology or political science or any other qualified faculty who has expertise in this field

Reference Books

1. Sen, Amartya. “More than one million women are missing”. New York Review of Books 37, 20 (20 December 1990). Print. ‘We Were Making History’.. Life Stories of Women in the Telangana people’s Struggle, New Delhi: Kali for Women, 1989.
2. Tripti Lahiri, By the Numbers: Where Indian Women Work.” Women’s Studies Journal (14 november 2012). Available online at: http:// blogs.wsj.com/India real time/2012/11/14/by – the-numbers-where-Indian-women-work/>
3. K. satyanarana and Susie Tharu (Ed) Steel Nibs are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu and Kannada http://harpercollins.co.in/BookDetail.asp?Book Code=3732
4. Vimala.”Vantillu (the kitchen)” . Women Writing in India: 600 BC to the Present. Volume II: The 20th Centuary. Ed. Susie Tharu and K.Lalita. Delhi: Oxford University Press, 1995, 599-601
5. Virginia Woolf. A Room of One’s Own. Oxford:Black Swan, 1992
6. K.Kapadia. The violence of Development: The politics of Identity, Gender and Social Inequalities in India. London: Zed Books, 2002

CHEMICAL REACTION ENGINEERING-II

B. Tech III Year II Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Chemical Reaction Engineering-I.

Course Objectives

By studying this subject student will learn about

1. To provide students through understanding of reaction engineering applications.
2. To apply the Knowledge of reaction engineering in design of a reactor dispersion model and Tanks in-series model.
3. To understand and identify deviations in non – ideal reactors.
4. To analyze the solid catalyzed reactions for heterogeneous reactions
5. To study and apply mechanism of catalyst activity and deactivation.

Course Outcomes

The student will be able to:

1. Develop rate laws for use in reactor design based on reaction data from a reactor or set of reactors.
2. Make comparisons of ideal reactor types (batch, plug flow, mixed flow, etc.) and be able to determine the best choice for simple objectives when using a single reactor or a set of reactors.
3. Predict reactor performance in situations where a reacting gas has a significantly changing density, including the case of variable pressure within an ideal plug flow reactor.
4. Determine optimal ideal reactor design for multiple reactions for yield or selectivity
5. To Determine the Catalysis and catalytic reactors

UNIT I

Basics of non-ideal flow: E-Curve, the age distribution of fluid, the RTD, Conversion in Non-ideal flow reactors, diagnosing reactor ills (qualitative discussion only).The dispersion model-axial dispersion, correlation for axial dispersion, chemical reaction and dispersion.

UNIT II

The tanks-in-series model-pulse response experiments and RTD, chemical conversion. The convection model for laminar flow-the convective model and its RTD, chemical conversion in laminar flow reactors.
Earliness of mixing, segregation and RTD-self mixing of a single fluid, mixing of two miscible fluids.

UNIT III

Catalysis and catalytic reactors: catalysts, steps in catalytic reactions, synthesizing a rate law, mechanism and rate limiting step (From chapter-10 Fogler). Heterogeneous reactions-Introduction.
Solid catalysed reactions: The rate equation for surface kinetics-Pore diffusion resistance combined with surface kinetics, Porous catalyst particles, Heat effects during reactions, Performance equations for reactors containing porous catalyst particles.
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UNIT IV

Solid catalysed reactions: Experimental methods for finding rates, Deactivating Catalysts-Mechanisms of catalyst deactivation, the rate and performance equations.

UNIT V

Fluid-fluid reactions: Kinetics-the rate equation. Fluid particle reactions: Kinetics-Selection of a model, shrinking core model for spherical particles of unchanging size, rate of reaction for shrinking spherical particles, extensions, determination of rate controlling steps.

Text Books

1. Chemical reaction engineering by Octave Levenspiel, 3rd ed. John Wiley and Sons, 1990.

Reference Books

1.Elements of Chemical reaction engineering by H.S. Fogler, 2nd ed.PHI, 1992.
2.Chemical engineering Kinetics by J.M. Smith, 3rd ed. Mc Graw Hill, 1981.

MASS TRANSFER OPERATIONS-II

B. Tech III Year II Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Chemical Process Calculations, Mass Transfer Operations-I

Course Objectives

By studying this subject student will learn about

1. To study the separation techniques in the process industry, and provide proper understanding of unit operations.
2. Study of the stage wise mass transfer operations, principles of various stage wise contact processes like distillation, extraction and leaching and adsorption operations.
3. Design aspects of the equipment's utilized for distillation, extraction and adsorption operations.
4. Determine number of stages and height of packed column in distillation, extraction and adsorption operations.
5. To understand membrane-based separation processes and Ability to analyze and design membrane separation systems.

Course Outcomes

The student will be able to:

1. To select the modern separation technique in various applications and apply the mass transfer concepts in the design of separation columns.
2. Able to operate simple, steam, fractional, steam, azeotropic and extractive distillation
3. Design and operate the unit operations like distillation, adsorption, liquid-liquid extraction, leaching.
4. Construct and analyze a multi-stage equilibrium separation process.
5. Develop different flow model equations for membrane separation process.

UNIT I

Distillation: Fields of applications, VLE for miscible liquids, immiscible liquids, Positive and negative deviations from ideality, enthalpy-concentration diagrams, flash vaporization and differential distillation for binary and multi component mixtures, Azeotropic distillation, extractive distillation, steam distillation.

UNIT II

Continuous rectification-binary systems, multistage tray towers –method of Mc Cabe and Thiele, enriching section, exhausting section, feed introduction, total reflux, minimum and optimum reflux ratios, use of open steam, condensers, multiple feeds , tray efficiencies, continuous-contact equipment(packed towers)

Multistage (tray) towers –the method of Ponchon and Savarit, the enriching and stripping sections, feed tray location, total reflux, minimum and optimum reflux ratios, use of open stem,reboilers.

UNIT III

Liquid-Liquid operations: fields of usefulness, liquid-liquid equilibrium, equilateral triangular co-ordinates, system of three liquids, choice of solvent, stage wise contact, multistage cross-current extraction, Multi stage counter current without reflux and with reflux, fractional extraction, Differential (continuous contact) extractors, spray towers, packed towers, mechanically agitated counter-current extractors, centrifugal extractors, dilute solutions.

Leaching: Fields of applications, preparation of solid for leaching, types of leaching, leaching equilibrium, single stage and multi stage leaching calculations, constant under flow conditions, equipment for leaching operation.

UNIT IV

Adsorption: Types of adsorptions, nature of adsorbents, adsorption equilibrium, single gases and vapors, Adsorption Hysteresis, effect of temperature, Heat of adsorption, Adsorption of solute from dilute and concentrated solutions, stage wise operation, application of Freundlich equation to single and multistage adsorption (cross current & counter current).

Adsorption of vapor from a gas, fluidized bed, steady state moving bed adsorbers, unsteady state–fixed bed adsorbers, adsorption wave, rate of adsorption in fixed bed, principles of ion exchange, rate of ion exchange.

UNIT V

Introduction and types of membrane separation processes, liquid permeation membrane processes, Solid permeation membrane processes, complete mixing models for gas separations by membranes and multi-component mixtures, cross flow model for gas separation by membranes, Derivation of equations for counter-current and co-current flow for gas separation for membranes, Reverse osmosis models for reverse osmosis, Ultrafiltration, Micro filtration membrane processes, Applications, equipment.

Text Books

1. Mass transfer operations by R.E. Tryebal, 3rd ed. Mc Graw Hill, 1980.
2. W.L. McCabe, J. Smith and P. Harriot, Unit Operations of Chemical Engineering, 7th Edition, Tata McGraw Hill, India, 2014.

Reference Books

1.Transport processes and Separation Process Principles 4th Ed., by Christie J. Geankoplis, PHI Learning Pvt. Ltd., New Delhi, 2009.
2.Diffusion: Mass Transfer in Fluid System by E. L. Cussler, 2009.Binay K.Dutta, Principles of Mass Transfer and Separation Processes,2nd edition, Prentice Hall of India,2007.

PLANT DESIGN AND ECONOMICS

B. Tech III Year II Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Prerequisites

Material & Energy Balance Computations

Course Objectives

By studying this subject student will learn about

1. Principles of cost estimation,
2. Feasibility analysis of plant location
3. Management, organization and quality control that will enable the students to perform as efficient managers.
4. Interest and investment cost
5. Profitability, Alternative investments and Replacements

Course Outcomes

The student will be able to:

1. Learn basics of Cost estimation, Working Capital and Capital Investment and understand the time value of money
2. Study depreciation methods and learn tax calculation methods
3. Learn the methods of estimation of profitability of an industry and procedures adopted for Replacement and Selection from Alternatives.
4. Understand process equipment design concept perform various optimize various parameters such as heat duty of heat exchanger, production rate of various process plants.
5. Understand the Optimum pipe Dia

UNIT I

Introduction, Process design development, General design considerations, cost and asset accounting. Cash flow for industrial operations, factors effecting investment and production cost, capital investments, estimation of capital investments, cost indices, cost factors in capital investment.

UNIT II

Organization for presenting capital investments, estimates by compartmentalization, estimation of total product cost direction, Production costs, fixed charges, plant overhead costs, financing

UNIT III

Interest and investment cost, types of interest, nominal and effective interest rates, continuous interest, present worth and discount annuities, cost due to interest on investment, source of capital, Taxes and insurances, type of taxes: Federal income taxes, insurance-types of insurances, Self-insurance.

Depreciation: types of Depreciation, service life, salvage value, Present value, Methods for determining depreciation.

UNIT IV

Profitability: Alternative investments and Replacements, profitability standards, Discounted cash flow, Capitalized cost, pay-out period, Alternative investments, analysis with small investments, increments and replacements.

UNIT V

Optimum design and Design strategy, incremental cost, general procedure for determining optimum condition, comparison of graphical and analytical methods, optimum production rates, semi continuous cyclic operation, fluid dynamics, mass transfer strategy of linearization.

Text Books

1. Plant Design and Economics for Chemical Engineering, 4th ed, M.S. Peters and K.D. Timmerhaus, Mc Graw-Hill, 1991.
2. Process Engineering Economics, H.E. Schweyer, Mc Graw Hill Co., New York, Kogakusha Co., Ltd., Tokyo. 1955.

Reference Books

1.Chemical Engineering plant Design by C.Vilbrandt and Dryden C.E. 4th Edition, Mc Graw Hill Book Co., 1959.

BIO CHEMICAL ENGINEERING

B. Tech III Year II Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Chemical Reaction Engineering I & II, Material & Energy Balance Computations.

Course Objectives

1. To learn the basic concepts of cell function and biomolecules in analysis and design of industrial biochemical processes.
2. To Understand the role of enzymes and development of mechanistic models for enzyme kinetics.
3. To Understand the various pathways by which cells consume and generate the energy for its function and growth.
4. To Design biological reactors.
5. To Identify the basic separation and purification methods for products recovery and purification from bioreactors.

Course Outcomes

1.Student will understand the basic concepts of cell function and biomolecules in analysis and design of industrial biochemical processes.
2.Student will be able to understand the role of enzymes and development of mechanistic models for enzyme kinetics.
3.Understand the various pathways by which cells consume and generate the energy for its function and growth.
4.Student will able to design biological reactors.
5.Identify the basic separation and purification methods for products recovery and purification from bioreactors.

UNIT I

Introduction to microbiology: Biophysics and the cell doctrine, the structure of the cells, important cell types, from nucleotides to RNA and DNA, amino acids into proteins. Kinetics of enzyme catalyzed reaction: the enzyme substrate complex and enzyme action. Simple enzyme kinetics with one and two substrates, other patterns of substrate concentration dependence, modulation and regulation of enzyme activity. Other influences on enzyme activity.

UNIT II

Immobilized Enzyme Technology: Enzyme immobilization. Methods of enzyme immobilization, uses of enzyme immobilization, Effect of inhibitors (competitive, non-competitive, uncompetitive, substrate and product inhibitions). Utilization and regeneration of Cofactor. Immobilized enzyme Kinetics.

UNIT III

Kinetics of cellular growth in batch and continuous culture. Models for cellular growth. Unstructured, structured and cybernetic models. Thermal death kinetics of cells and spores. Introduction to metabolic pathways, Biosynthesis, transport across cell membranes, end products of metabolism, Stoichiometry of cell growth and product formation.

UNIT IV

Design and analysis of biological reactors: Batch reactors, fed batch reactors, enzyme catalyzed reactions in CSTR, CSTR reactors with recycle and wall growth, Ideal plug flow reactors, Sterilization reactors, sterilization of gases, packed bed reactors using immobilized catalyst. Fermentation technology: Media formulation, design and operation of typical aseptic, aerobic fermentation process. Transport phenomena in bioprocess system: gas liquid mass transfer in cellular systems, determination of oxygen transfer rates, Overall K_La estimates and power requirements for sparged and agitated vessels, Scaling of mass transfer equipments, Heat Transfer.

UNIT V

Downstream Processing: Strategies to recover and purify products; Separation of insoluble product-filtration and centrifugation; Cell Disruption-Mechanical and Non-Mechanical methods; Separation of soluble products: Liquid-liquid Extractions, Membrane separation (Dialysis, Ultra filtration and reverse osmosis); Chromatographic Separation-Gel permeation chromatography, Electrophoresis, final steps in purification-Crystallization and drying.

Text Books

1. Biochemical Engineering Fundamentals, 2nd Ed, J.E. Bailey and D.F. Ollis, Mc Graw Hill Publishers, Newyork, 1987.

2.Bioprocess Engineering, 2nd Ed, M.L.Shuler and F.Kargi, PHI learning Pvt Ltd, New Delhi, 2009.

Reference Books

1.Biochemical Engineering, J.M.Lee, Prentice Hall, New Jersey, 1992.

2.Bioprocess Engineering principles, P.M.Doran, Elseveir Gurgaon, 2005.

3.Introduction to Biochemical Engineering, D.G.Rao,Tata McGraw Hill, New Delhi,2005.

INDUSTRIAL SAFETY AND HAZARD MANAGEMENT

B. Tech III Year II Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Environmental Engineering, Pollution Control and Engineering

Course Objectives

By studying this subject student will learn about
1. Concepts of effective use of chemical industry utilities.
2. Emphasis on the knowledge of loss prevention
3. Organize the personal safety and industrial safety.
4. Evaluation of the hazard analysis and the toxicology.
5. Express an importance on personal protective equipment's used in industries.

Course Outcomes

The student will be able to:
1. Understand the safety principles and toxicology studies.
2. Identify and evaluate the different types of Hazard analysis.
3. Analyse and take preventive measures of fire & explosions industrial hazards.
4. Apply the relief system for different types of valves used in industries and statistical analysis of accidents.
5. Acquire knowledge of accident investigation and personal protective equipment's.

UNIT I

Introduction:

Safety program, Engineering ethics, Accident and loss statistics, Acceptable risk, public perception.

Toxicology: How toxicants enter biological organisms, how toxicants are eliminated from biological organisms.

UNIT II

Industrial Hygiene:

Government regulations, Identification, material safety data sheets, Evaluation methods: evaluating exposures to volatile, Control: respirators, ventilation.

UNIT III

Fires and Explosions:

The fire triangle, Distinction between fire and explosions, Flammability characteristics of liquids and vapors, MOC, ignition energy, Auto ignition, Auto oxidation, adiabatic compression, Explosions.

Designs to prevent fires and explosions:

Inerting, Explosion proof equipment and instruments, Ventilations, Sprinkler systems. Hazards Identification: Process hazards checklists, Hazard surveys, and Hazop safety reviews.

UNIT IV

Introduction to Reliefs: Relief concepts, Location of reliefs, Relief types, Data for sizing reliefs, Relief systems.

Relief Sizing: Conventional spring-operated reliefs in liquids, Conventional spring-operated reliefs in vapor or gas service, Rupture disc reliefs in liquid, vapor or gas service.

UNIT V

Chemical Process Safety: Introduction, Chemical process in Hazardous operations, chemical reactors, Reaction Hazards, Operational Deviations and Technical Report.

Personal Protective Equipment: Introduction, Legal Requirements, Selection guide lines, Head Protection, Eye and Face Protection, Hand Protection, Foot and Leg Protection, Body Protection, Indian standards on Personal Protective Equipment.

Text Books

1. Chemical Process Safety – (Fundamentals with applications), D.A.Crowl & J.F.Louvar Prentice Hall, New Jersey, 1990.
2. Industrial Hygiene and Chemical safety –M.H.Faulekar, I.K. International, 2006.

Reference Books

1. Safety and Accident Prevention in Chemical Operations, H.H.Fawcett and W.S.Wood, 2nd Edition, John Wiley and sons, New York, 1982.
2. Coulson and Richardson's – Chemical engineering – R.K.Sinnot, Vol.6, Butterworth-Heinmann Limited, 1996.

PETROLEUM AND PETROCHEMICAL TECHNOLOGY

B. Tech III Year II Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Mechanical Unit Operations, Chemical Technology, Heat Transfer, Mass Transfer Operations.

Course Objectives

By studying this subject student will learn about

1. A Knowledge on origin and formation of Petroleum and their Refinery operations.
2. Identify the Production methods of crude oil and gas to meet energy needs
3. Develop the treatment techniques for different fraction of petroleum
4. Evaluation the refining of crude oil for a wide spectrum of useful products
5. Clarify the various products from Petrochemicals, Chemicals and Plastics.

Course Outcomes

The student will be able to:

1. Understand the various feed stocks of refinery and petroleum products in India.
2. Categorize with basic fractionation and conversion processes used in refining of crude oil.
3. Identify the challenges involved in treatment techniques from viewpoint of environment.
4. Apply the various thermal catalytic processes used to produce various petroleum products
5. Acquainted with technologies used for manufacturing petroleum products at commercial scale.

UNIT I

Origin formation and composition of petroleum: Origin and formation petroleum, Reserves and deposits of world, Indian petroleum Industry.
Petrochemical industry: feedstocks and their products

UNIT II

Petroleum processing data: Evaluation of petroleum, Thermal properties of petroleum Fractions, important products properties and test methods.

Fractionation of Petroleum: Dehydration and desalting of crudes, heating of crude pipes still heaters.

UNIT III

Distillation of petroleum: Atmospheric Distillation Unit, Vacuum Distillation Unit
Treatment techniques: Fraction-impurities, treatment of gasoline, treatment of kerosene, treatment of lubes.

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UNIT IV

Thermal and catalytic processes: cracking, catalytic cracking, catalytic forming, Naptha cracking, coking, Hydrogenation processes, Alkylation processes, Isomerization Process.

Chemicals from Methane: Introduction, production of methanol, formaldehyde ethylene glycol, PTFE, methylamines.

UNIT V

Chemicals from Ethane-Ethylene –Acetylene: Oxidation of ethane, production of Ethylene, Manufacture of Vinyl Chloride monomer, Vinyl Acetate manufacture, Ethanol from Ethylene, Acetylene Manufacture, Acetaldehyde from Acetylene.

Text Books

1. Modern Petroleum Refining Processes, 5th ed., B.K Bhaskara Rao, Oxford and IBH Publishing, 2007
2. Petroleum Refining Engineering, 4th ed., WL Nelson, McGraw Hill, New York, 1958.

Reference Books

1. Shreve's chemical Process industries, 5th ed., G.T Austin, Mc Graw –Hill, New York, 1984.
2. Chemical Technology of petroleum. W.S.Gruese and D.R Stevens, Mc Graw – Hill 1980.

ENVIRONMENTAL POLLUTION AND CONTROL

B. Tech III Year II Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Mass Transfer operations, Mechanical unit operations

Course Objectives

By studying this subject student will learn about

1. Understand the different types of wastes generated in an industry, their effects on living and non-living things.
2. Analyse the various air sampling methods and collection of particulates
3. Discuss and design the different control devices.
4. The quantification and analysis of wastewater and treatment
5. Understand the solid waste Recycling and Recovery

Course Outcomes

The student will be able to:

1. Understand the different types of wastes generated in an industry, their effects on living and non-living things.
2. Analyse the various air sampling methods and collection of particulates
3. Discuss and design the different control devices.
4. Quantify and analysis of wastewater and treatment
5. Understand the solid waste Recycling and Recovery

UNIT I

Introduction: Types of Emissions from Chemical industries: and effects of Environment, environment legislation, types of pollution, sources of Waste water, Effluent guide lines and standards. Characterization of effluent streams, oxygen demands and their determination (BOD,COD, TOC,) Oxygen sage curve, BOD curve mathematical, controlling of BOD curve, self-purification of running streams, sources and Characteristics of pollutants in petroleum, paper & pulp fertilizer industry

UNIT II

Air pollution sampling and measurement: Types of pollutant and sampling and measurement, ambient air sampling, collection of gaseous air pollutants. Collection of particulate air pollutants. Stack sampling: sampling system, particulate sampling and gaseous sampling. Analysis of air pollutants: sulphur dioxide, nitrogen oxides, carbon monoxide, oxidants and Ozone, hydrocarbons, particulate matter. General methods of

control and removal of $S0_2$, Oxides of nitrogen and organic vapors from gaseous effluent.

UNIT III

Air pollution control methods and equipments: Source collection methods, raw material changes, equipment modification. Cleaning of gaseous equipments particulate emission control: collection efficiency, control equipment like gravitational settling chambers, Cyclone separators, fabric filters, ESP and their constructional details and design.

Scrubbers: wet scrubbers, Spray towers, centrifugal scrubbers, packed beds and plate columns, venturi scrubbers, their design aspects .Control of gaseous emissions: Absorption by liquids and solids, absorption equipment and their design aspects.

UNIT IV

Biological treatment of waste waters – aerobic and anaerobic methods – suspended and attached growth processes – bacteria – Reproduction in bacterial – Bacterial growth crushes, conventional activated sludge process – Trickling filters, Aerated lagoons – stabilization ponds,– fluidized bed contractors.**Physical Treatment methods** : Principle and working of screening – sedimentation – flotation – filtration – flocculation, Tertiary Treatment methods – carbon adsorption – Ion exchange – Reverse Osmosis, Ultra filtration, Sludge treatment and disposal .

UNIT V

Solid waste management: Sources and classification, methods of Collection, Incineration,comdisposal methods:composting ,open dumping, sanitary landfilling and incineration.potential methods of disposal:utilization, Recovery and recycling.

Text Books

1.Environmental pollution and control engineering by Rao C. S. –Wiley Eastern Limited, India, 1993

2.Pollution control in process industries by S.P. Mahajan TMH.,1985.

Reference Books

1.Waste water treatment by M.Narayana Rao and A.K.Datta, Oxford and IHB publisher, New Delhi.

NANO SCIENCE AND NANO TECHNOLOGY

B. Tech III Year II Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-III	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Engineering Physics

Course Objectives

By studying this subject student will learn about

1. The most exciting and novel properties at nanoscale regime
2. The interdisciplinary issues in nanoscale science and technology.
3. The basics of nanotechnology
4. The classification and properties of nanomaterials
5. The various methods for synthesis of nanomaterials and their applications

Course Outcomes

The student will be able to:

1.Explain the concepts and applications of nanotechnology and the growth techniques of nanomaterials.

2.Apply the materials in the nanoscale.

3.Discuss about Synthesis Techniques of nanomaterials.

4.Classify the different characterization techniques of nanomaterials

5.Explain the applications in the fields of automobiles, textiles and energy

UNIT I: Introduction

History and Scope, Can Small Things Make a Big Difference?

Quantum confinement, Surface area to Volume ratio, Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges and Future Prospects.

UNIT II: Unique Properties of Nanomaterials

Microstructure and Defects in Nanocrystalline Materials: Dislocations, Twins,stacking faults and voids, Grain Boundaries, triple and disclinations. Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility. Magnetic Properties: Soft magnetic

nanocrystalline alloy, Permanent magnetic nanocrystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties and Mechanical Properties.

UNIT III: Synthesis Routes

Bottom-up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Sol-gel method, Self-assembly, Top-down approaches: Mechanical alloying, Nano-lithography.
Consolidation of Nanopowders: Shock wave consolidation, Hot isostatic pressing and Coldisostatic pressing Spark plasma sintering.

UNIT IV: Tools to characterize nanomaterials

X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nanoindentation.

UNIT V: Applications of Nanomaterials

Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nanocatalysts, Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, Water-Treatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Defence and Space Applications, Concerns and challenges of Nanotechnology.

Text Books

1.Text Book of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, University Press-IIM.

Reference Books

1.Nano: The Essentials by T.Pradeep, Mc Graw- Hill Education.
2.Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L.Schodek
3.Transport in Nano structures- David Ferry, Cambridge University press 2000
4.Nanofabrication towards biomedical application: Techniques, tools, Application and impact– Ed. Challa S.,S. R. Kumar, J. H. Carola.
5.Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
6.Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University press.

PROCESS INTENSIFICATION

B. Tech III Year II Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-III	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Chemical engineering principles and knowledge.

Course Objectives

By studying this subject student will learn about

1. The concept of Process Intensification.
2. The limitations of intensification of the chemical processes.
3. The techniques of intensification to a range of chemical processes.
4. The various process equipment used for intensifying the processes.
5. The application of PI in industrial safety.

Course Outcomes

The student will be able to:

1. Assess the values and limitations of process intensification, cleaner technologies and waste minimization options
2. Measure and monitor the usage of raw materials and wastes generating from production and frame the strategies for reduction, reuse and recycle.
3. Obtain alternative solutions ensuring a more sustainable future based on environmental protection, economic viability and social acceptance.
4. Analyze data, observe trends and relate this to other variables.
5. Able to apply PI in various chemical industries.

UNIT I: Basics of Process Intensification

Definition of Process Intensification (PI). Benefits of PI, Techniques for PI application: active and passive techniques. Spinning disc reactor (SDR): Operating principle and development of models for thin film flow on rotating disc. Examples of application of SDR to a range of processes.

UNIT II: Rotary & Oscillatory Systems

Rotary packed bed (RPBs): Operating principle of rotating Contactors. Development of models for counter-current multiphase flow in rotating systems, Examples of the application of multiphase Contactors.

Oscillatory flow reactor (OFR): Description & operating principles, Explanation of niche applications. Design, Case studies.

UNIT III: Heat Exchangers

Compact heat exchangers (CHE): Definition of CHE, Construction and main properties, Applications, Basic design procedures, the printed circuit heat exchanger (PCHE), Plate heat exchangers (PHEs).

UNIT IV: Micro Reactors

Micro-reactors: Description and operating principles, oscillatory baffled reactor, mixing-limited reactor involving mass transfer and membrane reactors.

UNIT V: Process Intensification for Safety

Introduction, concept of layer of protection for process safety, inherent safety strategies, PI as an inherent safety strategy, process intensification, Metrics for inherent safety and PI benefits for passive and active layers of protection.

Text Books

1.Re-Engineering the Chemical Processing Plant- Process Intensification,Stankiewicz, A., and Moulijn, Marcel Dekker Inc., New York, 2003.

Reference Books

1.Engineering for Efficiency, Sustainability and Flexibility- Process Intensification, David Reay, Colin Ramshaw and Adam Harvey, Butterworth Heinemann, Elsevier Ltd., 2008.

MEMBRANE TECHNOLOGY

B. Tech III Year II Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-III	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Mass Transfer Operations and Chemical Reaction Engineering

Course Objectives

By studying this subject student will learn about

1. The methods used for synthesizing the membranes
2. Characterize & Select membrane for a given application
3. Analyze the Pressure driven & electrically driven membrane processes.
4. Discuss the Concentration driven membrane separation techniques.
5. Analyze the membrane fouling reducing techniques

Course Outcomes

The student will be able to:

1. Understand the methods used for synthesizing the membranes
2. Characterize & Select membrane for a given application
3. Analyze the different Pressure driven & electrically driven membrane processes.
4. Discuss the Concentration driven membrane separation techniques
5. Analyze the membrane fouling reducing techniques

UNIT I

Introduction to membrane processes, definition of a membrane, classifications membrane processes. Preparation of Synthetic membranes: Types of Membrane materials, preparation of Synthetic membranes, phase inversion membranes, preparation technique for immersion precipitation, and preparation technique for composite membranes

UNIT II

Characterization of membranes; Introduction, membrane characterization, characterization of porous membranes, characterization of non-porous membranes. Transport in membranes: introduction, driving forces, non-equilibrium thermodynamics, transport through porous, non-porous, and ion exchange membranes

UNIT III

Membrane Processes: Introduction, osmosis, pressure driven membrane processes: Introduction, microfiltration, membranes for microfiltration, industrial applications, ultra-filtration: membranes for ultra-filtration, industrial applications, reverse Osmosis and

nanofiltration: membranes for reverse osmosis and nanofiltration, industrial applications, Electrically Driven processes: Introduction, electrodialysis, Process parameters, membranes for electrodialysis, applications, Membrane electrolysis, Bipolar membranes, Fuel Cells

UNIT IV

Concentration driven membrane processes: gas separation: gas separation in porous and non-porous membranes, membranes for gas separation, applications, pervaporation, membranes for pervaporation, applications, dialysis: membranes for dialysis, applications, liquid membranes: aspects, liquid membrane development, choice of the organic solvent and carrier, applications, introduction to membrane reactors

UNIT V

Polarization phenomenon and fouling: Introduction to concentration polarization, turbulence promoters, pressure drop, gel layer model, osmotic pressure model, boundary layer resistance model, concentration polarization in diffusive membrane separations and electro dialysis, membrane fouling, methods to reduce fouling, compaction. Module and process design: Introduction, plate and frame module, spiral wound module, tubular module, capillary module, hollow fibre module, comparison of module configurations

Text Books

1.Membrane Separations, M.H.V. Mulder, Springer Publications, 2007
2.Rate-Controlled Separations, P. C. Wanket, Elsevier Applied Science, London,1994.

Reference Books

1.Membrane Technology in the Chemical Industry, S.P. Nunes, K.V. Peinemann,
2.Membrane Processes in Separation and Purification, J.G.Crespo, K.W.Bodekes, Kluwer Academic Publications
3.Membrane Separation Processes, K. Nath, PHI Pvt. Ltd., New Delhi,2012

CHEMICAL REACTION ENGINEERING LAB

B. Tech III Year II Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-LAB	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Objectives

By studying this subject student will learn about

1. Determine the reaction order and specific reaction rate from experimental data.
2. Develop rate laws for use in reactor design based on reaction data from a reactor or set of reactors.
3. To impart knowledge on different types of chemical reactors.
4. Design of chemical reactors under isothermal and non-isothermal conditions.
5. To enable the students to learn the gas-solid catalytic and non-catalytic reactors and gas-liquid reactors.

Course Outcomes

The student will be able to:

1. Apply experimentally the kinetics and rate constants of reactions in different types of reactors. These studies have wide applications in various process industries.
2. Evaluate the selection of the reactor for the reaction and its design.
3. Comparisons of ideal reactor and real reactors types (batch, plug flow, mixed flow Reactors etc)
4. Optimize the best choice for simple objectives when using a single reactor or a set of reactors in RTD studies.
5. Solve both open-ended and closed-ended reaction engineering problems.

(Atleast **Ten** experiments out of the following experiments should be performed)

I. Batch Reactor Setup- Differential method of analysis

Determination of the kinetic parameters (reaction rate constant and order of the reaction) and analyzing the data by Differential method of analysis

II. Batch Reactor Setup- Integral method of analysis

Determination of the kinetic parameters (reaction rate constant and order of reaction) and analyzing the data by Integral method of analysis.

III. Batch Reactor Setup- Temperature Dependent Term

Determination of the rate constant and to find the temperature dependence term using Arrhenius form of equation.

IV. CSTR Apparatus- Kinetic Studies

Determination of the kinetic parameters (order of reaction, reaction rate constant) in a CSTR Apparatus

V. PFR Apparatus- Kinetic Studies

Determination of the kinetic parameters (order of reaction, reaction rate constant) in a PFR Apparatus

VI. Tubular Reactor Apparatus – RTD Studies

Determine the RTD and axial dispersion number in a tubular column using a tracer.

VII. Packed Bed Reactor Apparatus- RTD Studies

Determination of the kinetic parameters (reaction rate constant and order of reaction) and analyzing the data by Integral method of analysis.

VIII. Solid – Liquid System Setup

Determine the mass transfer coefficient with and without chemical reaction for a solid –liquid system

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IX. Liquid – Liquid System Setup

Determine the mass transfer coefficient with and without chemical reaction for a liquid –liquid system

X. CSTRs in Series Apparatus - Kinetic Studies

Compare the performance of mixed flow reactor in series with that of an ideal reactor.

XI. CSTRs in Series Apparatus- RTD Studies

Determine RTD and dispersion number (axial dispersion number) for a given mixed flow reactors in series using a tracer.

Text Books

1. Chemical Reaction Engineering, 3rd Edition. O. Levenspiel, John Wiley and Sons, 1999.

Reference Books

1. Elements of Chemical reaction engineering by H.S. Fogler, 2nd ed.PHI, 1992.
2. Chemical engineering Kinetics by J.M. Smith, 3rd ed. Mc Graw Hill, 1981.

MASS TRANSFER OPERATIONS LAB

B. Tech III Year II Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC-Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

Students will able to

1. To perform VLE, LLE related experiments and can estimate diffusivity coefficients.
2. Calculation of different parameters in distillation, absorption, drying and extraction operations.
3. Design distillation units, drying and evaporation units.
4. Calculate the HETP for packed towers
5. To solve industry related problems including design and to respond to changing impact of chemical engineering solutions at a global level and in society

(At least TEN experiments out of the following FOURTEEN experiments should be performed)

1.

Estimation of diffusivity coefficients.
Major equipment-Diffusivity apparatus

2.

Determination of Steam distillation Vaporization efficiency
Major equipment-Steam distillation unit

3.

Verification of Rayleigh's Equation by Simple (or) Differential distillation.
Major equipment- Simple (or)Differential Distillation unit

4.

Determination of Height Equivalent to Theoretical Plate using Packed towers
Major equipment-Packed column unit

5.

Determination of the Vapor Liquid Equilibrium for the given system
Major equipment-VLE apparatus

6.

Estimation of Critical moisture content and rate of drying.
Major equipment-Tray dryer

7.

Evaluation of Mass transfer coefficients for Wetted wall column
Major equipment-Wetted wall column unit

8

Determination of the equilibrium distribution data for the given system using LLE apparatus
Major equipment-LLE setup

9.

Determination of the Solid Liquid Equilibrium for the given system
Major equipment-SLE setup

10.

Determination of the Solubility characteristics for given system
shaker, Different sizes of sieves, Weighing Balance, Energy meter.

Text Books

1.Mass transfer operations by R.E. Treybal, 3rd ed. Mc Graw Hill, 1980.
2.Unit Operations in Chemical Engineering, McCabe, W.L., Smith, J.C., and Harriot, P., McGraw-Hill VII Edn., 2004.

Dept. of Computer Science and Engineering

ANURAG UNIVERSITY
Venkatapur (V), Ghatkesar (M), Medchal (Dist.), Hyderabad,
Telangana, India. 500 088. www.anurag.edu.in
Department of Computer Science and Engineering

Minutes of the Fourth Board of Studies (BoS) meeting

The fourth Board of Studies (BoS) Meeting of the Department of Computer Science and Engineering (CSE), Anurag University was held on Wednesday, 6th April 2022 from 9.30 a.m. The internal BoS members, the senior and doctorate faculty and the course coordinators of CSE Department were present in off line mode at G-block conference hall and the external members were present for BoS meeting in online mode.

The link for the meeting is

https://us02web.zoom.us/j/85683713787?pwd=NWZDVnZlalM4VTRLQk1kUGI1bjNhUT09

Agenda of the Meeting;

1. To review the CSE-Department Vision, Mission, Program Education Objectives, Program Outcomes and Program Specific Outcomes
2. To review the course structure for B.Tech(CSE) and B.Tech(Data Science) programs (the course structure and syllabus is already approved in the previous BoS).
3. To review the syllabus for B.Tech (CSE) and B.Tech (Data Science) III Year (the course structure & syllabus is already approved in the previous BoS).

The Chairperson, BoS has communicated the following well in advance to all the members of BoS:

a) Agenda of 4th BoS b) Anurag university vision & Department Vision; Anurag

University Mission, Department mission; Program Education Objectives, Program Outcomes and Program Specific Outcomes c) Course structure of B.Tech- CSE d) Course structure of CSE-Data Science (DS).

The Meeting was convened to discuss the above agenda

The Chairperson has welcomed the members and conducted the proceedings. The following Resolutions were made in the meeting.

Item No. 1: Department Vision, Mission, Program Education Objectives, Program Outcomes and Program Specific Outcomes

Resolution: The BoS members have suggested few changes in vision, mission of the Department and it is incorporated. Further the Members of BoS also suggested few changes in Program Education Objectives, and Program Specific Outcomes. The same was approved.

Item No. 2: Course Structure and syllabus of III of B. Tech in CSE- of AU-R20 regulations.

Resolution: The BoS members had an elaborate discussion on the Course structure of III & IV Year of B. Tech in CSE and suggested the following modifications:

a. insisted to make Software Engineering as core subject for CSE and suggested to replace Cloud Computing with Software Engineering (both of them are of same 3-credits);
b. suggested not to place Distributed Systems and cloud Computing in the same elective; to incorporate this Big Data of 4th Year first semester (PEC-IV) was replaced with Cloud computing of PEC-II of 3rd Year second semester.
c. The Couse structure of 4th Year CSE was approved tentatively.
d. The syllabus of 3rd Year CSE was approved.

The same was approved.

Item No. 3: Course Structure and syllabus of III Year of B. Tech in CSE-Data Science (CSE-DS) of AU-R20

Resolution: The BoS members had elaborate discussions on the Course structure and Syllabus of III & IV Years of B. Tech in CSE-DS. The members suggested for incorporating few Changes:

a. To place Deep Learning in 3rd Y second semester to have a continuity after Machine Learning Course. Initially it was thought to replace the Information retrieval systems (IRS) of PEC-II of 3rd Year second semester with Deep Learning (PEC-III) of Fourth year First semester; however this replacement will have a credit mismatch further the Deep Learning course will be missing the Lab component. Therefore it was decided to continue the same.
b. The members approved the syllabus of B. Tech in CSE-DS of third year.
c. The tentative course structure of final year was also approved.

The same was approved.

Item No.4: In case of amendments/changes in the course structure or syllabi, the Board has suggested Chairperson:

Resolution: a) In any case, if there are major changes or amendments either in course structure or syllabus, the BOS meeting shall be called for its approval.

b) In any case, if there are minor changes or amendments either in course structure or syllabus, it will be communicated to all BOS members through e-mail for e-approval.

The meeting was concluded with the Vote of Thanks.

The following members have attended the meeting

S.No	Name	Designation	Designation in BoS
1	Dr. R.B.V. Subramanyam	Professor, Dept. of CSE, and Chief Investigator, Electronics & ICT Academy (Set	External Member

2	Dr. Rajiv Wankar	Professor , Dept. of CSE , University of Hyderabad	External Member
3	Mr. Richard King	Regional Head, Academic Interface program , TCS, Hyderabad	External Member
4	Dr. G. Vishnu Murthy	Professor & Head Dept. of CSE, Dean-Engineering, AU	Internal Member
5	Ms. Sravanthi Satyavarapu	Asst. Manager, Tech. Mahindra , Alumini, Hyderabad	External Member
6	Dr. Sandeep Singh Rawat	Assoc. Professor Dept. of CSE, AU, Hyderabad	Internal Member
7	Dr.M. Sridevi	Assoc. Professor Dept. of CSE, AU, Hyderabad	Internal Member
8	Mrs V. Jyothi	Asst. Professor Dept. of CSE, AU, Hyderabad	Internal Member
9	Dr. V. Vijaya Kumar	Professor- Dean- Research & Development,	Chairperson - CSE

Member Invitee

S.No	Name	Designation	Designation in BoS
1	Prof.Syeda Sameen Fatima,	Registrar, Professor, Dept. of AI, AU.	Member Invitee
2.	Dr.K.Sudheer Reddy	Dean Academic and Planning,Head Dept.of IT	Member Invitee
3	Dr.A.Mallikarjun Reddy	Assoc., Prof., Dept of CSE	Member Invitee
4	Dr.P.Srilatha	Asst., Prof., Dept of CSE	Member Invitee
5	Dr.Padmavathi	Assoc., Prof., Dept of CSE	Member Invitee
6	Dr.Kanhaya sharma	Asst., Prof., Dept of CSE	Member Invitee
7	Ms.N.Swapna goud	Asst., Prof., Dept of CSE	Member Invitee
8	Ms.B.Jyothi	Asst., Prof., Dept of CSE	Member Invitee
9.	Mr.G.Balram	Asst., Prof., Dept of CSE	Member Invitee

Sd/

Chairperson Board of studies Department of Computer Science and Engineering Anurag University, Hyderabad

University Vision

To be a leading university that provides transformative education and research, to create leaders, innovators, and to expand frontiers of knowledge for the betterment of society

Department Vision

To emerge as a frontier in the field of Computer Science and Engineering by producing globally competent professionals to address industrial and societal needs.

Department Mission

M1. Imparting knowledge through effective, innovative, and research based teaching and learning processes

M2. Providing appropriate solutions for the changing and challenging needs of society

M3. Instilling problem-solving, leadership traits, team work and entrepreneurial abilities with devotion and ethical responsibilities

Programme Educational Objectives

The Programme Educational Objectives describe the career and professional accomplishments that the programme is preparing its graduates to accomplish. The following PEO's are articulated for the programme and these are directly aligned with the vision and mission of the department.

PEO 1: The Graduates are employable as software professionals in reputed industries

PEO 2 : The Graduates conceive the problems by applying the principles of computer science and domain based expertise with state of art technologies

PEO 3: The Graduates work productively in supportive and leadership roles on multidisciplinary teams with effective communication and team work skills with high regard to legal and ethical responsibilities.

Programme Outcomes (PO's)

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental

contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSOs)

1. **Professional Skill:** The ability to understand, analyze and develop software solutions.
2. **Problem-Solving Skills:** The ability to apply standard principles, practices and strategies for software development.
3. **Successful Research: The ability to conduct research to advance the state of the art in the domain of Computer Science.**

Course Structure and Syllabus of

B. Tech III Year (I & II Semesters)

Computer Science and Engineering

R20 Regulations

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.),
Hyderabad, Telangana, INDIA

info@anurag.edu.in; http://anurag.edu.in

B.TECH III YEAR I SEM **(5T+3L) +1 MC**

S. No	Category	Course	Hours per week			Credits
			L	T	P	
1	PCC	Computer Networks	3	0	0	3
2	PCC	Operating Systems	3	0	0	3
3	PCC	Fundamentals of Artificial Intelligence	3	0	0	3
4	PCC	Web Technologies	3	0	0	3
5	OEC-1	1.English for Professionals 2.Essential English and Employability Skills 3.Intellectual Property Rights 4.Number Theory 5.Entrepreneurship Development 6.The Power of Data Story telling	3	0	0	3
6	ESC-Lab	Quantitative Aptitude and Reasoning	0	0	3	1.5
7	PCC-Lab	Operating Systems & Computer Networks Lab	0	0	3	1.5
8	PCC-Lab	Web Technologies Lab	0	0	4	2
9	MC	NSS/NSO	0	0	2	0
			15	0	12	20

B.TECH III YEAR II SEM **[5 T +3L]**

S. No	Category	Course	Hours per week			Credits
			L	T	P	
1	PCC	Machine Learning	3	0	0	3
2	PCC	Compiler Design	3	1	0	4
3	PCC	Software Engineering	3	0	0	3
4	PEC–I	1. R Programming 2. Internet of Things 3. Fundamentals of Digital Image Processing 4. Object Oriented Modeling	2	0	0	2
5	PEC–II	1. Big data 2. Principles of Cryptography 3. Principles of Distributed System 4. Information Storage and Retrieval	3	0	0	3
6	ESC	Skill Integrated Lab	0	0	3	1.5
7	PEC I – Lab	1.R Programming Lab 2. Internet of Things Lab 3. Fundamentals of Digital Image Processing Lab 4. Object Oriented Modeling Lab	0	0	3	1.5
8	PCC-Lab	Machine Learning Lab	0	0	4	2
			14	1	10	20

COMPUTER NETWORKS

B. Tech III Year I Semester					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites:

C Programming Language and Data Structures.

Course Objectives:

1. Elaborate on the fundamental concepts of computer networks and network models.
2. Know about the error and flow control mechanisms in the data link layer.
3. Explore the knowledge of various routing algorithms.
4. Describe the transport layer functionalities.
5. Illustrate different application layer functionalities.

Course Outcomes:

At the end of this course, students will be able to:

1. Illustrate the functionalities of various network models and Data link Layer.
2. Analyze error and flow control mechanisms in the data link layer
3. Examine various Routing Protocols.
4. Compare various congestion control mechanisms to improve the QoS of networking.
5. Identify the suitable Application layer protocols for specific applications.

UNIT - I:

Network Models: Layered Tasks, OSI model, Layers in the OSI model, TCP/IP protocol Suite, Addressing.

Data Link Control: Error detection and Correction- Introduction, Hamming Distance, CRC, Checksum.

UNIT - II:

Data Link Layer: Responsibilities of Data Link Layer: Framing, Flow and Error Control, Noiseless Channels - Simplest Protocol, Stop-and-Wait protocol Noisy Channels - Stop-and-Wait Automatic Repeat Request, Go-Back-N Automatic Repeat request, Selective Repeat Automatic Repeat Request, High-Level Data link Control.

Multiple Access: Random Access, ALOHA,CSMA, CSMA/CD,CSMA/CA,Controlled Access - Reservation, Polling, Token Passing, Channelization - FDMA,TDMA,CDMA.

UNIT- III:

Network Layer: Responsibilities of Network Layer, Delivery, Direct Versus Indirect Delivery, Forwarding, Forwarding Techniques, Forwarding process, Types of Routing tables **Unicast Routing protocols:** Optimization, Intra- and Interdomain routing ,Distance Vector Routing, Link State Routing, Path Vector Routing,IPV4 Addressing, Address space, Classful Addressing, Classless Addressing, Frame format of IPV4,IPV6.

UNIT- IV:

Transport Layer: Responsibilities of Transport Layer, Process-to-Process delivery, User Datagram Protocol, Transmission Control Protocol, Congestion Control - Open-Loop Congestion, Closed-Loop Congestion Control, Quality of Service, Techniques to improve QoS - Scheduling, Traffic Shaping, Resource Reservation, Admission Control.

UNIT-V:

Application Layer: Responsibilities of Application Layer Domain Name Space, Distribution of Name Space, DNS in Internet, Generic Domain, Country Domain, Inverse Domain Resolution, Domain Name Space (DNS) Messages, Electronic mail, File Transfer Protocol.

Text books:

1) Behrouz A Forouzan ,Data Communications and Networking,4th Edition, McGraw-Hill.

Reference Books:

1) Andrew S. Tanenbaum, Computer Networks, Third Edition.
2) William Stallings, Data Communications, Eight Edition. Pearson Publishers.
3) http://highered.mheducation.com/sites/0072967757/student_view0/index.html

OPERATING SYSTEMS

B. Tech III Year I Semester					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites :

Computer Organization, Data Structures

Course Objectives:

1. Introduce basic concepts of operating system and process management
2. Discuss various CPU scheduling algorithms and problems of process synchronization.
3. Demonstrate different methods for handling deadlock.
4. Describe about memory management Techniques.
5. Explore the File system, system security and protection mechanisms.

Course Outcomes:

At the end of the course, students will be able to:

1. Summarize operating system and process management concepts.
2. Apply process scheduling and synchronization related issues.
3. Outline Deadlock Prevention, Avoidance, Detection and recovery mechanisms.
4. Analyze effectively memory management concepts.
5. Illustrate various protection and security measures.

UNIT I

Operating Systems Overview

Introduction -What operating system do, Operating system structure (uni-programmed and multi programmed), Operating system operations, Operating system services, System calls, Types of System calls, Operating system structure.

UNIT II

Process Management and Process Scheduling

Process Management- Process concepts, Process scheduling, Operations on processes, Inter process communication. Multithreading models. Process Scheduling – Basic concepts, scheduling criteria, scheduling algorithms.

UNIT III

Process Synchronization and Deadlocks

Process coordination: Synchronization – Background, The critical section problem, Peterson's solution, Synchronization hardware, Semaphore, Classical problems of synchronization, Monitors.

System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Detection and avoidance, Recovery from deadlock.

UNIT IV

Memory Management

Swapping, Contiguous memory allocation, Paging, Segmentation. Virtual memory management - Demand paging, copy-on-write, page-replacement, Thrashing.

UNIT – V

File system, system protection and security

Storage management – File concept, Access methods, Directory and disk structure, File-system mounting. System protection- Goals of protection, principles of protection, Domain of protection, Access matrix. System Security – Security problem, Program threats, System and Network threats.

Text Books

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, 9th edition ,John Wiley, 2016.

Suggested / Reference Books

1. D.M. Dharmdhere, Operating Systems – A Concept based Approach, 2nd Edition. TMH, 2007.
2. Andrew S Tanenbaum, Modern Operating Systems, 3rd Edition, PHI, 2008.
3. Behrouz A. Forouzan, Richard F. Gilberg, Unix and shell programming, cengage Learning 2009.

FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

B. Tech III Year I Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre-requisite:

Programming Knowledge, Computer Organization

Course Objectives:

1. To introduce the basic concepts of artificial intelligence, its foundations
2. To analyze various search strategies in intelligent systems
3. To apply search algorithms in games
4. To learn various representations of logic and knowledge
5. To understand production systems and its components

Course Outcomes:

At the end of this course, students will be able to:

1. Understand Strong AI and Weak AI and identify problems applicable to AI
2. Compare and contrast various uninformed and informed search algorithms to find an optimal solution for a given problem
3. Apply appropriate search algorithms for winning games
4. Learn various representations applicable to logic and knowledge useful in reasoning
5. Learn to apply appropriate inference methods in production or expert systems

Unit I:

Overview of Artificial Intelligence:

Introduction. The Turing Test, Strong AI versus Weak AI, Heuristics, Identifying Problems Suitable for AI, Applications and Methods, Early History of AI, Recent History of AI to the Present, AI In the New Millennium

Unit II :

Uninformed Search:

Introduction: Search in Intelligent Systems, State-Space Graphs, Generate-and-Test Paradigm, Blind Search Algorithms, Implementing and Comparing Blind Search Algorithms **Informed Search:** Introduction, Heuristics, Informed Search Algorithms – Finding Any Solution, The Best-First Search, The Beam Search, Additional Metrics for Search Algorithms, Informed Search – Finding An Optimal Solution,

Unit III:

Search Using Games:

Introduction, Game Trees and Minimax Evaluation, Minimax With Alpha-Beta Pruning, Variations and Improvements To Minimax, Games of Chance and the Expect minimax Algorithm

Unit IV:

Logic in Artificial Intelligence:

Introduction, Logic and Representation, Propositional Logic, Predicate Logic – Introduction, Several Other Logics, Uncertainty and Probability **Knowledge Representation:** Introduction, Graphical Sketches and the Human Window, Graphs and the Bridges of Königsberg Problem, Search Trees, Representational Choices, Production Systems, Object Orientation, Frames, Semantic Networks

Unit V:

Production Systems:

Introduction, Background, Production Systems and Inference Methods, Production Systems and Cellular Automata, Stochastic Processes and Markov Chains, Basic Features and Examples of Expert Systems

Text Books:

1. Stephen Lucci, Danny Kopec. Artificial Intelligence in the 21st Century. A Living Introduction. Mercury Learning and Information. 2nd Edition. 2016

Reference Books:

1. Russell, Norvig: Artificial Intelligence, A Modern Approach, Pearson Education, SecondEdition. 2004
2. Rich, Knight, Nair: Artificial Intelligence, Tata McGraw Hill, Third Edition 2009
3. Saroj Kaushik. Artificial Intelligence. Cengage Learning. 2011

WEB TECHNOLOGIES

B. Tech III Year I Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre-requisites:

Basics of Object Oriented programming, Java

Course Objectives:

1. To provide knowledge on web architecture, web services.
2. Client side scripting technologies to focus on the development of web-based information systems and web services.
3. To provide skills to design interactive and dynamic web sites.
4. To provide knowledge for implementing web applications with database connection

Course Outcomes:

Student will be able to:

1. Design static web pages and provide client side authentication.(L6)
2. Prepare Static Web pages With Validations.(L6)
3. Develop new tag sets using XML mechanism.(L5)
4. Design and develop web applications using JSP and MVC architecture.(L6)
5. Understand database connectivity and retrieving data using client/server database.(L2)

UNIT I:

INTRODUCTION TO WEB: Understanding Internet and Web, Web Architecture, Web servers, protocols: HTTP, Introduction HTML: History of HTML, WWW, HTML Basics: Elements, Attributes, Tags, Tables, Forms, Frames.div and span tags.HTML5

UNIT II:

CSS: Introduction to cascading style sheet, Types of style sheets, page layout, selectors, pseudo classes and elements.CSS3

JAVA SCRIPT: Introduction to scripting, control structures, conditional statements, Arrays functions, objects. JS framework(ReactJS)

HTML DOM: Predefined object (Window, Location, History, Navigator). Events, DOM Node methods, Navigation, creating nodes, adding nodes, inserting nodes, removing & Replaces Nodes, Form object and Elements, DHTML with Java Script. front end frameworks(bootstrap),

UNIT III:

XML: Basics of XML, Elements, Attributes, validation, Name space.
XML Scheme Languages: Introduction to DTD, internal and external DTD, Elements of DTD, DTD Limitations, XML Schema, Schema structure, Elements, parsing XML: XML DOM, Document node, element node, Text node, Java and DOM, Navigating DOM Tree.

UNIT IV:

AJAX: Introduction, Environment, Asynchronous communication, process steps, sending and Retrieving Information, Ajax with XML.
Servlets : Introduction, Lifecycle, Generic and HTTP servlet, passing parameters to servlet, HTTP servlet Request & Response interfaces, Deploying web Applications, Session Tracking: Hidden form fields, cookies, URL- Rewriting, session.

UNIT V:

JSP: Introduction, Difference Between servlets & JSP, Anatomy of JSP page, JSP elements: Directives, comments, Expressions, scriptlets, Declaration, Implicit JSP objects, using Action elements.
JDBC: Introduction, JDBC Drivers, Loading Driver, establishing connection, Executing SQL statement in JSP pages, MVC architecture.

Text Book:

1. Uttam K. Roy, Web Technologies, 8th Impression, Oxford Publication, 2014.

Reference Books:

1. Thomas Powell, “The Complete Reference HTML and CSS”, 5th Edition, Tata McGraw Hill, 2010.
2. Thomas Powell, Fritz Schneider, “The Complete Reference JavaScript 2.0”, 3rd Edition, Tata McGraw Hill, 2012.

ENGLISH FOR PROFESSIONALS

B. Tech III Year I Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Introduction:

The course aims at preparing the students with the tools needed for successful communication at the professional front. It is designed to improve students' academic and professional skills which the employers are currently looking for.

Objective:

To prepare the students to use the language effectively in all professional pursuits

Course Outcomes:

The students will be able to:

1. Analyze the language use in communicative process
2. Describe the process and product
3. Interpret the ideas in group activities
4. Apply different approaches to comprehend the written text
5. Write any technical and official correspondence within the framework

UNIT-I

Essentials of Communication:

Essentials of Grammar **-** Rudiments of Communications Skills (Listening, Speaking, Reading, and Writing) - Applied Grammar and Usage - Non-Verbal Communication

UNIT-II

Listening Skills:

Art of Listening - Developing Effective Listening Skills - Process of Listening, Intensive & Extensive Listening Podcasts, Vodcasts (ICT enabled) - Five steps to Active Listening - Effective and Ineffective Listening Skills -Listening & Note-Taking

UNIT-III

Speaking Skills:

Dynamics of Effective Speaking - Group Discussion - Simulated Presentations, Process & Product Descriptions - Proxemics, Paralinguistic Features

UNIT-IV

Reading Skills:

The Art of Effective Reading - Basic steps to Effective Reading - Extensive and Intensive Reading -Approaches to Efficient Reading - Reading Comprehension

UNIT-V

Writing Skills:

Art of Condensation - Descriptive Writing Techniques - Writing & Answering Memos, Circulars - Inter & Intra Official Communication - Writing Minutes of Meeting - Netiquette - E-mail & Blog Writing - Note-Making

PRESCRIBED TEXTBOOK:

1. Business Communication (Second Edition) by Meenakshi Raman & Prakash Singh. Oxford University Press. 2012.

REFERENCES:

1. Communicating at Work (Seventh edition) by Adlar, Ronarld.B. McGrawHill. 2004.
2. Cambridge English for Engineering Professionals by Mark Ibbotson. Cambridge University. 2008.
3. Professional Communication by Aruna Koneru. McGrawHill. 2017.
4. The Effective Communicator by Adair John. Jaico Publishing House. 1995.
5. Oxford English for Careers by Oxford University Press.

ESSENTIAL ENGLISH & EMPLOYABILITY SKILLS

B. Tech III Year I Semester					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

1. To enable students to develop their personality, infuse confidence and increase employability skills in any chosen career.

2.To provide the students hands-on experience to cope with the demands of the world of recruiters.

3. To help the students acquire the job skills essential for employment.

Course Outcomes:

1. Enhancement of employability skills and professional etiquette.
2. Acquisition of productive knowledge, competent learning and innovative thinking skills.
3. Implementation of verbal and non-verbal communication competencies in work place.

UNIT-I

Six Sigma: Dabbawala from English for Employability
Personality Development: A Must for Leadership and Career Growth from Personality Development and Soft Skills
Introduction - Learning about Personality Development from 3 Cases - Personality Analysis - Freudian analysis of Personality Development - Swami Vivekananda's Concept of Personality Development - Personality Begets Leadership Qualities

UNIT-II

Yet I am not defeated! from English for Employability
Interpersonal skills from Personality Development and Soft Skills
The Personality Attribute of Taking Bold Decisions - Personality Types and Leadership Qualities - Personality Tests

UNIT-III

Patricia Narayanan: An Entrepreneur by accident, from English for Employability

Soft Skills: Demanded by Every Employer from Personality Development and Soft Skills Introduction to Soft Skills - Lessons from the 3 Case Studies - Change in Today's Workplace - Soft Skills as a Competitive Weapon - Antiquity of Soft Skills - Classification of Soft Skills

UNIT-IV

Satya Nadella: CEO of Microsoft from English for Employability
Interview Skills from Personality Development and Soft Skills

UNIT-V

Body Language Reveals Your Inner self and Personality from Personality Development and Soft Skills
Introduction - Emotions Displayed by Body Language – Handshake -The Most Common Body Language - Eyes - A Powerful Reflection of One's Inner self - Entry to My Space - Personal Zones may vary - Body Language exhibited during different Professional Interactions.

Textbooks:

1. Purushotham, K. *English for Employability.* Orient Black Swan, Hyderabad.
2. Mitra, K. Barun. *Personality Development and Soft Skills*. Oxford University Press.

References:

1. *Enhancing English and Employability Skills.* State Board of Technical Education and Training. Hyderabad: Orient Black swan Private Limited, 2012.
2. Rao, M. S. *Soft Skills Enhancing Employability.* New Delhi: I. K. Publishing House, 2010.
3. Rao, Nageshwar. *Communication Skills.* New Delhi: Himalaya Publishing House Pvt. Ltd, 2008.
4. Sharma, T. K. *Enhancing Employability in Education.* India: Patridge Publishing House. 2015.
5. Yadav, Shalini. *Communication Technique.* New Delhi: University Science Press, 2010.

INTELLECTUAL PROPERTY RIGHTS

B. Tech III Year I Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objective:

The course aims to help the student understand the concept of Intellectual Property Rights and helps the student to appreciate the purpose and function of a trademark and the process involved in getting copyright, patent and related issues. The student is introduced to the importance of trade Secret and Geographical Indications.

Course Outcomes:

At the end of the course student will be able to

1. Explain the concepts of intellectual property rights and related agencies.
2. Describe the purpose and functions of a trademark in a competitive environment.
3. Analyze the process of copyright and procedure.
4. Understand the process of patent and patent issues.
5. Explore the trade secret and geographical indications of its protection from unfair practices.

Unit I:

Introduction to IPR

Concept of intellectual property rights, importance of intellectual property rights. Types of intellectual property, international agencies, and treaties.

Unit II:

Trademarks:

Concept of trademarks, purpose, and function of trademarks. Acquisition of trademark rights, protectable matter, selecting and evaluating trademark, trademark registration processes.

Unit III:

Law of copyrights:

Concept of copyright right, fundamentals of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration.

Unit IV:

Law of patents:

Introduction to patent, foundation of patent law, patent searching process, ownership rights and transfer.

Unit V:

Trade Secrets & Geographical Indication:

Law pertaining to trade secrets, determination of trade secrets. Trade secret litigation. Unfair competitions. Geographical Indication, concept of geographical indication, importance of geographical indication, new development of intellectual property rights.

Textbooks:

1. Deborah. E. Bouchoux,Intellectual property right, 5/e,2018,cengage learning.
2. Neeraj Pandey, Intellectual property right, PHI, 2019.

Reference Books:

1. Ramakrishna Chintakunta and M. Geethavani, Kindle e 2021
2. Prabuddha Ganguli,Intellectual Property Right:Unleashing the Knowledge Economy, 2/e, 2017 Tata Mc Graw Hill Publishing company Ltd.

NUMBER THEORY

B. Tech III Year I Semester					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

1. Explain the concepts of divisibility, prime number, congruence and number theorems
2. Demonstrate knowledge of elementary relationships involving integers through explanation.
3. To understand the multiplicative functions.
4. Understand basic concepts on number theory and their related algorithms
5. This unit will help students to understand the basic idea of finite fields and quadratic residues.

Course Outcomes:

1. Students will be able to compute to time complexity of an algorithm. This unit will also help students to understands basics of number theory
2. Students able to understand arithmetic functions, additive and multiplicative functions.
3. Apply the properties of multiplicative functions to solve problems involving the number- theoretic functions.
4. Apply various algorithms and residues to solve problems on number theory
5. Use the properties of quadratic residues to determine whether certain quadratic congruence's are solvable.

UNIT-I:

The Fundamental Theorem of arithmetic: Divisibility, GCD, Prime Numbers, Fundamental theorem of Arithemtic, the series of reciprocal of the Primes, The Euclidean Algorithm.

UNIT-II:

Arithmetic function and Dirichlet Multiplication, the functions φ(n), μ(n) and a relation connecting them, Product formulae for φ(n), Dirichlet Product, Dirichlet inverse and Mobius inversion formula and Mangoldt function Λ(n),

UNIT-III:

Multiplication function, multiplication function and Dirichlet multiplication, Inverse of a completely multiplication function, Liouville's function λ(n), the divisor function is σ_α(n)

UNIT-IV:

Congruences, Properties of congruences, Residue Classes and complete residue system, linear congruences conversion, reduced residue system and Euler Fermat theorem, polynomial congruence modulo P, Lagrange's theorem, Application of Lagrange's theorem, Chinese remainder theorem and its application, polynomial congruences with prime power moduli

UNIT-V:

Quadratic residue and quadratic reciprocity law, Quadratic residues, Legendre's symbol and its properties, evaluation of (−1/p) and (2/p), Gauss Lemma, the quadratic reciprocity law and its applications.

Text Book:

Introduction to analytic Number Theory by Tom M. Apostol. Chapters 1, 2, 5, 9.

References:

[1] Number Theory by Joseph H. Silverman.

[2] Theory of Numbers by K.Ramchandra.

[3] Elementary Number Theory by James K Strayer.

[4] Elementary Number Theory by James Tattusall.

[5] Thomas Koshy, Elementary Number Theory with Applications.

ENTREPRENEURSHIP DEVELOPMENT

B. Tech III Year I Semester					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

The objective of this course is to familiarize the student with entrepreneurship, the issues involved in it, the potential of entrepreneurship and intrapreneurship, the legal environment and statutory issues and explore various funding opportunities.

Course Outcomes At the end of the course the student will be able to

1. Interpret the concepts of Entrepreneurship and Intrapreneurship.
2. Apply the opportunity identification techniques
3. Differentiate needs of different segments
4. Develop business model and MVP
5. Recognize organizational forms, IPR concerns and funding opportunities for startups.

Unit – I:

Introduction to Entrepreneurship: Entrepreneurship and Intrapreneurship, Business Incubators, Rural entrepreneurship, Social Entrepreneurship, women entrepreneurs, Role of entrepreneurs in economic development, Types of entrepreneurs. Entrepreneurial mind set and stress, Causes of failure.

Unit – II:

Opportunity identification: Myths and realities of entrepreneurship, Opportunity identification, Problem worth solving, idea generation techniques, Design thinking.

Unit – III:

Customer analysis: Market segmentation, consumer persona, Product market fit, Unique Value proposition.

Unit – IV:

Business model and MVP: Business model canvas, MVP, Risks and assumptions, Importance of financial planning.

Unit – V:

Organizational forms Funding Opportunities: Organizational forms - Partnership, Sole proprietorship, Corporation. Intellectual Property Rights- Copyrights, Trademarks, Patents. Law

Vs. Ethics, Informal capital- Friends and Family, Angels, Venture Capitalists, Idea/ Patent, Growth strategies

Text Books:

1. Vasant Desai, YayatiNayak, Entrerpreneurship, Himalaya Publishing House,2018
2. D.F.Kuratko and T.V.Rao Entrepreneurship- Cengage Learning,2012

References:

1. Dhruv Nath, Sushanto Mitra, Funding Your Startup: And Other Nightmares, 2020
2. Rajeev Roy, Entrepreneurship, Oxford University Press, 2/e, 2012
3. V Srinivasa Rao, Lean Digital Thinking: Digitalizing Businesses in a New World Order, Bloomsbury India, 2021
4. S.K.Mohanty, Fundamentals of Entrepreneurship, PHI, 1/e,2005
5. MOOCS by Wadhwani Foundation

The Power of Data Storytelling

B. Tech III Year I Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Introduction:

This course will cover the fundamentals of effective data-driven storytelling. Story telling can put a human perspective on the increasingly complex and rapidly changing world of the digital era. Students will learn how to interpret and analyse the data and will learn to articulate the stories with data sets and communicate data findings in visual, oral, and written contexts.

Course Objectives:

4. Develop the skills necessary to be effective data storytellers.
5. Locate relevant datasets, extract insights from that data and present their findings in myriad formats.
6. Learn how to interpret data and to present it in different formatsto different audiences.

Course Outcomes:

1. Identify the stories within datasets and extract insights from that data.
2. Explain the importance of communication skills and competencies for individuals who serve as data storytellers.
3. Act as a data-driven visual storyteller for optimal presentation of trends, patterns, and insights.
4. make effective client presentations of their work using infographic visualizations.
5. learn tools and concepts which can be put to immediate use to transform data into stories.

Unit I:

Introduction

We are all storytellers- Stories Bring Data to Life- The Essence of Data Storytelling

Unit II:

Dynamics of Data Storytelling

Getting to the Core- Planning is Everything- The Quick Fix- Application of Story elements

Unit III:

Crafting the Data Story

The Psychology of Storytelling- The narrative Techniques - Making Good stories Great! – Writer to Storyteller

Unit IV:

Data Visualization

Use Visuals to Advantage: Data Presentation Skills- Infographics Visualizations

Unit V:

Anatomy of Data Story

Rudiments of Grammar - Parts of Speech - Concord Rules - Academic and Technical Vocabulary - Data Interpretation - Case Studies

Textbook:

1.Vora , Sejal (2019).*The Power of Data Storytelling*, Sage Publications India pvt Ltd.

Reference books:

1. Dykes, Brent (2020). *Effective Data Storytelling*: New Jersey, Wiley.
2. Knaflic, Cole Nussbaumer (2015).Storytelling with Data: A Data Visualization Guide for Business Professionals,https://www.amazon.com/Storytelling-Data-Visualization-Business-Professionals/dp/1119002257/
3. Morrow, Jordon (2021), Be Data Literate- The Data Literacy Skills Everyone Needs to Succeed, UK: Kogan Page Ltd.
4. Taylor, Scott (2021). Telling your Data Story: Data storytelling for Time Management, New Jersey: Technics Publications LLC.
5. https://www.amazon.com/Tableau-Your-Data-Analysis-Software/dp/1119001196/

Quantitative Aptitude and Reasoning

B. Tech III Year I Semester					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
	ESC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

UNIT I

Number System: Speed Math's, Numbers, Factors, Prime and co primes, LCM & HCF, Divisibility rules, Finding the unit digit and applications, remainder theory.

Ratio and Proportion with Ages: Definition of ratio and Proportion, Finding the resultant ratio. Problems based on Ratios and ages.

Percentages: Introduction to percentages, Percentage Increase /Decrease, Results on Population, Results on Depreciation, Variations, Applications of Percentage.

Profit and Loss: Classification of Profit and Loss, Profit/ Loss Percentages, Successive Discount.

UNIT II

Time and Distance: Difference between the average, Relative and Effective speed, reaching the destination late and early, stoppage time per hour, problems based on Trains and problems based on Boats.

Time and Work: Calculating Efficiency, alternate days concept, work and wages, Chain rule, problems based on Pipes and cisterns.

Simple and Compound Interest: Simple interest, Principle, Rate, Amount, Applications of Simple interest, Compound interest, compounded annually, Compounded Half yearly, Compounded Quarterly, Difference between simple and compound interest.

UNIT III

Permutations and Combinations: Fundamental rules, Problems on Permutations and Combinations.

Probability: Definition, Notations and Problems based on Probability.

Mean, Median and Mode: Introduction and problems on Mean, Median and Mode.

Partnership: Relation between Partners, Period of Investments and Shares.

Averages: Average of different groups, change in average by adding, deleting and replacement of objects

Flow Charts: Introduction of symbols and problems on flow charts.

UNIT IV

Seating Arrangement: Circular, Row, Column, Square and Double row arrangement

Puzzles: Paragraph puzzles, incomplete puzzles and problems on them.

Number Series: Number, Alphabet and Letter Series.

Analogy: Simple, Double, Word and Number Analogy

Coding and Decoding: Classifications and Problems on Coding and Decoding.

UNIT V

Clocks: Relation between minute and hour hand, angle between hands of a clock, exceptional cases in clocks. Gaining and loosing of time.

Calendars: Classification of years, finding the day of any random calendar date, repetition of calendar years.

Direction Sense Test: Sort of directions in puzzle, distance between two points, Problems on shadows.

Blood Relations: Defining the various relations among the members of a family, solving blood relation puzzles by using symbols and notations. Problems on coded relations.

Text Books

1. R.S Agarwal, Verbal and Non-Verbal Reasoning, New Edition, S. Chand.
2. R.S Agarwal, Quantitative Aptitude, New Edition, S. Chand.

Reference Book

1. Abhijeet Guha, Quantitative Aptitude, New Edition, Mc Graw Hill.

OPERATING SYSTEM AND COMPUTER NETWORKS LAB

B. Tech III Year I Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Objectives:

1. Analyze system calls that can offer operating system services
2. Demonstrate various operating system concepts
3. Understand and apply concepts of process synchronization
4. Understand the concept of Dead lock and its avoidance
5. Analyzing page replacement algorithms

Course Outcomes:

1. Understand system calls behavior and implement that can offer operating system services
2. Implement CPU scheduling algorithms multithreading
3. Implement the producer and consumer problem
4. Implement the dead lock avoidance using banker's algorithm
5. Implement page replacement algorithms

PART -A

1. Write a programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
2. Write a program to implement multithreading?
3. Give the list of processes, their CPU burst times and arrival times, display or print the Gantt chart for FCFS and SJF. For each of the scheduling policy compute and print the average waiting time and average turnaround time
4. Give the list of processes, their CPU burst times and arrival times, display or print the Gantt chart for Priority and Round Rabin. For each of the scheduling policy compute and print the average waiting time and average turnaround time.
5. Implement producer consumer problem using semaphore?
6. Write a program to implement Banker's algorithm for deadlock avoidance?
7. Write a program to implement page replacement algorithms (FCFS, Optimal, LRU)

PART - B

Course Objectives :

1. Understand data link layer framing methods.
2. Know about the various error detection methods.
3. Explore the knowledge of various routing algorithms.
4. Understand Traffic Analysis and Statistics in network.

Course Outcomes

1. Implement data link layer farming methods
2. Analyze error detection method
3. Analyze routing and congestion issues in network
4. Apply Traffic Analysis and Statistics in network

Programs:

1. Implement the data link layer framing method Bit stuffing.
2. Implement the data link layer framing method Character Stuffing.
3. Write a program to compute CRC 16.
4. Implement Dijkstra‘s algorithm to compute the Shortest path thru a graph.
5. Installation of Wireshark
6. Simulate Packet Capture Using Wire shark
7. Implement Viewing Captured Traffic Using Wire shark
8. Simulate Statistics & Filters Using Wire shark

WEB TECHNOLOGIES LAB

B. Tech III Year I Semester					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Objectives:

1. Client server architecture and able to develop static web application
2. Client-side data validation using java script
3. To create dynamic web application using server side technologies
4. To create fully functional web application with MVC architecture.

Course Outcomes:

Student will be able to:

1. Design static web pages and provide client side authentication.
2. Develop new tag sets using XML mechanism.
3. Understand database connectivity and retrieving data using client/server database.
4. Design dynamic web pages and develop web applications using MVC architecture.

Week-1:

Design the following static web pages required for an online book store web site.

1) HOME PAGE:

2) LOGIN PAGE:

Week -2:

Design the student REGISTRATION PAGE:

Week- 3:

Apply internal and external CSS (Cascading Style Sheets) for week1&2 pages.

Week -4:

VALIDATION:

Write JavaScript to validate the following fields of the above registration page.

Week -5:

Design the catalogue page.

Week -6:

Write an XML file which will display the Book information which includes the following: Write a Document Type Definition (DTD) to validate the above XML file.

Week -7:

Develop week(1-5) using bootstrap

Week -8:

Write a program to display the HELLO WORLD message using servlet.

Week -10:

Write a program to create cookies and retrieval using servlet.

Week -11:

Write a program to display the HELLO WORLD message using JSP

Week -12:

Convert all above static web pages into the JSP pages.

Week -13:

Using registration form. Authenticate the user when he submits the login form using the user name and password from the database

Week -14

Create tables in the database which contain the details of items (books in our case like Book name , Price, Quantity, Amount)) of each category. Modify your catalogue page (week 4)in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using JDBC.

Week -15

Implement week -10 in MVC architecture.

NATIONAL SPORTS ORGANIZATION (NSO) / NATIONAL SERVICE SCHEME (NSS)

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	Category	Hours / Week			Credits	Marks		
	MC	L	T	P	C	CIE	SEE	Total
		0	0	2	0	50		50

UNIT-I

Health and Wellness

Dimensions of Health: Physical, Mental and Social. Objectives of Health Education. Definition and Dimensions of Wellness – Physical, Emotional, Social, Spiritual, Intellectual and Environmental Wellness. Achieving Wellness.

Practical: Basketball, Cricket, Kho-Kho (Any Two) & Badminton (Mandatory)

Layout of Courts / Fields, Skills, Rules & Lead-up Games.

UNIT-II

Fitness and Body Composition

Physical Fitness Components: Body Composition, Muscular Endurance, Strength, Cardiovascular Fitness and Flexibility, Importance of Cardio-Respiratory Endurance. Obesity and Health Risk Factors. Body Composition Indicators and Measurements.

Practical: Football, Kabaddi, Volleyball (Any Two) & Table Tennis (Mandatory)

Layout of Courts / Fields, Skills, Rules & Lead-up Games.

UNIT-III

Introduction and Basic Concepts of NSS: History, Philosophy, Aims & Objectives of NSS. Emblem, Flag, Motto, Song, Badge, Organizational Structure, Roles and Responsibilities of Various NSS functionaries. NSS Programmes and Activities, Volunteerism and Shramdan.

UNIT-IV

Personality Development Through Community Service: Importance and Role of Youth Leadership, Life Competencies, Social Harmony and National Integration, Youth

Development Programmes in India, Citizenship, Health, Hygiene and Sanitation, Environment Issues, Disaster Management, Life Skills.

UNIT-V

Vocational And Entrepreneurship Skills Development: Definition and meaning of Entrepreneurship, Qualities of good entrepreneur, Steps /ways in operating an Enterprise and role of financial and support service Institutions. Project Cycle Management, Resource Mobilisation and Documentation and Reporting.

Project work/ Practical: Conducting Surveys on Special Theme, Involving in Shramadan, Swachh Bharat, Blood Donation, Tree Plantation, Awareness Programmes, Identify the Community Problems and List out the all Possible Solutions, Educate the Villagers on Health, Hygiene, Sanitation and Environment Protection. Self-Review of the Students on their Improvements by Participating in the Community Service Programmes.

References

1. Rajiv Parti, The Soul of Wellness: 12 holistic principles for achieving a healthy body, mind, heart and spirit, Select book incorporation, New York.
2. H. & Walter, H., (1976). *Turners School Health Education*. Saint Louis: The C.Y. Mosby Company.
3. Nemir, A. (n.d.). *The School Health Education*. New York: Harber and Brothers.
4. Edward T Howley, *Health Fitness Instructors Handbook*, Human Kinetics, USA.
5. **About NSS:** National Service Scheme Manual by Government of India Ministry of Youth Affairs & Sports, New Delhi.
6. Robert N Lussier, *Management Fundamentals - Concepts, Applications, Skill Development*, Cengage Leaning, First Edition, 2012.
7. Mroczex & Little, *Handbook of Personality Development* –(eds).2006.
8. Richard Blundel, *Exploring Entrepreneurship Practices and Perspectives*, Oxford, 2011.

MACHINE LEARNING

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre-requisites:

Python Programming, Statistics

Course Objectives:

To understand the need for machine learning for various problem solving

1. To study the various supervised and unsupervised learning algorithms in machine learning
2. To understand the latest trends in machine learning
3. To design appropriate machine learning algorithms for problem solving

Course Outcomes:

Student will be able to:

1. Understand the Concepts of Machine Learning (L2)
2. Develop Simple Regression Models .(L3)
3. Build various classification algorithms (L3)
4. Analyze the need of ensemble learning and dimension reduction (L4)
5. Apply the Clustering algorithms for developing applications (L3)

UNIT I:

Introduction to Machine Learning

What is Machine Learning,Types of Machine Learning, Applications of Machine learning, Preparing to Model, Modeling and Evaluation .

UNIT II:

Supervised Learning: Regression

Introduction to Regression,Example of Regression,Simple Linear Regression,Multiple Linear Regression,Assumptions in Regression Analysis,Improving the accuracy of the Linear Regression Model, Ridge Regression, Lasso Regression.

UNIT III:

Supervised Learning: Classification

What is Classification,General Approach to Classification, K-Nearest Neighbor Algorithm, Logistic Regression, Decision Trees: Construction, classification and regression trees, example, Naive Bayesian Classifier, Support Vector Machines: Optimal Separation, Kernels, Algorithm

UNIT IV:

Unsupervised Learning and Dimensionality Reduction

Types of Unsupervised Learning, Challenges in Unsupervised Learning, Clustering Algorithms: K-Means, Agglomerative, DBSCAN, Comparing and Evaluating Clustering Algorithms.Dimensionality Reduction: Linear Discriminant Analysis (LDA), Principal Component Analysis (PCA), Factor Analysis (FA).

UNIT V:

Ensemble Learning and Reinforcement Learning

Ensemble Methods: Bagging, Boosting & Random Forests, Reinforcement Learning: Overview, Example: Getting Lost, Markov Decision Process, Values, difference between SARSA and Q Learning, Uses of Reinforcement Learning

Text Books:

1. Machine Learning, Saikat Dutt, Subramanian Chandramouli and Amit Kumar Das, Pearson, 2018.
2. Machine Learning: An Algorithmic Perspective by Stephen Marsland, CRC Press, 2009
3. Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido, 2016,O'Reilly Media, Inc.

Reference Books:

1. Introduction to Machine Learning (Adaptive Computation and Machine Learning), Ethem Alpaydin, The MIT Press 2004.
2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition Aurélien Géron, 2019, O'Reilly Media, Inc.
3. Machine Learning, McGraw-Hill Education (India) Private Limited,Tom M. Mitchell, 2013.
4. Pattern Recognition and Machine Learning. First Edition. ,C. M. Bishop. Springer, 2006.

COMPILER DESIGN

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Pre-requisites: Formal Languages and Automata Theory, Computer Organization

Course Objectives :

1. Describe the fundamental principles in compiler design.
2. Discuss CFG's and parsing techniques.
3. Predict the performance of different parsers.
4. Summarize the role of runtime environments and memory organization for implementation of typical programming languages.
5. Predict various techniques for code optimization and code generation.

Course Outcomes:

Student will be able to:

1. Analyze the phases of a typical compiler, including the front- and backend.(L3)
2. Apply the role of a parser in a compiler and relate the yield of a parse tree to a grammar derivation.(L3)
3. Design and implement a parser using a typical parser generator.(L6)
4. Implement an intermediate code generator based on given code patterns.(L3)
5. Apply the optimization techniques to have a better code for code generation.(L3)

UNIT I:

Introduction to Compilers: Structure of Compiler-Phases of Compiler, Symbol Table Management, Grouping of Phases into Passes, Compiler Vs Interpreter.

Lexical Analysis: Role and need of Lexical Analyzer, Input Buffering, Regular expressions for identifiers, Signed numbers etc.., A Language for specifying Lexical Analyzer, Lexical phase errors.

UNIT II:

Syntactic Specification: Context Free Grammars, Derivations and Parse Trees, Capabilities of Context Free Grammars, Syntactic Phase errors, Semantic errors.

Basic Parsing Techniques: Parsers, Shift-Reduce Parsing, Operator-Precedence parsing, Top-Down parsing, Predictive parsers.

UNIT III:

Construction of efficient Parsers: LR Parsers, Canonical collection of LR(0) items, Constructing SLR parsing tables, Constructing LR parsing tables, Constructing LALR parsing tables, using Ambiguous grammar, Comparison of SLR,LALR and CALR parsers, Comparison of Top down and Bottom up parsers.

UNIT IV:

Syntax Directed Translation: Syntax Directed Translation schemes, Intermediate codes, Postfix notation, Three Address code, Quadruples and triples.

Symbol table: Contents of Symbol table, Data Structures for symbol tables, representing scope information.

Run-Time Environments: Storage Organization, Stack allocation of space, Access to non data.

UNIT V:

Code Optimization: Principal sources of optimization, Loop optimization, Copy Propagation, Dead code elimination, Redundant sub expression elimination.

Code Generation: Object programs, problems in Code generation, A Machine Model, A Simple Code generator, Register allocation and assignment, Peephole optimization.

Text Book:

1. Alfred V Aho, Jeffrey D Ullman, Principles of Compiler Design, Pearson Education, 2001.

Reference Books:

1. J P Trembly and P G Sorenson, The Theory and practice of Compiler Writing, Mc Graw Hill, 2005.
2. Alfred V Aho, Ravi sethi ,Jeffrey D Ullman, Compilers-Principles , Techniques and Tools , Pearson Education, second edition.
3. Dick Grone, Henri E Bal, Ceriel J H Jacobs, Modern Compiler Design, Wiley Dreamtech, 2006.

SOFTWARE ENGINEERING

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites:

Any programming language

Course objectives

1. Understand the framework activities for a given project.
2. Choose a process model for given project requirements.
3. Design various system models for a given scenario.
4. Design various testing techniques.
5. Understand metrics for Products.

Course Outcomes:

1. Outline the framework activities for a given project.
2. Apply Right process model for a given project.
3. Design various system models for a given Context.
4. Apply various testing techniques for a given project.
5. Identify various risks in project development.

UNIT -I:

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Software myths. A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI),

Process models: The waterfall model, Incremental process models, Evolutionary process model.

[TB-1,Ch-1,2,3]

UNIT -II:

Agile process Model: Agile principles, Extreme programming, Dynamic System Development Methods, Feature Driven Development, Scrum framework, Sprint, Scrum master, Roles of Scrum Master, Implementing Scrum - A case study. [TB-1,Ch-4]

Software Requirements: Functional and non-functional requirements, the software requirements document. Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management. [TB-2,Ch-6,7]

UNIT -III:

System models: Context Models, Behavioral models, Data models, Object models, structured methods. [TB-2,Ch-8]

Design Engineering: Design process and Design quality, Design concepts, the design model.Modeling component level design: design class based components, conducting component level design. Performing User interface design: Golden rules. [TB-1,Ch-9,11]

UNIT -IV:

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing.

Product metrics : Software Quality, Metrics for Analysis Model- function based metrics, Metrics for Design Model-object oriented metrics, class oriented metrics, component design metrics, Metrics for source code, Metrics for maintenance. [TB-1,Ch-13,14,15]

UNIT -V:

Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

Quality Management: Quality concepts, Metrics for Software Quality, Software Reviews, Formal Technical Reviews, Software Reliability, The ISO 9000 quality standards. [TB-1,Ch-25,26]

Text Books:

1. Roger S. Pressman, Software Engineering - A practitioner‘s Approach, 6th edition. McGraw Hill International Edition, 2005.
2. Somerville, Software Engineering, 7th edition, Pearson education, 2009.

Reference Books:

1. K.K. Agarwal & Yogesh Singh, Software Engineering, New Age International Publishers,3rd edition, 2008
2. Pankaj Jalote, An Integrated Approach to Software Engineering, Narosa Publishing House, 3rd edition 2005.
3. James F. Peters, Witold Pedrycz, Software Engineering - an Engineering approach, JohnWiely, 2007.
4. Waman S Jawadekar, Software Engineering Principles and Practice, The McGraw-Hill Companies, 2013.
5. https://nptel.ac.in/courses/106/105/106105182/
6. https://ff.tu-sofia.bg/~bogi/knigi/SE/Mcgraw%20Hill%20-%20Software%20Engineering%20-%20A%20Practitioner%27s%20Approach%20-%20Pressman%20(5Th%20Ed,2001,Bookmarked,Cover).pdf

R PROGRAMMING

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Prerequisites :

Basics of Statistics, Machine Learning and
Basic knowledge in any Programming language

Course Objectives:

1. To provide an overview of a new language R used for data science.
2. To Familiarize students with R syntax
3. Understand the concepts of vector, Factors, Data Frames and data types
4. Get exposed to a few functions
5. To familiarize students with how various statistics like mean median etc. can be collected for data exploration in R
6. To enable students to use R to conduct analytics on large real life datasets.

Course Outcomes:

At the end of this course students will be able to:

1. Demonstrate vector and matrix operations using R.
2. Apply various operators on data frames and list.
3. Write functions using iterative programming
4. Analyze the data using R
5. Describe linear and multiple regression models for time series data & web data

UNIT I :

Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types, Vectors**:** Creating and Naming Vectors, Vector Arithmetic, Vector Sub setting, Matrices**:** Creating and Naming Matrices, Matrix Sub setting, Arrays, Class.

UNIT II

Factors and Data Frames : Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, Subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.
Lists: Introduction, Creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors, Conditionals and

Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

UNIT III :

Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List.

Functions in R: Introduction, Writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R, Cumulative Sums and Products, Calculus in R, Input and Output Operations.

UNIT IV :

Apply Family in R : Introduction, Using Apply in R, Using Lapply in R, Using Sapply, Using Tapply in R: Split Function, Using Mapply in R, Charts and Graphs : Introduction, Pie Chart: Chart Legend, 3D Pie Chart, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.

UNIT V :

Data Interfaces: Introduction, CSV Files: Syntax, Importing a CSV File, Excel Files: Syntax, Importing an Excel file, Binary Files: Syntax, XML Files, Web Data, Databases.

Statistical Applications: Introduction, Basic Statistical Operations, Linear Regression Analysis, Chi-Squared Goodness of Fit Test, Chi-Squared Test of Independence, Multiple Regression, Time Series Analysis.

Text Books:

1. K G Srinivas ,G M Siddesh "Statistical programming in R", Oxford Publications.
2. Gardener, M (2013), Beginning R, New Delhi: Wiley India

Reference Books

1. K Beginning R: The Statistical Programming Language,Mark Gardener,Wrox
2. Y. Anchang Zhao ,R and Data Mining: Examples and Case Studies . Elsevier in December 2012.
3. Avril Coghlan ,A Little Book of R For Time Series,Release 0.2

INTERNET OF THINGS

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Pre-requisites:

Computer Networks, Python Programming

Course Objectives:

6. Differentiate Physical and Logical Design of IoT
7. Categorize pin configuration of Arduino Uno Board
8. Demonstrate Code in Node-RED
9. Identify communication between M2M
10. Develop an IoT Applications using Raspberry Pi board

Course Outcomes:

At the end of the course student will be able to:

6. Identify physical and logical design of IoT
7. Understand Arduino Uno Board
8. Implement code in Node-RED
9. Develop an IoT Application using Arduino Uno board
10. Develop an IoT Applications using Raspberry Pi board

UNIT **- I**

Introduction to IoT: Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs. (T1, Chapter 1)

Domain specific applications of IoT: Home automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and lifestyle. (T1, Chapter 2)

UNIT – II

Arduino Basics: Hardware Requirements, Software Requirements, Arduino Programming Lanugage References. (T2, Chapter 1)

Internet Connectivity: Arduino Uno Wired Connectivity(Ethrnet), Arduino Uno Wireless Connectivity(Wifi) (T2, Chapter 2)

UNIT - III

Communication Protocols: HTTP, MQTT (T2, Chapter 3)

Complex Flows: Node-RED: Hardware and Software Required, Circuit, Node-RED Flow, code (Arduino) (T2, Chapter 4)

UNIT - IV

Prototypes

IoT Patterns: Real-time Clients, Remote Control, On-Demand Clients, Web Apps, Location Aware, Machine to Human, Machine to Machine. (T2, Chapter 5-11)

UNIT - V

Using IOT for RFID and MQTT and the Raspberry Pi: Introduction to Raspberry Pi, RFID Technology, IoTRFID Hardware and Software, Building an MQTT Server on a Raspberry Pi, the Software on the Raspberry Pi, Building the IOTRFID Project (T3, Chapter 6)

TEXT BOOKS:

1. Arshdeep Bahga and Vijay Madisetti, Internet of Things - A Hands-on Approach, Universities Press, 2015
2. Adeel Javed, Building Arduino Projects for the Internet of Things Experiments with Real-World Applications, Apress, 2016
3. John C. Shovic , Raspberry Pi IoT Projects, Prototyping Experiments for Makers, Apress, 2016

REFERENCE BOOKS:

1. Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, (CRC Press)
2. Matt Richardson & Shawn Wallace, Getting Started with Raspberry Pi, O’Reilly (SPD), 2014
3. R.K.Mittal and I J Nagrath, Robotics and Control, TMH, 2003

FUNDAMENTALS OF DIGITAL IMAGE PROCESSING

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Pre requisite:

Basic Mathematics

Course Objectives:

1. Comprehend fundamental aspects of digital image processing
2. Understand the image noise models and enhancement methods
3. Evaluate the image segmentation methodologies
4. Understand the colour image processing techniques
5. Understand image morphological operations

Course Outcomes

At the end of the course the students will be able to:

1. Understand the fundamental concepts of digital image processing system.
2. Analyze the image noise models and enhancement techniques
3. Comprehend the different image segmentation and restoration methodologies.
4. Analyze the concepts of colour image processing.
5. Apply morphological operations on binary images

UNIT **I**

Introduction: Definition, Pixel, Digital image representation, Types of images, Fundamental steps in image processing, image processing applications. Digital image processing operations – Basic relationships and distance metrics, Classification of image processing operations- Arithmetic operations, Logical operations.

UNIT II

Image Enhancement and Restoration – Image quality and Need for image enhancement, image enhancement point operations, Histogram based techniques.Categories of Image Degradations- Image Restoration in the presence of noise only- Mean filters, order statistics filters.

UNIT III

Image Segmentation: Introduction, classification of image segmentation algorithms, detection of discontinuities, edge detection- stages in edge detection, types of edge detectors, First-order edge detection operators, second-order derivatives filters, edge operator performance, edge linking algorithms, principle of thresholding.

UNIT IV

Colour image processing: introduction, devices of colour imaging, colour image storage and processing, colour models-RGB Colour Model, HSI Colour Models, HSV Colour Model, Colour Quantization, Image filters for colour images.

UNIT V

Image Morphology: Need for morphological processing Morphological operators: Erosion, Dilation, Opening & Closing, Hit-or-Miss transform, Basic morphological algorithms, Gray-scale morphology

Text Books

1. S. Sridhar, Digital Image Processing, Oxford University Press, 2nd edition 2016.
2. D. Forsyth and J. Ponce, Computer Vision: A Modern Approach, Prentice Hall, 2nd Edition, 2015.
3. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer, 2011.
4. Gonzalez R.C., Woods R.E, Digital image processing, Pearson, Prentice-Hall of India Pvt.Ltd. New Delhi, 3rd Edition, 2018
5. Jan Erik Solem, Programming Computer Vision with Python, O'Reilly ,1st Edition, 2012

References

1. Milan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing, Analysis and Machine Vision, 4th Edition, Cengage Learning, 2013
2. Fundamentals of Digital Image Processing, by Anil K. Jain, Prentice- Hall of India Pvt. Ltd,NewDelhi,2002
3. Prince, Simon JD. Computer Vision: Models, Learning and Inference, Cambridge UniversityPress,1stEdition,2012.

OBJECT ORIENTED MODELING

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Prerequisites:

Any Programming Language

Course Objectives:

1. Introduce the basic concepts of UML.
2. Understand modelling of a real-word application by UML class diagram.
3. Describe the process of Interaction Diagrams.
4. Identify the importance of events, signal and state machines.
5. Demonstrate the component and deployment diagrams.

Course Outcomes:

Students will be able to:

1. Understand the concepts and principles of object-oriented programming in UML.
2. Compare the purposes, major components and key mechanisms of Class and Object Diagram.
3. Design the sequence and Collaboration Diagram for applications.
4. Construct the Start chart diagram for real world applications
5. Analyze the techniques for Component and Deployment Diagrams.

UNIT – I:

Introduction to UML: Importance of modeling, principles of modeling, object oriented Modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams.

UNIT – II:

Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages, Common modelling techniques.

Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object

Diagrams, Common modelling techniques.

UNIT – III:

Basic Behavioral Modeling-I: Interactions, Interaction diagrams

Basic Behavioral Modeling-II: Use cases, Use case Diagrams, Activity Diagrams

UNIT – IV:

Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams

UNIT-V

Architectural Modeling: Components, Deployment, Component diagrams and Deployment diagrams

Text Book:

1. Grady Booch, James Rumbaugh, Ivar Jacobson, *The Unified Modeling Language User Guide*, 7th Impression, Pearson Education, 2008.

Reference Books:

1. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, *UML2 Toolkit,* 2nd Edition, WILEY-Dreamtech India Pvt. Ltd., 2012.
2. Meilir Page-Jones, *Fundamentals of Object Oriented Design in UML,* Illustrated Edition, Pearson Education, 2000.
3. Pascal Roques, *Modeling Software Systems Using UML2*, 1st edition, WILEY-Dreamtech India Pvt. Ltd., 2011.
4. Atul Kahate, *Object Oriented Analysis & Design,* 1st Edition, The McGraw-Hill Companies, 2007.
5. Mark Priestley, *Practical Object-Oriented Design with UML,* 2nd Edition, TATA McGrawHill, 2005.

BIG DATA

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisite:

Database management system, Java and Linux

Course Objectives:

1. Identify various tools and techniques in big data analytics
2. Distinguish Hadoop and related technologies.
3. Apply the development of applications using MapReduce, HDFS, YARN
4. Illustrate Enterprise Data Science and data visualization tools
5. Distinguish various NoSQL databases

Course Outcomes:

Students will be able to:

1. Identify need of big data and various analytical tools [L2]
2. Analyze various components HDFS [L4]
3. Apply several data intensive tasks using Map-Reduce paradigm [L3]
4. Demonstrate the applications of Enterprise Data Science and data visualization tools [L3]
5. Compare various NoSQL databases [L4]

Unit I:

Overview of Big Data Analytics: Introduction to Data Analytics and Big Data, Evolution of big data, Challenges with Traditional Large Scale Systems, characteristics (3 V's), types (structured, semi-structured and unstructured) and sources of Big Data, Distributed, Parallel Computing and Cloud Computing for big data. **Analytics Toolkit:** Components of the analytics toolkit, Analytical Sandbox: Internal, External and Hybrid.

Unit II:

Hadoop Distributed File System (HDFS): Hadoop Architecture: HDFS, MapReduce, YARN, **HDFS Architecture:** Name node, Data node, Secondary Name Node, Scaling Out – Block, Data Flow, Replica.

MapReduce: Phases (Mapper, Sort and Shuffle, Reducer), **YARN:** Combiner Functions, Streaming, HDFS, filesystems, Job Scheduling, I/O, Data Integrity, Compression, Serialization, File based Data Structures, Developing a MapReduce Application.

Unit III:

Hadoop Cluster and MapReduce: Hadoop Cluster specification and modes of operation, Hadoop installation and configuration, YARN configuration, Sample Map Reduce Application. HDFS Concepts-Interacting HDFS using command line-Interacting Java API.

Unit IV:

Introduction to data visualization: What is data visualization, Importance of data exploration and data visualization. Fundamentals: Design principles, Dashboards, Visualization tools, Data Visualization in Healthcare and Media & Entertainment.

Unit V:

Hadoop Ecosystem: Apache Spark, Zookeeper and Sqoop. Introduction to Languages and Databases: Pig, Hive. NOSQL Databases: Cassandra, Mongo, Cloudera, CouchDB, Hbase

Text Books

1. Tom White, Hadoop: The Definitive Guide, 3rd Edition, O'Reilly, 2012.
2. Sridhar Alla, Big Data Analytics with Hadoop3, Packt Publication, 2018.
3. DT Editorial Services, Big Data: Black Book, 2016.

REFERENCES

1. Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.
2. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.
3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.

Web Resources

1. https://cognitiveclass.ai/learn/big-data
2. https://hadoop.apache.org/
3. https://mschermann.github.io/data_viz_reader/

PRINCIPLES OF CRYPTOGRAPHY

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

1. Understand fundamentals of cryptography and classic encryption techniques.
2. Compare and analyze encryption Algorithms
3. Learn various Authentication Functions using MAC & Hash
4. Know the Key Management and Distribution
5. Learn various web security protocols

Course Outcomes

Students will be able to

1. Describe fundamentals of cryptography and classic encryption techniques.(L2)
2. Analyze the symmetric encryption and Asymmetric encryption techniques (L4)
3. Summarize authentication functions using MAC & Hash (L2)
4. Illustrate Key Management and Distribution(L3)
5. Analyze the various methods and protocols to maintain E-mail security and web security(L4)

UNIT – 1

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security

Cryptography Concepts and Techniques: Introduction, plain text and cipher text, Substitution techniques-Caesar cipher, Mono alphabetic cipher, Poly alphabetic ciphers, onetime pad, transposition techniques, encryption and decryption, symmetric and Asymmetric key cryptography, steganography.

UNIT – II

Block ciphers

Symmetric key Ciphers**:** Block Cipher principles, Bloch cipher modes of operation, DES, AES, Blowfish, RC5 algorithms.

Public-key cryptography

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography.

UNIT – III

Hash functions and cryptographic applications

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-
512), Message authentication codes: Authentication requirements, HMAC, CMAC, and Digital Signatures, , Elgamal Digital Signature Scheme, Applications pertaining to Encryption using different ciphers and modes.

UNIT-IV

Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

UNIT-V

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS.

E-Mail Security: Pretty Good Privacy, S/MIME

IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations.

TEXT BOOKS:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

https://www.garykessler.net/library/crypto.html

https://paragonie.com/blog/2019/03/definitive-2019-guide-cryptographic-key-sizes-and-algorithm-recommendations

PRINCIPLES OF DISTRIBUTED SYSTEMS

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre-Requisite:

Operating Systems, Computer Networks

Course Objectives:

1. Outline various models for processing and communication in distributed systems
2. Examine the file characteristics and Naming services
3. Explores the concept of clocks and distributed algorithms
4. Describes about transactions and their properties in distributed systems
5. To design and implement sample distributed systems.

Course Outcomes:

After completion of the course the students will be able to:

1. Identify the models for distributed processing and communication
2. Apply the knowledge in naming synchronization, consistency and replication
3. Predict the advantages and challenges in designing distributed Algorithms
4. Analyse distributed transactions and transaction recovery
5. Design Distributed Systems

UNIT I:

Characterization of Distributed Systems: Introduction, Examples of Distributed systems, Resource sharing and web, challenges, Architectural model: Client Server model, Proxy Servers and Caches, Peer process model ,Fundamental model :Interaction model, Security model ,Failure model.

UNIT II:

Distributed file system: Characteristics of file systems, Distributed file system requirements, File service architecture. **Name Services:** Name space ,Name resolution

, Domain Name System ,DNS name servers ,Directory services, discovery services in Jini

UNIT III:

Time and Global States: Clocks, events and Process states, Synchronizing physical clocks , logical clocks, distributed debugging. Coordination and Agreement: Introduction, Distributed mutual exclusion, Elections, Multicast communication.

UNIT IV:

Transactions and Concurrency control: Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering. **Distributed Transactions**: Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT V:

Replication : System model , group communication ,Fault tolerant services ,Passive(primary-backup) replication,Active replication,Transactions with replicated data.**Designing Distributed Systems:Google Case Study** :Introducing the case study Google, physical model ,overall architecture and design philosophy ,Data storage and coordination services , Google file system, Chubby, BigTable ,Distributed computation services.

Text Books:

1. G Coulouris, J Dollimore, T Kindberg, Distributed Systems Concepts and Design, fifth Edition, Pearson Education.

Reference Books:

1. S.Mahajan and S.Shah, Distributed Computing, Oxford University Press.
2. PradeepK.Sinha, Distributed Operating Systems Concepts and Design, PHI.
3. M Singhal, N G Shivarathri, Advanced Concepts in Operating Systems, Tata McGraw-Hill Edition.
4. K.P.Birman, Reliable Distributed Systems, Springer.
5. A.S. Tanenbaum and M.V. Steen, Distributed Systems: Principles and Paradigms, Pearson Education.
6. R.Chow, T.Johnson, Distributed Operating Systems and Algorithm Analysis, Pearson.
7. A.S.Tanenbaum, Distributed Operating Systems, Pearson Education.

Web Resources:

https://www.cs.usfca.edu/~srollins/courses/cs682-s08/web/notes/models.html

INFORMATION STORAGE AND RETRIEVAL

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites:

Database management system

Course Objectives:

1. This course studies the basic principles and practical algorithms used for information retrieval and text mining
2. To understand the functions of Information retrieval
3. To provide exploration of information retrieval systems' evaluation tools
4. To provide hands-on experience in evaluating search engines to solve computational search problems.
5. To understand the complexity of Information Retrieval Systems.

Course Outcomes:

Student will be able to:

1. Acquire the knowledge of information retrieval system and its capabilities
2. Comprehend the knowledge of indexing and Data structure that can used for storing the data
3. Know the concept of indexing and clustering of the information
4. Understand the searching techniques and visualization
5. Have a handle on algorithms for text searching and multimedia retrieval

UNIT -1

Introduction to Information Retrieval Systems: Definition, Objectives, functional overview, Relation to Database Management system.
IRS capabilities: Search capabilities, Browse Capabilities, Miscellaneous Capabilities

UNIT –II

Cataloging and Indexing: History of objectives of Indexing, indexing process, automatic indexing
Data Structure: Introduction to Data structure, Stemming Algorithms, Invert file system, N-Gram Data structure, PAT data structure, Hypertext and XML data structure

UNIT- III

Automatic Indexing: Classes of Automatic indexing, Statistical indexing, Natural language, concept Indexing, Hypertext Linkage.
Document and Term Clustering: Introduction to clustering, Thesaurus Generation, Manual clustering, Automatic term clustering

UNIT –IV

User Search Techniques: Searching statement and binding, Similarity Measurement and Ranking, Relevance Feedback, Selective dissemination of information search, weighted searches of Boolean system.
Information Visualization: introduction to information visualization, Cognition and perception

UNIT –V

Text Search Algorithms:
Introduction to Text search techniques, Software text search algorithms, hardware text search system
Multimedia information retrieval: Spoken language audio retrieval, Non- speech audio retrieval, Graph Retrieval, Imagery retrieval, video retrieval

Text Book:

1. Gerald J.Kowalski, Mark T. Maybury,Information storage and retrieval systems, theory and implementation, 2nd Edition, Springer publications.

Reference Books:

1. Christopher D. Manning and Prabhakar, Raghavan, Introduction to information Retrieval, Cambridge University Press, 2008.
2. Ricardo baeza-Yates, Modern information retrieval, Pearson Education, 2007.
3. Robert Korthage, Information storage and Retrieval, John wiley& sons.

SKILL INTEGRATED LAB

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	ESC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Learning Objectives

1. To improve the students' fluency in English, through a well-developed vocabulary
2. To enable them to respond them appropriate socio-cultural and professional contexts.
3. They will be able to communicate their ideas relevantly and coherently in writing.

Course Outcomes

The students will be able to

1. make oral presentations effectively
2. participate in group discussions
3. develop vocabulary
4. write project/Business reports
5. take part in social and professional communication

Exercise I

Presentation Skills:

Oral presentations (individual and group) / JAM sessions/Seminar - Power point presentations - Body Language-kinesics - Haptics

Exercise II

Group Discussion:

Dynamics of Group Discussion - Dos and Don'ts – Intervention - Summarizing - Modulation of Voice - Relevance - Fluency and Coherence

Exercise III

Vocabulary Building:

synonyms and antonyms - Word Roots - One-Word Substitutes, - Prefixes and Suffixes - study of Word Origin- -Analogy -Idioms and Phrases

Exercise IV

Writing Skills:

Structure and presentation of different types of writing - Resume Writing /E-Correspondence/Statement of Purpose - Report Writing - Business Report Writing - Research Abilities/Data Collection/Organizing Data/Tools/Analysis

Exercise V

Interview Skills:

Concept and Process - Pre-Interview Planning - Opening Strategies - Answering Strategies - Interview through Telephone and Videoconferencing.

A mini project should be given for the students to work in teams and the Assessment is done.

References:

1. Dr. Rao, A. Ramakrishna., Dr. G. Natanam and Prof SA Sankaranarayana. *English Language Communication: A Reader cum Lab Manual. Chennai*: Anuradha Publications, 2008.
2. *English Vocabulary in Use series*. Cambridge University Press, 2008.
3. Nicholls, Anne. *Master Public Speaking.* JAICO Publishing House, 2006.
4. Sen, Leena. *Communication Skills.* New Delhi: PHI Learning Pvt Ltd, 2009.

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R PROGRAMMING LAB

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-I	L	T	P	C	CIE	SEE	Total
		0	3	0	1.5	50	50	100

Prerequisites :

Basics of Statistics, MachineLearning , Programming language C/C++

Course Outcomes:

1.Install and use R for simple programming tasks.
2.Explore R environment
3.Create loops and their own customized functions to solve different types of problems
4. Visualize data insights using charts and graphs

Week-1:

Installation and Environment set up R and Rstudio

Week-2:

Experiments on Vector Arithmetic operations

Week-3:

Experiments on Matrices operations

Week-4

Experiments on Arrays functions

Week-5:

Experiments on Factors

Week-6:

Experiments on Data Frames

Week-7:

Experiments on List operations

Week-8:

Write R scripts which demonstrate logical operations and Conditional Statements

Week-9:

Write R scripts which demonstrate Looping Over List

Week-10:

Write R scripts which demonstrate Nested Functions and
Function Scoping

Week-11:

Experiments on Mathematical Functions in R

Week-12:

Experiments on Calculus in R

Week13:

Experiments on Lapply, Sapply and Apply functions

Week-14:

Genarte different Charts and Graphs using R

INTERNET OF THINGS LAB

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Week 1:

1. Study and Install IDE of Arduino and different types of Arduinos.
2. Write program using Arduino IDE for Blink LED.
3. Write Program for RGB LED using Arduino.

Week 2:

4. Write program for buzzer using Arduino.
5. Write program for LDR using Arduino.
6. Write program for IR Sensor using Arduino.

Week 3:

7. Study the Temperature sensor and Write Program for monitor temperature using Arduino.

Week 4:

8. Study and Implement RFID, NFC using Arduino.

Week 5:

9. Study and implement MQTT protocol using Arduino.

Week 6:

10. Study and Implement Arduino Uno with Ethernet Connection to Send data to a Cloud

Week 7:

11. Study and Implement Arduino Uno with ESP 32 Connection to Send data to a Cloud

Week 8:

12. Study and Configure Raspberry Pi.
13. Write program for LED blink using Raspberry Pi
14. Write program for RGB LED using Raspberry Pi

Week 9:

15. Implement Raspberry Pi based Automated Street Lighting System.
16. Write an Arduino program for Distance Measurement Using Ultrasonic Sensor and displaying on LCD.

Week 10:

17. Write program for Buzzer using Raspberry Pi
18. Write program for LDR using Raspberry Pi
19. Write program for IR Sensor using Raspberry Pi

Week 11:

20. Implement IoT based weather monitoring system using Raspberry Pi.

Week 12:

21. Study and Implement RFID, NFC using Raspberry Pi.

Week 13:

22. Study and Implement Raspberry Pi with Ethernet Connection to Send data to a Cloud

Week 14:

23. Study and Implement Raspberry Pi with Wifi Connection to Send data to a Cloud

Week 15:

24. Study and Implement Zigbee Protocol using Arduino.

Week 16:

25. Study and Implement Zigbee Protocol using Raspberry Pi.

FUNDAMENTALS OF DIGITAL IMAGE PROCESSING LAB

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-I	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course objectives

1. Understand the basic vector and matrix commands in SCI lab.
2. Use various commands for arithmetic and histogram manipulations.
3. Analyze various types of Noises and filters.
4. Understand various color conversion functions.
5. Learn image segmentation and morphological operations.

Course outcomes

1. Apply basic vector and matrix commands of SCI lab. (L4)
2. Apply various commands to implement arithmetic operations and histogram operations. (L4)
3. Apply different types of noises and masks to the images. (L4)
4. Apply various colour conversion methods. (L4)
5. Implement morphological operations. (L6)

List of experiments

Week-1 & 2

Installation of SCI lab and basic commands

Week-3

Write the programs for vector arithmetic operations

Week-4

Write the programs for matrix operations and divide the matrix into overlapped 3*3 sub matrices.

Week-5

Write a program for displaying an image and printing of its properties.

Week-6

Write a program to implement arithmetic operations on images.

Week-7

Write a program to implement histogram equalization and display the histogram.

Week-8

Write a program for adding different types of noises with different percentages.

Week-9

Write a program to apply different types of masks for detecting the edges.

Week-10

Write the programs to implement various color image conversion models.

Week-11

Write a program to read an RGB image and segment it using threshold method.

Week-12

Write a program for color image histogram manipulations?

Week-13

Write a Program for following morphology operations

i. Dilation ii. Erosion iii. Open iv. Close v. Hit-or-Miss transform

Week-14

Write a program to rotate the image in different angles.

Week-15

Review

OBJECT ORIENTED MODELING LAB

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Objectives:

1. Understand object based view of the system
2. Learn the basic concepts of UML
3. Practice the notations for representing various UML diagrams
4. Analyze and design the problem by representing with UML diagrams.

Course Outcomes:

At the end of the course Students will be able to:

1. Understand the process to be followed in the software development life cycle
2. Design the usecase and class diagrams for real time applications.
3. Compare the interaction diagrams
4. Analyze the state chart diagrams
5. Construct the component and deployment diagrams

Case Studies:

1. ATM System
2. Railway Reservation System
3. Library Management System

Week 1-2 :

Model class diagrams for the above specified Case Studies.

Week 3-4 :

Model Use case diagrams for the above specified Case Studies.

Week 5-6:

Model activity diagrams for the above specified Case Studies.

Week 7-8 :

Model sequence and collaboration diagrams for the above Case Studies.

Week 9-10:

Model state chart diagrams for the above specified Case Studies.

Week 11-12:

Model component diagrams for the above specified Case Studies.

Week 13-14:

Model Deployment diagrams for the above specified Case Studies.

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MACHINE LEARNING LAB

B. Tech III Year II Semester					Dept. of Computer Science and Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Prerequisites:

Python Programming, Statistics

Course Objectives:

1. To study the way of classifying a new sample using machine learning algorithms.
2. To have an understanding of the strengths and weaknesses of many popular machine learning approaches
3. To appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and unsupervised.
4. To implement various machine learning algorithms in a range of real-world applications.

Course Outcomes :

Student will able to

1. To Demonstrate the Python Framework and install ML packages
2. To Design python programs for various machine learning algorithms
3. To Use appropriate datasets to the machine learning algorithms
4. To Apply Machine Learning algorithms to solve real world problems

List of Programs:

Week 1 & 2:

installation of IDE, Demonstration of Packages .

Week 3:

Program to demonstrate different kinds of preprocessing

Week 4:

Program to demonstrate simple linear regression

Week 5 :

Program to demonstrate ridge regression and lasso regression

Week 6:

Program to demonstrate K-Nearest Neighbor Classification

Week 7:

Program to demonstrate Decision Tree -ID3 Algorithm

Week 8:

a. Program to demonstrate Naive Bayes Classifier

b. Program to demonstrate Logistic Regression

Week 9:

Program to demonstrate SVM based Classification

Week 10:

Program to demonstrate the Ensemble Learning Algorithms: Bagging & Boosting

Week 11:

Program to demonstrate Random Forest Algorithm

Week 12:

Program to demonstrate PCA on any dataset

Week 13 :

Program to demonstrate K-Means Clustering Algorithm

Week 14:

Program to demonstrate DBSCAN Clustering Algorithm

Week15:

Program to demonstrate Comparison and Evaluation of Clustering Algorithms

Computer Science and Engineering – Data Science

Department of Computer Science and Engineering

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.),
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B.TECH III YEAR I SEM **(5T+3L) +1 MC**

S. No	Course code	Category	Subject Name	Hours per week			Credits
				L	T	P	
1		PCC	Computer Networks	3	0	0	3
2		PCC	Operating Systems	3	0	0	3
3		PCC	Machine Learning	3	0	0	3
4		PCC	Web Technologies	3	0	0	3
5		OEC-1	1.English for Professionals 2. Essential English and Employability Skills 3. Intellectual Property Rights 4. The Power of Data story Telling	3	0	0	3
6		ESC-Lab	Quantitative Aptitude and Reasoning	0	0	3	1.5
7		PCC-Lab	Web Technologies Lab	0	0	4	2
8		PCC-Lab	Operating Systems & Computer Networks Lab	0	0	3	1.5
9		MC	NSS/NSO	0	0	2	0
	TOTAL						20

B.TECH III YEAR II SEM **[5 T +3L]**

S. No	Course code	Category	Subject Name	Hours per week			Credits
				L	T	P	
1		PCC	Data Visualization	3	0	0	3
2		PCC	Predictive Analytics using R Programming	3	1	0	4
3		PEC–I	1. Mobile Application Development 2. Internet of Things 3. Fundamentals of Digital Image Processing 4. Object Oriented Modeling	2	0	0	2
4		PEC–II	1. Software Engineering 2. Language Processors 3. Information Storage and Retrieval 4. Principles of Distributed System	3	0	0	3
5		HSS&MC	Entrepreneurship Development	3	0	0	3
6		ESC	Skill Integrated Lab	0	0	3	1.5
7		PCC Lab	Data Visualization Lab	0	0	4	2
8		PCC-Lab	Predictive Analytics using R Programming Lab	0	0	3	1.5
	TOTAL						20

COMPUTER NETWORKS

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre requisites

C Programming Language and Data Structures.

Course Outcomes:

At the end of this course, students will be able to:

1. Illustrate the functionalities of various network models and Data link Layer.
2. Analyze error and flow control mechanisms in the data link layer
3. Examine various Routing Protocols.
4. Compare various congestion control mechanisms to improve the QoS of networking.
5. Identify the suitable Application layer protocols for specific applications.

UNIT - I:

Network Models: Layered Tasks, OSI model, Layers in the OSI model, TCP/IP protocol Suite, Addressing.

Data Link Control: Error detection and Correction- Introduction, Hamming Distance, CRC, Checksum.

UNIT - II:

Data Link Layer: Responsibilities of Data Link Layer: Framing, Flow and Error Control, Noiseless Channels - Simplest Protocol, Stop-and-Wait protocol Noisy Channels - Stop-and-Wait Automatic Repeat Request, Go-Back-N Automatic Repeat request, Selective Repeat Automatic Repeat Request, High-Level Data link Control.

Multiple Access: Random Access, ALOHA,CSMA, CSMA/CD,CSMA/CA,Controlled Access - Reservation, Polling, Token Passing, Channelization - FDMA,TDMA,CDMA.

UNIT- III:

Network Layer: Responsibilities of Network Layer, Delivery, Direct Versus Indirect Delivery, Forwarding, Forwarding Techniques, Forwarding process, Types of Routing tables **Unicast Routing protocols:** Optimization, Intra- and Interdomain routing ,Distance Vector Routing, Link State Routing, Path Vector Routing,IPV4 Addressing, Address space, Classful Addressing, Classless Addressing, Frame format of IPV4,IPV6.

UNIT- IV:

Transport Layer: Responsibilities of Transport Layer, Process-to-Process delivery, User Datagram Protocol, Transmission Control Protocol, Congestion Control - Open-Loop Congestion, Closed-Loop Congestion Control, Quality of Service, Techniques to improve QoS - Scheduling, Traffic Shaping, Resource Reservation, Admission Control.

UNIT-V:

Application Layer: Responsibilities of Application Layer Domain Name Space, Distribution of Name Space, DNS in Internet, Generic Domain, Country Domain, Inverse Domain Resolution, Domain Name Space (DNS) Messages, Electronic mail, File Transfer Protocol.

Text books:

1. Behrouz A Forouzan, Data Communications and Networking,4th Edition, McGraw-Hill.

Reference Books:

1. Andrew S. Tanenbaum, Computer Networks, Third Edition.
2. William Stallings, Data Communications, Eight Edition. Pearson Publishers.

http://highered.mheducation.com/sites/0072967757/student_view0/index.html

OPERATING SYSTEMS

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites :

Computer Organization, Data Structures

Course Objectives:

1. Introduce basic concepts of operating system and process management
2. Discuss various CPU scheduling algorithms and problems of process synchronization.
3. Demonstrate different methods for handling deadlock.
4. Describe about memory management Techniques.
5. Explore the File system, system security and protection mechanisms.

Course Outcomes:

At the end of the course, students will be able to:

1. Summarize operating system and process management concepts.
2. Apply process scheduling and synchronization related issues.
3. Outline Deadlock Prevention, Avoidance, Detection and recovery mechanisms.
4. Analyze effectively memory management concepts.
5. Illustrate various protection and security measures.

UNIT I

Operating Systems Overview

Introduction -What operating system do, Operating system structure (uni-programmed and multi programmed), Operating system operations, Operating system services, System calls, Types of System calls, Operating system structure.

UNIT II

Process Management and Process Scheduling

Process Management- Process concepts, Process scheduling, Operations on processes, Inter process communication. Multithreading models. Process Scheduling – Basic concepts, scheduling criteria, scheduling algorithms.

UNIT III

Process Synchronization and Deadlocks

Process coordination: Synchronization – Background, The critical section problem, Peterson's solution, Synchronization hardware, Semaphore, Classical problems of synchronization, Monitors.

System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Detection and avoidance, Recovery from deadlock.

UNIT IV

Memory Management

Swapping, Contiguous memory allocation, Paging, Segmentation. Virtual memory management - Demand paging, copy-on-write, page-replacement, Thrashing.

UNIT – V

File system, system protection and security

Storage management – File concept, Access methods, Directory and disk structure, File-system mounting. System protection- Goals of protection, principles of protection, Domain of protection, Access matrix. System Security – Security problem, Program threats, System and Network threats.

Text Books

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, 9th edition ,John Wiley, 2016.

Suggested / Reference Books

1. D.M. Dharmdhere, Operating Systems – A Concept based Approach, 2nd Edition. TMH, 2007.
2. Andrew S Tanenbaum, Modern Operating Systems, 3rd Edition, PHI, 2008.
3. Behrouz A. Forouzan, Richard F. Gilberg, Unix and shell programming, cengage Learning 2009.

MACHINE LEARNING

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre-requisites:

Python Programming, Statistics

Course Objectives:

1. To understand the need for machine learning for various problem solving
2. To study the various supervised and unsupervised learning algorithms in machine learning
3. To understand the latest trends in machine learning
4. To design appropriate machine learning algorithms for problem solving

Course Outcomes:

Student will be able to:

1. Understand the Concepts of Machine Learning
2. Develop Simple Regression Models .
3. Build various classification algorithms
4. Analyze the need of ensemble learning and dimension reduction
5. Apply the Clustering algorithms for developing applications

UNIT I:

Introduction to Machine Learning

What is Machine Learning,Types of Machine Learning, Applications of Machine learning, Preparing to Model, Modeling and Evaluation .

UNIT II:

Supervised Learning: Regression

Introduction to Regression,Example of Regression,Simple Linear Regression,Multiple Linear Regression,Assumptions in Regression Analysis,Improving the accuracy of the Linear Regression Model, Ridge Regression, Lasso Regression.

UNIT III:

Supervised Learning: Classification

What is Classification,General Approach to Classification, K-Nearest Neighbor Algorithm, Logistic Regression, Decision Trees: Construction, classification and regression trees, example, Naive Bayesian Classifier, Support Vector Machines: Optimal Separation, Kernels, Algorithm

UNIT IV:

Unsupervised Learning and Dimensionality Reduction

Types of Unsupervised Learning, Challenges in Unsupervised Learning, Clustering Algorithms: K-Means, Agglomerative, DBSCAN, Comparing and Evaluating Clustering Algorithms.Dimensionality Reduction: Linear Discriminant Analysis (LDA), Principal Component Analysis (PCA), Factor Analysis (FA).

UNIT V:

Ensemble Learning and Reinforcement Learning

Ensemble Methods: Bagging, Boosting & Random Forests, Reinforcement Learning: Overview, Example: Getting Lost, Markov Decision Process, Values, difference between SARSA and Q Learning, Uses of Reinforcement Learning

Text Books:

1. Machine Learning, Saikat Dutt, Subramanian Chandramouli and Amit Kumar Das, Pearson, 2018.
2. Machine Learning: An Algorithmic Perspective by Stephen Marsland, CRC Press, 2009
3. Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido, 2016,O'Reilly Media, Inc.

Reference Books:

1. Introduction to Machine Learning (Adaptive Computation and Machine Learning), Ethem Alpaydin, The MIT Press 2004.
2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition Aurélien Géron, 2019, O'Reilly Media, Inc.
3. Machine Learning, McGraw-Hill Education (India) Private Limited,Tom M. Mitchell, 2013.
4. Pattern Recognition and Machine Learning. First Edition. ,C. M. Bishop. Springer, 2006.

WEB TECHNOLOGIES

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre-requisites:

Basics of Object Oriented programming, Java

Course Objectives:

1. To provide knowledge on web architecture, web services.
2. Client side scripting technologies to focus on the development of web-based information systems and web services.
3. To provide skills to design interactive and dynamic web sites.
4. To provide knowledge for implementing web applications with database connection

Course Outcomes:

Student will be able to:

1. Design static web pages and provide client side authentication.
2. Prepare Static Web pages With Validations.
3. Develop new tag sets using XML mechanism.
4. Design and develop web applications using JSP and MVC architecture.
5. Understand database connectivity and retrieving data using client/server database.

UNIT I:

INTRODUCTION TO WEB: Understanding Internet and Web, Web Architecture, Web servers, protocols: HTTP, Introduction HTML: History of HTML, WWW, HTML Basics: Elements, Attributes, Tags, Tables, Forms, Frames.div and span tags.HTML5

UNIT II:

CSS: Introduction to cascading style sheet, Types of style sheets, page layout, selectors, pseudo classes and elements.CSS3

JAVA SCRIPT: Introduction to scripting, control structures, conditional statements, Arrays functions, objects. JS framework(ReactJS)
HTML DOM: Predefined object (Window, Location, History, Navigator). Events, DOM Node methods, Navigation, creating nodes, adding nodes, inserting nodes, removing & Replaces Nodes, Form object and Elements, DHTML with Java Script. front end frameworks(bootstrap),

UNIT III:

XML: Basics of XML, Elements, Attributes, validation, Name space.
XML Scheme Languages: Introduction to DTD, internal and external DTD, Elements of DTD, DTD Limitations, XML Schema, Schema structure, Elements, parsing XML: XML DOM, Document node, element node, Text node, Java and DOM, Navigating DOM Tree.

UNIT IV:

AJAX: Introduction, Environment, Asynchronous communication, process steps, sending and Retrieving Information, Ajax with XML.
Servlets : Introduction, Lifecycle, Generic and HTTP servlet, passing parameters to servlet, HTTP servlet Request & Response interfaces, Deploying web Applications, Session Tracking: Hidden form fields, cookies, URL- Rewriting, session.

UNIT V:

JSP: Introduction, Difference Between servlets & JSP, Anatomy of JSP page, JSP elements: Directives, comments, Expressions, scriptlets, Declaration, Implicit JSP objects, using Action elements.
JDBC: Introduction, JDBC Drivers, Loading Driver, establishing connection, Executing SQL statement in JSP pages, MVC architecture.

Text Book:

1. Uttam K. Roy, Web Technologies, 8th Impression, Oxford Publication, 2014.

Reference Books:

1. Thomas Powell, “The Complete Reference HTML and CSS”, 5th Edition, Tata McGraw Hill, 2010.
2. Thomas Powell, Fritz Schneider, “The Complete Reference JavaScript 2.0”, 3rd Edition, Tata McGraw Hill, 2012.

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ENGLISH FOR PROFESSIONALS

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	Category	Hours / Week			Credits	Marks		
	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Introduction:

The course aims at preparing the students with the tools needed for successful communication at the professional front. It is designed to improve students' academic and professional skills which the employers are currently looking for.

Objective:

To prepare the students to use the language effectively in all professional pursuits

Course Outcomes:

The students will be able to:

1. Analyze the language use in communicative process
2. Describe the process and product
3. Interpret the ideas in group activities
4. Apply different approaches to comprehend the written text
5. Write any technical and official correspondence within the framework

UNIT-I

Essentials of Communication:

Essentials of Grammar **-** Rudiments of Communications Skills (Listening, Speaking, Reading, and Writing) - Applied Grammar and Usage - Non-Verbal Communication

UNIT-II

Listening Skills:

Art of Listening - Developing Effective Listening Skills - Process of Listening, Intensive & Extensive Listening Podcasts, Vodcasts (ICT enabled) - Five steps to Active Listening - Effective and Ineffective Listening Skills -Listening & Note-Taking

UNIT-III

Speaking Skills:

Dynamics of Effective Speaking - Group Discussion - Simulated Presentations, Process & Product Descriptions - Proxemics, Paralinguistic Features

UNIT-IV

Reading Skills:

The Art of Effective Reading - Basic steps to Effective Reading - Extensive and Intensive Reading -Approaches to Efficient Reading - Reading Comprehension

UNIT-V

Writing Skills:

Art of Condensation - Descriptive Writing Techniques - Writing & Answering Memos, Circulars - Inter & Intra Official Communication - Writing Minutes of Meeting - Netiquette - E-mail & Blog Writing - Note-Making

PRESCRIBED TEXTBOOK:

1. Business Communication (Second Edition) by Meenakshi Raman & Prakash Singh. Oxford University Press. 2012.

REFERENCES:

1. Communicating at Work (Seventh edition) by Adlar, Ronarld.B. McGrawHill. 2004.
2. Cambridge English for Engineering Professionals by Mark Ibbotson. Cambridge University. 2008.
3. Professional Communication by Aruna Koneru. McGrawHill. 2017.
4. The Effective Communicator by Adair John. Jaico Publishing House. 1995.
5. Oxford English for Careers by Oxford University Press.

ESSENTIAL ENGLISH AND EMPLOYABILITY SKILLS

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

1. To enable students to develop their personality, infuse confidence and increase employability skills in any chosen career.
2. To provide the students hands-on experience to cope with the demands of the world of recruiters.
3. To help the students acquire the job skills essential for employment.

Course Outcomes:

1. Enhancement of employability skills and professional etiquette.
2. Acquisition of productive knowledge, competent learning and innovative thinking skills.
3. Implementation of verbal and non-verbal communication competencies in work place.

UNIT-I

"Six Sigma: Dabbawala" from **"English for Employability"** by K Purushotham published by Orient Black Swan, Hyderabad, India.

"Personality Development: A Must for Leadership and Career Growth" from **"Personality Development and Soft Skills"** by Barun.K.Mitra, published by Oxford Publications -

Introduction, Learning about Personality Development from 3 Cases, Personality Analysis, Freudian analysis of Personality Development, Swami Vivekananda's Concept of Personality Development, Personality Begets Leadership Qualities.

UNIT-II

"Yet I am not defeated!" from **"English for Employability"** by K Purushotham published by Orient Black Swan, Hyderabad, India.

"Interpersonal skills" from **"Personality Development and Soft Skills"** by Barun.K.Mitra, published by Oxford Publications -

The Personality Attribute of Taking Bold Decisions, Personality Types and Leadership Qualities, Personality Tests

UNIT-III

"Patricia Narayanan: An Entrepreneur by accident", from **"English for Employability"** by K Purushotham published by Orient Black Swan, Hyderabad, India.

"Soft Skills: Demanded by Every Employer" from **"Personality Development and Soft Skills"** by Barun.K.Mitra, published by Oxford Publications
Introduction to Soft Skills, Lessons from the 3 Case Studies, Change in Today's Work place; Soft Skills as a Competitive Weapon, Antiquity of Soft Skills, Classification of Soft Skills

UNIT-IV

"Satya Nadella: CEO of Microsoft" from "English for Employability" by K Purushotham published by Orient Black Swan, Hyderabad, India.
"Interview Skills" from **"Personality Development and Soft Skills"** by Barun.K.Mitra, published by Oxford Publications.

UNIT-V

"Body Language Reveals Your Inner self and Personality" from **"Personality Development and Soft Skills"** by Barun.K.Mitra, published by Oxford Publications - Introduction, Emotions Displayed by Body Language , Handshake-The Most Common Body Language, Eyes-A Powerful Reflection of One's Inner Self, Entry to My Space – Personal Zones May Vary, Body Language Exhibited during Different Professional Interactions.

Textbooks:

1. "English for Employability" by K Purushotham published by Orient Black Swan, Hyderabad

2. "Personality Development and Soft Skills" by Barun K.Mitra, published by Oxford University Press

References:

1. Cottrell,Stella.*Skills for Success*.London:Palgrave Macmillan,2003.
2. *Enhancing English and Employability Skills*, State Board of Technical Education and Training, Hyderabad: Orient Blackswan Private Limited, 2012.
3. Knight,T.Peter and Mantz Yorke.*Assessment, Learning and Employability*.U.K:Mac Graw-Hill House,2003.
4. Rao,M.S. *Soft Skills Enhancing Employability*.New Delhi: I.K.Publishing House,2010.
5. Rao, Nageshwar.Communication *Skills.* New Delhi: Himalaya Publishing House Pvt.Ltd, 2008.
6. Sharma,T.K.Enhancing Employability in Education.India:Patridge Publishing House.2015.
7. Sharma,T.K.Enhancing Employability in Education.India:Patridge Publishing House.2015.
8. Sinha, K. K.*Business Communication.NewDelhi*: Galgotia Publishing Company ,2008.
9. Yadav, Shalini. *Communication Techniques,* New Delhi: University Science Press,2010.

INTELLECTUAL PROPERTY RIGHTS

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	Category	Hours / Week			Credits	Marks		
	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objective:

The course aims to help the student understand the concept of Intellectual Property Rights and helps the student to appreciate the purpose and function of a trademark and the process involved in getting copyright, patent and related issues. The student is introduced to the importance of trade Secret and Geographical Indications.

Course Outcomes:

At the end of the course student will be able to

6. Explain the concepts of intellectual property rights and related agencies.
1. Describe the purpose and functions of a trademark in a competitive environment.
2. Analyze the process of copyright and procedure.
3. Understand the process of patent and patent issues.
4. Explore the trade secret and geographical indications of its protection from unfair practices.

Unit I:

Introduction to IPR:

Concept of intellectual property rights, importance of intellectual property rights. Types of intellectual property, international agencies, and treaties.

Unit II:

Trademarks:

Concept of trademarks, purpose, and function of trademarks. Acquisition of trademark rights, protectable matter, selecting and evaluating trademark, trademark registration processes.

Unit III:

Law of copyrights:

Concept of copyright right, fundamentals of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration.

Unit IV:

Law of patents:

Introduction to patent, foundation of patent law, patent searching process, ownership rights and transfer.

Unit V:

Trade Secrets & Geographical Indication:

Law pertaining to trade secrets, determination of trade secrets. Trade secret litigation. Unfair competitions. Geographical Indication, concept of geographical indication, importance of geographical indication, new development of intellectual property rights.

Textbooks:

1. Deborah. E. Bouchoux,Intellectual property right, 5/e,2018,cengage learning.
2. Neeraj Pandey, Intellectual property right, PHI, 2019.

Reference Books:

1. Ramakrishna Chintakunta and M. Geethavani, Kindle e 2021
2. Prabuddha Ganguli,Intellectual Property Right:Unleashing the Knowledge Economy, 2/e, 2017 Tata Mc Graw Hill Publishing company Ltd.

The Power of Data Storytelling

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Introduction:

This course will cover the fundamentals of effective data-driven storytelling. Story telling can put a human perspective on the increasingly complex and rapidly changing world of the digital era. Students will learn how to interpret and analyse the data and will learn to articulate the stories with data sets and communicate data findings in visual, oral, and written contexts.

Course Objectives:

1. Develop the skills necessary to be effective data storytellers.
2. Locate relevant datasets, extract insights from that data and present their findings in myriad formats.
3. Learn how to interpret data and to present it in different formatsto different audiences.

Course Outcomes:

1. Identify the stories within datasets and extract insights from that data.
2. Explain the importance of communication skills and competencies for individuals who serve as data storytellers.
3. Act as a data-driven visual storyteller for optimal presentation of trends, patterns, and insights.
4. make effective client presentations of their work using infographic visualizations.
5. learn tools and concepts which can be put to immediate use to transform data into stories.

Unit I:

Introduction

We are all storytellers- Stories Bring Data to Life- The Essence of Data Storytelling

Unit II:

Dynamics of Data Storytelling

Getting to the Core- Planning is Everything- The Quick Fix- Application of Story elements

Unit III:

Crafting the Data Story

The Psychology of Storytelling- The narrative Techniques - Making Good stories Great! – Writer to Storyteller

Unit IV:

Data Visualization

Use Visuals to Advantage: Data Presentation Skills- Infographics Visualizations

Unit V:

Anatomy of Data Story

Rudiments of Grammar - Parts of Speech - Concord Rules - Academic and Technical Vocabulary - Data Interpretation - Case Studies

Textbook:

1.Vora , Sejal (2019).*The Power of Data Storytelling*, Sage Publications India pvt Ltd.

Reference books:

1. Dykes, Brent (2020). *Effective Data Storytelling*: New Jersey, Wiley.
2. Knaflic, Cole Nussbaumer (2015).*Storytelling with Data: A Data Visualization Guide for Business Professionals,*https://www.amazon.com/Storytelling-Data-Visualization-Business-Professionals/dp/1119002257/
3. Morrow, Jordon (2021), *Be Data Literate- The Data Literacy Skills Everyone Needs to Succeed*, UK: Kogan Page Ltd.
4. Taylor, Scott (2021). *Telling your Data Story: Data storytelling for Time Management*, New Jersey: Technics Publications LLC.
5. https://www.amazon.com/Tableau-Your-Data-Analysis-Software/dp/1119001196/

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Quantitative Aptitude and Reasoning

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	Category	Hours / Week			Credits	Marks		
	ESC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

UNIT I

Number System: Speed Math's, Numbers, Factors, Prime and co primes, LCM & HCF, Divisibility rules, Finding the unit digit and applications, remainder theory.

Ratio and Proportion with Ages: Definition of ratio and Proportion, Finding the resultant ratio. Problems based on Ratios and ages.

Percentages: Introduction to percentages, Percentage Increase /Decrease, Results on Population, Results on Depreciation, Variations, Applications of Percentage.

Profit and Loss: Classification of Profit and Loss, Profit/ Loss Percentages, Successive Discount.

UNIT II

Time and Distance: Difference between the average, Relative and Effective speed, reaching the destination late and early, stoppage time per hour, problems based on Trains and problems based on Boats.

Time and Work: Calculating Efficiency, alternate days concept, work and wages, Chain rule, problems based on Pipes and cisterns.

Simple and Compound Interest: Simple interest, Principle, Rate, Amount, Applications of Simple interest, Compound interest, compounded annually, Compounded Half yearly, Compounded Quarterly, Difference between simple and compound interest.

UNIT III

Permutations and Combinations: Fundamental rules, Problems on Permutations and Combinations.

Probability: Definition, Notations and Problems based on Probability.

Mean, Median and Mode: Introduction and problems on Mean, Median and Mode.

Partnership: Relation between Partners, Period of Investments and Shares.

Averages: Average of different groups, change in average by adding, deleting and replacement of objects

Flow Charts: Introduction of symbols and problems on flow charts.

UNIT IV

Seating Arrangement: Circular, Row, Column, Square and Double row arrangement

Puzzles: Paragraph puzzles, incomplete puzzles and problems on them.

Number Series: Number, Alphabet and Letter Series.

Analogy: Simple, Double, Word and Number Analogy

Coding and Decoding: Classifications and Problems on Coding and Decoding.

UNIT V

Clocks: Relation between minute and hour hand, angle between hands of a clock, exceptional cases in clocks. Gaining and loosing of time.

Calendars: Classification of years, finding the day of any random calendar date, repetition of calendar years.

Direction Sense Test: Sort of directions in puzzle, distance between two points, Problems on shadows.

Blood Relations: Defining the various relations among the members of a family, solving blood relation puzzles by using symbols and notations. Problems on coded relations.

Text Books

1. R.S Agarwal, Verbal and Non-Verbal Reasoning, New Edition, S. Chand.
2. R.S Agarwal, Quantitative Aptitude, New Edition, S. Chand.

Reference Book

1. Abhijeet Guha, Quantitative Aptitude, New Edition, Mc Graw Hill.

WEB TECHNOLOGIES LAB

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Objectives:

1. Client server architecture and able to develop static web application
2. Client-side data validation using java script
3. To create dynamic web application using server side technologies
4. To create fully functional web application with MVC architecture.

Course Outcomes:

Student will be able to:

1. Design static web pages and provide client side authentication.
2. Develop new tag sets using XML mechanism.
3. Understand database connectivity and retrieving data using client/server database.
4. Design dynamic web pages and develop web applications using MVC architecture.

Week-1:

Design the following static web pages required for an online book store web site.

1) HOME PAGE:

2) LOGIN PAGE:

Week -2:

Design the student REGISTRATION PAGE:

Week- 3:

Apply internal and external CSS (Cascading Style Sheets) for week1&2 pages.

Week -4:

VALIDATION:

Write JavaScript to validate the following fields of the above registration page.

Week -5:

Design the catalogue page.

Week -6:

Write an XML file which will display the Book information which includes the following: Write a Document Type Definition (DTD) to validate the above XML file.

Week -7:

Develop week(1-5) using bootstrap

Week -8:

Write a program to display the HELLO WORLD message using servlet.

Week -10:

Write a program to create cookies and retrieval using servlet.

Week -11:

Write a program to display the HELLO WORLD message using JSP

Week -12:

Convert all above static web pages into the JSP pages.

Week -13:

Using registration form. Authenticate the user when he submits the login form using the user name and password from the database

Week -14

Create tables in the database which contain the details of items (books in our case like Book name , Price, Quantity, Amount)) of each category. Modify your catalogue page (week 4)in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using JDBC.

Week -15

Implement week -10 in MVC architecture.

OPERATING SYSTEM AND COMPUTER NETWORKS LAB

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Objectives:

1. Analyze system calls that can offer operating system services
2. Demonstrate various operating system concepts
3. Understand and apply concepts of process synchronization
4. Understand the concept of Dead lock and its avoidance
5. Analyzing page replacement algorithms

Course Outcomes:

1. Understand system calls behavior and implement that can offer operating system services
2. Implement CPU scheduling algorithms multithreading
3. Implement the producer and consumer problem
4. Implement the dead lock avoidance using banker's algorithm
5. Implement page replacement algorithms

PART -A

1. Write a programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
2. Write a program to implement multithreading?
3. Give the list of processes, their CPU burst times and arrival times, display or print the Gantt chart for FCFS and SJF. For each of the scheduling policy compute and print the average waiting time and average turnaround time
4. Give the list of processes, their CPU burst times and arrival times, display or print the Gantt chart for Priority and Round Rabin. For each of the scheduling policy compute and print the average waiting time and average turnaround time.
5. Implement producer consumer problem using semaphore?
6. Write a program to implement Banker's algorithm for deadlock avoidance?
7. Write a program to implement page replacement algorithms (FCFS, Optimal, LRU)

PART - B

Course Objectives :

1. Understand data link layer framing methods.
2. Know about the various error detection methods.
3. Explore the knowledge of various routing algorithms.
4. Understand Traffic Analysis and Statistics in network.

Course Outcomes

1. Implement data link layer farming methods
2. Analyze error detection method
3. Analyze routing and congestion issues in network
4. Apply Traffic Analysis and Statistics in network

Programs:

1. Implement the data link layer framing method Bit stuffing.
2. Implement the data link layer framing method Character Stuffing.
3. Write a program to compute CRC 16.
4. Implement Dijkstra‘s algorithm to compute the Shortest path thru a graph.
5. Installation of Wireshark
6. Simulate Packet Capture Using Wire shark
7. Implement Viewing Captured Traffic Using Wire shark
8. Simulate Statistics & Filters Using Wire shark

NATIONAL SPORTS ORGANIZATION (NSO) / NATIONAL SERVICE SCHEME (NSS)

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	Category	Hours / Week			Credits	Marks		
	MC	L	T	P	C	CIE	SEE	Total
		0	0	2	0	50		50

UNIT-I

Health and Wellness

Dimensions of Health: Physical, Mental and Social. Objectives of Health Education. Definition and Dimensions of Wellness – Physical, Emotional, Social, Spiritual, Intellectual and Environmental Wellness. Achieving Wellness.

Practical: Basketball, Cricket, Kho-Kho (Any Two) & Badminton (Mandatory)

Layout of Courts / Fields, Skills, Rules & Lead-up Games.

UNIT-II

Fitness and Body Composition

Physical Fitness Components: Body Composition, Muscular Endurance, Strength, Cardiovascular Fitness and Flexibility, Importance of Cardio-Respiratory Endurance. Obesity and Health Risk Factors. Body Composition Indicators and Measurements.

Practical: Football, Kabaddi, Volleyball (Any Two) & Table Tennis (Mandatory)

Layout of Courts / Fields, Skills, Rules & Lead-up Games.

UNIT-III

Introduction and Basic Concepts of NSS: History, Philosophy, Aims & Objectives of NSS. Emblem, Flag, Motto, Song, Badge, Organizational Structure, Roles and Responsibilities of Various NSS functionaries. NSS Programmes and Activities, Volunteerism and Shramdan.

UNIT-IV

Personality Development Through Community Service: Importance and Role of Youth Leadership, Life Competencies, Social Harmony and National Integration, Youth Development Programmes in India, Citizenship, Health, Hygiene and Sanitation, Environment Issues, Disaster Management, Life Skills.

UNIT-V

Vocational And Entrepreneurship Skills Development: Definition and meaning of Entrepreneurship, Qualities of good entrepreneur, Steps /ways in operating an Enterprise and role of financial and support service Institutions. Project Cycle Management, Resource Mobilisation and Documentation and Reporting.

Project work/ Practical: Conducting Surveys on Special Theme, Involving in Shramadan, Swachh Bharat, Blood Donation, Tree Plantation, Awareness Programmes, Identify the Community Problems and List out the all Possible Solutions, Educate the Villagers on Health, Hygiene, Sanitation and Environment Protection. Self-Review of the Students on their Improvements by Participating in the Community Service Programmes.

References

9. Rajiv Parti, The Soul of Wellness: 12 holistic principles for achieving a healthy body, mind, heart and spirit, Select book incorporation, New York.
10. H. & Walter, H., (1976). *Turners School Health Education*. Saint Louis: The C.Y. Mosby Company.
11. Nemir, A. (n.d.). *The School Health Education*. New York: Harber and Brothers.
12. Edward T Howley, *Health Fitness Instructors Handbook*, Human Kinetics, USA.
13. **About NSS:** National Service Scheme Manual by Government of India Ministry of Youth Affairs & Sports, New Delhi.
14. Robert N Lussier, *Management Fundamentals - Concepts, Applications, Skill Development*, Cengage Leaning, First Edition, 2012.
15. Mroczex & Little, *Handbook of Personality Development* –(eds).2006.
16. Richard Blundel, *Exploring Entrepreneurship Practices and Perspectives*, Oxford, 2011.

DATA VISUALIZATION

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites:

Programming knowledge

Course Objectives:

1. To provide an overview and best practices of data visualization
2. To introduce the data types, relationships, and visualization formats.
3. To provide the basic principles for data visualization.
4. To introduce the storytelling for effective data presentation.
5. To introduce a trends in market research and data visualization dashboards,

Course Outcomes:

At the conclusion of the course, students should be able to:

1. Identify the skill sets needed for best practices of data visualization.
2. Explain the significance of data types, relationships and visualization formats in data visualization.
3. Identify principles of data visualization.
4. Apply the storytelling for effective data presentation
5. Evaluate a trends in business using data visualization dashboards.

UNIT I:

Introduction: What is data visualization? History, The data visualization process, Why is data visualization so important in reports and statements? Explaining, Exploring, Analyzing.

UNIT II:

Data types: Quantitative, Qualitative, relationships: Ranking, Deviation, Nominal comparisons, Correlation, Partial and total relationships, Series over time, Distribution. Visualization formats: Bar chart, Histograms, Pie charts, Scatter plots, Heat maps, Line charts, Bubble charts, Radar charts, Waterfall charts, Tree maps, Area charts

UNIT III:

Basic principles for data visualization, Graphics with an objective: seeking your mantra,

Layout and design: communicative elements, Prioritize patterns in your visualizations: Gestalt

UNIT IV:

Storytelling for social and market communication, Data storytelling, A basic recipe for storytelling in your presentations and final reports, Trends in market research and data visualization dashboards, Scrollytelling.

UNIT V:

Application of Data Visualization, Visualizing data tools: HTML5 CANVAS: Linear interpolations, A Simple Column Chart, Animations, Google Charts API Basics, D3.js, and Dashboard using Tableau, Future of data visualization.

Text Books:

1. Chun-houh Chen, Wolfgang Härdle, Antony Unwin, "Handbook of Data Visualization", Springer, 2008.
2. Pérez, J. and Vialcanet, G., Visualize It: A Comprehensive Guide to Data Visualization, 2013.

Reference Books:

1. E. Tufte, “The Visual Display of Quantitative Information”, Second Edition, Graphics Press, 2007.
2. Ward, Grinstein Keim, “Interactive Data Visualization: Foundations, Techniques, and
3. Applications”, Natick: A K Peters, Ltd.
4. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.
5. A Julie Steele and Noah Iliinsky, “Designing Data Visualizations: Representing Informational Relationships”, O’Relly.
6. Andy Kirk, Data Visualization: A Successful Design Process, PAKT.
7. Scott Murray, “Interactive Data Visualization for Web”, O’Relly.
8. Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.

Web references:

1. Visualization through Tableau http://www.tableausoftware.com/public
2. Gap Minder and Google Motion Charts (www.gapminder.org).

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PREDICTIVE ANALYTICS USING R PROGRAMMING

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

1. Use R for statistical programming, computation, and graphics.
2. Write User defined functions and use R in an efficient way,
3. Fit some basic types of statistical models
4. Use R in their own research,

Course Outcomes:

At the end of this course students will be able to:

1. Understand the basics in R programming in terms of vector, matrix and List (L1)
2. Apply various operations on data frames. (L4)
3. Use the apply family of functions to iterate functions across data for real world problems. (L6)
4. Import, Explore data-sets to create testable hypotheses and identify appropriate statistical tests (L6)
5. Able to apply R programming for predictive analysis Formulate linear and multiple regression models using R
6. Understand the fundamentals of Predictive Analytics in R.

UNIT I:

Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types, Vectors**:** Creating and Naming Vectors, Vector Arithmetic, Vector Sub setting, R operators

Matrices: Creating and Naming Matrices, Matrix Sub setting, Arrays,

Lists: Introduction, Creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors,

UNIT II:

Factors and Data Frames : Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, Subsetting of Data Frames, Extending Data Frames, Sorting Data Frames,

Conditionals and Control Flow: Conditional Statements.

Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List.

UNIT III:

Functions in R: Introduction, Writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R, Input and Output Operations.

Apply Family in R : Introduction, Using Apply in R, Using Lapply in R, Using Sapply, Using Tapply in R: Split Function, Using Mapply in R.

UNIT IV:

Charts and Graphs : Introduction, Pie Chart: Chart Legend, 3D Pie Chart, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.

Data Interfaces: Introduction, CSV Files: Syntax, Importing a CSV File, Excel Files: Syntax, Importing an Excel file, Binary Files: Syntax, XML Files, Web Data, Databases.

UNIT V:

I**ntroduction to Predictive modeling and Predictive modeling Techniques:** What is predictive modeling, importance of predictive modeling, applications of Predictive Modeling, Hypothesis Testing, Analysis of Variance (One way ANOVA, Two way ANOVA),T-Test, Linear regression in R, Logistic Regression in R ,Clustering with R.

Text Books:

1. K G Srinivas ,G M Siddesh "Statistical programming in R", Oxford Publications.

Reference Books:

1. K Beginning R: The Statistical Programming Language,Mark Gardener, Wrox.
2. Norman Matloff , "The Art of R Programming: A Tour of Statistical Software Design", NoStarch Press, 2011.
3. Y. Anchang Zhao ,R and Data Mining: Examples and Case Studies . Elsevier in December 2012.
4. Avril Coghlan ,A Little Book of R For Time Series, Release 0.2.

MOBILE APPLICATION DEVELOPMENT

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Course Objectives:

1. Outline the usage of Android development framework.
2. Understand the main components of an Android application and its entire life Cycle.
3. Develop database programming using SQLite.
4. Identify the use of location-based service in android applications.
5. Build SMS and MMS applications using Intents.

Course Outcomes:

At the end of this Mobile Application Development course, students will be able to:
1. Analyze the architecture of android and current trends in mobile operating systems.
2. Apply suitable software tools and APIs for the design of User Interfaces to a particular mobile application.
3. Design applications for mobile devices using SQLite Database.
4. Apply the location-based services in android applications.
5. Summarize the Monitoring changes to the phone, network, data connectivity and SIM states.

UNIT I:

Introduction to Android, Features of Android, The development framework**:** Understanding the Android Software Stack, Android Application Architecture; the Dalvik Virtual Machine, Creating First Android Application, Types of Android Applications, Android Development Tools: The Android Virtual Device Manager, Android Emulator, The Dalvik Debug Monitor Service.

UNIT II:

Creating applications and Activities: Introduction to the application Manifest File, Using the Manifest Editor, Externalizing Resources: Creating Resources - Simple Values, Drawables, Layouts, Menus, Animations.The Android Activity Life cycle. **Building User Interfaces:** Fundamental Android UI design, Introducing Layouts:

Defining Layouts, Using Layouts to Create Device Independent User Interfaces, Optimizing Layouts.

UNIT III:

Databases and Content Providers: Introduction to Android Databases, Introducing SQLite, Content Values and Cursors, working with SQLite Databases - Introducing the SQLiteOpenHelper, querying a Database, Extracting Values from a Cursor, Adding, Updating, and Removing Rows, Creating Content Providers, Using Content Providers - Introducing the Content Resolver, Querying Content Providers, Adding, Deleting, and Updating Content

UNIT IV:

Maps and Location based services: Using the location-based services, selecting a Location Provider, selecting a Location provider, finding current location; **Creating Map-Based Activities**: Introducing Map View and Map Activity, Creating a Map-Based Activity, Maps and Fragments

UNIT V:

Telephony and SMS: Using telephony - Initiating Phone Calls, Accessing Telephony Properties and Phone State, Monitoring Changes in Phone State Using the Phone State Listener, Introducing SMS and MMS - Using SMS and MMS in Your Application, Sending SMS and MMS from Your Application Using Intents, Sending SMS Messages Using the SMS Manager.

Text Book:

1. Reto Meier, Professional Android 4 Application Development, 1st Edition, Wrox Press, Wiley Publishing, 2014.

Reference Books:

1. Pradeep Kothari, Android Application Development (with Kitkat Support), Black Book, 2014, Dreamtech Press publisher, Kogent Learning Inc., 2014
2. Erik Hellman, Android Programming: Pushing the Limits, 1st Edition, Wiley Publications, 2014.
3. Mike Wolfson, Android Developer Tools Essentials, O'Reilly Edition, 1st Edition, 2013.

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INTERNET OF THINGS

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Pre-requisites:

Computer Networks, Python Programming

Course Objectives:

1. Differentiate Physical and Logical Design of IoT
2. Categorize pin configuration of Arduino Uno Board
3. Demonstrate Code in Node-RED
4. Identify communication between M2M
5. Develop an IoT Applications using Raspberry Pi board

Course Outcomes:

At the end of the course student will be able to:

1. Identify physical and logical design of IoT
2. Understand Arduino Uno Board
3. Implement code in Node-RED
4. Develop an IoT Application using Arduino Uno board
5. Develop an IoT Applications using Raspberry Pi board

UNIT - I

Introduction to IoT: Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs. (T1, Chapter 1)

Domain specific applications of IoT: Home automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and lifestyle. (T1, Chapter 2)

UNIT – II

Arduino Basics: Hardware Requirements, Software Requirements, Arduino Programming Lanugage References. (T2, Chapter 1)

Internet Connectivity: Arduino Uno Wired Connectivity(Ethrnet), Arduino Uno Wireless Connectivity(Wifi) (T2, Chapter 2)

UNIT - III

Communication Protocols: HTTP, MQTT (T2, Chapter 3)

Complex Flows: Node-RED: Hardware and Software Required, Circuit, Node-RED Flow, code (Arduino) (T2, Chapter 4)

UNIT - IV

Prototypes

IoT Patterns: Real-time Clients, Remote Control, On-Demand Clients, Web Apps, Location Aware, Machine to Human, Machine to Machine. (T2, Chapter 5-11)

UNIT - V

Using IOT for RFID and MQTT and the Raspberry Pi: Introduction to Raspberry Pi, RFID Technology, IoTRFID Hardware and Software, Building an MQTT Server on a Raspberry Pi, the Software on the Raspberry Pi, Building the IOTRFID Project (T3, Chapter 6)

TEXT BOOKS:

1. Arshdeep Bahga and Vijay Madisetti, Internet of Things - A Hands-on Approach, Universities Press, 2015
2. Adeel Javed, Building Arduino Projects for the Internet of Things Experiments with Real-World Applications, Apress, 2016
3. John C. Shovic , Raspberry Pi IoT Projects, Prototyping Experiments for Makers, Apress, 2016

REFERENCE BOOKS:

1. Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, (CRC Press)
2. Matt Richardson & Shawn Wallace, Getting Started with Raspberry Pi, O’Reilly (SPD), 2014
3. R.K.Mittal and I J Nagrath, Robotics and Control, TMH, 2003

FUNDAMENTALS OF DIGITAL IMAGE PROCESSING

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science		
Category	**Hours / Week**			**Credits**	**Marks**		
PEC-I	L	T	P	C	CIE	SEE	Total
	2	0	0	2	40	60	100

Pre requisite:

Basic Mathematics

Course Objectives:

1. Comprehend fundamental aspects of digital image processing
2. Understand the image noise models and enhancement methods
3. Evaluate the image segmentation methodologies
4. Understand the colour image processing techniques
5. Understand image morphological operations

Course Outcomes

At the end of the course the students will be able to:

1. Understand the fundamental concepts of digital image processing system
2. Analyze the image noise models and enhancement techniques
3. Comprehend the different image segmentation and restoration methodologies.
4. Analyze the concepts of colour image processing.
5. Apply morphological operations on binary images.

UNIT-I

Introduction: Definition, Pixel, Digital image representation, Types of images, Fundamental steps in image processing, image processing applications. Digital image processing operations – Basic relationships and distance metrics, Classification of image processing operations- Arithmetic operations, Logical operations.

UNIT – II

Image Enhancement and Restoration – Image quality and Need for image enhancement, image enhancement point operations, Histogram based techniques.

Categories of Image Degradations- Image Restoration in the presence of noise only-Mean filters, order statistics filters.

UNIT-III

Image Segmentation: Introduction, classification of image segmentation algorithms, detection of discontinuities, edge detection- stages in edge detection, types of edge detectors, First-order edge detection operators, second-order derivatives filters, edge operator performance, edge linking algorithms, principle of thresholding.

UNIT –IV

Colour image processing: introduction, devices of colour imaging, colour image storage and processing, colour models-RGB Colour Model, HSI Colour Models, HSV Colour Model, Colour Quantization, Image filters for colour images.

UNIT –V

Image Morphology: Need for morphological processing Morphological operators: Erosion, Dilation, Opening & Closing, Hit-or-Miss transform, Basic morphological algorithms, Gray-scale morphology

Text Books

1. S. Sridhar, Digital Image Processing, Oxford University Press, 2nd edition 2016.
2. D. Forsyth and J. Ponce, Computer Vision: A Modern Approach, Prentice Hall, 2nd Edition, 2015.
3. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer, 2011.
4. Gonzalez R.C., Woods R.E, Digital image processing, Pearson, Prentice-Hall of India Pvt.Ltd. New Delhi, 3rd Edition, 2018
5. Jan Erik Solem, Programming Computer Vision with Python, O'Reilly ,1st Edition, 2012

References

1. Milan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing, Analysis and Machine Vision, 4th Edition, Cengage Learning, 2013
2. Fundamentals of Digital Image Processing, by Anil K. Jain, Prentice- Hall of India Pvt. Ltd,NewDelhi,2002
3. Prince, Simon JD. Computer Vision: Models, Learning and Inference, Cambridge UniversityPress,1stEdition,2012.

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OBJECT ORIENTED MODELING

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Prerequisites:

Any Programming Language

Course Objectives:

1. Introduce the basic concepts of UML.
2. Understand modelling of a real-word application by UML class diagram.
3. Describe the process of Interaction Diagrams.
4. Identify the importance of events, signal and state machines.
5. Demonstrate the component and deployment diagrams.

Course Outcomes:

Students will be able to:

1. Understand the concepts and principles of object-oriented programming in UML.
2. Compare the purposes, major components and key mechanisms of Class and Object Diagram.
3. Design the sequence and Collaboration Diagram for applications.
4. Construct the Start chart diagram for real world applications
5. Analyze the techniques for Component and Deployment Diagrams.

UNIT – I:

Introduction to UML: Importance of modeling, principles of modeling, object oriented Modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.
Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams.

UNIT – II:

Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages, Common modelling techniques.
Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams, Common modelling techniques.

UNIT – III:

Basic Behavioral Modeling-I: Interactions, Interaction diagrams
Basic Behavioral Modeling-II: Use cases, Use case Diagrams, Activity Diagrams

UNIT – IV:

Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams

UNIT-V

Architectural Modeling: Components, Deployment, Component diagrams and Deployment diagrams

Text Book:

1. Grady Booch, James Rumbaugh, Ivar Jacobson, *The Unified Modeling Language User Guide*, 7th Impression, Pearson Education, 2008.

Reference Books:

1. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, *UML2 Toolkit,* 2nd Edition, WILEY-Dreamtech India Pvt. Ltd., 2012.
2. Meilir Page-Jones, Fundamentals of Object Oriented Design in UML, Illustrated Edition, Pearson Education, 2000.
3. Pascal Roques, Modeling Software Systems Using UML2, 1st edition, WILEY-Dreamtech India Pvt. Ltd., 2011.
4. Atul Kahate, Object Oriented Analysis & Design, 1st Edition, The McGraw-Hill Companies, 2007.
5. Mark Priestley, Practical Object-Oriented Design with UML, 2nd Edition, TATA McGrawHill, 2005.

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SOFTWARE ENGINEERING

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science		
Category	**Hours / Week**			**Credits**	**Marks**		
PEC-II	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Prerequisites:

Any programming language

Course objectives

1. Understand the framework activities for a given project.
2. Choose a process model for given project requirements.
3. Design various system models for a given scenario.
4. Design various testing techniques.
5. Understand metrics for Products.

Course Outcomes:

1. Outline the framework activities for a given project.
2. Apply Right process model for a given project.
3. Design various system models for a given Context.
4. Apply various testing techniques for a given project.
5. Identify various risks in project development.

UNIT -I:

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Software myths. A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI),

Process models: The waterfall model, Incremental process models, Evolutionary process model.

[TB-1,Ch-1,2,3]

UNIT -II:

Agile process Model: Agile principles, Extreme programming, Dynamic System Development Methods, Feature Driven Development, Scrum framework, Sprint, Scrum master, Roles of Scrum Master, Implementing Scrum - A case study. [TB-1,Ch-4]

Software Requirements: Functional and non-functional requirements, the software requirements document. Requirements engineering process: Feasibility studies,

Requirements elicitation and analysis, Requirements validation, Requirements management. [TB-2,Ch-6,7]

UNIT -III:

System models: Context Models, Behavioral models, Data models, Object models, structured methods. [TB-2,Ch-8]

Design Engineering: Design process and Design quality, Design concepts, the design model.Modeling component level design: design class based components, conducting component level design. Performing User interface design: Golden rules. [TB-1,Ch-9,11]

UNIT -IV:

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing.

Product metrics : Software Quality, Metrics for Analysis Model- function based metrics, Metrics for Design Model-object oriented metrics, class oriented metrics, component design metrics, Metrics for source code, Metrics for maintenance. [TB-1,Ch-13,14,15]

UNIT -V:

Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

Quality Management: Quality concepts, Metrics for Software Quality, Software Reviews, Formal Technical Reviews, Software Reliability, The ISO 9000 quality standards. [TB-1,Ch-25,26]

Text Books:

1. Roger S. Pressman, Software Engineering - A practitioner‘s Approach, 6th edition. McGraw Hill International Edition, 2005.
2. Somerville, Software Engineering, 7th edition, Pearson education, 2009.

Reference Books:

1. K.K. Agarwal & Yogesh Singh, Software Engineering, New Age International Publishers,3rd edition, 2008
2. Pankaj Jalote, An Integrated Approach to Software Engineering, Narosa Publishing House, 3rd edition 2005.
3. James F. Peters, Witold Pedrycz, Software Engineering - an Engineering approach, JohnWiely, 2007.
4. Waman S Jawadekar, Software Engineering Principles and Practice, The McGraw-Hill Companies, 2013.
5. https://nptel.ac.in/courses/106/105/106105182/
6. https://ff.tu-sofia.bg/~bogi/knigi/SE/Mcgraw%20Hill%20-%20Software%20Engineering%20-%20A%20Practitioner%27s%20Approach%20-%20Pressman%20(5Th%20Ed,2001,Bookmarked,Cover).pdf

LANGUAGE PROCESSORS

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science		
Category	**Hours / Week**			**Credits**	**Marks**		
PEC-II	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Pre-requisites:

Formal Languages and Automata Theory, Computer Organization

Course Objectives :

1. Describe the fundamental principles in compiler design.
2. Discuss CFG's and parsing techniques.
3. Predict the performance of different parsers.
4. Summarize the role of runtime environments and memory organization for implementation of typical programming languages.
5. Predict various techniques for code optimization and code generation.

Course Outcomes:

Student will be able to:

1. Analyze the phases of a typical compiler, including the front- and backend.(L3)
2. Apply the role of a parser in a compiler and relate the yield of a parse tree to a grammar derivation.(L3)
3. Design and implement a parser using a typical parser generator.(L6)
4. Implement an intermediate code generator based on given code patterns.(L3)
5. Apply the optimization techniques to have a better code for code generation.(L3)

UNIT I:

Introduction to Compilers: Structure of Compiler-Phases of Compiler, Symbol Table Management, Grouping of Phases into Passes, Compiler Vs Interpreter.

Lexical Analysis: Role and need of Lexical Analyzer, Input Buffering, Regular expressions for identifiers, Signed numbers etc.., A Language for specifying Lexical Analyzer, Lexical phase errors.

UNIT II:

Syntactic Specification: Context Free Grammars, Derivations and Parse Trees, Capabilities of Context Free Grammars, Syntactic Phase errors, Semantic errors.

Basic Parsing Techniques: Parsers, Shift-Reduce Parsing, Operator-Precedence parsing, Top-Down parsing, Predictive parsers.

UNIT III:

Construction of efficient Parsers: LR Parsers, Canonical collection of LR(0) items, Constructing SLR parsing tables, Constructing LR parsing tables, Constructing LALR parsing tables, using Ambiguous grammar, Comparison of SLR,LALR and CALR parsers, Comparison of Top down and Bottom up parsers.

UNIT IV:

Syntax Directed Translation: Syntax Directed Translation schemes, Intermediate codes, Postfix notation, Three Address code, Quadruples and triples.

Symbol table: Contents of Symbol table, Data Structures for symbol tables, representing scope information.

Run-Time Environments: Storage Organization, Stack allocation of space, Access to non data.

UNIT V:

Code Optimization: Principal sources of optimization, Loop optimization, Copy Propagation, Dead code elimination, Redundant sub expression elimination.

Code Generation: Object programs, problems in Code generation, A Machine Model, A Simple Code generator, Register allocation and assignment, Peephole optimization.

Text Book:

1. Alfred V Aho, Jeffrey D Ullman, Principles of Compiler Design, Pearson Education, 2001.

Reference Books:

1. J P Trembly and P G Sorenson, The Theory and practice of Compiler Writing, Mc Graw Hill, 2005.
2. Alfred V Aho, Ravi sethi ,Jeffrey D Ullman, Compilers-Principles , Techniques and Tools , Pearson Education, second edition.
3. Dick Grone, Henri E Bal, Ceriel J H Jacobs, Modern Compiler Design, Wiley Dreamtech, 2006.

INFORMATION STORAGE AND RETRIEVAL

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science		
Category	**Hours / Week**			**Credits**	**Marks**		
PEC-II	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Prerequisites:

Database management system

Course Objectives:

1. This course studies the basic principles and practical algorithms used for information retrieval and text mining
2. To understand the functions of Information retrieval
3. To provide exploration of information retrieval systems' evaluation tools
4. To provide hands-on experience in evaluating search engines to solve computational search problems.
5. To understand the complexity of Information Retrieval Systems.

Course Outcomes:

Student will be able to:

1. Acquire the knowledge of information retrieval system and its capabilities
2. Comprehend the knowledge of indexing and Data structure that can used for storing the data
3. Know the concept of indexing and clustering of the information
4. Understand the searching techniques and visualization
5. Have a handle on algorithms for text searching and multimedia retrieval

UNIT -1

Introduction to Information Retrieval Systems: Definition, Objectives, functional overview, Relation to Database Management system.
IRS capabilities: Search capabilities, Browse Capabilities, Miscellaneous Capabilities

UNIT –II

Cataloging and Indexing: History of objectives of Indexing, indexing process, automatic indexing
Data Structure: Introduction to Data structure, Stemming Algorithms, Invert file system, N-Gram Data structure, PAT data structure, Hypertext and XML data structure

UNIT- III

Automatic Indexing: Classes of Automatic indexing, Statistical indexing, Natural language, concept Indexing, Hypertext Linkage.
Document and Term Clustering: Introduction to clustering, Thesaurus Generation, Manual clustering, Automatic term clustering

UNIT –IV

User Search Techniques: Searching statement and binding, Similarity Measurement and Ranking, Relevance Feedback, Selective dissemination of information search, weighted searches of Boolean system.
Information Visualization: introduction to information visualization, Cognition and perception

UNIT –V

Text Search Algorithms: Introduction to Text search techniques, Software text search algorithms, hardware text search system
Multimedia information retrieval: Spoken language audio retrieval, Non- speech audio retrieval, Graph Retrieval, Imagery retrieval, video retrieval

Text Book:

1. Gerald J.Kowalski, Mark T. Maybury,Information storage and retrieval systems, theory and implementation, 2nd Edition, Springer publications.

Reference Books:

1. Christopher D. Manning and Prabhakar, Raghavan, Introduction to information Retrieval, Cambridge University Press, 2008.
2. Ricardo baeza-Yates, Modern information retrieval, Pearson Education, 2007.
3. Robert Korthage, Information storage and Retrieval, John wiley& sons.

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PRINCIPLES OF DISTRIBUTED SYSTEM

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science		
Category	**Hours / Week**			**Credits**	**Marks**		
PEC-II	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Pre-Requisite:

Operating Systems, Computer Networks

Course Objectives:

1. Outline various models for processing and communication in distributed systems
2. Examine the file characteristics and Naming services
3. Explores the concept of clocks and distributed algorithms
4. Describes about transactions and their properties in distributed systems
5. To design and implement sample distributed systems.

Course Outcomes:

After completion of the course the students will be able to:

1. Identify the models for distributed processing and communication
2. Apply the knowledge in naming synchronization, consistency and replication
3. Predict the advantages and challenges in designing distributed Algorithms
4. Analyse distributed transactions and transaction recovery
5. Design Distributed Systems

UNIT I:

Characterization of Distributed Systems: Introduction, Examples of Distributed systems, Resource sharing and web, challenges, Architectural model: Client Server model, Proxy Servers and Caches, Peer process model ,Fundamental model :Interaction model, Security model ,Failure model.

UNIT II:

Distributed file system: Characteristics of file systems, Distributed file system requirements, File service architecture. **Name Services:** Name space ,Name resolution , Domain Name System ,DNS name servers ,Directory services, discovery services in Jini

UNIT III:

Time and Global States: Clocks, events and Process states, Synchronizing physical clocks , logical clocks, distributed debugging. Coordination and Agreement: Introduction, Distributed mutual exclusion, Elections, Multicast communication.

UNIT IV:

Transactions and Concurrency control: Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering. **Distributed Transactions**: Flat and Nested Distributed

Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT V:

Replication : System model , group communication ,Fault tolerant services ,Passive(primary-backup) replication,Active replication,Transactions with replicated data.**Designing Distributed Systems:Google Case Study** :Introducing the case study Google, physical model ,overall architecture and design philosophy ,Data storage and coordination services , Google file system, Chubby, BigTable ,Distributed computation services.

Text Books:

1. G Coulouris, J Dollimore, T Kindberg, Distributed Systems Concepts and Design, fifth Edition, Pearson Education.

Reference Books:

1. S.Mahajan and S.Shah, Distributed Computing, Oxford University Press.
2. PradeepK.Sinha, Distributed Operating Systems Concepts and Design, PHI.
3. M Singhal, N G Shivarathri, Advanced Concepts in Operating Systems, Tata McGraw-Hill Edition.
4. K.P.Birman, Reliable Distributed Systems, Springer.
5. A.S. Tanenbaum and M.V. Steen, Distributed Systems: Principles and Paradigms, Pearson Education.
6. R.Chow, T.Johnson, Distributed Operating Systems and Algorithm Analysis, Pearson.
7. A.S.Tanenbaum, Distributed Operating Systems, Pearson Education.

Web Resources:

https://www.cs.usfca.edu/~srollins/courses/cs682-s08/web/notes/models.html

ENTREPRENEURSHIP DEVELOPMENT

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science		
Category	**Hours / Week**			**Credits**	**Marks**		
HSS&MC	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Course Objectives:

The objective of this course is to familiarize the student with entrepreneurship, the issues involved in it, the potential of entrepreneurship and intrapreneurship, the legal environment and statutory issues and explore various funding opportunities.

Course Outcomes

1. Interpret the concepts of Entrepreneurship and Intrapreneurship.
2. Apply the opportunity identification techniques
3. Differentiate needs of different segments
4. Develop business model and MVP
5. Recognize organizational forms, IPR concerns and funding opportunities for startups.

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Unit – I:

Introduction to Entrepreneurship: Entrepreneurship and Intrapreneurship, Business Incubators, Rural entrepreneurship, Social Entrepreneurship, women entrepreneurs, Role of entrepreneurs in economic development, Types of entrepreneurs. Entrepreneurial mind set and stress, Causes of failure.

Unit – II:

Opportunity identification: Myths and realities of entrepreneurship, Opportunity identification, Problem worth solving, idea generation techniques, Design thinking.

Unit – III:

Customer analysis: Market segmentation, consumer persona, Product market fit, Unique Value proposition.

Unit – IV:

Business model and MVP: Business model canvas, MVP, Risks and assumptions, Importance of financial planning.

Unit – V:

Organizational forms Funding Opportunities: Organizational forms - Partnership, Sole proprietorship, Corporation. Intellectual Property Rights- Copyrights, Trademarks, Patents. Law Vs. Ethics, Informal capital- Friends and Family, Angels, Venture Capitalists, Idea/ Patent, Growth strategies

Text Books:

1. Vasant Desai, YayatiNayak, Entrerpreneurship, Himalaya Publishing House,2018
2. D.F.Kuratko and T.V.Rao Entrepreneurship- Cengage Learning,2012

References:

1. Dhruv Nath, Sushanto Mitra, Funding Your Startup: And Other Nightmares, 2020
2. Rajeev Roy, Entrepreneurship, Oxford University Press, 2/e, 2012
3. V Srinivasa Rao, Lean Digital Thinking: Digitalizing Businesses in a New World Order, Bloomsbury India, 2021
4. S.K.Mohanty, Fundamentals of Entrepreneurship, PHI, 1/e,2005
5. MOOCS by Wadhwani Foundation

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SKILL INTEGRATED LAB

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	ESC LAB	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Learning Objectives

1. To improve the students' fluency in English, through a well-developed vocabulary
2. To enable them to respond them appropriate socio-cultural and professional contexts.
3. They will be able to communicate their ideas relevantly and coherently in writing.

Course Outcomes

The students will be able to

1. make oral presentations effectively
2. participate in group discussions
3. develop vocabulary
4. write project/Business reports
5. take part in social and professional communication

Exercise I

Presentation Skills:

Oral presentations (individual and group) / JAM sessions/Seminar - Power point presentations - Body Language-kinesics - Haptics

Exercise II

Group Discussion:

Dynamics of Group Discussion - Dos and Don'ts – Intervention - Summarizing - Modulation of Voice - Relevance - Fluency and Coherence

Exercise III

Vocabulary Building:

synonyms and antonyms - Word Roots - One-Word Substitutes, - Prefixes and Suffixes - study of Word Origin- -Analogy -Idioms and Phrases

Exercise IV

Writing Skills:

Structure and presentation of different types of writing - Resume Writing /E-Correspondence/Statement of Purpose - Report Writing - Business Report Writing - Research Abilities/Data Collection/Organizing Data/Tools/Analysis

Exercise V

Interview Skills:

Concept and Process - Pre-Interview Planning - Opening Strategies - Answering Strategies - Interview through Telephone and Videoconferencing.

A mini project should be given for the students to work in teams and the Assessment is done.

References:

1. Dr. Rao, A. Ramakrishna., Dr. G. Natanam and Prof SA Sankaranarayana. *English Language Communication: A Reader cum Lab Manual. Chennai*: Anuradha Publications, 2008.
2. *English Vocabulary in Use series*. Cambridge University Press, 2008.
3. Nicholls, Anne. *Master Public Speaking.* JAICO Publishing House, 2006.
4. Sen, Leena. *Communication Skills.* New Delhi: PHI Learning Pvt Ltd, 2009.

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DATA VISUALIZATION LAB

B. Tech II Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC LAB	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Prerequisites:

Some exposure to programming.

Course Objectives:

- To acquire in-depth understanding of the data visualization techniques.
- To empower students with tools and techniques for handling and analyzing data.
- To empower students with tableau tool for managing and interpreting data.
- To strengthen the analytical and problem solving skill through developing real time applications.

Course outcomes

At the conclusion of the course, students should be able to:

- Understand data visualization concepts related to different applications.
- Apply different techniques for accessing data sources.
- Create different charts, stories using Tableau.
- Create powerful business dashboards using Tableau.

Programming Languages/Tools:

- Tableau Desktop. Tablea
- u's data visualization software is provided through the

Tableau for Teaching program at http://www.tableau.com/data-visualizationsoftware

List of Experiments:

Week 1:

Introduction to Tableau interface **/** Installation of Tableau.

Week 2 – Week 3:

Apply accessing, importing data/connecting to external Sources using Tableau. Graphs and Layouts, Colors, Size, Text and Typography, Shape, Lines.

Week 4 – Week 6:

Charting in Tableau: Colors, Shapes, and Sizes, Dual Line Charts, Tableau Tooltip. Bar Charts, Line Graphs, Pie Charts, Maps, Scatter Plots, Gantt Charts, Bubble Charts, Histograms, Bullet Charts, Heat Maps and Highlight Tables, Tree maps and Box-and-Whisker Plots.

Week 7:

Multivariate visualization on given dataset using Tableau.

Week 8:

Maps and Geographic Data Analysis using Tableau.

Week 9 - Week 12:

Creating dashboards and stories: Hierarchies, Actions, Filters, and Parameters using Tableau. Connecting/publishing data using Tableau Public Server.

Week 13 – Week 16:

Study projects on selected applications using data visualization. Submission of abstract, introduction, related work, and progress, Final report, final presentations and videos.

References:

1. Nandeshwar, A. (2015), Tableau Data Visualization Cookbook, Mumbai: PACKT / Shroff Publishers.
2. https://public.tableau.com/en-us/s/resources

PREDICTIVE ANALYTICS USING R PROGRAMMING LAB

B. Tech II Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	Category	Hours / Week			Credits	Marks		
	PCC LAB	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Prerequisites:

Basics of Statistics, Machine Learning and Basic knowledge in any Programming language.

Course Objectives:

The
1. To acquire in-depth understanding of the predictive analytics.
2. To empower students with tools and techniques for handling, managing, analyzing and interpreting data.
3. To acquire in-depth understanding of charts and graphs.
4. Practice R operations required for predictive analytics.
5. Understand linear regression model.

Course outcomes:

1. Demonstrate and set up of R studio.
2. Apply EDA tools for managing, analyzing and interpreting data.
3. Summarize data insights using charts and graphs.
4. Develop R scripts for predictive analytics.
5. Analyse data with linear regression model.

Week-1:

Installation and Environment set up R and R studio.

Week-2:

Experiments on Vector Arithmetic operations.

Week-3:

Experiments on Matrices operations.

Week-4:

Experiments on Arrays functions.

Week-5:

Experiments on Factors.

Week-6:

Experiments on Data Frames.

Week-7:

Experiments on List operations.

Week-8:

Write R scripts which demonstrate logical operations and Conditional Statements.

Week-9:

Write R scripts which demonstrate Looping over List.

Week-10:

Write R scripts which demonstrate Nested Functions and Function Scoping.

Week-11:

Experiments on Mathematical Functions, Lapply, Sapply and Apply functions in R.

Week13:

Generate different Charts and Graphs using R.

Week-14:

Perform ANOVA Test, Regression, and Clustering on data using R.

Week 15 – Week 16:

Study projects on selected applications on predictive analytics. Submission of abstract, introduction, related work, and progress, Final report, final presentations and videos.

Dept. of Electrical and Electronics Engineering

ANURAG UNIVERSITY

(Formerly Anurag Group of Institutions)
Venkatapur (V), Ghatkesar (M), Medchal dist.
Department of Electrical and Electronics Engineering

Date: 3/04/2021

Minutes of Meeting

The BOS meeting of the Department of EEE, AU was held on 09-03-22 in the Electrical simulation lab of the department. The meeting started at 10.00 AM. The following members attended the meeting.

List of BOS members present

S.No	Name	Designation
1	Prof. L. Rajasekhar Goud	Professor, Chairman of BOS
2	Dr. T. Anil Kumar	HOD
3	Dr. M. Vinod Kumar	Professor
4	Dr. G. Yesuratnam	Professor
5	Dr. K. Siva Kumar	Assoc. Professor
6	Dr. Sudha Radhika	Asst. Professor
7	Mr. Chow Reddy	Product Development Engg
8	Dr. G. Venu Madhav	Assoc. Professor
9	Dr. C. Nagamani	Assoc. Professor
	Dr.P.Nagaraju Mandadi	Assoc. Professor
10	Mr. T. Dinesh	Asst. Professor
11	Mr. MD. Yaseen	Asst. Professor
12	Mrs. S. Saraswathi	Asst. Professor
13	Dr. P. Harish	Assoc. Professor
14	Mr. Ch. Srinivasa Rao	Assoc. Professor
15	Mr. Sai Preetham Sridhara	Alumni

The chairman welcomed the members, after fruit full deliberations the following decisions were taken in the meeting.

- External Members of BOS Suggested the following points and same are incorporated in the concerned theory subjects and Laboratory

1. Suggested for addition of boost and buck converters and rename the 4th chapter as DC to DC converters in Power Electronics Course.
2. Suggested to add applications of fractional watt motors in 5th chapter of EM-III.
3. Suggested to mention name of any two algorithms for MPPT tracking in Renewable Energy Technology course.
4. Suggested for name change of experiment no-7 into No Load and Blocked Rotor test on Single phase induction Motor.
5. Suggested to add Micro Processor based relays in the course Switch Gear and Protection.
6. Suggested to change the entire course syllabus of AI&ML course.
7. Suggested to include first 8 experiments from Measurements and Instrumentation instead of only from Measurements in Measurements and Instrumentation Lab

- Members of BOS has approved the panel of examiners for paper setting and evaluators for B.Tech, M.Tech and Ph.D examinations
- Members of BOS has approved department Vision, Mission, PEOs, POs and PSOs

Finally the Chairman thanked to all the members for their valuable suggestions.

Vision

To become one of the reputed centers at the national and international levels for imparting value based quality education in the fields of Electrical & Electronics Engineering, initiate quality research programmes and get involved in goal – oriented community services which fulfill the ever changing needs of the society.

Mission

Imparting Quality Technical Education by providing the state-of-the-art laboratories with effective industry interaction and preparing them to work innovatively, effectively to find solutions for engineering problems with multi-disciplinary approach by inculcating research aptitude, lifelong learning, team work skills with ethical responsibility for successful professional career.

Program Educational Objectives (PEOs):

PEO-I: Able to engage in design, development, testing and manufacturing of electrical and electronics machinery and equipment and allied systems with entrepreneurial practices.

PEO-II: Able to provide the cost-effective engineering solutions to the real time complex engineering problems by applying electrical and electronics engineering knowledge with research attitude.

PEO-III: Able to exhibit professionalism, ethical responsibility, team work skills and leadership qualities to work effectively in multidisciplinary groups.

PEO-IV: To inculcate intellectual skills, life-long learning to caters the needs of society.

ProgramOutcomes (POs):

PO1: Ability to apply knowledge of Mathematics, Scienceand Engineering, knowledge.

PO2: Ability to design and conduct experiments, as well as to analyze and interpret data, Experimentation & Interpret/Engineering Analysis.

PO3: Ability to design a system, component or process to meet desired needs within realistic constraints such as Economic, Environmental, Social, Political, Ethical, Health and Safety, Manufacturability and Sustainability, Design and Modeling.

PO4: Ability to identify, formulate and solve complex engineering problems.

PO5: Ability to use techniques, skills and modern engineering tools necessary for engineering practice.

PO6: Knowledge of contemporary issues and non-contemporary issues, nontechnical issues, global awareness with society concern.

PO7: The Broad education necessary to understand the impact of engineering solutions in a global economic, environmental and social context.
PO8: Understanding of professional and ethical responsibility.
PO9: Ability to function on multidisciplinary teams.
PO10: Ability to communicate effectively.
PO11: To prepare the students ready for industry usage by providing required training in cutting edge technologies for project management.
PO12: Recognition of the needs and an ability to engage in lifelong learning.
Department of EEE

Program Specific Outcomes (PSOs):
PSO1: Ability to apply the professional core theories and process to choose the sustainable control, measuring and drive circuitry for the specified upcoming fields.
PSO2: Ability to design, simulate and analysis of various problems related to electrical and electronics engineering for different applications in modern fields.
PSO3: To prepare the students to succeed in competitive examinations for higher education and employment related to electrical and electronics engineering.
PSO4: Ability to find engineering solutions for society concern problems related to electrical and electronics engineering.

Program Structure and Syllabus of

B. Tech III-Year (I & II Semesters)

Electrical & Electronics Engineering

R20 Regulations

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.), Hyderabad, Telangana, INDIA

info@anurag.edu.in; http://anurag.edu.in

III YEAR I SEMESTER **COURSE STRUCTURE**

S.No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PCC	Power Systems-II	3	0	0	3
2		PCC	Power Electronics	3	0	0	3
3		PCC	Electrical Machines –III	3	0	0	3
4		PCC	Integrated Circuits & Applications	2	0	0	2
5		PEC-I	Renewable Energy Technology Electrical Machine Design Control System Design	3	0	0	3
6		OE-I	Logical Reasoning & Quantitative Aptitude Disaster Preparedness and Planning Introduction to Artificial Intelligence and Machine Learning	3	0	0	3
7		PCC	Electrical Machines Lab -II	-	0	3	1.5
8		HSMC	Skills Integrated Language Lab	-	0	2	1.5
9		MC	NSS/NSO	2	0	-	0
TOTAL				**19**	**00**	**05**	**20**

III YEAR II SEMESTER **COURSE STRUCTURE**

S.No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PCC	Switch Gear & Protection	3	0	0	3
2		PCC	Power System Operation & Control	3	0	0	3
3		PCC	Micro Processor & Micro Controllers	3	0	0	3
4		PCC	Electrical Measurements & Instrumentation	3	0	0	3
5		PEC-II	Signals & Systems Advanced Power Electronics Converters Industrial Electrical Systems	3	0	0	3
6		ESC	Data Base Management Systems	2	0	0	2
7		PCC	Power Electronics & Simulation Lab	0	0	3	1.5
8		PCC	Measurements and Instrumentation Lab	0	0	3	1.5
TOTAL				**17**	**00**	**06**	**20**

ANURAG UNIVERSITY

Power Systems-II								
B. Tech III Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of PS-II are to:

1. To gain knowledge on the basic transmission line parameters.
2. To classify & study the performance of short, medium & long transmission lines.
3. To gain knowledge on various factors governing the performance of transmission line
4. To understand overhead line insulators
5. To perform sag calculations and study underground cables.

Course Outcomes:

At the end of this PS-II course, students will be able to

1. Determine the line parameters of Transmission lines.
2. Analyze the Performance of short, Medium, long Transmission lines.
3. Assess various factors governing the performance of Transmission Lines.
4. Understand the various types of overhead line insulators.
5. Perform sag and tension calculations for various transmissions and also describe the features of Under Ground Cables.

Unit- I:

Transmission Line Parameters

Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition, Numerical Problems.

Calculation of capacitance for single phase two wire system, effect of ground on capacitance, Capacitance calculations for symmetrical and asymmetrical - three phase and double circuit lines, Numerical Problems.

Unit- II:

Performance of Short, Medium and Long Transmission Lines

Classification of Transmission Lines - Short, medium and long lines and their model representations - Nominal-T, Nominal-Pie and ABCD Constants for symmetrical &

Asymmetrical Networks, Numerical Problems, voltage regulation and efficiency of all types of lines - Numerical Problems. Long Transmission Line-Rigorous Solution, evaluation of ABCD Constants, Surge Impedance and SIL of Long Lines

Unit- III:

Factors Governing the Performance of Transmission line

Skin and Proximity effects - Description and effect on Resistance of Solid Conductors - Ferranti effect - Charging Current - Effect on Regulation of the Transmission Line, Shunt Compensation. Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.

Unit- IV:

Overhead Line Insulators

Types of Insulators, String efficiency and Methods for improvement, Numerical Problems voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding.

Unit- V:

Sag and Tension Calculations and Underground Cables

Sag and Tension Calculations with equal and unequal heights of towers Effect of Wind and Ice on weight of Conductor, Numerical Problems - Stringing chart and sag template. Types of Cables, Construction, Types of Insulating materials, Calculations of Insulation resistance and stress in cables, Grading of Cables - Capacitance grading, Numerical Problems, Description of Inter-sheath grading.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, Dhanpat Rai & Co Pvt. Ltd.
2. Principles of Power Systems - V.K Mehta and Rohit Mehta, S.Chand Company Ltd., New Delhi 2004

References Books:

1. Electrical power systems - by C.L.Wadhwa, New Age International (P) Limited Publishers, 1998.
2. Power System Analysis and Design by B.R.Gupta, Wheeler Publishing.
3. Power System Analysis by Hadi Saadat – TMH Edition.

ANURAG UNIVERSITY

Power Electronics

B. Tech III Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of PE are to:

1. To learn the basic concepts of power electronic devices and their characteristics
2. To understand the various triggering & commutation methods for SCRs
3. To study the principle of operation of single phase and three phase line commutated converters
4. To understand the principle of operation of AC Voltage controllers and Cyclo converters
5. To study the principle of operation of various types of Choppers and Inverters.

Course Outcomes:

At the end of this PE course, students will be able to

1. Evaluate the characteristics of various Power Electronics devices such as SCR, MOSFET, IGBT and TRIAC
2. Analyze different types of Trigerring and commutation techniques for SCR
3. Use concepts of Power Electronic devices in Single Phase and three phase controlled rectifiers for speed control of DC Motor
4. Analyze the operation of AC voltage controllers, Cyclo Converters with different loads
5. Use Inverters, Choppers for speed control of AC and DC Motors.

Unit-I:

Power Semi Conductor Devices and Commutation Circuits

Thyristors – Silicon Controlled Rectifiers (SCRs) – BJT – Power MOSFET – Power IGBT and their characteristics and other thyristors .Basic theory of operation of SCR – Static characteristics and Dynamic characteristics of SCR - Turn on and Turn off times – Turn on and turn off methods- Salient points. Types of Power Supplies.

Two transistor analogy of SCR - UJT firing circuit - Series and parallel connections of SCRs Snubber circuit details – Specifications and Ratings of SCRs, BJT, IGBT - Numerical problems.

Unit-II:

Single Phase Half Controlled and Fully Controlled Converters

Phase control technique - Single phase Line commutated converters Midpoint and Bridge connections – Half controlled converters with Resistive, RL loads and RLE load with continuous current mode of operation –Derivation of average load voltage and current -Active and Reactive power inputs to the converters without and with Freewheeling Diode.

Fully controlled converters, Midpoint and Bridge connections with Resistive, RL loads and RLE load for continuous current mode of operation. Derivation of average load voltage and current – Line commutated inverters. Active and Reactive power inputs to the converters without and with Freewheeling Diode. Effect of source inductance – Derivation of load voltage and current – Numerical problems.

Unit-III:

Three Phase Line Commutated Converters

Three phase converters – Three pulse and six pulse converters – Midpoint and bridge connections average load voltage With R and RL loads.

Effect of Source inductance–Dual converters (both single phase and three phase) - Waveforms –Numerical Problems.

Unit-IV:

DC to DC Converter

AC voltage controllers – Single phase two SCRs in anti parallel – With R and RL loads – modes of operation of Triac with R and RL loads – Derivation of RMS load voltage, current and power factor wave forms. Firing circuits -Numerical problems.

Cyclo converters – Single phase midpoint Cyclo converters with Resistive and inductive loads (Principle of operation only) – Bridge configuration of single phase Cyclo converter (Principle of operation only) – Waveforms

Unit-V:

Choppers and Inverters

Choppers – Time ratio control and Current limit control strategies – Buck choppers Derivation of load voltage and currents with R, RL and RLE loads for continuous and discontinuous current modes. Boost Chopper – load voltage expression. Morgan's chopper – Jones chopper (Principle of operation only) -Waveforms - AC Chopper – Problems.

Inverters – Single phase inverter – Basic series inverter – Basic parallel Capacitor inverter- Bridge inverters -120^{o} and 180^{o} modes of operation – Waveforms – Simple forced commutation circuits for bridge inverters. Voltage control techniques for inverters-Pulse width modulation techniques – Numerical problems.

Text Books:

1. Power Electronics-P.S. Bimbhra- Khanna Publishers, 4th Edition
2. Power Electronics – M.D. Singh & K.B. Kanchandhani, Tata Mc Graw – Hill Publishing Company, 2nd edition.

Reference Books:

1. Power Electronics: Circuits Devices and Applications – M.H. Rashid, Prentice Hall of India, and 3rd edition.
2. Thyristorised Power Controllers – G.K. Dubey, S.R Doradra, A. Joshi and R.M.K. Sinha, New Age international Pvt Ltd. Publishers latest edition.
3. Power Electronics – P.C. Sen, Tata Mc Graw-Hill Publishing

Electrical Machines- III

B. Tech III Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course objectives:

Course Objectives of EM-III are to:

1. To understand principle of operation & characteristics of synchronous Generators
2. To gain knowledge of various methods to determine voltage regulation of synchronous generators
3. To understand parallel operation of synchronous Generators
4. To study the principle of operation of Synchronous motors
5. To learn the principle of Operation & applications of special motors.

Course Outcomes:

At the end of this EM-III course, students will be able to

1. Explain the principle of operation of Synchronous motors.
2. Describe different methods of voltage regulation and parallel operation of Synchronous Generators.
3. Operate synchronous generators in parallel.
4. Describe the constructional details and principle of operation of Synchronous motors.
5. Explain the operation of special motors and their applications in daily life.

Unit-I:

Construction-Principle of Operation & Characteristics of Synchronous Generator
Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings – distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated e.m.f. – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – experimental determination - phasor diagram – load characteristics.

Unit-II:

Voltage Regulation of Synchronous Generators

Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – Salient pole alternators – two reaction theory – experimental determination of X_d and X_q (Slip test) Phasor diagrams – Regulation of salient pole alternators. Numerical Problems.

Unit-III:

Parallel Operation of Synchronous Generators

Synchronizing alternators with infinite bus bars – Synchronizing power and synchronizing torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input. Analysis of short circuit current wave form – determination of sub-transient, transient and steady state reactance's. Numerical Problems.

Unit-IV:

Synchronous Motors

Principle of operation-methods of starting-phasor diagram-Variation of current and power factor with excitation-synchronous condenser-Mathematical analysis for power developed-circle diagrams of synchronous machines-hunting and its suppression-damper windings. Numerical Problems.

Unit-V:

Special Motors

Basic Principle of operation and application of AC series motor-Universal motor-Stepper motor –shaded pole motor-Reluctance motor-BLDC motor (Elementary treatment only). Applications of Fractional Watt Motors.

Text Books:

1. Theory and performance of Electrical Machines- JB Gupta, SK kataria and sons, 14th Edition
2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.

References Books:

1. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

Integrated Circuit Applications

B. Tech III Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Course Objectives:

Course Objectives of ICA are to:

1. To introduced the basic building blocks of linear integrated circuits.
2. To understand the linear and non – linear applications of operational amplifiers.
3. To introduce the concepts of waveform generation and introduce some special function ICs.
4. To understand the theory and applications of PLL, and design ADC and DAC.
5. To understand and implement the working of basic digital circuits

Course Outcomes:

At the end of this ICA course, students will be able to

1. Design various applications of Op-Amps.
2. Design the circuits using special ICs like 555 timer, 723 voltage regulator and 565 PLL.
3. Design A/D and D/A Converters using ICs.
4. Design digital circuits using digital ICs.
5. Design different families of digital integrated circuits and their characteristics.

UNIT I:

Integrated Circuits

Introduction: Classification. Chip Size and Circuit Complexity, Ideal and Practical Op-Amp, Op-amp characteristics-DC and AC Characteristics. 741 Op-Amp and its Features, Modes of operation-inverting, non-inverting, differential.
Applications: Basic Applications of Op-Amp, Instrumentation Amplifier, V to I and I to V Converters, Sample & Hold Circuits, Differentiators and Integrators, Comparators. Introduction to Voltage Regulators.

UNIT II:

Active Filters & Oscillators

Active Filters: First Order and Second Order Low Pass, High Pass and Band Pass Filters. Active Band Reject and All Pass Filters.

Oscillators: Principle of Operation and Types of Oscillators – RC, Wien Bridge and quadrature type. Waveform Generators – Triangular, Saw Tooth, Square Wave.

UNIT III:

555 Timer & PLL

Introduction to 555 Timer: Functional Diagram, Monostable and Astable Operations and Applications, Schmitt Trigger.

PLL: Introduction, Block Schematic, Principles and Description of individual Blocks of 565, VCO.

UNIT IV:

D-A & A- D Converters

Introduction, Basic DAC Techniques - Weighted Resistor Type, R-2R Ladder Type, Inverted R-2R Type. Different types of ADCs - Parallel Comparator Type, Counter Type, Successive Approximation Register Type and Dual Slope Type, DAC/ADC Specifications.

UNIT V:

Digital Integrated Circuits Introduction

Classification of Integrated Circuits, Standard TTL NAND Gate-Analysis & Characteristics, TTL Open Collector Outputs, Tristate TTL, MOS & CMOS Open Drain and Tristate outputs, Comparison of Various Logic Families. IC interfacing- TTL driving CMOS & CMOS driving TTL.

Combinational Circuit ICs: Use of TTL-74XX Series- Multiplexer, Demultiplexer, Encoder Sequential Circuit ICs: Commonly Available 74XX-J K Flip flop, D-Flip flop, Decade Counter.

Text Books:

1. Linear Integrated Circuits -D. Roy Choudhury, New Age International (p)Ltd, 3" Ed., 2008.
2. Digital Fundamentals - Floyd and Jain, Pearson Education,8th Edition, 2005.
3. Op-Amps and Linear Integrated Circuits - Concepts and Applications by James M.Fiore, Cengage/ Jaicc, 2/e, 2009.

Reference books:

1. Modern Digital Electronics - RP Jain - 4/e - TMH, 2010.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.

Renewable Energy Technology

B. Tech III Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of RET are to:

1. To learn about photovoltaic energy conversion & its basics.
2. To understand solar panels such as flat plate collectors, dish collectors and converter systems.
3. To learn Renewable energy sources, like Wind Energy & Bio-Mass.
4. To understand about geothermal, ocean, tidal and wave energy & concepts of DEC.
5. To learn about various converter topologies for Wind Power Generation.

Course Outcomes:

At the end of this RET course, students will be able to

1. Describe Renewable energy sources, generating systems, its performance characteristics and potential in India
2. Explain about solar photovoltaic energy conversion systems.
3. Analyze the Non-conventional energy sources like Wind Energy & Bio Mass.
4. Illustrate the types of energy generating systems, construction, principle, operation and applications.
5. Demonstrate the different topologies of wind energy conversion system.

Unit – I:

Solar Radiation and Solar Energy Collection

Principles of Solar Radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

Unit – II:

Solar photovoltaic

Photovoltaic energy conversion, Technologies-Amorphous, monocry stalline, polycrystalline; V-I & PV characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT)

algorithms- Peturb and observe algorithm and incremental conductance algorithm, Converter Control.
Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating
collectors, orientation, advanced collectors.

Unit-III:

Wind Energy and Bio-Mass

Wind Energy: Sources and potentials, horizontal and vertical axis windmills, tip speed ratio, stall & Pitch Control, performance characteristics, Betz criteria.
Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking.

Unit-IV:

Geothermal, Ocean, Tidal and Wave Energy

Geothermal Energy: Methods of harnessing the energy.
Ocean Energy: OTEC, Principles utilization, setting of OTEC plants.
Tidal and Wave energy: Potential and conversion techniques.
Direct Energy Conversion: Need for DEC, Carnot cycle, limitations and principles of DEC. Seebeck effect, MHD generators (Ideal and Practical).

Unit-V:

Wind Generator Topologies

Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent-Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control.

Text Books:

1. Non-Conventional Energy Sources - G.D. Rai, Khanna Publishing House, 2011.
2. Doubly fed induction machine: modeling and control for wind energy generation - Abad, Gonzalo, Jesus Lopez, Miguel Rodriguez, Luis Marroyo, and Grzegorz Iwanski, John Wiley & Sons, 2011.

Reference Books:

1. Non-Conventional Energy Systems - K Mittal, Wheeler Publishing Co.
2. Renewable energy resources- Tiwari and Ghosal, Narosa Publishing House, 2007.
3. Non-Conventional Energy - Ashok V Desai, Wiley Eastern Ltd, New Delhi, 2003.

Electrical Machine Design

B. Tech III Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of EMD are to:

1. To know the fundamental requirements for designing various electrical machines like transformers, IMS and Synchronous Motors
2. To expose the student the basic requirements for designing the transformers using dimensions rating space factors, cooling methods etc.
3. To study and acquire basic concepts necessary for design the induction motors
4. To provide the knowledge required for designing the various parts of synchronous machines and the winding details suitable for various ratings
5. To learn the need of CAD analysis design optimization methods FEM based design and complex structures of PMSM, BLDC and SRMS

Course Outcomes:

At the end of this EMD course, students will be able to

1. Explain the concepts for design of various machines.
2. Analyze the designing of transformers of different ratings.
3. Design the induction motors of various ratings.
4. Design the synchronous machines with various ratings and specifications.
5. Apply the concepts and knowledge of CSD, FEM based machines design for various applications and also able to use PMSM, BLDC, SRM for various applications.

Unit- I:

Introduction

Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines.

Unit- II:

Transformers

Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

Unit- III:

Induction Motors

Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of polyphase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.

Unit- IV:

Synchronous Machines

Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.

Unit- V:

Computer aided Design (CAD):

Limitations (assumptions) of traditional designs, need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design. Introduction to **c**omplex structures of modern machines-PMSMs, BLDCs, SRM and claw-pole machines.

Text Books:

1. K. Sawhney, “A Course in Electrical Machine Design”, Dhanpat Rai and Sons, 1970.
2. M.G. Say, “Theory, Performance & Design of A.C. Machines”, ELBS London.
3. S. K. Sen, “Principles of Electrical Machine Design with computer programmes”, Oxford and IBH Publishing, 2006.

References Books:

1. K. L. Narang, “A Text Book of Electrical Engineering Drawings”, Satya Prakashan, 1969.
2. A.Shanmugasundaram, G. Gangadharan and R. Palani, “Electrical Machine Design Data Book”, New Age International, 1979.
3. K. M. V. Murthy, “Computer Aided Design of Electrical Machines”, B.S. Publications, 2008.
4. Electrical machines and equipment design exercise examples using Ansoft’s Maxwell 2D
machine design package.

Control Systems Design

B. Tech III Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of CSD are to:

1. To expose the student to design specifications and its physical relevance
2. To provide the students with basic knowledge to design the classical control System in the time domain
3. To learn the design of the classical control system in the frequency domain
4. To introduce the design of PID controllers and control system design in state space representation
5. To learn to design control systems in state space and also understand the effect of non linear parameters on system performance.

Course Outcomes:

At the end of this CSD course, students will be able to

1. Explain the various design specifications and design problems in classical control systems
2. Design of classical control system in the time domain such as Lag, Lead, lag-Lead compensator
3. Design of classical control systems in frequency domain such as Feedback and Feed forward compensator design using Bode Diagram
4. Design and analysis of PID controllers in time and frequency domain in different order systems
5. Analyze the non linearties and its effects on systems performance.

Unit- I:

Design Specifications

Introduction to design problem and philosophy. Introduction to time domain and frequency domain design specification and its physical relevance. Effect of gain on transient and steady state response. Effect of addition of pole on system performance. Effect of addition of zero on system response.

Unit- II:

Design of Classical Control System in the time domain

Introduction to compensator. Design of Lag, lead lag-lead compensator in time domain. Feedback and Feed forward compensator design. Feedback compensation. Realization of compensators.

Unit- III:

Design of Classical Control System in frequency domain

Compensator design in frequency domain to improve steady state and transient response.

Feedback and Feed forward compensator design using bode diagram.

Unit- IV:

Design of PID Controllers

Design of P, PI, PD and PID controllers in time domain and frequency domain for first, second and third order systems. Control loop with auxiliary feedback – Feed forward control.

Unit- V:

Control System Design in State Space

Review of state space representation. Concept of controllability & observability, effect of pole zero cancellation on the controllability & observability of the system, pole placement design through state feedback. Ackerman's Formula for feedback gain design. Design of Observer. Reduced order observer. Separation Principle.

Nonlinearities and its effect on system performance

Various types of non-linearties. Effect of various non-linearties on system performance. Singular points. Phase plot analysis.

Text Books:

1. M. Gopal, "Digital Control Engineering", Wiley Eastern, 1988.
2. K. Ogata, "Modern Control Engineering", Prentice Hall, 2010.

Reference Books:

1. B. C. Kuo, "Automatic Control system", Prentice Hall, 1995
2. N. Nise, "Control system Engineering", John Wiley, 2000.
3. I. J. Nagrath and M. Gopal, "Control system engineering", Wiley, 2000.

Logical Reasoning, Verbal and Quantitative Ability

B. Tech III Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Unit I:

Number Systems

Classification of numbers, Squares, Fractions, Simplifications, Divisibility Test, Power Cycle, Reminder Cycle, Factors, LCM, HCF, Application of LCM & HCF

Ratio and Proportion: Tricks to solve ratio, proportions, continuous proportions, Variations, Ages

Percentages: Percentage Increase/ Decrease , Results on population , Results on Depreciation, Simple Interest , Principal , Interest , Amount , Application of Simple Interest, Compound Interest , Compound Annually , Compound Half-yearly , Compound Quarterl, Difference between Compound Interest and Simple Interest

Unit II:

Geometry

Lines , Properties of lines , Triangles, Properties of Triangles, Angles , Sectors , Chords , Planes , Quadrilateral

Mensuration: Area & Perimeter of Triangle, Quadrilateral, Rectangle, Square, Parallelogram, Trapezium, Surface Area & Volume of 3D Figures

Data Interpretation: Table Charts, Pie Charts, Bar Graphs, Line Graphs

Data Sufficiency: Problems On all quant and Logical topics

Unit III:

Seating Arrangement

Circular arrangement, row arrangement, column arrangement, Square arrangement, Double row arrangement

Syllogisms: Two Statements & Conclusion, Three Statements & Conclusion, Six Statements

Unit IV:

Number Series

Letter Series, Number Series, Letter & Number Series

Analogy: Simple Analogy, Double Analogy, Word Analogy, Number Analogy, Choosing Analogy Pairs

Coding & Decoding: Letter Coding, Number Coding, Symbol Coding, Letter - Number Coding, Letter - Symbol Coding, Direct Coding, Indirect Coding
Blood Relations: Based on Dialogue or conversation, Based on puzzles

Unit V:

Nouns
Types of nouns, rules, usages and error spotting
Pronouns: Types of nouns, rules, usages and error spotting
Articles: Definite and indefinite articles, Omission of articles, rules, usage and error spotting
Adjectives and Adverbs: Types of nouns, rules, usages and error spotting
Preposition: Types of nouns, rules, usages and error spotting

Text Books:

1. Verbal and Non Verbal Reasoning - *R.S.Agarwal*.
2. Quantitative Aptitude - *R.S.Agarwal*.
3. Quantitative Aptitude - *Abhijit Guha*.

Disaster Preparedness and Planning

B. Tech III Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course objectives:

Course Objectives of Disaster Preparedness & Planning are to:

1. To know the concept, definition and terminology of the Disaster Management.
2. To know the classification and occurrence of disasters in India and elsewhere.
3. To know and analyse the socio-economic, environmental aspects of disasters impacts.
4. To know the pre, post and emergency management mitigation strategies.
5. To know the environment of vulnerable disaster areas

Course Outcome:

At the end of this Disaster Preparedness & Planning course, students will be able to

1. To acquire knowledge of disaster Management.
2. To acquaint with different disasters in India and other parts of the world.
3. To classify, assess the magnitude and intensity of various impacts of disasters.
4. To learn the management methods.
5. Learn effective sustainable environmental modification techniques.

UNIT-I

Introduction: Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation.

UNIT-II

Disasters: Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility

UNIT-III

Disaster Impacts:

Disaster impacts (environmental, physical, social, ecological, economic, political,

etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate-change and urban disasters.

UNIT-IV

Disaster Risk Reduction (DRR):

Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster, Management Authority.

UNIT-V

Disasters, Environment And Development

Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Text books

1. H.K. Gupta,Disaster Management - - University Press, India, 2003.
2. Singh B.K, Handbook of Disaster Management: techniques and Guidelines -., Rajat, Publications, 2008

References Books

1. Pardeep Sahni, Disaster Mitigation: Experiences and Reflections -
2. Pradeep Sahni, Disaster Risk Reduction in South Asia, Prentice Hall, 2004.

NPTEL

1. https://nptel.ac.in/courses/105104183/

Introduction to Artificial Intelligence and Machine Learning

B. Tech III Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of Introduction to Artificial Intelligence and Machine Learning are to:

1. To familiarize with the concepts of Artificial Intelligence
2. To understand the challenges, applications and models of Machine Learning
3. To apply and evaluate supervised machine learning algorithms for classification and regression tasks
4. To apply and evaluate unsupervised learning algorithms for clustering tasks
5. To understand the Ensemble learning, apply and evaluate different type of these algorithms for better prediction.

Course Outcomes:

At the end of this Introduction to Artificial Intelligence and Machine Learning course, students will be able to

1. Explain the concepts and applications of Artificial Intelligence
2. Understand the essentials of feature engineering, state-of-art tools and concepts of machine learning
3. Design and evaluate different types of supervised learning algorithms for classification and regression tasks.
4. Design and evaluate different types of unsupervised learning algorithms for clustering tasks.
5. Design and evaluate strong learners for better real time prediction ensemble learning algorithms

Unit-I:

Introduction to Artificial Intelligence:

Fundamentals of Artificial Intelligence Introduction to AI Representation, Non-AI & AI Techniques, Representation of Knowledge, Knowledge Base Systems, Intelligent Agents and Environments, concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation, Identifying Problems Suitable for AI, Applications

Unit-II:

Introduction to Machine Learning

What is Machine Learning, Why Machine Learning, Types of Machine Learning models, Challenges of Machine Learning, Applications of Machine Learning, Essential libraries and Tools, Generalization over fitting and under fitting, Bias–variance trade-off, metrics

Unit-III:

Supervised Learning

Classification and Regression, Linear Regression: Single and Multiple, Logistic Regression, K-Nearest Neighbor, Naive Bayes Classifier, Decision Tree, Support Vector Machine

Unit-IV:

Unsupervised Learning and Pre-processing

Types of Unsupervised Learning, Challenges in Unsupervised Learning, Applications of Unsupervised Learning, Pre-processing and Scaling, clustering, K-Means Clustering, Agglomerative Clustering, Comparing and evaluating the clustering algorithms.

Unit-V:

Ensemble Learning and Random Forest

Voting Classifiers, Bagging and pasting, Random Patches and Random subspaces, Random Forest, Boosting-Ada Boost and Gradient Boost.

Text Books:

1. Elaine Rich and Kevin Knight: "Artificial Intelligence" Third Edition,Tata McGraw Hill,2009
2. SaikatDutt, Subramanian Chandramouli, Amit Kumar Das "*Machine Learning*", Pearson Education India, 2018.

3. AurélienGéron, "*Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow*

Concepts,Tools, and Techniques to Build Intelligent Systems" O'Reilly Media, Inc, 2017.

Reference Books:

1. Andreas C. Müller, Sarah Guido, "*Introduction to Machine Learning with Python*", O'Reilly Media, Inc, October 2016.

2. Tom M. Mitchell, "*Machine Learning*", McGraw-Hill Education (India) Private Limited, 2013.
3. EthemAlpaydin, "*Introduction to Machine Learning (Adaptive Computation and Machine Learning*)", The MIT Press, 2004.
4. Stephen Marsland, "*Machine Learning: An Algorithmic Perspective*", CRC Press, 2009.

Electrical Machines- II Lab

B. Tech III Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Objectives:

Course Objectives of EM-II Lab are to:

1. To understand the various tests performed on 1-Phase Transformers.
2. To study 3 phase to 2 phase conversion by means of Scott connections
3. To obtain performance of three phase induction motor from circle diagram.
4. To evaluate the different methods to calculate regulation of alternators.
5. To determine X_d & X_q of Salient Pole Synchronous Machines

Course Outcomes:

At the end of this EM-II Lab course, students will be able to

1. Connect two 1 phase transformers in parallel and study their operation, determine the various losses in the 1 phase transformers by performing necessary test
2. Connect two transformers in Scott connection and demonstrate 3 phase to 2 phase conversion.
3. Obtain the performance characteristics of 3-Phase Induction Motor.
4. Calculate voltage regulation of alternator by performing appropriate tests.
5. Draw V and inverted V curves for a given synchronous motors.

List of Experiments:

Part A

1. O.C. & S.C. Tests on single phase transformer.

2. Sumpner's test on a pair of single phase transformers.

3. Brake test on three phase squirrel cage induction motor.

4. No-load & blocked rotor tests on three phase Slip ring Induction motor.

5. Regulation of three phase alternator by synchronous impedance (EMF & MMF) method.

6. V and inverted V curves of three - phase Synchronous motor.

7. No Load and blocked rotor test on Single phase Induction Motor .

8. Slip test on salient pole synchronous machine.

Part B

1. Parallel Operation of Single Phase Transformers.

2. Separation of core losses of a single phase transformer.

3. Scott connection of Transformers.

4. Regulation of a three phase alternator by ZPF & ASA method.

5. Efficiency of a three phase alternator.

6. Measurement of sequence Impedance of a 3phase alternator.

Note:-All experiments from part A and two experiments from part B to be conducted.

Skills Integrated Language Lab

B. Tech III Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	HSMC	L	T	P	C	CIE	SEE	Total
		0	0	2	1.5	50	50	100

Course Objectives:

Course Objectives of SIL Lab are to:

1. To improve the students' fluency in English, through a well-developed vocabulary
2. To enable them to respond them appropriate socio-cultural and professional contexts.
3. They will be able to communicate their ideas relevantly and coherently in writing.

Course Outcomes

At the end of this SIL Lab course, students will be able to

1. make oral presentations effectively
2. participate in group discussions
3. develop vocabulary
4. write project/Business reports
5. take part in social and professional communication

Exercise I

Presentation Skills:

Oral presentations (individual and group) / JAM sessions/Seminar - Power point presentations- Body Language-kinesics - Haptics

Exercise II

Group Discussion:

Dynamics of Group Discussion - Dos and Don'ts – Intervention - Summarizing - Modulation of Voice - Relevance - Fluency and Coherence

Exercise III

Vocabulary Building:

Synonyms and antonyms - Word Roots - One-Word Substitutes, - Prefixes and Suffixes - study of Word Origin- -Analogy -Idioms and Phrases

Exercise IV

Writing Skills:

Structure and presentation of different types of writing - Resume Writing /E-Correspondence/Statement of Purpose -Report Writing- Business Report Writing - Research Abilities/Data Collection/Organizing Data/Tools/Analysis

Exercise V

Interview Skills:

Concept and Process - Pre-Interview Planning - Opening Strategies - Answering Strategies - Interview through Telephone and Videoconferencing.

A mini project should be given for the students to work in teams and the Assessment is done.

Minimum Requirements:

The English Language Lab shall have two parts:

i) The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.

ii) The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a digital stereo –audio & video system.

System Requirement (Hardware component):

Computer network with Lan with minimum 60 multimedia systems with the following specifications:

i) PIV Processor , a) Speed – 2.8 GHZ

b) RAM – 512 MB Minimum

c) Hard Disk – 80 GB

ii) Headphones of High quality

References:

1. Dr. Rao, A. Ramakrishna., Dr. G. Natanam and Prof SA Sankaranarayana. *English Language Communication: A Reader cum Lab Manual. Chennai*: Anuradha Publications, 2008.
2. *English Vocabulary in Use series*. Cambridge University Press, 2008.
3. Nicholls, Anne. *Master Public Speaking.* JAICO Publishing House, 2006.
4. Sen, Leena. *Communication Skills.* New Delhi: PHI Learning Pvt Ltd, 2009

Switch Gear and Protection

B. Tech III Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of SGP are to:

1. To introduce students to power system protection and switchgear
2. To provide students the knowledge on theory, construction, applications of main types Circuit breakers, Relays
3. To understand the protection of generators and transformers.
4. To gain knowledge on protection of feeders from over- voltages and other hazards
5. To understand various types of neutral grounding and over voltage protection schemes.

Course Outcomes:

At the end of this SGP course, students will be able to

1. Describe the operation principle of different types of circuit breakers and relays.
2. Illustrate various protection schemes used for Generators & transformers.
3. Analyze different protection schemes used in feeders and bus bars.
4. Distinguish between different types of Neutral Grounding and lightning arresters.
5. Explain the causes of over voltages in power systems and protection schemes used.

Unit - I:

Circuit Breakers

Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages. - Restriking Phenomenon, Average and Max. RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB ratings and Specifications: Types and Numerical Problems. – Auto reclosures.

Description and Operation of following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF_6 circuit breakers.

Unit-II:

Electromagnetic and Static Relays

Principle of Operation and Construction of Attracted armature, Balanced Beam, Induction Disc and Induction Cup relays. Relays Classification: Instantaneous, DMT and IDMT types.

Applications of relays: Over current/ under voltage relays, Direction relays, Differential Relays and Percentage Differential Relays. Universal torque equation, Distance relays: Impedance, Reactance and Mho Relays. Static relays:-introduction, phase comparators, amplitude comparators, static relays versus electromagnetic relays. Micro Processor based relays (Elementary Treatment Only).

Unit-III:

Generator and Transformer Protection

Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on (%) Winding Unprotected.

Protection of transformers: Percentage Differential Protection, Numerical Problems on Design of CTs Ratio in differential protection, Buchholtz relay Protection.

Unit-IV:

Feeder and Bus-Bar Protection

Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays. Translay Relay. Protection of Bus bars – Differential protection

Unit-V:

Neutral Grounding and Protection against Over Voltages

Grounded and Ungrounded Neutral Systems.- Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance - Arcing Grounds and Grounding Practices.

Generation of Over Voltages in Power Systems.-Protection against Lightning Over Voltages – Ground wires, Ground Rods and counter poise - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination.

Text Books:

1. Power System Protection and Switchgear - Badri Ram, D.N Viswakarma, TMH Publications.
2. Switchgear and Protection – Sunil S Rao, Khanna Publishers

Reference Books:

1. Transmission network Protection -Y.G. Paithankar, Taylor and Francis, 2009.
2. Power System Protection and Switch Gear - Bhuvanesh Oza, TMH 2010.
3. Electrical Power systems – C.L. Wadhwa, New Age International (P) Limited, Publishers, 6th Edition.

Power System Operation & Control

B. Tech III Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of PSOC are to:

1. To understand the economic operation of thermal Power Systems.
2. To demonstrate the necessity of economic dispatch in hydro thermal scheduling.
3. To model different power system components contributing for automatic generation control
4. To analyze single area load frequency control and 2 area load frequency control.
5. To know how to control reactive power in power system.

Course Outcomes:

At the end of this PSOC course, students will be able to

1. Analyze the economic operation of thermal-thermal Power Systems.
2. Demonstrate the necessity of economic dispatch in hydro thermal scheduling.
3. Model different power system components contributing for Automatic Generation Control
4. Analyze single area load frequency control and 2 area load frequency control.
5. Explain the importance of reactive power control in power systems.

Unit - I:

Economic Operation of Power Systems

Optimal operation of Generators in Thermal Power Stations, - Heat rate Curve – Cost Curve –Incremental fuel and Production costs, input-output characteristics, Optimum generation allocation with line losses neglected.

Optimum generation allocation including the effect of transmission line losses – Loss coefficients, General transmission line loss formula.

Unit - II:

Hydro Thermal Scheduling

Optimal scheduling of Hydrothermal System: Hydroelectric power plant models, scheduling problems-Short term hydrothermal scheduling problem.

Unit- III:

Modeling of Turbine, Generator and Automatic Controllers

Modeling of Governor: Mathematical Modeling of Speed Governing System – Derivation of small signal transfer function.

Modeling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models.

Generator – Load Model.

Modeling of Excitation System: Fundamental Characteristics of an Excitation system, Transfer function, Block Diagram Representation of IEEE Type-1 Model

Unit- IV :

Load Frequency Control

Necessity of keeping frequency constant. Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response –Controlled and Uncontrolled cases.

Load frequency control of 2-area system – uncontrolled case and controlled case, tie-line bias Control. Proportional plus Integral control of single area and its block diagram representation, steady state response – Load Frequency Control and Economic dispatch control.

Unit-V:

Reactive Power Control

Overview of Reactive Power control – Reactive Power compensation in transmission systems –advantages and disadvantages of different types of compensating equipment for transmission systems; load compensation – Specifications of load compensator, Uncompensated and compensated transmission lines: shunt and Series Compensation.

Text Books:

1. Modern Power system Analysis - D P Kothari and I J Nagrath - Tata McGraw-Hill - 4th Edition.
2. Power System Operation and Control - S. *Sivanagaraju* - Pearson Education India, 1st Edition.

Reference Books:

1. Operation and Control In Power Systems - P S R Murthy.
2. Power generation, Operation and Control – Allen J Wood.
3. Power System Analysis – C.L. Wadhwa, Newage International – 6th Edition.

Microprocessors and Microcontrollers

B. Tech III Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of Micro Processor & Micro Controllers are to:

1. To understand the concepts of microprocessors, different addressing modes and programming of 8085.
2. To understand the basic concepts of 8086.
3. To Study about interrupt structure, communication standards and Serial communication and programming of 8086.
4. To understand the basic concepts of 8051.
5. To interface 8051 with real time applications.

Course Outcomes:

At the end of this Micro Processor & Micro Controllers course, students will be able to

1. Write the assembly language programs of 8085 for simple applications.
2. Write assembly language programs for different addressing modes of 8086.
3. Apply the knowledge of interrupt structure of 8086, communication standards and Serial communication in 8086 interfacing.
4. Write the assembly language programs of 8051 for simple applications.
5. Design 8051 interfacing with different peripherals.

UNIT-I:

8085 Microprocessor

Evolution of microprocessors, The 8085 Microprocessor, Microprocessor communication and bus timings, Generating control signals, 8085 MPU and its architecture and pin diagram, Decoding and Executing an Instruction, Instruction set and Assembly Language programming.

UNIT–II:

8086 Microprocessor

8086 architecture, register organization, memory segmentation, programming model, memory Addresses, physical memory organization, signal descriptions of 8086, timing diagrams.

UNIT–III:

Instruction set and Assembly Language programming of 8086

Addressing modes, assembler directives, macros, simple programs involving logical, arithmetic expressions and string manipulations. Interrupt structure of 8086, Serial communication standards, 8251 USART architectures and interfacing, RS-232C. I/O Interface with 8255-PPI, various modes of operation and interfacing to 8086, 8257 DMA controller to 8086, Memory interfacing to 8086.

UNIT-IV:

8051 Microcontroller

Architecture, I/O ports, register set, Memory organization, Addressing modes and Instruction set of 8051, Interrupts in 8051, Interrupt Priority in the 8051.

UNIT–V:

8051 Interface

Timers/Counters and Serial communication registers in 8051, Interface with Keyboard & Displays, Serial data communication and Timer/Counter Interfacing program.

Text Books:

1. Ramesh S Goankar, "Microprocessor Architecture Programming and Applications with the 8085, Penram International Pvt.Ltd.
2. A.K. Ray & Bhurchandi Advanced Microprocessors and peripherals –, TMH publications.

Reference Books:

1. Kenneth Ayala and Dhanunjay Gadre, 'The 8051 microcontroller' Penram International/ Thomson,1995.
2. Douglas V Hall, "Microprocessors and Interfacing: Programming and Hardware", 2nd, TMH publications.
3. 8086 Micro Processor -Kenneth J. Ayala, Penram International/ Thomson,1995.

Electrical Measurements & Instrumentation

B. Tech III Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of Electrical Measurements & Instrumentation are to:

1. To know the operation of various measuring instruments like Voltmeters/ Ammeters.
2. To study the basic principle of operation CT, PT, pf meters & frequency meters.
3. To understand the power measurement using wattmeters and energy measurement by using energy meters.
4. To learn how to measure the unknown voltage & current using potentiometer and to study the methods of measurement of R, L & C elements.
5. To study about oscilloscopes & Transducers and their applications.

Course Outcomes:

At the end of this Electrical Measurements & Instrumentation course, students will be able to

1. Describe the construction, principle & operation of various measuring instruments.
2. Analyze the various measuring instruments in order to extend the range & minimize the errors
3. Measure3 phase active & reactive power by various methods.
4. Find unknown AC & DC emf, currents using various potentiometers& Use various bridges to find unknown R, L&C values and its quality & dissipation factors for capacitance.
5. Demonstrate the principle of operation of CRO and its applications &explain the importance and working principle of various Transducers.

Unit-I:

Measuring Instruments

Classification – deflecting, control and damping torques – Ammeters and Voltmeters – Permanent Magnet Moving Coil, Moving iron type instruments–expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series multipliers. Elementary treatment of Electrostatic Voltmeters – Extension of range of Electrostatic Voltmeters.

Unit-II:

Instrument Transformers

Current Transformer and Potential Transformer – Ratio and phase angle errors-Numericals – design considerations- Type of P.F. Meters – dynamometer and moving iron type – 1-phase and 3-phase meters – Frequency meters – Resonance type and Weston type – Synchroscopes.

Unit-III:

Measurement of Power and Energy

Single phase dynamometer wattmeter, LPF and UPF, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems-Numericals

Single phase induction type energy meter – driving and braking torques – errors and compensations – testing-Numericals

Unit IV:

Measurement of R, L & C and Potentiometers

Measurement of R, L & C: Method of measuring Low Resistance with Kelvin's double bridge, Medium resistance –Whetstone's bridge, High resistance – loss of charge method.

Measurement of inductance, Quality Factor - Maxwell's bridge, Hay's bridge, Anderson's bridge, Owen's bridge. Measurement of capacitance and loss angle - Desauty bridge– Schering Bridge-Numerical.

Potentiometers: Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate types–Numerical- applications.

Unit- V:

Oscilloscopes, Digital Voltmeters and Transducers

Oscilloscopes: Cathode ray Oscilloscope-Cathode ray tube-time base generator-Horizontal and vertical amplifiers-CRO probes-Applications of CRO-Measurement of phase and frequency-Lissajous patterns.

Digital Voltmeters: Successive approximation, Ramp, Dual-Slope integration type.

Transducers: Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of LVDT, LVDT Applications.

Text Books:

1. Electrical & Electronic Measurement & Instruments - A.K.Sawhney Dhanpat Rai & Co. Publications, 3rd Edition
2. Electrical & Electronics measurements and Instrumentation- ER.R.K Rajput, S.Chand Publications-Fourth Edition

Reference Books:

1. Electrical Measurements – Buckingham and Price, PHI
2. Transducers and Instrumentation - D.V.S Murthy, Prentice-Hall Of India Pvt. Limited, 2nd edition, 2004.
3. Electrical Measurements: Fundamentals, Concepts, Applications – Reissland, M.U, New Age International (P) Limited, Publishers.
4. Electrical Measurements and measuring Instruments – E.W. Golding and F.C. Widdis, 5th Edition, Wheeler Publications.

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ANURAG UNIVERSITY

Signals and Systems

B. Tech III Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of Signals & Systems are to:

1. To explain signals and systems representations/classifications and also describe the time and frequency domain analysis of continuous time signals with Fourier series
2. To get the idea of signal representation in Fourier transforms domain and sampling
3. To understand operation of linear systems and corresponding responses of system
4. To present the concepts of convolution and correlation integrals and make the foundation for advanced courses.
5. To analyze the system using Laplace and Z-transforms

Course Outcomes:

At the end of this Signals & Systems course, students will be able to

1. Represent any arbitrary signals in terms of complete sets of orthogonal functions and understands the principles of impulse functions, step function and signum function.
2. Express periodic signals and non-periodic signals in terms of Fourier transform and representation of the spectrum and to design a system for sampling a signal.
3. Understand the principle of linear system, filter characteristics of a system and its band width,
4. Understand the concepts of auto correlation and cross correlation and power Density Spectrum.
5. Find Laplace transform and Z-transform of various signals and response of the system using Laplace transform and Z-transform

UNIT-I:

Signal Analysis and Fourier Series:

Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal

functions, Orthogonality in Complex functions, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.
Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.

UNIT-II:

Fourier Transforms and Sampling

Deriving Fourier Transform from Fourier Series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function,
Sampling theorem–Graphical and analytical proof for Band Limited Signals, Types of Sampling -Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples.

UNIT-III:

Signal Transmission Through Linear Systems: Linear System, Impulse response, Response of a Linear System, Linear Time Invariant (LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI system, Filter characteristics of Linear Systems, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics,.

UNIT-IV:

Convolution and Correlation of Signals: Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution, Convolution property of Fourier Transforms, Cross Correlation and Auto Correlation of functions, Properties of Correlation function, Energy density spectrum, Parseval's Theorem, Power density spectrum, Relation between Auto Correlation function and Energy/Power spectral density function.

UNIT-V:

Laplace Transforms and Z-Transforms

Review of Laplace Transforms (L.T), Partial fraction expansion, Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Constraints on ROC for various classes of signals, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.
Fundamental difference between Continuous and Discrete time signals, Discrete time signal representation using Complex exponential and Sinusoidal components, Periodicity of Discrete time signal using complex exponential signal, Concept of Z-Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

Text Books:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.

2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.

References Books:

1. Signals & Systems - Simon Haykin and Van Veen,Wiley, 2nd Edition.
2. Fundamentals of Signals and Systems Michel J. Robert, MGH International Edition, 2008.
3. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, Pearson education.3rd Edition, 2004.Publications, 2nd Edition, 2005.

Advance Power Electronics Converters

B. Tech III Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of Advanced Power Electronics Converters are to:

1. To study controlled rectifier circuits with various types of passive filters.
2. To learn the basics of line-commutated rectifiers – 6 pulse and multi-pulse configurations.
3. To understand the operation of 1 phase AC-DC single switch boost converter
4. To study the principle of operation of AC- DC bidirectional boost converter
5. To understand the operation of 1 phase AC-DC fly-back converter

Course Outcomes:

At the end of this Advanced Power Electronics Converters course, students will be able to

1. Analyze thyristor rectifiers with different types of filtering Circuits
2. Compare and contrast 3,6 and 12 poles converter circuits
3. Explain the principle operation of single phase single switch boosts converters
4. Describe the operation of AC-DC bidirectional boost converter
5. Explain the operation of isolated single-phase AC-DC flyback converter

Unit-I:

Thyristor rectifiers with passive filtering

Half-wave thyristor rectifier with RL and RC loads; 1-phase thyristor rectifier with L and LC filter; 3-phase thyristor rectifier with L and LC filter; continuous and discontinuous conduction, input current wave shape.

Unit-II:

Multi-Pulse converter

Review of transformer phase shifting, generation of 6-phase ac voltage from 3-phase ac, 6-pulse converter and 12-pulse converters with inductive loads, steady state analysis, commutation overlap, notches during commutation.

Unit-III:

Single-phase AC-DC single-switch boost converter

Review of dc-dc boost converter, power circuit of single-switch AC-DC converter, steady state analysis, unity power factor operation, closed-loop control structure.

Unit-IV:

AC-DC bidirectional boost converter

Review of 1-phase inverter and 3-phase inverter, power circuits of 1-phase and 3-phase AC-DC boost converter, steady state analysis, operation at leading, lagging and unity power factors. Rectification and regenerating modes. Phasor diagrams, closed-loop control structure.

Unit-V:

Isolated single-phase AC-DC fly back converter

DC-DC fly back converter, output voltage as a function of duty ratio and transformer turns ratio. Power circuit of AC-DC fly back converter, steady state analysis, unity power factor operation, closed loop control structure.

Text Books:

1. L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.
2. G. De, “Principles of Thyristorised Converters”, Oxford & IBH Publishing Co, 1988.

References Books:

1. J.G. Kassakian, M. F. Schlecht and G. C. Verghese, “Principles of Power Electronics”, Addison-Wesley, 1991.
2. N. Mohan and T. M. Undeland, “Power Electronics: Converters, Applications and Design”, John Wiley & Sons, 2007.

Industrial Electrical Systems

B. Tech III Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of Industrial Electrical Systems are to:

1. To gain knowledge on various LT wiring system components
2. To study the requirements of residential and commercial electrical Systems
3. To study the components of HT and LT systems in detail.
4. To study DG Sets, UPS & Batteries in detail
5. To learn about industrial automation using PLC and SCADA.

Course Outcomes:

At the end of this Industrial Electrical Systems course, students will be able to

1. Explain the various electrical system components
2. Design of residential and commercial wiring systems
3. Describe the HT, LT system
4. Selection of UPS, DG sets and batteries for various applications
5. Explain how industrial automation is achieved using PLC and SCADA

UNIT-I

Electrical System Components

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices

UNIT-II

Residential and Commercial Electrical Systems

Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, earthing of commercial installation, selection and sizing of components.

UNIT-III

Industrial Electrical Systems - I

HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

UNIT-IV

Industrial Electrical Systems - II

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

UNIT-V

Industrial Electrical System Automation

Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

Text Books:

1. S. L. Uppal and G. C. Garg, “Electrical Wiring, Estimating &Costing”, Khanna publishers, 2008.
2. H. Joshi, “Residential Commercial and Industrial Systems”, McGraw Hill Education, 2008.

Reference Books:

1. K. B. Raina, “Electrical Design, Estimating & Costing”, New age International, 2007.
2. S. Singh and R. D. Singh, “Electrical estimating and costing”, DhanpatRai and Co., 1997.Web site for IS Standards.

Database Management Systems

B. Tech III Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
	ESC	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Course Objectives:

Course Objectives of DMS are to:

1. Discuss Database management systems, databases and its applications
2. Familiarize the students with a good formal foundation on the relational model.
3. Outline the various systematic database design approaches
4. Describe the concepts of transactions and transaction processing and the issues, techniques related to concurrency and recovery manager.
5. Explore the File organizations, indexing and hashing mechanisms.

Course Outcomes:

At the end of this DMS course, students will be able to

1. Model Entity-Relationship diagrams for enterprise level databases
2. Formulate Queries using SQL and Relational Formal Query Languages
3. Apply different normal forms to design the Database
4. Summarize concurrency control protocols and recovery algorithms
5. Identify suitable Indices and Hashing mechanisms for effective storage and retrieval of Data

Unit I:

Introduction to Database System Concepts: Database-System Applications, Purpose of Database Systems, View of Data, Database Language, Database Design, Database Architecture, Database Users and Administrators.

Introduction to the Relation Models and Database Design using ER Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations Overview of the Design Process, The Entity-Relationship Model, Constraints, Entity-Relationship Diagrams- Unary, Binary, ternary, Aggregation.

Unit II:

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Aggregate Functions, Nested Sub queries.
Formal Relational Query Languages: The Relational Algebra, Tuple Relational Calculus.

Unit III:

Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Functional Dependencies, Closure set of Functional dependencies, Procedure for Computing F^{+}, Boyce Codd Normal form, BCNF Decomposition Algorithm, Third Normal Form, Third Normal Form Decomposition Algorithm
Transactions: Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Serializability.

Unit IV:

Concurrency Control: Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols.
Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, ARIES, Remote Backup Systems.

Unit V:

File Organization: Fixed and variable length records, Sequential file organization, Data Dictionary, Buffer manager.
Indexing and Hashing: Basic Concepts, Ordered Indices, B+-Tree Index Files, B+-Tree Extensions, Multiple-Key Access, Static Hashing, Extendible Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices.

Text Book:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, Sixth Edition, Tata McGraw-Hill 2006.

Reference Books:

1. Raghu Rama Kirshna, Johannes Gchrke, Database Management System, Third Edition, TATA MC Graw Hill, 2003.
2. C J Date, AKannan, S Swamynathan, An Introduction to Database Systems, Eigth Edition
Pearson 2006
3. P Raja Sekhar Reddy, AMallikarjunaReddy, Foundations of Database Management Systems, Lambert Academic Publishing, 2020 (e-Book)
4. https://www.pdfdrive.com/fundamentals-of-database-systems-pdf-e51477130.html

Power Electronics and Simulation Lab

B. Tech III Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Objectives:

Course Objectives of Power Electronics & Simulation Lab are to:

1. To provide basic foundation for analysis of performance of Power Electronics Converters and semiconductor switches.
2. To get practical exposure of different power electronic circuits like rectifiers, inverters, choppers and cyclo converters
3. To study the characteristics of MOSFET, IGBT, SCR
4. To understand the firing & commutation circuits used in thyristor based power electronic circuits
5. To design the simulate power electronic converters using appropriate software.

Course Outcomes:

At the end of this Power Electronics & Simulation Lab course, students will be able to

1. Explain the characteristics SCR, IGBT and MOSFET
2. Investigate different firing and commutation circuits used in thyristor based power electronic circuits
3. Analyze the operation of voltage controllers
4. Examine the performance of various types of rectifiers, inverters, choppers and cyclo converters
5. Design various power electronic converters using simulation software.

List of Experiments:

PART – A

1. Study of Volt - Ampere characteristics of SCR, MOSFET & IGBT.
2. Gate firing circuits for SCR.
3. Single phase ac voltage controller with R and RL loads.
4. Single phase half controlled bridge rectifier with R and RL loads with and without freewheeling Diode.

5. Single phase fully controlled bridge rectifier with R and RL loads.
6. Forced commutation circuits (Class A, Class B, Class C, Class D & Class E).
7. DC Jones chopper with R and RL loads.
8. Single phase parallel inverter with R and RL loads.
9. Single phase series inverter with R and RL loads.
10. Single phase Cyclo converter with R and RL loads.

PART –B

1. Simulation of single phase full converter using RLE load.
2. Simulation of Single phase AC voltage controller using RLE load.
3. Simulation of single phase inverter with PWM control.
4. Simulation of 3-ph full converter using RLE load.

Note: Any 8 experiments from part – A and any 2 experiments from part - B.

Measurements and Instrumentation Lab

B. Tech III Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Objectives:

Course Objectives of Measurements & Instrumentation Lab are to:

1. To calibrate the various meters to find the % error in measuring various quantities.
2. To analyze the various measuring instruments in order to extend the range & minimize the errors.
3. To perform experiment for the measurement of 3 phase active, reactive power & choke coil parameters
4. To illustrate the capacitance pick up characteristics of LVDT.
5. To know how to use the various bridges to find unknown R, L&C values and its quality & dissipation factor of capacitance.

Course Outcomes

At the end of this Measurements & Instrumentation Lab course, students will be able to

1. Calibrate the various measuring instruments.
2. Find the ratio & phase angle errors of CTs.
3. Measure the 3 phase active, reactive power & choke coil parameters.
4. Measure the unknown voltage & current using potentiometer.
5. Measure unknown values of R, L & C using appropriate bridges and calculate dissipation factor of capacitance

The following experiments are required to be conducted as compulsory experiments:

1. Calibration and Testing of single phase energy Meter
2. Calibration of dynamometer power factor meter
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter
4. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.
5. Measurement of % ratio error and phase angle of given C.T. by comparison.
6. Schering bridge & Anderson bridge.
7. Measurement of 3 phases reactive power with single-phase wattmeter.
8. LVDT and capacitance pickup – characteristics and Calibration

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted:

9. Calibration LPF wattmeter using Phantom loading.
10. Measurement of 3 phase power with single watt meter and 2 No's of C.T.
11. Dielectric oil testing using H.T. testing Kit
12. Measurement of Phase and Frequency using CRO.

Dept. of Electronics and Communication Engineering

ANURAG UNIVERSITY

Department of Electronics and Communication Engineering

Board of Studies Meeting 2022

Minutes of the meeting

Date: 15th March 2022

The Board of Studies meeting of Department of Electronics and Communication Engineering has been convened on 15.03.2022 at 10:30 am in 'E' Block Auditorium with the following BoS members:-

- Prof.S.Sathees Kumaran, Chairperson,HOD/ECE
- Dr.P.Chandrasekhar,OU
- Dr.Gajendranath Choudary,IIT,Hyderabad
- Dr.M.Chakravarthy,Scientist-G,DLRL
- Dr.Shantha Thoutam,Startup Evangrlist
- Mr.Venu Gopal,Alumni
- Prof.M.Narayana, Professor,AU
- Dr.D.Haripriya,Associate Professor,AU
- Dr.D.Narendhar Singh,Assistant Professor,AU

The agenda of the BoS meeting are:

1. To approve the modifications and corrections in approved curriculum and structure of R20 III & IV B.Tech. ECE
2. To approve the syllabus of R20 III & IV B.Tech ECE
3. To approve the correction of course titles and formatting the syllabus of R20 II B.Tech ECE for maintaining uniformity throughout
4. To approve the modifications in the list and syllabus of Open Electives offered by ECE Department
5. To discuss about the Vision and Mission of ECE department

Agenda No.1:- The approved Curriculum of R20 III & IV B.Tech ECE has been discussed for modifications and corrections. The proposals and approvals by the BoS members are listed below:

- Course title, “Microprocessors and Microcontrollers” in III B.Tech II Semester to be replaced by “Microprocessors & Microcontrollers and Interfacing” in view of the content of the syllabus. Similar modification is to be done for associated lab course title.
- Typological error of PE in III B.Tech I Semester to be corrected as OE.
- Course title, “Introduction to Robotics & Automation” in III B.Tech I Semester to be replaced by “Fundamentals of Engineering Materials”. Since it is not being offered by department of Mechanical Engineering.
- Course title, “Digital Communication systems” in III B.Tech II Semester to be replaced by “Digital Communication” as system concept is not significant in the syllabus.
- Typological error of OE in III B.Tech II Semester to be corrected as PE for Professional Elective-I.
- Professional Core (PC) course “Embedded Systems & IoT” in III B.Tech II Semester to be listed in sequence with other PC courses and course code to be changed accordingly.
- The number of lecture hours (L) and tutorial hours (T) for PC, “Microwave & Radar Engineering” in IV B.Tech I Semester to be modified as L:3 and T:0 as the course is mostly theoretical.
- Spelling error of ‘Tele Medicine’ in IV B.Tech I Semester to be corrected as ‘Telemedicine’.
- Course title, “Advanced antenna theory & design” in IV B.Tech I Semester to be replaced by “Antenna theory & design” based on the content of syllabus and previous course coverage.
- Course code EC705 of PE-IV in IV B.Tech I Semester to be renumbered as EC706 due to repetition of EC705 .
- Course title, “Machine Learning & Artificial Intelligence” in IV B.Tech I Semester to be replaced by “Machine Learning & Artificial Neural Networks”

based on the content of the syllabus. Similar modification is to be done for associated lab course title.

- Course title, “Industry 4.0 smart manufacturing” in IV B.Tech II Semester to be replaced by “Green Technologies”. Since it is not being offered by department of Mechanical Engineering.
- Course title “Technical and Business Communication” of OE-II to be interchanged by “Data Science and Analytics” of OE-III in IV B.Tech II semester.

Agenda No.2:- The syllabi of R20 III & IV B.Tech ECE courses have been discussed for approval and suggestions. The suggestions and approvals by the BoS members are listed below:

- Review of signals and systems including sampling theorem to be the first topic in ‘Digital signal processing’ in III B.Tech II Semester since two semester gap is there between ‘Signals and Systems’ and Digital Signal Processing courses.
- FPGA and ASIC design flow to be included as a topic in Unit-IV of “VLSI design” course in III B.Tech I Semester.
- Keeping latest trend of Radars and Applications in view, Pager Radar to be included as a topic in Unit-IV of “Microwave & Radar Engineering” in IV B.Tech I Semester.

Agenda No.3:- The approved Curriculum of R20 II B.Tech ECE has been discussed for modifications and corrections. The proposals and approvals by the BoS members are listed below:

- Course title, “Java programming” in II B.Tech II Semester to be replaced by “Object Oriented Programming through Java” as per the instruction of AU Examination Branch.

- The syllabus of II B.Tech I & II Semesters to be reformatted like III & IV B.Tech so as to maintain uniformity and to restrict the number of prescribed text books to two (Maximum three).

Agenda No.4:- The modifications in the list and syllabus of Open Electives offered by ECE Department has been discussed and outcome of the discussions are listed below.

- Course titles and syllabus of four courses listed under Open Electives offered by ECE department are to be changed which are listed below, since open elective courses should cover fundamentals only.
- "Digital Image Processing" as "Basic Principles of Digital Image Processing".
- "Digital Electronics and Microprocessors" as "Fundamentals of Digital Electronics and Microprocessors".
- "Embedded systems & IoT" as "Introduction to Embedded Systems".
- "Introduction to Autonomous Systems" as "Introduction to Drones".

Agenda No.5:- Vision and Mission of ECE department is presented to BoS members. Suggestions are given below.

- External BoS members suggested mail communication on finalized copy of "Vision and Mission" of ECE department for formal approval.
- State-of-the-art technologies, in semiconductors, communication and combination fields are also to be projected in the "Vision and Mission" of ECE department.

The Chairperson, BoS is entitled to make minor modifications to incorporate Open Electives and Ph.D Course Work subjects as per the need.

General suggestions:

- A book for GATE Exam preparation for all relevant courses to be included under reference books.
- The topic 'study state and transient analysis' to be included in suitable course.
- Possibility of exposure to '3D printing technologies' either as an elective course or through Guest lecture is recommended.

- Industry related courses like, 'Digital Design', 'System Verilog' and Open Source Software Tools' with a scope for placements are suggested to be handled or introduced through guest lectures by relevant industry experts.

Chairperson, BoS

VISION:

To contemplate attaining a global centre of excellence status by creating Electronics and Communication Engineers of high professional calibre to suit the demanding needs of industry and academia.

MISSION:

- To incorporate highly student centric education paradigm for capacity building
- To develop graduates with remarkable skills by adopting efficient teaching-learning

practices and providing state-of-the-art facilities

- To inspire young minds to innovate excel for better employability and to create capable entrepreneurs
- To imbibe ethical values to develop citizens to suit the societal needs

➢ **Program Outcomes (POs)**

- **PO1** - **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.
- **PO2** - **Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **PO3** - **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet t h e specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
- **PO4** - **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments,

analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

- **PO5** - **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.
- **PO6** - **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **PO7** - **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **PO8** - **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **PO9** - **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10** - **Communication:** Communicate effectively on complex engineering activities with the engineering community and with t h e society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11** - **Project management and finance:** Demonstrate knowledge and understanding of t h e engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **PO12** - **Life-long learning:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

➢ **Program Educational Objectives (PEOs)**

- **PEO1** - The graduates should have a solid foundation of conceptual knowledge in mathematics, sciences and basic engineering and other support courses that are requisites for understanding the core subjects of the curriculum

- **PEO2** - The graduates should have the professional competency in cutting edge technologies and skills to handle modern tools to solve complex technological problems and become proficient in research, design and development of products, processes and systems as may be required in their career in Electronics engineering in a global scenario.

- **PEO3** - The graduates should be endowed with professionalism, ethical behavior, effective communication skills, spirit of teamwork, multidisciplinary approach and ability to relate engineering issues to broader social and environmental issues

- **PEO4** - The graduates should have the inbuilt capacity for lifelong learning to keep updated constantly with emerging technologies and tools and create a niche for themselves and the institute attracting high demand for employability in the area of their choice in industry, in research, in academics or as an entrepreneur.

➢ **Program Specific Outcomes (PSOs)**

- **PSO1** - **Professional Skills:** An ability to understand the basic concepts of electronic devices and apply them in the design and implementation of circuits and systems in various areas, like Electronic Instrumentation, Microwave and Communication systems, Digital Signal processing, VLSI, automation, Embedded systems etc.
- **PSO2** - **Problem-Solving Skills:** Design and implementation of functional blocks of both hardware and software for solving complex Electronics and communication engineering problems.
- **PSO3** - Achieve successful Career growth: To have a successful career in organizations or as an Entrepreneur in the Field of Electronics and Communication Engineering.

ANURAG UNIVERSITY
Department of ECE
R20 Curriculum & Syllabus

III YEAR I SEMESTER **5T+ 3L**

S.No	Course Code	Category	Course Title	L	T	P	Credits
1	EC501	PC	Analog Communication Systems	3	0	0	3
2	EC502	PC	Microprocessors & Microcontrollers and Interfacing	2	1	0	3
3	EC503	PC	Linear Control Systems	2	1	0	3
4	EC504	PC	VLSI Design	3	0	0	3
5	EC505	OE	**Open Elective – I** 1. Entrepreneurship Development 2. Fundamentals of Engineering Materials 3. Mobile Application Development	3	0	0	3
6	EC506	PC	Analog Communication Systems Lab	0	0	2	1
7	EC507	PC	Microprocessors & Microcontrollers and Interfacing Lab	0	0	3	1.5
8	EC508	PC	VLSI Design Lab	0	0	2	1
9	EC509	MC	NSS/NSO	2	0	0	0
10	EC510	HS	LRQA	0	0	3	1.5
Total				**15**	**02**	**10**	**20**

III YEAR II SEMESTER **5T+3L**

S.No	Course Code	Category	Course Title	L	T	P	Credits
1	EC601	HS	Project Management	3	0	0	3
2	EC602	PC	Digital Communication	2	1	0	3
3	EC603	PC	Digital Signal Processing	3	1	0	4
4	EC604	PC	Embedded Systems & IOT	3	0	0	3
5	EC605	PE	**Professional Elective-I** 1. CPLD &FPGA Architectures 2. Computer Organization and Operating System 3. Computer Networks	3	0	0	3
6	EC606	PC	Digital Signal Processing Lab	0	0	3	1.5
7	EC607	PC	Embedded Systems & IOT Lab	0	0	3	1.5
8	EC608	HS	Skills Integrated English Lab	0	0	2	1
Total				**14**	**02**	**08**	**20**

IV YEAR I SEMESTER **6T+2L**

S.No	Course Code	Category	Course Title	L	T	P	Credits
1	EC701	PC	Microwave & Radar Engineering	3	0	0	3
2	EC702	PC	Machine Learning & Artificial Neural Networks	2	1	0	3
3	EC703	PE	**Professional Elective –II** 1. Digital Image Processing 2. Software Defined Radio 3. Low power VLSI	3	0	0	3
4	EC704	PE	**Professional Elective –III** 1. Cellular & Mobile Communication 2. CAD for VLSI circuits 3. Adaptive Signal Processing	3	0	0	3

5	EC705	PE	**Professional Elective –IV** 1. Antenna Theory & Design 3. Optical Communication 4. Bio-Medical Signal Processing and Telemedicine	3	0	0	3
6	EC706	PE	**Professional Elective-V** 1. Analog VLSI Design 2. Organic and Flexible Electronics 3. Satellite Communication	3	0	0	3
7	EC707	PC	Microwave & Digital Communication Lab	0	0	2	1
8	EC708	PC	Machine Learning & Artificial Neural Networks Lab	0	0	2	1
9	EC709	PW	Mini Project	-	-	-	2
Total				**18**	**02**	**04**	**22**

IV YEAR II SEMESTER

S. No	Course Code	Category	Course Title	L	T	P	Credits
1	EC801	OE	**Open Elective –II** 1. Intellectual Property Rights 2. Data Science and Analytics 3. Disaster Management	3	0	0	3
2	EC802	OE	**Open Elective –III** 1. Deep Learning 2. Technical and Business Communication 3. Green Technologies	3	0	0	3
3	EC803	PW	Technical Seminar	-	-	4	2
4	EC804	PW	Comprehensive VIVA	-	-	-	2
5	EC805	PW	Project	-	-	-	10
Total				**12**	**02**	**22**	**20**

List of Open Electives offered by ECE Department:

Open Elective – I:

1. Basics of Electronics Engineering (Prerequisite: Applied Physics)
2. Instrumentation and Sensors (Prerequisite: Applied Physics)
3. Fundamentals of Signal Processing (Prerequisite: Mathematics-I)

Open Elective – II:

4. Modeling and Simulation for Engineering Applications (Prerequisite: Mathematics)
5. Fundamentals of Digital Electronics and Microprocessors (Prerequisite: Applied Physics)
6. Introduction to Drones (Prerequisite: Applied Physics)

Open Elective – III:

7. Introduction to Robotics (Prerequisite: Applied Physics)
8. Basic Principles of Digital Image Processing (Prerequisite: Mathematics)
9. Introduction to Embedded Systems (Prerequisite: Mathematics)

S.No	Category	Credits
1	HS	9
2	BS	25
3	ES	23
4	PC	60
5	PE	18
6	OE	9
7	PROJECT WORKS	16
	TOTAL	**160**

Program Structure and Syllabus of

B. Tech III Year

(I & II Semesters)

ELECTRONICS & COMMUNICATION ENGINEERING (ECE)

R20 Regulations

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.), Hyderabad, Telangana, INDIA

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B.TECH III YEAR I SEMESTER 5T+ 3L

S.No	Course Code	Category	Course Title	L	T	P	Credits
1	EC501	PC	Analog Communication Systems	3	0	0	3
2	EC502	PC	Microprocessors & Microcontrollers and Interfacing	2	1	0	3
3	EC503	PC	Linear Control Systems	2	1	0	3
4	EC504	PC	VLSI Design	3	0	0	3
5	EC505	OE	**Open Elective – I** 1. Entrepreneurship Development 2. Fundamentals of Engineering Materials 3. Mobile Application Development	3	0	0	3
6	EC506	PC	Analog Communication Systems Lab	0	0	2	1
7	EC507	PC	Microprocessors & Microcontrollers and Interfacing Lab	0	0	3	1.5
8	EC508	PC	VLSI Design Lab	0	0	2	1
9	EC509	MC	NSS/NSO	2	0	0	0
10	EC510	HS	LRQA	0	0	3	1.5
Total				**15**	**02**	**10**	**20**

III YEAR II SEMESTER 5T+3L

S.No	Course Code	Category	Course Title	L	T	P	Credits
1	EC601	HS	Project Management	3	0	0	3
2	EC602	PC	Digital Communication	2	1	0	3
3	EC603	PC	Digital Signal Processing	3	1	0	4
4	EC604	PC	Embedded Systems & IOT	3	0	0	3
5	EC605	PE	**Professional Elective-I** 1. CPLD &FPGA Architectures 2. Computer Organization and Operating System 3. Computer Networks	3	0	0	3
6	EC606	PC	Digital Signal Processing Lab	0	0	3	1.5
7	EC607	PC	Embedded Systems & IOT Lab	0	0	3	1.5
8	EC608	HS	Skills Integrated English Lab	0	0	2	1
Total				**14**	**02**	**08**	**20**

ANALOG COMMUNICATION SYSTEMS

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC501	PC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisite: Signals and Systems, Electronic Devices & Circuits

Course Objectives:

- To learn the basic concepts of amplitude modulation.
- To study DSB-SC and SSB-SC modulation generation and detection methods.
- To know about AM transmitters, receivers and know their performance.
- To study the concepts of angle modulation techniques and know their applications.
- To analyze the noise performance of Analog Modulation systems.

Unit-I: Amplitude Modulation:

Introduction to communication system, need for modulation, amplitude modulation- definition, time domain and frequency domain description, power relations in AM waves, Generation of AM waves:- square-law modulator, switching modulator. Detection of AM waves:-square law detector, envelope detector.

Unit-II: DSB-SC and SSB-SC Modulation:

DSB-SC Modulation: Definition, time domain and frequency domain description. Generation of DSBSC Waves- balanced modulator, ring modulator. Demodulation of DSB-SC waves- coherent detection, COSTAS Loop. SSB-SC modulation- Definition, time domain and frequency domain description. Generation of SSB-SC waves, frequency discrimination method and phase discrimination method. demodulation of SSB waves using synchronous detector.

Unit III: AM Transmitters and Receivers:

Introduction to vestigial side band modulation. AM transmitter block diagram and explanation of each block. AM receiver types- tuned radio frequency receiver, super heterodyne receiver. RF section and characteristics- Frequency changing and tracking,

comparison of AM, DSB-SC, SSB-SC and VSB-SC Techniques. Applications of different AM systems.

Unit IV: Angle Modulation:

Basic concepts, frequency modulation: single tone frequency modulation, spectrum analysis of sinusoidal FM wave, narrow band FM, wide band FM, power and transmission bandwidth of FM wave. comparison of FM and AM.

Generation of FM waves: Direct method- parametric variation method (varactor diode, reactance modulator). Indirect method:- Armstrong method. Detection of FM waves- balanced frequency discriminator, phase locked loop.

Unit V: Noise and Pulse Modulation:

Noise in analog communication system, noise in DSB and SSB system, noise in AM System, pre-emphasis and de-emphasis. Types of Pulse modulation, PAM (Single polarity, double polarity) PWM- Generation and demodulation of PWM. PPM- Generation and demodulation of PPM.

Text Books:

1. H Taub & D. Schilling, Gautam Saha, “Principles of Communication Systems”, TMH, 3rd edition, 2007.
2. R.P. Singh, SP Sapre, “Communication Systems”, TMH, 2nd edition, 2007

Reference Books:

1. George Kennedy and Bernard Davis, “Electronics & Communication System”, TMH, 4th edition, 2009.
2. Simon Haykin, John Wiley, “Communication Systems”, Wiley, 4th edition, 2008.
3. KN Hari Bhat & Ganesh Rao, “Analog Communications”, Pearson Education India, 2nd edition, 2008.
4. B.P Lathi, “Communication Systems”, BS Publication, 2006.

MICROPROCESSORS & MICROCONTROLLERS AND INTERFACING

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC502	PC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Outcomes:

After completing this course, the student will be able to

- Understand the need for modulation and basic concepts of Amplitude modulation.
- Explain the advantages of DSB-SC and SSB-SC modulation techniques compared to AM.
- Apply and relate analog modulation techniques to real time applications like telecommunications, TV's etc.
- Discuss the angle modulation technique FM its performance.
- Describe the noise performance of AM, DSB-SC, SSB-SC and FM Systems.

Prerequisite: Digital Circuits

Course Objectives:

- To understand the concepts of microprocessors, different addressing modes and programming of 8085.
- To understand the basic concepts of 8086.
- To Study the interrupt structure, communication standards and Serial communication and programming of 8086.
- To understand the basic concepts of 8051.
- To interface 8051 for realtime applications.

Unit-I: 8085 Microprocessor:

Evolution of microprocessors, the 8085 microprocessor, microprocessor communication and bus timings, generating control signals, 8085 MPU and its architecture and pin diagram, decoding and executing an instruction, instruction set and assembly language programming.

Unit–II: 8086 Microprocessor:

8086 architecture, register organization, memory segmentation, programming model, memory Addresses, physical memory organization, signal descriptions of 8086, timing diagrams. Addressing modes, assembler directives, macros, instruction set and assembly language programming of 8086: addressing modes, assembler directives, macros, simple programs involving logical, arithmetic expressions and string manipulations.

Unit–III: Interfacing to Microprocessors:

I/O interface with 8255-PPI, 8255-various modes of operation and interfacing to 8086, interrupt structure of 8086, serial communication standards, 8251 USART architectures and its interfacing to 8086, RS-232C. 8257 DMA controller and its interfacing to 8086, memory interfacing to 8086.

Unit-IV: 8051 Microcontroller:

Architecture, I/O ports, register set, memory organization, addressing modes and instruction set of 8051, interrupts in 8051, interrupt priority in the 8051.

Unit–V: Interfacing to Microcontroller:

Timers/Counters and serial communication registers in 8051, interface with keyboard & displays, serial data communication and timer/counter interfacing program.

Text Books:

1.Ramesh S Goankar, “Microprocessor Architecture Programming and Applications with the 8085”, Penram International Publishing 2013.
2. A.K. Ray & Bhurchandi, “Advanced Microprocessors and peripherals”, TMH publications, 2012.

Reference Books:

1. Kenneth Ayala and Dhanunjay Gadre, “The 8051 microcontroller”, Penram International/ Thomson, 2008.
2. Douglas V Hall, “Microprocessors and Interfacing: Programming and Hardware”, 2nd, TMH publications, 1992.
3. Kenneth J. Ayala, “8086 Micro Processor”, Penram International/ Thomson, 1995.

LINEAR CONTROL SYSTEMS

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC503	PC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Outcomes:

After completing the course, students should be able to

1. Write the assembly language programs of 8085 for simple applications.
2. Write assembly language programs for different addressing modes of 8086.
3. Apply the knowledge of interrupt structure of 8086, communication standards and serial communication in 8086 interfacing.
4. Write the assembly language programs of 8051 for simple applications.
5. Design 8051 interfacing with different peripherals.

Prerequisite: Signals and systems, Mathematics

Course Objectives:

- To introduce basic concepts of control systems and transfer function representation
- To employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions and identify the needs of different
  types of controllers to ascertain the required dynamic response from the system
- To formulate different types of analysis in frequency domain to explain the nature of stability of the system.
- To design compensators and determine the stability of the system using state space analysis

Unit - I: Introduction to Control System:

Introduction: Concepts of control systems, open-loop and closed-loop systems. different examples of control systems. feedback characteristics, effects of feedback.

Transfer function representation: block diagram algebra, determining the transfer functionfrom block diagrams, signal flow graphs(SFG) - reduction using mason's gain formula.

Unit - II: Time Response Analysis & PID Controllers:

Time response analysis- standard test signals. Time response of first and second order systems. Time domain specifications, steady state errors and error constants.
PID controllers- effects of proportional derivative, proportional integral systems on steady state error.

Unit - III: Stability Analysis:

Concept of stability - Routh-Hurwitz Criteria. limitations of Routh's stability.
Root-Locus technique- construction of Root-loci, effects of adding poles and zeros to G(s)H(s) on the root loci.

Unit - IV: Frequency Response Analysis:

Introduction, frequency domain specifications, determination of frequency domain specifications from the bode diagrams, polar plots, concept of nyquist stability criterion.

Unit - V: Compensation Techniques & State Variable Analysis:

Compensation techniques – lag, lead, lead-lag compensators design in frequency domain. State Variable analysis - concepts of state variables, state space model, solution of state equations, state transition matrix (STM) and its properties, concept of controllability and observability.

Text Books:

1. B. C. Kuo, "Automatic Control Systems", John wiley and son's, 8th edition, 2003.
2. I.J.Nagrath and M.Gopal, "Control Systems Engineering", New Age International (P) Limited, Publishers, 2nd edition, 2009.

References:

1. A. Nagoor kani, "Control Systems", RBA Publications, June 2006.
2. Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
3. N.K.Sinha, "Control Systems", New Age International (P) Limited Publishers, 3rd Edition, 1998.

VLSI DESIGN

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC504	PC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Outcomes:

After completing the course, students will be able to

- Characterize any system in Laplace domain to illustrate different specification of the system using transfer function concept.
- Employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions & effect of controllers on steady state response.
- Apply Routh-Hurwitz criterion and Root Locus to determine the stability of linear time-invariant systems in time domain.
- Formulate different types of analysis in frequency domain to explain the nature of stability of the system.
- Identify the needs of different types of compensator to ascertain the required dynamic response from the system and analyse linear control system using the state space technique.

Prerequisite: Electronic Devices & circuits, Digital Circuits

Course objectives:

- To give exposure to different steps involved in the fabrication of ICs using, transistors and passive components
- To explain electrical properties of transistors to analyse the behaviour of inverters designed with various loads.
- To give exposure to the design rules to be followed to draw the layout of any logic circuit.
- To provide concept to design different types of logic gates and analyse their transfer characteristics.
- To provide design concepts to design building blocks of data path of any system using gates.
- To understand basic programmable logic devices and testing of the circuits.

Unit-I: Introduction to IC Technology and Electrical Properties:

Metal-oxide-semiconductor (MOS), P-channel MOS, N-channel MOS, complementary MOS(CMOS) and Bi-CMOS technologies- oxidation, lithography, diffusion, ion implantation, metallization, encapsulation, probe testing, integrated resistors and capacitors, CMOS nanotechnology. Basic electrical properties : Basic electrical properties of MOS and Bi-CMOS circuits- Ids-Vds relationships, MOS transistor threshold voltage, gm, gds, figure of merit ωo, pass transistor, NMOS inverter, various pull ups, CMOS inverter analysis and design, Bi-CMOS inverters.

Unit-II: VLSI Circuit Design Processes:

VLSI design flow, MOS layers, stick diagrams, design rules and layout, 2μm CMOS design rules for wires, contacts and transistors layout diagrams for NMOS and CMOS inverters and logic gates, scaling of MOS circuits.

Unit- III: Gate Level Design Data Path Subsystems:

Complex gates, switch logic, alternate gate circuits, time delays, driving large capacitive loads, wiring capacitances, fan-in and fan-out, choice of layers. Data path subsystems: Subsystem design, shifters, adders, ALUs, multipliers, parity generators, comparators, zero/one detectors, counters.

Unit- IV: Array Subsystems and Semiconductor Integrated Circuit Design:

SRAM, DRAM, ROM, serial access memory, content addressable memory

Semiconductor integrated circuit design: PLAs, FPGAs, CPLDs, standard cells, programmable array logic, design approach, parameters influencing low power design.

Unit- V: CMOS Testing:

CMOS testing, need for testing, test principles, design strategies for test, chip level test techniques, system-level test techniques, and layout design for improved testability.

Text Books:

1. Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, “Essentials of VLSI circuits and systems”, PHI, 2005 Edition.
2. Wayne Wolf, “Modern VLSI Design” Pearson Education, 3rd Edition, 2002.

References:

1. John P. Uyemura “CMOS logic circuit Design”, Springer, 2007.
2. Neil H.E Weste, David Harris, Ayan Banerjee. “CMOS VLSI Design – A circuits and systems perspective”, Pearson, 2009.

3. A. Albert Raj, Latha, “VLSI Design”, PHI, 2008.
4. Mead & Convey, “Introduction to VLSI”, BS Publications, 2010.
5. M. Micheal Vai, “VLSI Design”, CRC Press, 2009.

Entrepreneurship Development

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC505	OE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Outcomes:

After completing the course, students should be able to

- Utilize knowledge about the fabrication process of integrated circuit using MOS transistors.
- Draw the layout of any logic circuit which helps to understand and estimate parasitic of any logic circuit.
- Design building blocks of data path using different types of logic gates.
- Design simple memories using MOS transistors and can understand design of large memories.
- Explain the different types of faults that can occur in a system and learn the concept of testing and adding extra hardware to improve testability of system.

Course Objectives:

- To familiarize the student with entrepreneurship, the issues involved in it,
- The potential of entrepreneurship and intrapreneurship,
- The legal environment and statutory issues and explore various funding opportunities.

Unit – I: Introduction to Entrepreneurship:

Entrepreneurship and intrapreneurship, business incubators, rural entrepreneurship, social entrepreneurship, women entrepreneurs, role of entrepreneurs in economic development, types of entrepreneurs. entrepreneurial mind set and stress, causes of failure.

Unit – II: Opportunity Identification:

Myths and realities of entrepreneurship, opportunity identification, problem worth solving, idea generation techniques, design thinking.

Unit – III: Customer Analysis:

Market segmentation, consumer persona, product market fit, unique value proposition.

Unit – IV: Business Model and MVP:

Business model canvas, MVP, risks and assumptions, importance of financial planning.

Unit – V: Organizational Forms Funding Opportunities:

Organizational forms - Partnership, sole proprietorship, corporation. intellectual property rights- copyrights, trademarks, patents. law vs. ethics, informal capital- friends and family, angels, venture capitalists, idea/ patent, growth strategies.

Textbooks:

1. Vasant Desai, YayatiNayak, “Entrerpreneurship”, Himalaya Publishing House,2018
2. Rajeev Roy, “Entrepreneurship”, Oxford University Press, 2/e, 2012

References:

1. 1.D.F.Kuratko and T.V.Rao, “Entrepreneurship”, Cengage Learning,2012
2. 2.Dhruv Nath, Sushanto Mitra, “Funding Your Startup: And Other Nightmares”, 2020
3. V Srinivasa Rao, “Lean Digital Thinking: Digitalizing Businesses in a New World Order”, Bloomsbury India, 2021
4. S.K.Mohanty, “Fundamentals of Entrepreneurship”, PHI, 1/e,2005
5. MOOCS by Wadhwani Foundation

Fundamentals of Engineering Materials

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC505	OE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Outcomes:

After completing the course, students should be able to

- *Interpret the concepts of Entrepreneurship and Intrapreneurship.*
- *Apply the opportunity identification techniques*
- *Differentiate needs of different segments and their*
- *Develop business model and MVP*
- *Recognize organizational forms, IPR concerns and funding opportunities for startups.*

Course Objectives:

- Identify the relation between processing, structure and physical properties
- Understand the phase diagrams of binary systems
- Study the heat treatment principles
- Classify the different types of ferrous and non-ferrous metals
- Learn the recent developments in materials science and engineering

Unit-I: Crystal Structure:

Unit cells – metallic crystal structures – imperfections in solids: point, line, surface and volume defects – dislocation strengthening mechanisms – effect of grain size on the properties of metals and alloys

Unit-II: Alloys and Phase diagrams:

Necessity of alloying – effect of various alloying elements – substitutional and interstitial solid solutions – Hume Rothery's rules for solid solution – phase rule – lever rule. Phase diagrams: Interpretation of binary phase diagrams – isomorphous, eutectic, peritectic diagrams – iron iron-carbide phase diagram

Unit-III: Heat Treatment:

Annealing, normalizing, hardening, tempering, austempering, martempering – isothermal transformation curves – continuous cooling curves – surface hardening methods: case hardening, carburizing, nitriding, cyaniding, carbo-nitriding – age hardening

Unit-IV: Ferrous Metals, Non-Ferrous Metals and Alloys:

Ferrous metals: Classification, properties and applications of cast irons, plain carbon steels, stainless steel, tool steels, maraging steels, hadfield manganese steels, high speed steels. Non-ferrous metals and alloys: Properties and applications of copper and copper alloys: brass, bronze and cupro-nickel – aluminum and Al-Cu-Mg alloys – nickel based super alloys – titanium alloys

UNIT-V: Non-metals:

Classification, properties and applications of polymers, ceramics, composites and nano materials

Text Books:

1. Sidney H. Avener,"Introduction to Physical Metallurgy",Tata Mc-Graw Hill Publications.
2. Donald R. Askeland,"Essential of Materials for Science and Engineering", CL Engineering Publications.
3. Kodgire,"Material Science and Metallurgy", Everest Publishing Home.

References Books:

1. Agarwal,"Science of Engineering Materials",McGraw Hill Education.
2. William and collister,"Materials Science and Engineering", John Wiley and Sons.
3. V. Raghavan,"Elements of Material Science",Prentice Hall India Learning Pvt Ltd.
4. W. G. Vinas and H. L. Mancini,"An Introduction to Material Science", Princeton University Press.
5. R. A. Flinn and P. K. Trojan,"Engineering Materials and their Applications",Jaico books.

Course Outcomes:

At the end of this course, students will be able to:

- *Discuss the crystal structure and defects*
- *Demonstrate the concept of alloying*
- *Construct the equilibrium diagrams of different alloys*
- *Select suitable heat treatment process to achieve desired properties of materials classify metals and non- metals*

Mobile Application Development

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC505	OE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

- Outline the usage of Android development framework.
- Understand the main components of an Android application and its entire life Cycle.
- Develop database programming using SQLite.
- Identify the use of location-based service in android applications.
- Build SMS and MMS applications using Intents.

Unit-I:Introduction to Android

Introduction to android, features of android, the development framework: understanding the android software stack, android application architecture; the dalvik virtual machine, creating first android application, types of android applications, android development tools: the android virtual device manager, android emulator, the dalvik debug monitor service.

Unit-II: Creating applications and Activities:

Introduction to the application manifest file, using the manifest editor, externalizing resources: creating resources - simple values, drawables, layouts, menus, animations. the android activity life cycle. building user interfaces: fundamental android ui design, introducing layouts: defining layouts, using layouts to create device independent user interfaces, optimizing layouts.

Unit-III: Databases and Content Providers:

Introduction to android databases, introducing sqlite, content values and cursors, working with sqlite databases - introducing the sqliteopenhelper, querying a database, extracting values from a cursor, adding, updating, and removing rows, creating content providers, using content providers - introducing the content resolver, querying content providers, adding, deleting, and updating content

Unit-IV: Maps and Location based services:

Using the location-based services, selecting a location provider, selecting a location provider, finding current location; Creating map-based activities: Introducing map view and map activity, creating a map-based activity, maps and fragments

Unit-V: Telephony and SMS:

Using telephony - initiating phone calls, accessing telephony properties and phone state, monitoring changes in phone state using the phone state listener, introducing SMS and MMS -using SMS and MMS in your application, sending SMS and MMS from your application using intents, sending SMS messages using the SMS manager.

Text Book:

1. Reto Meier, “Professional Android 4 Application Development”, 1stEdition, Wrox Press, Wiley Publishing, 2014.

Reference Books:

1. Pradeep Kothari, “Android Application Development (with Kitkat Support)”, Black Book, 2014.
2. Erik Hellman, “Android Programming: Pushing the Limits”, 1st Edition, Wiley Publications, 2014.
3. Mike Wolfson, “Android Developer Tools Essentials”, O’Reilly Edition, 1st Edition, 2013.

Course Outcomes:

At the end of this course, students will be able to:

- Analyze the architecture of android and current trends in mobile operating systems.
- Apply suitable software tools and APIs for the design of user Interfaces to a particular mobile application.
- Design applications for mobile devices using SQLite database.
- Apply the location-based services in android applications.
- Summarize the monitoring changes to the phone, network, data connectivity and SIM states.

ANALOG COMMNICATION SYSTEMS LAB

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC506	PC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	40	60	100

List of Experiments:

PART-A

All the experiments to be simulated using MATLAB or equivalent:

1. Amplitude Modulation & Demodulation
2. SSB-SC Modulation & Demodulation
3. Frequency Modulation & Demodulation
4. Frequency Synthesizer
5. Spectrum analysis of AM and FM Signals
6. Pulse Position Modulation & Demodulation

. PART-B

All the experiments to be verified in Hardware:

1. Amplitude Modulation & Demodulation
2. DSB-SC Modulation & Demodulation
3. Frequency Modulation & Demodulation
4. Frequency Synthesizer
5. Pulse Amplitude Modulation and Demodulation

6. Pulse Width Modulation & Demodulation

Equipments required for Laboratory:

i) CRO's - 0-20 M Hz

ii) Function Generators - 0- 1 M Hz

iii) Trainer kits

iv) TV Receiver Demo kit

v) Software: MATLAB or Equivalent

vi) Computers with latest Specifications.

Outcomes:

After completing the course, students should be able to

- Generate and detect analog modulated signals such as AM, DSB-SC, SSB-SC and FM and to analyze their performance.
- Study the functionality of Frequency Synthesizer and its applications.
- Generate and detect analog modulated signals such as PAM, PPM and PWM and to analyze their performance.
- Observe the spectral Characteristics of AM and FM signals.

MICROPROCESSORS & MICROCONTROLLERS AND INTERFACING LAB

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
EC507	PC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	40	60	100

Course objectives:

- To understand the fundamentals of assembly level programming of microprocessors.
- To understand the concepts of assembly language programming and its applications.
- To learn to develop the assembly level programming using 8086 instruction set.
- To learn to develop the assembly level programming using 8051 instruction set.
- To learn to interface peripherals with 8086 and 8051.

Note: Minimum of 12 experiments to be conducted.

List of Experiments:

The Following programs/experiments are to be written for assembler and execute the same with 8086 Microprocessor and 8051 microcontroller.

1. Programs for 16 bits arithmetic operations for 8086 (using Various Addressing Modes).

2. Program for sorting an array and to generate Fibonacci series for 8086.

3. Programs for string manipulations for 8086.

4. Program for digital clock design using 8086.

5. Interfacing ADC and DAC to 8086.

6. Parallel communication between two microprocessors using 8255.

7. Interfacing to 8086 and programming to control stepper motor using.

8. To interface Seven Segment Display using 8086

9. Programming using arithmetic, logic and bit manipulation instructions of 8051.

10. Program and verify Timer / Counter in 8051.

11. Program and verify Interrupt handling in 8051.

12. UART Operation in 8051.

13. LCD interface with 8051.

14. Keypad Interface with 8051.

Course outcomes:

After completing the course, students should be able to

- Build a program on a microprocessor using instruction set of 8086.
- Analyze the problems and apply a combination of hardware and software to address the problem
- Contrast how different I/O devices can be interfaced to processor and will explore several techniques of interfacing.
- Experiment with standard microprocessor interfaces including GPIO, serial ports, digital-to-analog converters and analog-to-digital converters
- Design 8051 microcontroller interface with I/O peripherals.

VLSI DESIGN LAB

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC508	PC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	40	60	100

Course Objectives

- To design combinational circuits using HDL
- To design sequential circuits using HDL
- To design and analyse combinational circuits using Cadence/mentor graphics
- To design and analyse sequential circuits using Cadence/mentor graphics

List of Experiments:

Note: All experiments from each cycle are to be conducted.

E-CAD programs:

Programming can be done using any complier. Down load the programs on FPGA/CPLD boards and performance testing may be done by simulation using XILINX or equivalent front end tools.

Cycle -1

1. HDL code to realize all the logic gates
2. Design of full adder using 3 modelling styles
3. Design of flip flops: SR, D.
4. Design of 4 bit binary counter

Cycle -2

VLSI Experiments:

Experiments can be done using CADENCE or Equivalent CAD tools

Draw the schematic, Layout and perform physical verification, of the following.

1. CMOS inverter
2. CMOS NAND NOR, gates
3. CMOS AND, OR, gates
4. CMOS XOR and MUX gates
5. CMOS 1-bit Full Adder
6. CMOS SR and D Flip Flops
7. Pass Transistor
8. Design of 4 bit binary counter

Requirements:

1. PC: P-IV
2. Operating system: Windows XP or Higher version
3. Software: XILINX, Cadence/Mentor Graphics
4. Kits: FPGA Spartan 3 & ZED Boards.

Course Outcomes:

After completing the course, students should be able to

- Realize all logic gates
- Design combinational circuits
- Design Sequential circuits
- Understand Combinational Circuits Design using Cadence tool
- Analyse combinational, sequential circuits using CAD Tool.

ANURAG UNIVERSITY

LRQA

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC510	HS	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	40	60	100

Course Objectives

Unit- I:

Number System : Speed Math's , Numbers , Factors ,Prime and co primes , LCM & HCF , Divisibility rules , Finding the unit digit and applications , remainder theory. Ratio and Proportion with Ages: Definition of ratio and Proportion, Finding the resultant ratio. Problems based on Ratios and ages. Percentages: Introduction to percentages, percentage increase /decrease, results on population, results on depreciation, variations, applications of percentage Profit and Loss: Classification of profit and loss, profit/ loss percentages, successive discount.

Unit-II:

Time and Distance: Difference between the average, relative and effective speed , reaching the destination late and early , stoppage time per hour, problems based on trains and problems based on boats. Time and Work: Calculating efficiency, alternate days concept, work and wages ,chain rule , problems based on pipes and cisterns. Simple and Compound Interest : Simple interest ,principle , rate, amount , applications of simple interest , compound interest , compounded annually , compounded half yearly , compounded quarterly , difference between simple and compound interest .

Unit-III:

Permutations and Combinations: Fundamental rules, problems on permutations and combinations. Probability: Definition, notations and problems based on probability.

Mean, Median and Mode : Introduction and problems on mean, median and mode. Partnership: Relation between partners, period of investments and shares. Averages: Average of different groups, change in average by adding, deleting and replacement of objects. Flow Chart : Introduction of symbols and problems on flow charts.

Unit-IV:

Seating Arrangement: Circular, Row, Column, Square and Double row arrangement. Puzzles : Paragraph, incomplete puzzles and problems on them. Number Series: Number, Alphabet and Letter Series. Analogy: Simple, Double, Word and Number Analogy. Coding and Decoding: Classifications and Problems on Coding and Decoding.

Unit-V:

Clocks: Relation between minute and hour hand, angle between hands of a clock, exceptional cases in clocks. Gaining and loosing of time. Calendars: Classification of years, finding the day of any random calendar date, repetition of calendar years. Direction Sense Test: Sort of directions in puzzle, distance between two points, Problems on shadows. Blood Relations: Defining the various relations among the members of a family, Solving blood relation puzzles by using symbols and notations. Problems on coded relations.

Text Books :

1. R.S Agarwal,*"Verbal and Non Verbal Reasoning",* New Edition -2020, S. Chand.
2. R.S Agarwal,*"Quantitative Aptitude",* New Edition- 2020, S. Chand.

References:

1. Abhijeet Guha,*"Quantitative Aptitude",* New Edition-2020, Mc Graw Hill.

Course Outcomes:

After completing the course, students should be able to

PROJECT MANAGEMENT

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC601	HS	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course objectives:

- understand the concepts of project management,
- explain how to identify the projects and planning,
- analyze how to execute the projects,
- assess how to lead the team and evaluation of projects
- to explain the Performance Measurement and Evaluation of the projects.

UNIT-I: Introduction

Introduction to project management, need for project management, project management principles. Project lifecycle, project management phases in lifecycle, project management research in brief, project management today, organization structure, stake holder management, creating a culture for project management.

UNIT-II: Project Identification and Planning

Project identification process, defining the project, approaches to project screening and selection, project planning, work breakdown structure, financial module, getting approval and compiling a project charter, setting up a monitoring and controlling process.

UNIT-III: Project Execution

Initiating the project, controlling and reporting project objectives, conducting project evaluation, risk, role of risk management, project management, risk management an integrated approach, cost management, creating a project budget.

UNIT-IV: Leading Project Teams

Building a project team, characteristics of an effective project team. Achieving cross-functional co-operation, virtual project teams, conflict management, negotiations.

UNIT-V: Performance Measurement and Evaluation

Monitoring project performances, Project control cycles, Earned Value management, Human factors in project evaluation and control. Project termination, types of project terminations, project follow-up. Current and future trends in project management.

Text book:

1. Jeffery K. Pinto, “Project Management”, Pearson Education,2015

2.Gray, Larson, “Project Management”, Tata McGraw Hill,2015.

References Books:

1. Enzo Frigenti, “Project Management”, Kogan, 2015.
2. R. Panneerselvam & P. Senthilkumar, “Project Management”, PHI, 2015.
3. Thomas M.Cappels, “Financially Focused Project Management”, SPD,2008.
4. Guide to Project Management Body of Knowledge (PMBOK® Guide) of Project Management Institute, USA.

- Analyze how to lead the project team
- Discuss the recent trends in project management.

DIGITAL COMMUNICATION

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC602	PC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course outcomes:

After completing the course, students should be able to

- Explain the phases of project life cycle.
- Identify the projects and planning the projects
- Evaluate to control the project execution.

Course Objectives:

- To understand the model of digital communication system and its individual blocks.
- To study various digital modulation techniques and their performance in terms of Probability of error.
- To describe the concept of entropy and need for source coding technique.
- To analyze the necessity of error control coding in digital communication systems.
- To discuss the concept of spread spectrum technique and its applications in CDMA.

UNIT –I: Digital Communication System and Baseband Transmission:

Model of digital communication system, advantages of digital communication system, digital representation of analog signal. baseband transmission-pulse code modulation (PCM), PCM generation and reconstruction, quantization noise, Non uniform quantization and companding, differential pulse code modulation(DPCM), delta

modulation (DM) and it's draw backs, adaptive delta modulation (ADM), noise in PCM and DM.

UNIT- II: Digital Modulation Techniques:

Amplitude shift keying (ASK), ASK modulator, ASK detector, binary frequency shift keying (BFSK), bandwidth and frequency spectrum of BFSK, non coherent BFSK detector, binary phase shift keying (BPSK), coherent BPSK detector, quadrature phase shift keying (QPSK), signal space representation, probability of error of ASK, BFSK and BPSK.

UNIT-III: Information Theory:

Information and entropy, conditional entropy and redundancy, mutual information, source coding techniques-Shannon-Fano coding, Huffman coding, Source coding to increase average information per bit. Bandwidth- S/N tradeoff, Hartley-Shannon law.

UNIT-IV: Error Control Coding:

Matrix description of linear block codes, Error detection and correction capabilities of linear block codes. Cyclic codes - Algebraic structure and encoding, Syndrome calculation and decoding. Convolutional codes - Encoding using state, Tree and trellis diagrams, Decoding using veterbi algorithm.

UNIT-V: Spread Spectrum Modulation:

Use of spread spectrum, direct sequence spread spectrum (DSSS), spread spectrum and code division multiple access, ranging using DSSS, frequency hopping spread spectrum, PN sequence generation and characteristics.

Text Books:

1. Herbert Taub. Donald L Schiling, Goutam Saha, *"Principles of communication systems"*, McGraw-Hill,Third Edition, 2008.

2. Simon Haykin, "*Digital Communication*", John Wiley, 2008.

Reference Books:

1. John G. Proakis,Masoudsalehi, "*Digital Communications*",McGraw-Hill,Fifth Edition, 2008.
2. Ian A. Glover, Peter M. Grant, "*Digital Communications*", Pearson Education, Third Edition 2008.
3. R.P Singh, S D Sapre ,"*Communication Systems*", McGraw-Hill,Second Edition,2007.

Course Outcomes:

After completing this course, the student will be able to

- Understand the advantages of digital communication system.
- Analyze the performance of various digital modulation techniques such as ASK, FSK and PSK in terms of their probability of error.
- Apply source coding technique to increase average information per bit
- Study block codes, cyclic codes and convolutional codes.
- Get familiarized with spread spectrum systems.

DIGITAL SIGNAL PROCESSING

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC603	PC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Prerequisite: Mathematics -I, Signals and Systems.

Course Objectives:

- To understand the fast computation of DFT and appreciate the FFT processing
- To study the designs and structures of digital (IIR and FIR) filters and analyze and synthesize for a given specifications.
- To learn the design procedures used for filter bank and FIR filter
- To learn to program a DSP processor to filter signals

Unit –I: Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT):

Review - Sampling Theorem, Fourier series, Fourier Transform. Discrete Fourier Series (DFS)- representation of periodic sequences, properties. Discrete Fourier transform-properties, linear convolution of sequences using DFT, computation of DFT. Relation between Z-transform and DFT. Fast Fourier Transform-Radix-2 decimation in time and decimation in frequency FFT algorithms.

Unit-II: Realization of Digital Filters:

Application of Z-transforms, solution of difference equations of digital filters, block diagram representation of linear constant coefficient difference equations. Basic structures of IIR systems-direct form-I, direct form-II, cascade, parallel structure. Basic structures of FIR systems-direct form, cascade form, linear phase structure.

Unit-III: Infinite Impulse Response (IIR) Digital Filters:

Analog filter approximations-Butterworth and Chebyshev. Design of IIR digital filters from analog filters, Impulse Invariance and bilinear transformation method.

Unit-IV: Finite Impulse Response (FIR) Digital Filters & Multirate Digital Signal Processing:

Characteristics of FIR digital filters, frequency response, design of FIR digital filters using window techniques, frequency sampling technique, comparison of IIR and FIR filters.

Multirate Signal Processing: Decimation, Interpolation, Sampling rate conversion, Implementation of sampling rate conversion.

Unit–V: Introduction to Digital Signal Processors:

Introduction to programmable DSPs , Multiplier and Accumulator, Modified Bus Structures and Memory, Access, schemes in DSPs, Multiple access memory, Multiport memory, VLSI Architecture, Pipelining, Special addressing, Architecture of TMS 320C5X-Introduction,Bus structure, Central Arithmetic Logic unit, Auxiliary registrar, Index Registrar, Auxiliary Register, Compare Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, Program controller, Some flags in the status registers, On-chip registers, On-chip peripherals.

Text Books:

1. John G. Proakis, Dimitris G.Manolakis, "Digital Signal Processing- principles, Algorithms, and Applications",fourth edition, Pearson Education, 2007.

2. A. V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing" ,PHI,second edition, 2009.

3., B. Venkataramani,M. Bhaskar, "Digital Signal Processing-Architecture, Programming and Applications" ,TATA McGraw Hill, 2002.

References Books:

1. Emmanuel C. Ifeachor and Barrie W. Jervis,"*Digital Signal Processing - A Practical approach*",second Edition, Pearson Education, 2009.
2. Andreas Antoniou," *Digital Signal Processing*",TATA McGraw Hill, Edition 2006.
3. MH Hayes, schaum's Outlines, "*Digital Signal Processing*",TATAMc-Graw Hill,2007.
4. Robert J. Schilling, Sandra L. Harris, "*Fundamentals of Digital Signal Processing using MATLAB*" , Thomson, 2007.
5. Alan V.Oppenheim, RonaldW. Schafer," *Digital Signal Processing*",PHI Edition.,2006

Course Outcomes:

After completing the course, the student will able to

- Understand the spectra of signals that are to be processed by a discrete time filter, and to compute the DFT by various algorithms.
- Analyze and Implement a digital filter structures
- Design and realize IIR by Butter worth and Chebyshev methods

- Design and realize FIR by windowing methods
- Apply signal processing algorithms in DSP processor

EMBEDDED SYSTEMS & IoT

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
EC604	PC	L	T	P	C	CIE	SEE	Total
		3	0	0	4	40	60	100

Prerequisite: Microprocessors & Microcontrollers and Interfacing

Course Objectives:

- To understand the prerequisite of embedded system,
- To differentiate embedded systems with general purpose systems.
- To analyze module requirement of embedded systems
- To evaluate the embedded systems applications to IOT
- To design the IoT applications for industry applications.

Unit-I: Introduction to Embedded Systems:

Definition of embedded system, embedded systems vs general computing systems, history of embedded systems, classification, major application areas, purpose of embedded systems

Typical Embedded System: Core of the embedded System: General purpose and domain specific processors, ASICs, PLDs, commercial off-the-shelf components (COTS).

Unit-II: Memories for embedded systems:

ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems, sensors and actuators, communication interface: On board-I2C and SPI, external communication interfaces-RS232, ethernet, USB, bluetooth,Wifi.

Unit-III: RTOS Based Embedded System Design:

Operating system basics, types of embedded operating systems, tasks, task scheduling algorithms : Preemptive, non-preemptive, round robin, weighted round robin. Kernel objects, semaphores, mutex, pipes and message queues.

Unit-IV: Introduction to Internet of Things (IoT):

Definition and characteristics of IoT, physical design of IoT, Logical Design of IoT, IoT enabling technologies, IoT Levels and deployment templates. Introduction to M2M, difference between IoT and M2M.

Unit-V: Domain Specific IoTs :

Home automation, cities, environment, energy, retail, logistics, agriculture , industry ,health and lifestyle.

Text Books:

1. Shibu K.V, *"Introduction to Embedded Systems",* McGraw Hill, edition 2,2016.
2. Raj Kamal, "Embedded Systems", TMH,2nd edition, 2008.
3. Vijay Madisetti, Arshdeep Bahga, —*Internet of Things (A Hands-on Approach*), Universities Press, 2015.

References Books:

1. Frank Vahid, Tony Givargis, "*Embedded System Design*", John Wiley, 3rd Edition, 2006.

2. Dr. K. V. K. K. Prasad; "*Embedded / real –time systems: concepts, design & programming*," Black Book; Dream tech press, Reprint edition 2013.

3. David E. Simon, "*An Embedded Software Primer*", Pearson Education, Reprint 2005.

Course Outcomes:

After completing the course, students should be able to

- Explain the basics of Embedded Systems.
- Apply basic concepts in designing Embedded Systems.
- Describe Different Embedded Systems Development tools in designing Embedded Systems.
- Utilize the techniques used in debugging embedded software.
- Design the applications of embedded systems

CPLD AND FPGA ARCHITECTURES

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC605	PE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisite: Digital Circuits, VLSI Design

Course Objectives:

- To understand the types of programmable logic devices and the differences between these devices.
- To gain knowledge of various FPGA architectures and their applications.
- To analyse and compare different architectures of FPGAs based on their performance
- To analyse and compare different architectures of CPLDs based on their performance
- To perform Case studies on advanced FPGA/CPLD architectures

Unit-I: Introduction to Programmable Logic Devices:

Introduction, simple programmable logic devices, read only memories, programmable logic arrays, programmable array logic architectures, applications implementation of MSI circuits using PLDs.

Unit –II: Field Programmable Gate Arrays:

Organization of FPGAs, FPGA programming technologies, programmable logic block architectures, programmable interconnects , programmable I/O blocks in FPGAs, dedicated specialized components of FPGAs, applications of FPGA.

Unit-III: FPGA Architectures:

Introduction, SRAM programmable FPGAs, anti-fuse programmable FPGAs, XC4000 architectures, Altera's FLEX 8000/10000 FPGAs and their performances. Case study: XC7Z020; XC7A200.

Unit –IV: CPLD Architectures:

Complex programmable logic devices; Altera MAX 7000, Actel ACT1, ACT2 and ACT3 Architectures and their performances, AMD's-CPLD (Mach 1 to Mach 5).

Unit-V: Design Applications:

Design considerations using CPLDs & FPGAs of parallel adder cell, Parallel adder sequential circuits, counters, multiplexers, parallel counters. Case study: design considerations of zynq7000 series and Artix7 series

Text Books:

1. S. Brown, R.Francis, J.Rose, Z.Vransic, "*Field Programmable Gate Array*", Kluwer Publications, 1992.
2. P.K. Chan & S. Mourad, "*Digital Design Using Field Programmable Gate Array*", prentice Hall(Pte), 1994.

Reference Books:

1. J. Old Field, R.Dorf, "*Field Programmable Gate Arrays*", John Wiley & Sons, New York, 1995.
2. S.Trimberger, Edr. "*Field Programmable Gate Array Technology*", Kluwer Academic Publications, 1994.

Course Outcomes:

After completing the course, student will be able to

- Acquire Knowledge about various architectures and device technologies of PLDs
- Comprehend FPGA Architectures.
- Describe different FPGA architectures and analyse their performances.
- Describe different CPLD architectures and analyse their performances.
- Analyze System level Design on advanced FPGA/CPLD architectures

COMPUTER ORGANIZATION AND OPERATING SYSTEM

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC605	PE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisite: Microprocessors & Microcontrollers and Interfacing

Course Objectives:

- To get familiarized with the concepts of memory connection to CPU.
- To understand the connectivity and communication between processors.
- To implement scheduling algorithms in operating system.
- To study single set of code that can be used by several processors at different stages of execution.
- To demonstrate the knowledge of task synchronization deadlock issues and allocating memory in OS.

Unit -I: Basic Structure of Computers and Memory Hierarchy:

Basic Structure of Computers-Computer Types, Functional Unit, Memory Hierarchy-Main memory, memory address map, memory connection to CPU, Auxiliary memory-Magnetic disks, magnetic tapes, Cache memory- hit and miss ratio, direct, associative and set associative mapping.

Unit-II: Multiprocessors:

Characteristic of multiprocessor, Interconnection structure- time shared common bus, multiport memory, cross bar switch, multistage switching network, Interprocessor communication and synchronization-mutual exclusion with a semaphore.

UNIT-III: Operating Systems Overview and Process Management:

Introduction-What operating system do, operating system structure (uni-programmed and multi programmed), operating system operations, operating system services, System calls, types of system calls, process scheduling – basic concepts, scheduling criteria, scheduling algorithms, thread scheduling.

Unit-IV: Multithreading and Synchronization:

Multithreaded programming-Overview, multithreading models, process coordination synchronization-background, the critical section problem, Peterson's solution, synchronization hardware, semaphore, classical problems of synchronization, monitors.

Unit-V: Deadlocks & Memory Management:

Principles of deadlock-system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, detection and avoidance, recovery from deadlock. Memory management- swapping, contiguous memory allocation, paging, segmentation.

Text Books:

1. M.Morris Mano, "*Computer Systems and Architecture*" , Third Edition, Pearson /PHI,2011.
2. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "*Operating System Concepts*", 9th edition , John Wiley, 2016.

References Books:

1. **C.** Hamacher, Z. Vranesic and S. Zaky, "*Computer Organization*", McGraw-Hill, 2002.
2. W. Stallings, "*Computer Organization and Architecture - Designing for Performance*", Prentice Hall of India, 2002.
3. J .P. Hayes, "*Computer Architecture and Organization*", McGraw-Hill, 1998.
4. D.M. Dharmdhere, "*Operating Systems – A Concept based Approach*", 2nd Edition. TMH, 2007.
5. Andrew S Tanenbaum, "*Modern Operating Systems*", 3rd Edition, PHI, 2008.

Course Outcomes:

After completing this course, the student will be able to

- Improve usage of memory hierarchy in CPU.
- Select suitable interconnection structure and communication in multiprocessors.
- Evaluate suitable scheduling algorithms in operating system applications.
- Analyze task Synchronization and multithreading in operating systems.
- Examine Memory management techniques and dead lock avoidance

COMPUTER NETWORKS

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC605	PE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisite: Digital Circuits, Digital communication

Course Objectives:

- To get familiarized with a general overview of the concepts, fundamentals of computer networks, and error-free transmission.
- To become aware of protocols related to data link layer and channel access and utilization methods.
- To get familiarized themselves with the process of routing protocols and strategies.
- To learn to know different techniques for reliable transmission and quality services in computer networks.
- To get familiarized to use different protocols for the exchange of data from the server.

Unit-I: Network Models:

Network Models: Layered tasks, OSI model, layers in the OSI model, TCP/IP protocol Suite, Addressing. Data Link Layer: Error detection and correction-check sum, crc; data link control-framing, flow, and error control.

Unit-II: Data Link Layer:

Data link layer protocols, noiseless channels, noisy channels, HDLC; Multiple Access - random access, controlled access, channelization.

Unit -III: Network Layer:

Network Layer: Internetworking, IPv4, IPv6, Transition from IPv4 to IPv6; Delivery, forwarding, routing- static routing, dynamic routing, unicast routing protocols.

Unit-IV: Transport Layer:

Transport Layer: TCP, UDP, SCTP; congestion control and quality of service - data traffic, congestion control. Quality of service, techniques to improve QoS.

Unit-V: Application Layer:

Application Layer: Domain name system: name space, domain name space, DNS in the Internet, DNS Messages, Electronic Mail, FTP, HTTP.

Text Books:

1. Behrouz A Forouzan, "*Data Communications and Networking*", 4th edition, McGraw-Hill Special Indian Edition 2006.
2. Andrew S Tanenbaum, David. j. Wetherall, "*Computer Networks*" 5th edition. Pearson Education/PHI 2011.

References:

1. S. Keshav, "*An Engineering Approach to Computer Networks*", 2nd edition, Pearson Education, 1997.
2. William Stallings, "*Data Communications*", 8th edition, Pearson Publishers.

Course Outcomes:

After completing the course, students should be able to

- Gain the knowledge of the basic computer network technology, functions of each layer in the OSI and TCP/IP reference model.
- Gain the knowledge of multiple access protocols for different networks
- Obtain the skills of subnetting and routing mechanisms.
- Obtain the skills to improve quality data transmissions.
- Familiarity with the essential protocols which function as an interface between the user and communicating devices.

DIGITAL SIGNAL PROCESSING LAB

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC606	PC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	40	60	100

Course Objectives:

- To verify properties of a discrete system
- To analyse discrete time signals using various transforms
- To design and implement different types of digital filters
- To verify basic properties of multi rate systems

List of Experiments

Note: - 8 experiments from part A and 4 experiments from part B should be performed. (minimum of 12 experiments must be conducted)

PART-A

1. Generation of Sinusoidal waveform / signal based on recursive difference equations.

2. To find DFT and IDFT of given sequence using FFT function

3. To find frequency response and Impulse response of a given system (Transfer Function / Differential equation form)

4. Determination of Power Spectrum of a given signal(s).
5. Design of Low Pass and High Pass IIR filter for a given specifications.
6. Design of Low Pass and High Pass FIR filter for a given specifications.
7. Generation of Sinusoidal signal through filtering.
8. Generation of Dual Tone Multi Frequency signals.
9. Verify Decimation, Interpolation and I / D sampling rate converters for given discrete time signal
10. Audio specification such as to plot time and frequency display of microphone plus a cosine using DSP. Read a wav file and match with their respective spectrograms.
11. Implementation of noise removal: Add noise above 3 KHz and then remove; Interference suppression using 400 Hz ton

12. To find Circular convolution of two given sequences.

PART-B

1. Generation of Sinusoidal waveform
2. Verify linear convolution
3. Implementation of FFT and IFFT of given sequence.
4. Compute Power Spectrum Density of a sequence
5. Implementation of LP and HP IIR filter for a given sequence
6. Implementation of FIR filter using Windowing Technique

Course Outcomes:

After completing the course, students should be able to

- Describe and develop of various signal processing applications
- Analyze various signals in transform domain
- Perform simulation of digital filter algorithms
- Analyze and implement multi rate signal processing applications
- Design and develop various filter based on DSP Processors.

EMBEDDED SYSTEMS & IOT LAB

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
EC607	PC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	40	60	100

Course Objectives:

On completion of this lab course the students will be able to:

1. Learn to design and implement various embedded system.
2. Learn to code python.
3. Learn to implement communication protocol.
4. Learn to implement MQ Telemetry Transport protocol.

List of Experiments

1. Familiarization with Arduino/Raspberry PI and perform necessary software installation.

2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.

3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.

4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.

5. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.

6. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.

7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.

8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when `1T0' is received from smartphone using Bluetooth.

9. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.

10. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.

11. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.

12. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data

Course Outcomes:

- Understand the Embedded system applications
- Integrate Embedded modules specific application
- Implement an architectural design for IoT for specified requirement
- Solve the given societal challenge using IoT
- Choose between available technologies and devices for stated IoT challenge

SKILLS INTEGRATED ENGLISH LAB

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
EC608	HS	L	T	P	C	CIE	SEE	Total
		0	0	2	1	40	60	100

Course Objectives

4. To improve the students' fluency in English, through a well-developed vocabulary
5. To enable them to respond them appropriate socio-cultural and professional contexts.
6. They will be able to communicate their ideas relevantly and coherently in writing.

Exercise I

Presentation Skills: Oral presentations (individual and group) / JAM sessions/Seminar - Power point presentations - Body Language-kinesics - Haptics

Exercise II

Group Discussion: Dynamics of Group Discussion - Dos and Don'ts – Intervention - Summarizing - Modulation of Voice - Relevance - Fluency and Coherence

Exercise III

Vocabulary Building: synonyms and antonyms - Word Roots - One-Word Substitutes, - Prefixes and Suffixes - study of Word Origin- -Analogy -Idioms and Phrases

Exercise IV

Writing Skills: Structure and presentation of different types of writing - Resume Writing /E-Correspondence/Statement of Purpose - Report Writing - Business Report Writing - Research Abilities/Data Collection/Organizing Data/Tools/Analysis

Exercise V

Interview Skills: Concept and Process - Pre-Interview Planning - Opening Strategies - Answering Strategies - Interview through Telephone and Videoconferencing.

A mini project should be given for the students to work in teams and the Assessment is done.

Minimum Requirements:

The English Language Lab shall have two parts:

i) The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.

ii) The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a digital stereo –audio & video system.

System Requirement (Hardware component): *Computer network with Lan with minimum 60* multimedia systems with the following specifications:

i) P – IV Processor

a) Speed – 2.8 GHZ

b) RAM – 512 MB Minimum

c) Hard Disk – 80 GB

ii) Headphones of High quality

References Books:

5. Dr. Rao, A. Ramakrishna., Dr. G. Natanam and Prof SA Sankaranarayana. *English Language Communication: A Reader cum Lab Manual. Chennai*: Anuradha Publications, 2008.
6. *English Vocabulary in Use series*. Cambridge University Press, 2008.
7. Nicholls, Anne. *Master Public Speaking.* JAICO Publishing House, 2006.
8. Sen, Leena. *Communication Skills.* New Delhi: PHI Learning Pvt Ltd, 2009.

Course Outcomes

The students will be able to

- make oral presentations effectively
- participate in group discussions
- develop vocabulary
- write project/Business reports
- take part in social and professional communication

Dept. of Information Technology

ANURAG UNIVERSITY

Minutes of the Meeting of Board of Studies

The Board of Studies (BoS) meeting of the Department of Information Technology, Anurag University was held on Thursday, 31st March 2022 at 11:00 AM.

The meeting was convened to discuss and finalize the following:

- Vision, Mission, POs, PEOs and PSOs of the Department of Information Technology
- Course structure and syllabus of III Year B. Tech Information Technology
- Course structure and syllabus of III Year B. Tech Cyber Security
- Paper Setters and Evaluators

The Chairman has welcomed the members and conducted the proceedings. The following resolutions are made.

Item	Description	Resolution
Item No. 1:	Vision, Mission, POs, PEOs and PSOs of Department of Information Technology	The members of board approved the Vision and Mission statements and appreciated that the statements are in-line with the University Vision and Mission. Also, the members approved POs, PEOs and PSOs of the department.
Item No. 2:	Course Structure and Syllabus of III Year B. Tech – IT (AU-R20)	The BoS members had a glance of the Course Structure and Syllabus of III Year B. Tech IT. The following changes were suggested in the Course structure: • The course entitled, **Writing Secure Code** was suggested to be offered in III year II semester, in place of Design Thinking Lab.

		• Machine Learning and its applications course was suggested to offer in III year I semester. • Artificial Intelligence course was suggested to offer in III year II semester. • All the members have approved the syllabus of all courses. The suggestions are incorporated.
Item No. 3:	Course Structure and syllabi of III Year B. Tech - Cyber Security (AU-R20)	The BoS members had a glance of the course structure of III Year B.Tech Cyber Security. All the members approved the course structure. After an elaborate discussion, the BoS has approved the syllabi of III Year B. Tech - Cyber Security. The members suggested modifications to the course objectives and outcomes of few courses. The suggestions are incorporated.
Item No. 4:	Paper Setters and Evaluators	The members of the BoS have approved the list of Paper Setters and Evaluators.
Item No. 5:	In case of amendments / changes in the course structure or syllabi, the Board has suggested the Chairman:	a. In any case, if there are major changes/amendments either in course structure or syllabus, the BoS meeting shall be called for its approval

b. If there are any minor changes in course structure or syllabus, it will be communicated to all BoS members through email for e-approval.

The meeting was concluded with a vote of thanks.

The following members have attended the meeting:

S.No	Name	Designation in BOS
1	Dr. Atulnegi, Professor, University of Hyderabad	External Member
2	Mr. Neeraj Kapre, Asst. Manager, Campus Hiring , CapGemini, Mumbai	External Member
3	Mr. Kartheek, TCS, Hyderabad	External Member
4	Ms. T. Niveditha, (Alumnus), Associate Consultant, Amazon India, Hyderabad	External Member
5	Dr. A. Prasanth Rao, Professor, Dept. of Information Technology	Internal Member
6	Mrs. Niteesha Sharma, Asst. Professor, Dept. of Information Technology	Internal Member
7	Dr. K. S. Reddy, Professor and Head, Dept. of Information Technology	Chairman
8	Other senior faculty members and doctorates were also attended	Internal Members

Sd/

Chairman, Board of Studies, Dept. of Information Technology,

Anurag University, Hyderabad.

Vision

To produce global professionals who will make a mark in the Society, by infusing excellence in Education and Research.

Mission

M1: Provide holistic education to instill algorithmic thinking and creativity by leveraging best-in class infrastructural facilities.

M2: Strong liaison with industry, academia, research organizations and Govt. for academic enrichment.

Program Educational Objectives:

PEO-1: Graduates will be able to take up the professional responsibilities and effectively communicate with diversified teams.

PEO-2: Graduates will have the commitment towards the sustainable development for the advancement of the society by adhering ethics and values.

PEO-3: Graduates will practice lifelong learning in producing innovative solutions for complex problems.

Department Mission contribution for attainment of the Department Vision

PROGRAM OUTCOMES

1. Engineering Graduates will be able to:
1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES

PSO1 **Professional Skills:** The ability to understand, analyse, apply and develop solutions to complex problems.

PSO2 **Problem Solving Skills:** The ability to apply basic principles of programming, approach to problem solving, logic building, best practices and strategies for developing sophisticated software applications.

PSO3 **Successful Career**: The ability to become a Globally accepted engineer, to have a successful career in organizations or as an Entrepreneur in the domain of Information Technology.

ANURAG UNIVERSITY

Program Structure and Syllabus of

B. Tech III Year

Information Technology

R20 Regulations

B.TECH III YEAR I SEMESTER [4 T + 4 P + 1 M]

S.No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PCC	Computer Networks	3	0	0	3.0
2		PCC	Operating Systems	3	0	0	3.0
3		PEC-I	1. Machine Learning and its Applications 2. Object Oriented Analysis and Design	3	1	0	4.0
4		PCC	Design and Analysis of Algorithms	3	1	0	4.0
5		PCC LAB	Computer Networks Lab	0	0	3	1.5
6		PCC LAB	Web Technologies Lab	0	0	3	1.5
7		PEC-I LAB	1. Machine Learning 2. Object Oriented Analysis and Design	0	0	3	1.5
8		BSC LAB	Quantitative Aptitude and Reasoning	0	0	3	1.5
9		MC	NSO & NSS	2	0	0	0
			TOTAL	**14**	**2**	**12**	**20**

B.TECH III YEAR II SEMESTER [4 T + 4 P]

S.No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PCC	Artificial Intelligence	3	0	0	3.0
2		HSS&MC	Entrepreneurship Development	2	1	0	3.0
3		PEC –II	1. Mobile Application Development 2. Cloud Application Architectures 3. Data Warehousing and Data Mining	3	1	0	4.0
4		PEC – III	1. Compiler Design 2. Software Project Management 3. Data Science	3	1	0	4.0
5		PCC LAB	Writing Secure Code Lab	0	0	3	1.5
6		PEC –II LAB	1. Mobile Application Development 2. Cloud Computing 3. Data Warehousing and Data Mining	0	0	3	1.5
7		BSC LAB	Verbal Ability and Critical Reasoning	0	0	3	1.5
8		HSS & MC LAB	Professional Skills Lab	0	0	3	1.5

TOTAL	11	3	12	20

COMPUTER NETWORKS

B. Tech III Year I Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

Course Objectives of Computer Networks are to:

1. Elaborate the fundamental concepts of computer networks and network models
2. Interpret the error and flow control mechanisms in the data link layer
3. Explore the knowledge of various routing algorithms
4. Describe the transport layer functionalities
5. Illustrate different application layer functionalities

Course Outcomes

At the end of this Computer Networks course, students will be able to:

1. Illustrate the functionalities of various network models and Data Link Layer
2. Analyze error and flow control mechanisms in the data link layer
3. Examine various Routing Protocols
4. Compare various congestion control mechanisms to improve the QoS of networking
5. Identify the suitable Application layer protocols for specific applications

UNIT I

Introduction: Physical Structures**,** Network Models-Layered Tasks, OSI model, TCP/IP protocol Suite, Addressing.

Data Link Layer: Introduction, Hamming Distance, Cyclic Redundancy Check, Checksum.

UNIT II

Data Link Control: Framing, Flow and Error Control, Noiseless Channels, Noisy Channels, HDLC.

Multiple Access: Random Access, Controlled Access, Channelization.

UNIT III

Network Layer: IPV4 and IPV6 address space, Classful and classless Addressing, IPV4 and IPV6 datagram format, Transition from IPv4 to IPv6, Delivery, Forwarding and Routing, **Routing protocols:** Distance Vector Routing, Link State Routing, Path Vector Routing.

UNIT IV

Transport Layer: Process-to-Process delivery, Transmission control protocol, User datagram protocol, Data traffic, Congestion Control, Quality of Service, Techniques to improve QoS.

UNIT V

Application Layer: Domain Name Space, Distribution of Name Space, DNS in the Internet, Resolution, DNS Messages, Electronic mail, File Transfer Protocol.

Text Book

1. Behrouz A Forouzan," Data Communications and Networking", 4th Edition, McGraw-Hill, 2007

Reference Books

1. Andrew S. Tanenbaum, Computer Networks, Third Edition, Prentice Hall, 2012.
2. William Stallings, Data and Computer Communications, Eight Editions. Pearson Publishers, 2008.
http://highered.mheducation.com/sites/0072967757/student_view0/index.html

OPERATING SYSTEMS

B. Tech III Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

Course Objectives of Operating System are to:

1. Introduce basic concepts of operating system and process management
2. Discuss various CPU scheduling algorithms and problems of process synchronization
3. Demonstrate different methods for handling deadlock
4. Describe about memory management Techniques
5. Explore the File system, system security and protection mechanisms

Course Outcomes

At the end of the Operating System course, students will be able to:

1. Summarize operating system and process management concepts
2. Apply process scheduling and synchronization related issues
3. Outline Deadlock Prevention, Avoidance, Detection and recovery mechanisms
4. Analyze effectively memory management concepts
5. Illustrate various protection and security measures

UNIT I

Operating Systems Overview and Process Management: Introduction-What operating systems do, uni-programmed and multi-programmed, Operating System operations, Operating system services, System calls, Types of System calls, Operating System structure.

Process Management: Process concepts, Operations on processes, Inter process communication. Threads: overview, Multithreading models

UNIT II

Process Scheduling and Synchronization: Process Scheduling – Basic concepts, Scheduling criteria, Scheduling algorithms, Thread scheduling.

Process Synchronization: Background, The critical section problem, Peterson's solution, Synchronization hardware, Semaphore, Classical problems of synchronization, Monitors.

UNIT III

Deadlocks: System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Detection and avoidance, Recovery from deadlock.

UNIT IV

Memory Management: Swapping, Contiguous memory allocation, Paging, Segmentation.

Virtual memory management - Demand paging, copy-on-write, page-replacement, Thrashing.

UNIT V

File System, System Protection and Security: Storage management – File concept, Access methods, Directory and disk structure, File-system mounting. System protection- Goals of protection, principles of protection, Domain of protection, Access matrix.

System Security – Security problem, Program threats, System and Network threats.

Text Book

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, 9th Edition, John Wiley, 2016.

Reference Books

1. D. M. Dharmdhere, Operating Systems – A Concept based Approach, 2nd Edition, TMH, 2007.
2. Andrew S Tanenbaum, Modern Operating Systems, Third Edition, PHI, 2008.
3. Behrouz A. Forouzan, Richard F. Gilberg, Unix and Shell programming, Cengage Learning, 2009.

MACHINE LEARNING AND ITS APPLICATIONS (PEC-I)

B. Tech III Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Professional Elective-I	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives are to:

1. Summarize the need for machine learning for various problem solving
2. Outline the various supervised learning algorithms in machine learning
3. Discuss various unsupervised learning algorithms in machine learning
4. Elaborate Artificial Neural network and deep learning
5. Describe active learning, instance based learning and ensemble learning

Course Outcomes

At the end of this course, students will be able to:

1. Describe Fundamental concepts of machine learning and its applications.
2. Apply supervised learning algorithms for the given problem
3. Compare the performance of unsupervised learning algorithms
4. Discuss Artificial Neural Network and deep learning
5. Appraise active learning, instance based learning and ensemble learning

UNIT I

Introduction to Machine Learning: What is Machine Learning, Why Machine Learning, Types of Machine Learning Systems, Challenges of Machine Learning, Applications of Machine Learning, Essential libraries and Tools, Generalization overfitting and underfitting, Bias–variance trade-off, metrics (TB-1)

UNIT II

Supervised Learning: Classification and Regression, Linear Regression: Single and Multiple, Logistic Regression: Ridge Regression, Lasso Regression, k-Nearest Neighbour, Naive Bayes Classifier, Decision Tree, Support Vector Machine (TB-1)

UNIT III

Unsupervised Learning: Introduction, Supervised Vs Unsupervised Learning, Applications of Unsupervised Learning, clustering, k-Means Clustering, Agglomerative Clustering, Comparing and evaluating the clustering algorithms (TB-2).

UNIT IV

Artificial Neural Networks - Introduction, Understanding the Biological Neuron, Exploring the Artificial Neuron, Types of Activation Functions, Early Implementations of ANN, Architectures of Neural Network: Single-layer feed forward network, Multi-layer feed forward ANNs , Recurrent network, Learning Process in ANN, Backpropagation, Deep Learning (TB-1).

UNIT V

Other types of learning: Introduction, Representation of Learning, Active Leaning, Heuristic for Active Learning, Active Learning Query Strategies, Instance Based Learning, Radial Basis function, Ensemble learning algorithms, bagging, boosting, gradient boosting Machines (TB-1).

Text Books

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Machine Learning, 2019, Pearson.
2. Andreas C. Müller, Sarah Guido, Introduction to Machine Learning with Python, October 2016, O'Reilly Media, Inc.

Reference Books

1. Aurélien Géron, Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems, 2019.
2. Tom M. Mitchell, Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
3. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
4. Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
5. http://www.cs.cmu.edu/~tom/mlbook.html

OBJECT ORIENTED ANALYSIS AND DESIGN (PEC-I)

B. Tech III Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Professional Elective-I	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Object-Oriented Analysis and Design are to:

1. Appraise the basic concepts of UML
2. Understand modelling of a real-word application by UML class diagram
3. Describe the process of Interaction Diagrams
4. Identify the importance of events, signal and state machines
5. Demonstrate the component and deployment diagrams

Course Outcomes

At the end of this Object-Oriented Analysis and Design course, students will be able to:

1. Describe the concepts and principles of Object-Oriented programming in UML
2. Compare the major components and key mechanisms of Class and Object Diagram
3. Design the sequence and collaboration diagram for various applications
4. Construct the state chart diagram for real world applications
5. Analyze the techniques for Component and Deployment Diagrams

UNIT I

Introduction to UML: Importance of modeling, principles of modeling, object-oriented Modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.

Basic Structural Modeling: Classes, Relationships, Common Mechanisms, and diagrams.

UNIT II

Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams.

UNIT III

Basic Behavioral Modeling-I: Interactions, Interaction diagrams

Basic Behavioral Modeling-II: Use cases, Use case Diagrams, Activity Diagrams

UNIT IV

Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams

UNIT V

Architectural Modeling: Components, Deployment, Component diagrams and Deployment diagrams

Text Book

1. Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide, 7th Impression, Pearson Education, 2008.

Reference Books

1. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, UML2 Toolkit, Second Edition, WILEY-Dreamtech India Pvt. Ltd., 2012.
2. Meilir Page-Jones, Fundamentals of Object-Oriented Design in UML, Illustrated Edition, Pearson Education, 2000.
3. Pascal Roques, Modeling Software Systems Using UML2, First Edition, WILEY-Dreamtech India Pvt. Ltd., 2011.
4. Atul Kahate, Object Oriented Analysis & Design, 1st Edition, The McGraw-Hill Companies, 2007.
5. Mark Priestley, Practical Object-Oriented Design with UML, Second Edition, Tata McGrawHill, 2005.

SOFTWARE TESTING (PEC-I)

B. Tech III Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Professional Elective-I	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Software Testing are to:

1. Demonstrate the fundamentals of Software Testing
2. Outline path, Transaction, Dataflow and Domain testing strategies
3. Analyze node reduction algorithms
4. Explore the logic & static testing strategies
5. Acquire knowledge on various automated testing tools

Course Outcomes

At the end of this Software Testing course, students will be able to:

1. Prioritize & categorize the bugs and take necessary measures
2. Apply path, Transaction and Dataflow & Domain testing strategies
3. Identify the number of test cases by applying node reduction algorithms
4. Apply logic & state testing strategies
5. Analyze various automated testing tools

UNIT I

Introduction: Purpose of testing, Dichotomies, model for testing.

Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT II

Transaction Flow Testing: Transaction flows, transaction flow testing techniques.

Data Flow testing: Basics of data flow testing, strategies in data flow testing, application of data flow testing.

UNIT III

Domain Testing: Domains and paths, Nice & ugly domains, domain testing, domains and interface testing.

Paths, Path products and Regular expressions: Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

UNIT IV

Logic Based Testing: Overview, decision tables, path expressions, kv charts, specifications.

State, State Graphs and Transition testing: State graphs, good & bad state graphs, state testing

UNIT V

Graph Matrices and Application: matrix of graph relations, power of a matrix, node reduction algorithm.

Text Book

1. Boris Beizer, Software Testing Techniques, Dreamtech, Second edition, 2017.

Reference Books

1. Dr. K. V. K. K. Prasad, Software Testing Tools, Dreamtech, 2012.
1. Brian Marick, The craft of Software Testing, Pearson Education, 1st Edition, 2007.
2. Software Testing Techniques – SPD(Oreille), Second Edition, 2007.
3. Edward Kit, Software Testing in the Real World, Pearson, 3rd edition, 2013.
4. Perry, Effective methods of Software Testing, John Wiley, 3rd edition, 2008.
5. Meyers, Art of Software Testing John Wiley, 2nd edition, 2006.

DESIGN AND ANALYSIS OF ALGORITHMS

B. Tech III Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Design and Analysis of Algorithms are to:

1. Analyze the asymptotic performance of algorithms
2. Apply the Paradigms and approaches to appreciate the impact of algorithm design in practice
3. Synthesize efficient algorithms in common engineering design situations
4. Analyze complex engineering problems using backtracking
5. Utilize data structures and algorithmic design techniques in solving new problems

Course Outcomes

At the end of this Design and Analysis of Algorithms course, students will be able to:

1. Formulate the knowledge of algorithm analysis and its notations that are applied on the problems solved by divide and conquer paradigm.
2. Design the major graph algorithms for model engineering problems and knowledge of the greedy paradigm
3. Apply the dynamic-programming paradigm and recite algorithms that employ this paradigm
4. Illustrate the concept of backtracking, branch and bound paradigm for real time problems
5. Analyze the complexity of problems and differentiate that in terms of P and NP problems with examples

UNIT I

Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Disjoint Sets- disjoint set operations, union and find operations. [TB:1, CH:1] [TB:2, CH:3]

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort. [TB:1, CH:3]

UNIT II

Graphs: breadth first search, depth first search, spanning trees, connected and bi connected components. [TB:1, CH:2]

Greedy method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem. [TB:1, CH:4]

UNIT III

Dynamic Programming: General method, Multistage graph, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling salesperson problem. [TB:1, CH:5]

UNIT IV

Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles. [TB:1, CH:7]

Branch and Bound: General method, applications -
Travelling salesperson problem,0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution. [TB:1, CH:8]

UNIT V

Lower Bound Theory: Comparison trees, NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP Complete classes, Clique Decision Problem (CDP), Node cover decision problem. [TB-1, CH-10,11]

Text Books

1. Ellis Horowitz, Satraj Sahni and Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publications Pvt. Ltd, Second Edition, 2007.
2. Thomas H. Cormen, Charles E. Leiserson,Ronald L. Rivert and Clifford Stein, Introduction to Algorithms, Third Edition ,PHI Learning Private Limited, Eastern Economy Edition, 2008.

Reference Books

1. Aho, Ullman and Hopcroft, Design and Analysis of algorithms, Pearson education, Reprint 2002
2. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, Introduction to Design and Analysis of Algorithms: A strategic approach, McGraw Hill, 2005.
3. Allen Weiss, Data structures and Algorithm Analysis in C++, Third Edition, Pearson Education.

COMPUTER NETWORKS LAB

B. Tech III Year I Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

At the end of this Computer Networks Lab course, students will be able to:

1. Apply different data link layer framing methods
2. Implement error control methods
3. Examine different protocols of noiseless Channels
4. Develop programs for protocols in noisy Channels
5. Implement programs for routing protocols in network simulation

List of Experiments

1. Implement the data link layer framing methods Bit stuffing, Character Stuffing.
2. Implement CRC 16 error control mechanism in data link layer
3. Implement minimum hamming Distance
4. Implement Stop and Wait protocol.
5. Implement Go-Back-N and Selective Repeat Request protocols.
6. Implement CSMA/CD Using C program.
7. Write a C program for CSMA/CA.
8. Study and installation of simulation tool and its features.
9. Implementation of STAR and MESH topologies using simulation tool
10. Implementation of Subnetting using simulation tools.
11. Configuration of simple Static Routing Protocol using simulation tool.
12. Configuration of Dynamic Routing Protocol using simulation tool.
13. Configuration of Link State Routing (OSPF) Protocol using simulation tool.
14. Configuration of Distance Vector Routing protocol using simulation tools.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

ANURAG UNIVERSITY

WEB TECHNOLOGIES LAB

B. Tech III Year I Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

At the end of this Web Technologies lab course, students will be able to:

1. Design static web pages and validate using java script.
2. Implement database connectivity using JDBC
3. Create Database and Manipulate data using Open Source Tools
4. Deploy servlet-servlet chaining
5. Construct Dynamic web pages using Servlets and JSP

Week 1

Practice Basic HTML Programs:

1. Basic Tags
2. Lists
3. Tables
4. Frames
5. Forms
6. Div and Span

Week 2

Design the following static web pages required for online book store application.

1. Registration page
2. Login page
3. User profile page
4. Shopping page
5. Catalog page

Apply internal and external CSS (Cascading Style Sheets) for Online book store application.

Week 3

Implement Alert Box, Confirm Box, Prompt Box. & Control Structures, Conditional Statements using Javascript.

Week 4

Write JavaScript to validate the following fields of registration page [Book Store Application]: Username Field, Password Field, Phone Number Field, Email-id.

Week 5-6

Introduction to Open Source database tools - MySql / Mongo DB/ No SQL.

Perform Data Definition Language (DDL) and Data Manipulation Language (DML) commands using open source tools.

Implement Database connectivity using JDBC and perform the following:

i) Table creation ii) Data Manipulation.

Week 7

Apache Tomcat Installation Procedure.

Write a program to display the HELLO WORLD message using Java servlet.

Week 8-9

Develop a Java Servlet application to implement and demonstrate get() and post() methods (Using HTTPServlet Class)

Write a Java Servlet program to implement a dynamic HTML using servlet (Username and password should be accepted using HTML and displayed using Servlet)

Write a JAVA Servlet to track HttpSession by accepting user name and password using HTML and display the profile page on successful login.

Week 10

Write a Java Servlet application using Cookies to remember user preferences.

Write a Java Servlet to Auto web page refresh (consider a webpage which is displaying Date and time or stock market status. For all such type of pages, you would need to

refresh your web page regularly; Java servlet makes this job easy by providing refresh automatically after a given interval.

Week 11

Demonstrate the Java servlet-servlet chaining.

Demonstrate the Java servlet and JDBC connection.

Week 12-13

Introduction to JSP.

Write a program to display the HELLO WORLD message using JSP.

Write a JSP program which uses jsp:include and jsp:forward action to display a Webpage.

Write a Java JSP program which uses <jsp:plugin> tag to run a applet.

Week 14-15

Write a JSP application to insert data into the STUDENT database and retrieve info based on particular queries (For example, update, delete, and others).

Write a Java JSP program to implement all attribute of page directive tag.

Week 16

Review.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

MACHINE LEARNING LAB (PEC-I LAB)

B. Tech III Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Professional Elective-I	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

At the end of this Machine Learning Lab course, students will be able to:

1. Explore various packages of machine learning available in Python
2. Implement various supervised learning algorithms
3. Implement clustering techniques for given problems and compare the performance
4. Perform ensemble learning for the given dataset
5. Demonstrates CNN model for image classification

Week 1

Usage of python with tool in machine learning and Data analysis using NumPy and Pandas.

Week 2

Implementation of Data visualization using Matplotlib, Seaborn

Week 3

Implementation of Data visualization using Plotly and cufflinks

Week 4

Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select the appropriate data set for your experiment and draw graphs.

Week 5

Implement logistic regression algorithm for stock prices prediction

Week 6

Implementation of decision tree based ID3 algorithm and use an appropriate data set for building the decision tree.

Week 7

Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.

Week 8

Implementation of naive Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

Week 9

Implement a classifier for the sales data using a Support vector machine

Week 10

Implement K- means clustering algorithm for identifying cancerous data and compare the performance.

Week 11

Implementation of Agglomerative Clustering algorithm to cluster a set of data stored

in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.

Week 12

Implementation of Boosting-Ada Boost and Gradient Boost to convert weak learner to

strong learners.

Week 13

Develop a CNN model for image classification

Week 14

Review

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

OBJECT ORIENTED ANALYSIS AND DESIGN LAB (PEC-I LAB)

B. Tech III Year I Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
	Professional Elective-I	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

At the end of this Lab course, students will be able to:

1. Demonstrate the process to be followed in the software development life cycle
2. Design the use case and Class diagrams for real time applications
3. Compare Sequence and Collaboration diagrams for given problems
4. Draw and analyze the State chart diagram for a given application
5. Construct the Component and Deployment diagrams

Case Studies

1. ATM System
2. Railway Reservation System
3. Library Management System

Week 1-2

Model Class Diagrams for the above specified Case Studies.

Week 3-4

Model Use case diagrams for the above specified Case Studies.

Week 5-6

Model Activity Diagrams for the above specified Case Studies.

Week 7-8

Model Sequence and Collaboration Diagrams for the above Case Studies.

Week 9-10

Model State Chart Diagrams for the above specified Case Studies.

Week 11-12

Model Component Diagrams for the above specified Case Studies.

Week 13-14

Model Deployment Diagrams for the above specified Case Studies.

Week 15

Review.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

SOFTWARE TESTING LAB (PEC-I LAB)

B. Tech III Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Professional Elective-I	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

At the end of this Software Testing Lab course, students will be able to:

1. Prioritize the usage of Programming constructs
2. Analyze specific problems alone or in teams
3. Design test cases and analyze a problem using tools
4. Create a test plan document for a given application
5. Develop a project using a test management tool

List of Experiments

1. Write Program in 'C' Language to demonstrate the working of the following constructs: DO…WHILE, WHILE, SWITCH, FOR, IF-ELSE.
2. "A Program written in 'C' language for Matrix Multiplication fails" Introspect the causes for its failure and write down the possible reasons for its failure.
3. Take any system (ATM System) and study its system specifications and report the various bugs.
4. Write the test cases for any known application (GMAIL).
5. Create a test plan document for any application (LIBRARY MANAGEMENT SYSTEM)
6. Study of any testing tool (WINRUNNER)
7. Study of any web testing tool (SELENIUM)
8. Study of any bug tracking tool (BUGZILLA)
9. Study of any test management tool (TEST DIRECTOR)

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

ANURAG UNIVERSITY

QUANTITATIVE APTITUDE AND REASONING

B. Tech III Year I Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
	BSC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

UNIT I

Number System: Speed Math's, Numbers, Factors, Prime and co primes, LCM & HCF, Divisibility rules, Finding the unit digit and applications, remainder theory.

Ratio and Proportion with Ages: Definition of ratio and Proportion, Finding the resultant ratio. Problems based on Ratios and ages.

Percentages: Introduction to percentages, Percentage Increase /Decrease, Results on Population, Results on Depreciation, Variations, Applications of Percentage.

Profit and Loss: Classification of Profit and Loss, Profit/ Loss Percentages, Successive Discount.

UNIT II

Time and Distance: Difference between the average, Relative and Effective speed, reaching the destination late and early, stoppage time per hour, problems based on Trains and problems based on Boats.

Time and Work: Calculating Efficiency, alternate days concept, work and wages, Chain rule, problems based on Pipes and cisterns.

Simple and Compound Interest: Simple interest, Principle, Rate, Amount, Applications of Simple interest, Compound interest, compounded annually, Compounded Half yearly, Compounded Quarterly, Difference between simple and compound interest.

UNIT III

Permutations and Combinations: Fundamental rules, Problems on Permutations and Combinations.

Probability: Definition, Notations and Problems based on Probability.

Mean, Median and Mode: Introduction and problems on Mean, Median and Mode.

Partnership: Relation between Partners, Period of Investments and Shares.

Averages: Average of different groups, change in average by adding, deleting and replacement of objects

Flow Charts: Introduction of symbols and problems on flow charts.

UNIT IV

Seating Arrangement: Circular, Row, Column, Square and Double row arrangement

Puzzles: Paragraph puzzles, incomplete puzzles and problems on them.

Number Series: Number, Alphabet and Letter Series.

Analogy: Simple, Double, Word and Number Analogy

Coding and Decoding: Classifications and Problems on Coding and Decoding.

UNIT V

Clocks: Relation between minute and hour hand, angle between hands of a clock, exceptional cases in clocks. Gaining and loosing of time.

Calendars: Classification of years, finding the day of any random calendar date, repetition of calendar years.

Direction Sense Test: Sort of directions in puzzle, distance between two points, Problems on shadows.

Blood Relations: Defining the various relations among the members of a family, solving blood relation puzzles by using symbols and notations. Problems on coded relations.

Text Books

1. R.S Agarwal, Verbal and Non-Verbal Reasoning, New Edition, S. Chand.
2. R.S Agarwal, Quantitative Aptitude, New Edition, S. Chand.

Reference Book

1. Abhijeet Guha, Quantitative Aptitude, New Edition, Mc Graw Hill.

NATIONAL SPORTS ORGANIZATION &

NATIONAL SERVICE SCHEME

B. Tech III Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Mandatory	L	T	P	C	CIE	SEE	Total
		2	0	0	0	--	--	--

Course Outcomes

At the end of this NSO & NSS course, students will be able to:

1. Apply knowledge of physical education, growth and development, sports and games knowledge, history of physical education and yoga to explain aim and objectives of physical education.
2. Learn health education, personal hygiene, health problems-prevention and control, physical fitness and wellness, health and first aid management.
3. Develop a broad understanding of NSS and Volunteerism for more involvement.
4. Understand the working of community service model for their all-round personality development.
5. Understand the entrepreneurship and its implementation to solve the community identified problems and work on a project by using learned skills on identified problem of the society.

UNIT I

HEALTH AND WELLNESS: Dimensions of Health: Physical, Mental and Social. Objectives of Health Education. Definition and Dimensions of Wellness – Physical, Emotional, Social, Spiritual, Intellectual and Environmental Wellness. Achieving Wellness.

Practical: Basketball, Cricket, Kho-Kho (Any Two) & Badminton Mandatory),
Layout of Courts / Fields, Skills, Rules & Lead-up Games.

UNIT II

FITNESS AND BODY COMPOSITION: Physical Fitness Components: Body Composition, Muscular Endurance, Strength, Cardiovascular Fitness and Flexibility, Importance of Cardio-Respiratory Endurance. Obesity and Health Risk Factors. Body Composition Indicators and Measurements.

Practical: Football, Kabaddi, Volleyball (Any Two) & Table Tennis (Mandatory) Layout of Courts / Fields, Skills, Rules & Lead-up Games.

UNIT III

Introduction And Basic Concepts of NSS: History, Philosophy, Aims & Objectives of NSS. Emblem, Flag, Motto, Song, Badge, Organizational Structure, Roles and Responsibilities of Various NSS functionaries. NSS Programmes and Activities, Volunteerism and Shramdan.

UNIT IV

Personality Development Through Community Service: Importance and Role of Youth Leadership, Life Competencies, Social Harmony and National Integration, Youth Development Programmes in India, Citizenship, Health, Hygiene and Sanitation, Environment Issues, Disaster Management, Life Skills.

UNIT V

Vocational And Entrepreneurship Skills Development: Definition and meaning of Entrepreneurship, Qualities of good entrepreneur, Steps /ways in operating an Enterprise and role of financial and support service Institutions. Project Cycle Management, Resource Mobilisation and Documentation and Reporting.

Project work/ Practical: Conducting Surveys on Special Theme, Involving in Shramadan, Swachh Bharat, Blood Donation, Tree Plantation, Awareness Programmes, Identify the Community Problems and List out the all-Possible Solutions, Educate the Villagers on Health, Hygiene, Sanitation and Environment Protection. Self-Review of the Students on their Improvements by Participating in the Community Service Programmes.

References

NSO:

1. The Soul of Wellness: 12 holistic principles for achieving a healthy body, mind, heart and spirit, Rajiv Parti, Select book incorporation, New York.
2. H. & Walter, H., (1976). Turners School Health Education. Saint Louis: The C.Y. Mosby Company.
3. Nemir, A. (n.d.). The School Health Education. New York: Harber and Brothers.
4. Health Fitness Instructor's Handbook, Edward T Howley, Human Kinetics, USA.

NSS:

1. About NSS: National Service Scheme Manual by Government of India Ministry of Youth Affairs & Sports, New Delhi.
2. Robert N Lussier, Management Fundamentals - Concepts, Applications, Skill Development, Cengage Learning, First Edition, 2012.
3. Handbook of Personality Development – Mroczek Little (eds), 2006.
4. Richard Blundel, Exploring Entrepreneurship Practices and Perspectives, Oxford, 2011.

ARTIFICIAL INTELLIGENCE

B. Tech III Year II Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

Course Objectives of Artificial Intelligence are to:

1. Summarize overview of artificial concepts
2. Discuss uniform search and informed search
3. Demonstrate how to solve the zero sum gain problem
4. Describe the logic in artificial intelligence and knowledge representation
5. Elaborate notion of different production and expert systems in AI

Course Outcomes

At the end of the Artificial Intelligence course, students will be able to:

1. Describe the concepts and applications of artificial intelligence
2. Compare uniform search and informed search algorithms
3. Solve problems using Zero Sum Game algorithms
4. Represent logic for given problems using facts and rules
5. Summarize functionalities of production and expert systems

UNIT I

Overview of Artificial Intelligence: Introduction. The Turing Test, Strong AI Versus Weak AI, Identifying Problems Suitable for AI, Applications and Methods, Early History of AI, Recent History of AI to the Present, AI in the New Millennium

UNIT II

Uninformed Search: Introduction: Search in Intelligent Systems, State-Space Graphs, Generate-and-Test Paradigm, Blind Search Algorithms, Implementing and Comparing Blind Search Algorithms

Informed Search: Introduction, Heuristics, Informed Search Algorithms – Finding Any Solution, The Best-First Search, The Beam Search, Additional Metrics for Search Algorithms, Informed Search – Finding an Optimal Solution.

UNIT III

Search Using Games: Introduction, Game Trees and Minimax Evaluation, Minimax with Alpha-Beta Pruning, Variations and Improvements to Minimax, Games of Chance and the Expect minimax Algorithm

UNIT IV

Logic in Artificial Intelligence: Introduction, Logic and Representation, Propositional Logic, Predicate Logic – Introduction, Several Other Logics, Uncertainty and Probability

Knowledge Representation: Introduction, Graphical Sketches and the Human Window, Graphs and the Bridges of Königsberg Problem, Search Trees, Representational Choices, Production Systems, Object Orientation, Frames, Semantic Networks

UNIT V

Production Systems: Introduction, Background, Production Systems and Inference Methods, Production Systems and Cellular Automata, Stochastic Processes and Markov Chains, Basic Features and Examples of Expert Systems

Text Book

1. Stephen Lucci, Danny Kopec, Artificial Intelligence in the 21st Century-A Living Introduction, Mercury Learning and Information, Second Edition, 2016

Reference Books

1. Russell, Norvig: Artificial Intelligence, A Modern Approach, Pearson Education, Second Edition, 2004
2. Rich, Knight, Nair: Artificial Intelligence, Tata McGraw Hill, Third Edition, 2009
3. Saroj Kaushik. Artificial Intelligence. Cengage Learning, 2011

ENTREPRENEURSHIP DEVELOPMENT

B. Tech III Year II Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
	HSS&MC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

Course Objectives of Entrepreneurship Development are to:

The objective of this course is to familiarize the student with entrepreneurship, the issues involved in it, the potential of entrepreneurship and intrapreneurship, the legal environment and statutory issues and explore various funding opportunities.

Course Outcomes

At the end of this Entrepreneurship Development course, students will be able to:

1. Interpret the concepts of Entrepreneurship and Intrapreneurship.
2. Apply the opportunity identification techniques
3. Differentiate needs of different segments
4. Develop business model and MVP
5. Recognize organizational forms, IPR concerns and funding opportunities for startups.

UNIT I

Introduction to Entrepreneurship: Entrepreneurship and Intrapreneurship, Business Incubators, Rural entrepreneurship, Social Entrepreneurship, women entrepreneurs, Role of entrepreneurs in economic development, Types of entrepreneurs. Entrepreneurial mind set and stress, Causes of failure.

UNIT II

Opportunity identification: Myths and realities of entrepreneurship, Opportunity identification, Problem worth solving, idea generation techniques, Design thinking.

UNIT III

Customer analysis: Market segmentation, consumer persona, Product market fit, Unique Value proposition.

UNIT IV

Business model and MVP: Business model canvas, MVP, Risks and assumptions, Importance of financial planning.

UNIT V

Organizational forms Funding Opportunities: Organizational forms - Partnership, Sole proprietorship, Corporation. Intellectual Property Rights - Copyrights, Trademarks, Patents. Law Vs. Ethics, Informal capital- Friends and Family, Angels, Venture Capitalists, Idea/ Patent, Growth strategies.

Text Books

1. Vasant Desai, YayatiNayak, Entrerpreneurship, Himalaya Publishing House, 2018.
2. D.F.Kuratko and T.V.Rao Entrepreneurship, Cengage Learning, 2012.

Reference Books

1. Dhruv Nath, Sushanto Mitra, Funding Your Startup: And Other Nightmares, 2020
2. Rajeev Roy, Entrepreneurship, Oxford University Press, 2/e, 2012
3. V Srinivasa Rao, Lean Digital Thinking: Digitalizing Businesses in a New World Order, Bloomsbury India, 2021
4. S.K.Mohanty, Fundamentals of Entrepreneurship, PHI, 1/e, 2005
5. MOOCS by Wadhwani Foundation

MOBILE APPLICATION DEVELOPMENT (PEC-II)

B. Tech III Year II Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Professional Elective-II	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Mobile Application Development are to:

1. Outline the usage of Android development framework.
2. Understand the main components of an Android application and its entire life Cycle.
3. Develop database programming using SQLite.
4. Identify the use of location-based service in android applications.
5. Build SMS and MMS applications using Intents.

Course Outcomes

At the end of this Mobile Application Development course, students will be able to:

1. Analyze the architecture of android and current trends in mobile operating systems.
2. Apply suitable software tools and APIs for the design of User Interfaces to a particular mobile application.
3. Design applications for mobile devices using SQLite Database.
4. Apply the location-based services in android applications.
5. Summarize the Monitoring changes to the phone, network, data connectivity and SIM states.

UNIT I

Introduction to Android: Features of Android, The development framework**:** Understanding the Android Software Stack, Android Application Architecture; the Dalvik Virtual Machine, Creating First Android Application, Types of Android Applications, Android Development Tools: The Android Virtual Device Manager, Android Emulator, The Dalvik Debug Monitor Service.

UNIT II

Creating applications and Activities: Introduction to the application Manifest File, Using the Manifest Editor, Externalizing Resources: Creating Resources - Simple Values, Drawable, Layouts, Menus, Animations. The Android Activity Life cycle.

Building User Interfaces: Fundamental Android UI design, Introducing Layouts: Defining Layouts, Using Layouts to Create Device Independent User Interfaces, Optimizing Layouts.

UNIT III

Databases and Content Providers: Introduction to Android Databases, Introducing SQLite, Content Values and Cursors, working with SQLite Databases - Introducing the SQLiteOpenHelper, querying a Database, Extracting Values from a Cursor, Adding, Updating, and Removing Rows, Creating Content Providers, Using Content Providers - Introducing the Content Resolver, Querying Content Providers, Adding, Deleting, and Updating Content.

UNIT IV

Maps and Location based services: Using the location-based services, selecting a Location Provider, selecting a Location provider, finding current location; **Creating Map-Based Activities**: Introducing Map View and Map Activity, Creating a Map-Based Activity, Maps and Fragments.

UNIT V

Telephony and SMS: Using telephony - Initiating Phone Calls, Accessing Telephony Properties and Phone State, Monitoring Changes in Phone State Using the Phone State Listener.

Introducing SMS and MMS - Using SMS and MMS in Your Application, Sending SMS and MMS from Your Application Using Intents, Sending SMS Messages Using the SMS Manager.

Text Book

1. Reto Meier, Professional Android 4 Application Development, First Edition, Wrox Press, Wiley Publishing, 2014.

Reference Books

1. Pradeep Kothari, Android Application Development (with Kitkat Support), Black Book, 2014, Dreamtech Press publisher, Kogent Learning Inc., 2014
2. Erik Hellman, Android Programming: Pushing the Limits, First Edition, Wiley Publications, 2014.
3. Mike Wolfson, Android Developer Tools Essentials, O'Reilly Edition, First Edition, 2013.

CLOUD APPLICATION ARCHITECTURES (PEC-II)

B. Tech III Year II Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
	Professional Elective-II	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives are to:

1. Impart the concepts of virtualization and its benefits
2. Discuss various Virtualization Technologies
3. Demonstrate the use of storage virtualization
4. Analyze various cloud architectures
5. Acquire the knowledge of disaster recovery and security in the cloud

Course Outcomes

At the end of this course, students will be able to:

1. Appreciate Virtualization Concepts
2. Analyze various Virtualization Technologies
3. Compare cloud storage mechanisms
4. Draw cloud architecture
5. Apply security mechanisms for cloud computing

UNIT I

Introduction to Virtualization: Objectives of virtualization, history of virtualization, benefits of virtualized technology, the virtual service desk, what can be virtualized, related forms of computing, cloud computing, software as a service – SaaS, grid computing, utility computing, virtualization processes. [TB:1, CH:1]

UNIT II

Virtualization Technologies: Storage virtualization, Virtualization density, Para-virtualization, OS virtualization, Virtualization software, Data Storage virtualization, Intel virtualization technology, Thinstall virtualization suite, Net framework virtualization, Windows virtualization on Fedora, Storage virtualization technologies, Virtualization level, Security monitoring and virtualization, Oracle virtualization. [TB:1, CH:3]

UNIT III

Virtualization and Storage Management: The heart of cloud computing-virtualization, defining virtualization, why virtualize, what can be virtualized, where does virtualization happen, how does virtualization happen, on the road to storage virtualization, improving availability using virtualization, improving performance through virtualization, improving capacity through virtualization, business value for virtualization. [TB:1, CH:6]

UNIT IV

Overview of Cloud Computing: Essentials, Need and History of Cloud Computing, Benefits and Limitations.

Cloud Computing Architecture: Introduction, Grid Architecture, Advantages and Challenges. Cloud Computing Architecture – on the basis, Similarities and Differences between Grid and Cloud Computing, Characteristics of Cloud Computing, Cloud Service Models**.** [TB:2, CH: 1,3, 4.1]

UNIT V

Models of Cloud Computing: Cloud Computing Deployment Models, Cloud Data Center Core Elements, Replication Technologies, Backup, and Disaster Recovery.

Security issues of Cloud Computing – Introduction, Security Concerns, Information Security Objectives, Design Principles, and Security Services. [TB:2, CH:4.4,5,10]

Text Books

1. Ivanka Menken, Gerard Blokdijk, Cloud Computing Virtualization Specialist Complete Certification Kit - Study Guide Book, 2009
2. Shailendra Singh, Cloud Computing, Oxford University Press, 2018

Reference Books

1. Anthony T. Velte, TobeJ.Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Publication Pearson Education, 2009
2. Tom Clark, Storage Virtualization: Technologies for Simplifying Data Storage and Management, Addison-Wesley, 2005
3. Curtis Brian, J.S. Chee, Cloud Computing Technologies and Strategies of the Ubiquitous Datacenter, 2010
4. George Reese, Cloud Application Architectures Building Applications and Infrastructure in the Cloud, O'Reilly Media Press, 2009.

DATA WAREHOUSING AND DATA MINING (PEC-II)

B. Tech III Year II Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Professional Elective-II	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Data Warehousing and Data Mining are to:

1. Discuss various schemas in Data Warehousing
2. Explain data mining functionalities and preprocessing techniques
3. Elaborate the concept of Association and Classification algorithms
4. Describe various clustering techniques for different datasets
5. Examine spatial and web data mining

Course Outcomes

At the end of this Data Warehousing and Data Mining course, students will be able to:

1. Design a data mart or data warehouse for any organization
2. Apply Preprocessing techniques for different datasets
3. Identify appropriate data mining algorithms to solve real world problems
4. Apply the clustering techniques for different data sets
5. Explore recent trends in data mining such as web mining, spatial-temporal mining

UNIT I

Data Warehouse and OLAP Technology: what is a Data Warehouse, Multidimensional Data Model, OLAP Operations on Multidimensional Data, Data Warehouse Architecture.

UNIT II

Introduction to Data Mining: Fundamentals of data mining, Data Mining Functionalities, Data Mining Task Primitives, Major issues in Data Mining. **Data Preprocessing**: Needs for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction.

UNIT III

Mining Frequent Pattern: Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules.

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification.

UNIT IV

Cluster Analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods-K-means, PAM, Hierarchical Methods-BIRCH, Density-Based Methods-DBSCAN, Outlier Detection.

UNIT V

Pattern Discovery in real world data: Mining Time-Series Data, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web, Data Mining Applications.

Text Book

1. Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, Second Edition, Elsevier, 2007.

Reference Books

1. Alex Berson and Stephen J. Smith, Data Warehousing, Data Mining & OLAP, Tata McGraw Hill, Tenth Reprint, 2007.
2. Arun K.Pujari, Data Mining Techniques,2nd Edition, Universities press.

COMPILER DESIGN (PEC-III)

B. Tech III Year II Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
	Professional Elective-III	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Compiler Design are to:

1. Describe the fundamental principles in compiler design
2. Discuss CFG's and parsing techniques
3. Predict the performance of different parsers
4. Summarize the role of runtime environments and memory organization for implementation of typical programming languages
5. Predict various techniques for code optimization and code generation

Course Outcomes

At the end of this Compiler Design course, students will be able to:

1. Analyze the phases of a typical compiler, including the front- and backend
2. Apply the role of a parser in a compiler and relate the yield of a parse tree to a grammar derivation
3. Design and implement a parser using a typical parser generator
4. Develop an intermediate code generator based on given code patterns
5. Apply the optimization techniques to have a better code for code generation

UNIT I

Introduction to Compilers: Structure of Compiler-Phases of Compiler, Symbol Table Management, Grouping of Phases into Passes, Compiler Vs Interpreter.

Lexical Analysis: Role and need of Lexical Analyzer, Input Buffering, Regular expressions for identifiers, signed numbers etc. A Language for specifying Lexical Analyzer, Lexical phase errors.

UNIT II

Syntactic Specification: Context Free Grammars, Derivations and Parse Trees, Capabilities of Context Free Grammars, Syntactic Phase errors, Semantic errors.

Basic Parsing Techniques: Parsers, Shift-Reduce Parsing, Operator-Precedence parsing, Top-Down parsing, Predictive parsers.

UNIT III

Construction of efficient Parsers: LR Parsers, Canonical collection of LR(0) items, Constructing SLR parsing tables, Constructing LR parsing tables, Constructing LALR parsing tables, using Ambiguous grammar, Comparison of SLR,LALR and CALR parsers, Comparison of Top down and Bottom up parsers.

UNIT IV

Syntax Directed Translation: Syntax Directed Translation schemes, Intermediate codes, Postfix notation, Three Address code, Quadruples and triples.

Symbol table: Contents of Symbol table, Data Structures for symbol tables, representing scope information.

Run-Time Environments: Storage Organization, Stack allocation of space, Access to non-data.

UNIT V

Code Optimization: Principal sources of optimization, Loop optimization, Copy Propagation, Dead code elimination, Redundant subexpression elimination.

Code Generation: Object programs, problems in Code generation, A Machine Model, A Simple Code generator, Register allocation and assignment, Peephole optimization.

Text Book

1. Alfred V Aho, Jeffrey D Ullman, Principles of Compiler Design, Pearson Education, 2001.

Reference Books

1. J P Trembly and P G Sorenson, The Theory and Practice of Compiler Writing, McGraw Hill, 2005.
2. Alfred V Aho, Ravi Sethi, Jeffrey D Ullman, Compilers-Principles, Techniques and Tools, Pearson Education, second edition.
3. Dick Grone, Henri E Bal, Ceriel J H Jacobs, Modern Compiler Design, Wiley Dreamtech, 2006.

SOFTWARE PROJECT MANAGEMENT (PEC-III)

B. Tech III Year II Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
	Professional Elective-III	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives are to:

1. Provide knowledge of software project management principles
2. Demonstrate a project evaluation and assign resources
3. Choose an appropriate project schedule and activity plan
4. Identify project risks, monitor and track project deadlines
5. Summarize the various team structures

Course Outcomes

At the end of this course, students will be able to:

1. Apply the practice of project management in delivering projects
2. Evaluate the project against strategic, technical and economic criteria
3. Identify effort estimation and activity plan of a project
4. Categorize and prioritize actions for risk management
5. Evaluate the characteristics of various team structures

UNIT I

Introduction to Software Project Management: Introduction, importance of software project management, Categorization of software project, problems, setting of objectives, stakeholders, the business case, management control.

Stepwise: Overview of Project Planning: Introduction, selection of projects, objectives infrastructure, products and activities, activity risks. Analysis of project characteristics, estimation of effort for each activity, allocation of resources, review/publicize plan/execute plan.

UNIT II

Programme Management and Project Evaluation: programme management, management of allocation of resources within a programme, strategic programme management, creating a programme management, aids to programme management, benefits, evaluation of individual project's, technical assessment, cost benefit analysis, evaluation techniques, cash flow forecasting.

Selection of an Appropriate Project Approach: choosing technologies, technical

plan content list, and dynamic system development method.

UNIT III

Software Effort Estimation: applications and its problems, the basis of software estimation.

Activity Planning: objectives, plan, project schedules, projects and activities (sequencing and scheduling), network planning models, formulating the network models, far ward and backward pass, identifying the critical path, activities.

UNIT IV

Risk Management: framework (identification, assessment, planning, and management), evaluating risks to the schedule, applying the PERT techniques, monte carol simulation, and critical chain concepts.

Resource Allocation: Nature, identifying requirements, scheduling, creating critical paths, counting costs, publishing, cost schedule, scheduling sequence.

UNIT V

Monitoring and Control: creating framework, collecting data, visualizing progress, cost monitoring, earned value analysis, prioritizing monitoring, change control.

Managing Contracts: ISO 12207 approach, supply process, types, stages, typical terms of a contract, contract management, acceptance.

Managing People and Organizing Teams: organizational behavior, selecting the right person, instruction and best methods, motivation, Oldham-Hackman job characteristics working in groups, becoming a team, decision making, leadership, organizational structures, dispersed and virtual teams, influence of culture, stress, health and safety.

Text Book

1. Bob Hughes and Mike Cotterell, Software Project Management, 5th Edition, Tata McGraw-Hill, 2015.

Reference Books

1. Newtown Square A Guide to The Project Management Body of Knowledge (PMBOK
2. Guide), Pa.: Project Management Institute, Inc., 2004. Print.
3. Walker Royce, Software Project Management, Pearson Education, 2006.
4. Joel Henry, Software Project Management, Pearson Education, 2005.
5. Pankaj Jalote, Software Project Management in practice, Pearson Education, 2007.

DATA SCIENCE (PEC-III)

B. Tech III Year II Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
	Professional Elective-III	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives are to:

1. Summarize the concepts of data science
2. Outline various steps involved in data science
3. Discuss data collection and manipulation methods in data science
4. Describe how to handle categorical and time series data
5. Compare various methodologies in data visualization

Course Outcomes

At the end of this course, students will be able to:

1. Discuss data science concepts and Process
2. Handle large data in Single Computer
3. Manipulate large data using Python Programming language
4. Analyze large categorical and time series data
5. Create dashboards to display the data using visualization

UNIT I

Data science in a Big Data World: Benefits and uses of data science and big Data-Facets of data-The data science process-The big data ecosystem and data science. **The data science process-**Overview of the data science process-Steps: Defining research goals and creating-- Retrieving data. [TB:1, CH:1]

UNIT II

Handling Large Data on a Single Computer: The problem in handling large data-General techniques for handling large volumes of data-General programming tips for dealing with large data sets-Case Studies. [TB:1, CH:2,4]

UNIT III

Data Manipulation with Pandas: Introducing Pandas Objects- Data Indexing and Selection- Operating on Data in Pandas- Handling Missing Data- Hierarchical Indexing-Combining Datasets: Concat and Append- Combining Datasets: Merge and Join-Aggregation and Grouping. [TB:2, CH:3]

UNIT IV

Data Manipulation with Pandas: Pivot Tables- Vectorized String Operations- Working with Time Series- High-Performance Pandas: eval () and query (). [TB:2, CH:3]

UNIT V

Visualization with Matplotlib: Simple Line Plots- Simple Scatter Plots- Visualizing Errors- Density and Contour Plots- Histograms, Binnings, and Density- Customizing Plot Legends- Customizing Colorbars- Multiple Subplots- Text and Annotation- Customizing Ticks- Customizing Matplotlib: Configurations and Stylesheets- Three-Dimensional Plotting in Matplotlib- Geographic Data with Basemap. [TB:2, CH:4]

Text Books

1. Davy Cielen, Arno d. B. Meysman, Mohamed Ali, Introduction to Data Science, Manning Publications, 2016.
2. Jake Vanderplas, Python Data science Hand Book, O'Reilly, 2017.

Reference Books

1. Cathy O'neil, Rachel Schutt, Doing Data Science, straight talk from the frontline, O'Reilly, 2013
2. Jure Leskovek, Anand Rajaraman, Jeffry Ullman, Mining of Massive datasets, V2.1, Cambridge University Press, 2014.
3. Joel Grus, Data Science from Scratch: First Principles with Python, first edition, O'Reilly, 2015.

Web References

1. **An introduction to data science**

https://www.edureka.co/blog/what-is-data-science/

https://intellipaat.com/blog/what-is-data-science/

2. **Data collection:**

http://bigdata-madesimple.com/3-effective-methods-of-data-collection-for-market-research/

3. **Data sources:**

https://www.allerin.com/blog/top-5-sources-of-big-data

http://tdan.com/combining-data-from-multiple-sources-join-integrate-blend/19877
https://www.techrepublic.com/blog/big-data-analytics/use-normalization-and-etl-to-get-the-big-data-results-you-want/

https://www.youtube.com/watch?v=f0nMfV1GvOg

WRITING SECURE CODE LAB

B. Tech III Year II Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

At the end of this Writing Secure Code lab course, students will be able to:

1. Write Secure Code for a software application.
2. Appreciate security vulnerabilities and how they are exploited.
3. Explore various tools to implement secure code
4. Develop skills to provide high secured security-oriented software techniques.

List of Experiments

Week 1

1. Writing Secure Code – An introduction

Week 2

2. Introduction to various Tools and Libraries to write secure code.
3. Secure Software Tools Installation.

Week 3-4

4. Write a program to handle Array Indexing Errors.
5. Write a program to Safe String Handling.

Week 5

6. Implement a program to Avoiding Server Hijacking.
7. Write a program to Limiting the Domain Usage.
8. Write a program to test User Input Vulnerabilities.

Week 6-7

9. Implement SQL Injection technique.

10. Implement X-Frame options.

Week 8-9

11. Write a program to implement HTTP security headers.
12. Write a program to implement HTTP Cookies.

Week 10-11

13. Write a program for Testing Sockets-Based Applications.
14. Write a program for Testing HTTP-Based Applications.

Week 12-15

15. Write a program for Testing File-Based Applications.
16. Write a program for Testing Command Line Arguments.
17. Write a program for Testing Cross-Site Scripting and Script-Injection Bugs.

Week 16

Review.

TEXT BOOK:

1. Michael Howard and David LeBlanc, Writing Secure Code, Microsoft, 2001.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

MOBILE APPLICATION DEVELOPMENT LAB (PEC-II LAB)

B. Tech III Year II Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Professional Elective-II	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

At the end of this Mobile Application Development Lab course, students will be able to:

1. Develop user interfaces for the Android platform
2. Implement various mobile applications using Emulators
3. Create a database for mobile applications using SQLite Database
4. Perform location-based services in android applications
5. Create telephony and SMS for android applications

List of Experiments

1. Develop an application that Uses GUI Components, Font and Colors.
2. Develop an application that Uses Layout Managers and Event Listeners.
3. Develop a Native Calculator Application.
4. Write an application that Draws Basic Graphical Primitives on The Screen.
5. Develop an application that Makes Use of databases.
6. Develop a Native application that Uses GPS Location Information.
7. Implement an application that Writes Data to The SD Card.
8. Implement an application that Creates an Alert Upon Receiving A Message.
9. Write a Mobile application that Creates Alarm Clock.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

CLOUD COMPUTING LAB (PEC-II LAB)

B. Tech III Year II Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Professional Elective-II	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

At the end of this Cloud Computing Lab course, students will be able to:

1. Run their application on the instantiated VMs over different hypervisors
2. Simulate their sample proposed system
3. Setup a private cloud with open-source cloud tools and deploy simple cloud services
4. Familiarize with the SaaS features
5. Implement the PaaS oriented Applications

Week 1

Installation of various hypervisors and instantiation of VMs with image file using open-source hypervisors such as Virtual Box, VMWare Player, Xen and KVM.

Week 2

Client server communication between two virtual machine instances, execution of chat application.

Week 3

Creation of simple network topology using open-source network virtualization tools (like mininet and others).

Week 4

Implementation of various scheduling mechanisms using open-source cloud simulators.

Week 5

Familiarization and usage of the following cloud services with open-source cloud tools (like Eucalyptus, Openstack, OpenNebula and others)

Week 6

Familiarization and usage of collaborative applications (SaaS).

Week 7

Implementing applications of PaaS

References

ttps://mitmecsept.wordpress.com/cloud-computing-lab/

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

DATA WAREHOUSING AND DATA MINING LAB (PEC-II LAB)

B. Tech III Year II Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
	Professional Elective-II	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

At the end of this Lab course, students will be able to:

1. Design multidimensional data models for an enterprise using open-source tools
2. Explore filtering techniques for preprocessing and integration
3. Perform classification and prediction techniques on real world data
4. Apply k-means clustering algorithm on different datasets
5. Implement various data mining techniques to solve the problems

List of Experiments

Week 1

Design multi-dimensional data models namely star, snowflake and Fact constellation schemas for one enterprise (Like banking) using open-source tools like Pentaho Data Integration and Pentaho Business Analytics.

Week 2-3

Apply below preprocessing techniques on given dataset.

Handling Missing Values, remove records having a NULL value, Replace Numeric attributes by mean value, remove Nominal attributes having null value, Sampling, Discretization (Binning), Normalization.

Week 4-5

Demonstrate performing Association rule mining on data sets using Apriori and FP growth algorithms with different support and confidence values. Compare association rule mining results of Apriori and FP growth for given dataset, and deduce which algorithms are performing best and poor for each dataset and justify.

Week 6-7

Demonstrate performing classification on data sets using Id3, J48 classification algorithm. Compare classification results of ID3, J48 and Naïve-Bayes classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.

Week 8-9

Demonstrate performing clustering on given data sets using k-means clustering algorithm with different values of k (number of desired clusters). Compare with other clustering techniques available in Weka. Explore visualization features of Weka to visualize the clusters. Derive interesting insights and explain.

Week 10-16

Study projects on data mining techniques. Form groups of 3 members each. Submission of abstract, introduction, related work and progress review, final report and final presentations.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

VERBAL ABILITY AND CRITICAL REASONING

B. Tech III Year II Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
	BSC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

UNIT I

Data Interpretation: Tabular, Pie-charts, Bar and line graphs and Problems on all models.
Data Sufficiency: Introduction and Problems based on all Quant and logical topics.

Allegations and Mixtures: Allegation rule, mean value of the mixture, Replacement of equal quantity of mixtures.

UNIT II

Geometry: Line, line segment, angle, Triangles and Polygons with their Properties.

Mensuration: Area and perimeter of Triangle, Rectangle, Square, Parallelogram, Trapezium, Surface area & Volume of 3D figures.

Logarithms: Formulas and Problems based on Logarithms.

Progressions and Quadratic Equations: Arithmetic, Geometric and Harmonic Progressions and their relations. General forms of Quadratic equations and finding the roots and their nature.

UNIT III

Syllogisms: Statements and Conclusions by using vein diagrams.

Odd One Out: Classification and problems based of Odd one out.

Cubes and Dice: Types of cubes and dice with Examples.

Statement and Conclusions: Introduction, Types of conclusions and different cases.

UNIT IV

Tenses: Types, usages, question solving
Vocabulary: Types, usage and error spotting**.**

Inference: Conclusion reached on the basis of evidence and reasoning, question solving.

Para jumbles: Arranging the jumbled sentences by using the strategies.

Sentence completion: Completing a sentence by filling the gaps by understanding & analyzing the meaning of the sentence along with the approaches.

UNIT V

Subject Verb Agreement: Rules and examples for finding the right subject and verb.

Sentence Correction: Error spotting and correcting the sentence.

Reading Comprehension: Understanding Meaning. Understanding the meaning of a text means figuring out what the passage is trying to tell you. ...Drawing Connections. ...Summarizing and Synthesizing.

Direct & Indirect Speeches: What is Direct & Indirect Speech? reporting the message of the speaker in the exact words as spoken by the speaker and examples.

Active Voice & Passive Voice: Types of active and passive voice, rules and examples.

Text Books

1. R.S Agarwal, Verbal and Non-Verbal Reasoning, New Edition, S. Chand.
2. R.S Agarwal, Quantitative Aptitude, New Edition, S. Chand

Reference Book

1. Abhijeet Guha, Quantitative Aptitude, New Edition, Mc Graw Hill.

PROFESSIONAL SKILLS LAB

B. Tech III Year II Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
	HSS & MC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Introduction

The world needs skillful employees who can contribute towards organizational growth. The professionals are expected to be confident and maintain amicable relations with clients and customers. With this backdrop, this course helps the students understand the importance of various aspects of professional life.

The course aims at making the students familiar with the corporate world and grooms them accordingly. This course is designed to improvise communication principles, interpersonal communication and public speaking of learners.

Course Objectives

Course Objectives of Professional Skills Lab are to:

1. Prepare the students to understand and acquire different personality traits
2. Mould the students for global challenges and international careers
3. Excel the students in areas of self - management and ethics at the workplace

Course Outcomes

At the end of this Professional Skills Lab course, students will be able to:

1. Demonstrate their listening skills and effectively use verbal and non-verbal communication
2. Identify and analyze their self-discovery skills
3. Develop their efficient work habits and self-management skills in the workplace
4. Exhibit their leadership, empowering and influencing skills to promote change and innovation
5. Analyze their professional interests' qualifications and other required skills for their career development

EXERCISE- I: Self – Improvement

Self Esteem – SWOT Analysis – Attitude - Image Matters

EXERCISE – II: Communication Essentials

Communication Basics - Barriers to Communication - Listening Skills - Communication Styles - Fitting in and Getting Along - Communicating Electronically

EXERCISE – III: Work Skills

Self - Management Tools - Efficient Work Habits - Our Diverse Society - Understanding Other Cultures - Fairness in the Workplace - Right and Wrong in the Workplace

EXERCISE – IV: Leadership Skills

What Makes a Leader - Empowering and influencing others - Leading change and Innovation

EXERCISE – V: Career Planning

Analyse your interest and qualifications- Networking and other sources of Job Leads- Job Search Documents- the Job Interview- Planning your Career - Networking – It never stops

Minimum Requirement of infrastructural facilities for Professional Skills Lab

A Spacious room with movable chairs, Public Address System, etc.

References

1. Carnegie, Dale. How to win friends & Influence People. Maanu Graphics Publishers.
2. Covey, Stephen. Seven Habits of Highly Effective People. New York: Simon and Schuster, Inc., 1989.
3. Peale, Norman.V. The Power of Positive Thinking. New York: Simon and Schuster, 2002.
4. Sharma, Robin. The Monk Who Sold His Ferrari. Jaico.
5. Wallace, Masters. Personal Development for Life and Work. CENGAGE Learning.

Program Structure and Syllabus of

B. Tech III Year

Cyber Security

R20 Regulations

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.),
Hyderabad, Telangana, INDIA

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B. TECH III YEAR I SEMESTER [5 T + 3 P + 1 M]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PCC	Introduction to Cryptography	3	0	0	3.0
2		PCC	Network Security	3	1	0	4.0
3		PEC-I	1. Software Engineering 2. Artificial Intelligence 3. Formal Languages and Automata Theory	3	0	0	3.0
4		PCC	Operating Systems	3	0	0	3.0
5		HSS& MC	Entrepreneurship Development	2	1	0	3.0
6		PCC LAB	Cryptography Lab	0	0	2	1
7		PCC LAB	Network Security Lab	0	0	3	1.5
8		BSC LAB	Quantitative Aptitude and Reasoning	0	0	3	1.5
9		MC	NSO & NSS	2	0	0	0
			TOTAL	**16**	**2**	**8**	**20**

B. TECH III YEAR II SEMESTER [4 T + 4 P]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PCC	Web Application Security	3	0	0	3.0
2		PCC	Writing Secure Code	3	0	0	3.0
3		PEC-II	1. Fundamentals of Cyber Security 2. Elliptical Curve Cryptography 3. Digital Forensics	3	1	0	4.0
4		PEC-III	1. Cyber Law & Security Policy 2. Security Assessment & Risk Analysis 3. Security for Cyber Physical Systems	3	1	0	4.0
5		PCC LAB	Web Applications Security Lab	0	0	3	1.5
6		PCC LAB	Writing Secure Code Lab	0	0	3	1.5
7		BSC LAB	Verbal Ability and Critical Reasoning	0	0	3	1.5
8		HSS & MC LAB	Professional Skills Lab	0	0	3	1.5
			TOTAL	**12**	**2**	**12**	**20**

INTRODUCTION TO CRYPTOGRAPHY

B. Tech III Year I Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

Course Objectives of Introduction to Cryptography are to:

1. Explain the basics of cryptography.
2. Examine secure a message through insecure channel by various means.
3. Illustrate how to maintain the Confidentiality, Integrity and Availability of a data.
4. Analyze private and public key cryptography algorithms.
5. Design digital signatures.

Course Outcomes

At the end of this Introduction to Cryptography course, students will be able to:

1. Outline the basics cryptography algorithms.
2. Distinguish Secure message transfer over insecure channel transfer.
3. Summarize the Confidentiality, Integrity and Availability of a data.
4. Explain various public and private key cryptography algorithms.
5. Apply digital signature to an application.

UNIT I

Private-Key (Symmetric) Cryptography

Private-Key Encryption: Computational Security, Defining Computationally Secure Encryption, Constructing Secure Encryption Schemes, Stronger Security Notions, Modes of Operation and Chosen-Cipher text Attacks.

UNIT II

Message Authentication Codes: Message Integrity, Message Authentication Codes-Definitions, Constructing Secure Message Authentication Codes, Authenticated Encryption.

Hash Functions and Applications: Definitions, Message Authentication Using Hash Functions (Hash-and-MAC, HMAC), Generic Attacks on Hash Functions and Additional Applications of Hash Functions

UNIT III

Practical Constructions of Symmetric-Key Primitives

Stream Ciphers: Linear-Feedback Shift Registers, Adding Nonlinearity, Trivium and RC4. **Block Ciphers:** Substitution-Permutation Networks, Feistel Networks, DES, 3DES and AES

Hash Functions: Hash Functions from Block Ciphers, MD5, SHA-0, SHA-1, and SHA-2 and SHA-3.

UNIT IV

Public-Key (Asymmetric) Cryptography

Cryptographic Assumptions in Cyclic Groups, Public-Key Encryption – An Overview, Security against Chosen-Plaintext Attacks, Multiple Encryptions, Security against Chosen-Cipher text Attacks, CDH/DDH-Based Encryption, RSA algorithm, RSA Implementation Issues and Pitfalls.

UNIT V

Advanced Topics in Public-Key Encryption

Digital Signature Schemes: Digital Signatures – An Overview, Definitions, The Hash-and-Sign Paradigm and RSA Signatures,Public-Key Encryption from Trapdoor Permutations, The Paillier Encryption Scheme, Secret Sharing and Threshold Encryption, The Goldwasser–Micali Encryption Scheme, The Rabin Encryption Scheme.

Text Book

1. Jonathan Katz, Yehuda Lindell, Introduction to Modern Cryptography, Second Edition, CRC Press, 2015.

Reference Books

1. Hans delfs, Helmut Knebl, Introduction to Cryptography Principles and Applications, Third Edition, Springer, 2015.
2. Alfred J. Menezes et. Al, Handbook of Applied Cryptography, CRC Press.

3. Johannes A. Buchmann, Introduction to Cryptography, Second Edition, Springer-Verlag, 2003.

NETWORK SECURITY

B. Tech III Year I Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Network Security are to:

1. Summarize the basics of network security and protocols.
2. Identify and classify various types of attacks and hacking techniques.
3. Describe the various authentication tools & services.
4. Discuss about Firewalls and Virtual Private Network (VPN).
5. Compare various types of Intrusion Detection System (IDS) and to construct safe hosts.

Course Outcomes

At the end of this Network Security course, students will be able to:

1. Identify some of the factors which are essential for the network security.
2. Differentiate various types of attacks and hacking methods / techniques.
3. Distinguish various authentication tools.
4. Discuss Firewalls and Virtual Private Network (VPN).
5. Compare different types of Intrusion Detection System (IDS).

UNIT I

Introduction: Security Truisms, Picking a Security Policy, Host-Based Security, Perimeter Security, Strategies for a Secure Network and The Ethics of Computer Security.

A Security Review of Protocols: Lower Layers Basic Protocols, Managing Addresses and Names, IP version 6, Network Address Translators and Wireless Security.

Security Review: The Upper Layers Messaging, Internet Telephony, RPC-Based Protocols, File Transfer Protocols, Remote Login, Simple Network Management Protocol-SNMP, The Network Time Protocol and Proprietary Protocols.

UNIT II

Classes of Attacks: Stealing Passwords, Social Engineering, Bugs and Back Doors, Authentication Failures, Protocol Failures, Information Leakage, Exponential Attacks-Viruses and Worms, Denial-of-Service Attacks, Botnets and Active Attacks.

The Hacker's Workbench, and Other Munitions: Introduction, Hacking Goals, scanning a Network, breaking into the Host, The Battle for the Host, Covering Tracks, Metastasis, Hacking Tools and Tiger Teams.

UNIT III

Safer Tools and Services:

Authentication: Remembering Passwords, Time-Based One-Time Passwords, Challenge/Response One-Time Passwords, Lamport's One-Time Password Algorithm, Smart Cards, Biometrics, RADIUS, SASL: An Authentication Framework and Host-to-Host Authentication.

Using Some Tools and Services: inetd-— Network Services, SSH—Terminal and File Access, Syslog, Network Administration Tools, chroot—Caging Suspect Software, Jailing the Apache Web Server, AFTPD—A Simple Anonymous FTP Daemon, Mail Transfer Agents, POP3 and lMAP, Samba: An SMB Implementation and Adding SSL Support with SSL wrap.

UNIT IV

Firewalls and VPNs

Kinds of Firewalls: Packet Filters, Application-Level Filtering, Circuit-Level Gateways, Dynamic Packet Fitters, Distributed Firewalls and What Firewalls Cannot Do.

Filtering Services: Reasonable Services to Filter, Digging for Worms, Services We Don't Like and Other Services.

Firewall Engineering: Rulesets, Proxies, Building a Firewall from Scratch, Firewall Problems and Testing Firewalls.

Tunnelling and VPNs: Tunnels, Virtual Private Networks (VPNs) and Software vs. Hardware.

UNIT V

Protecting an organization

Network Layout: Intranet Explorations, Intranet Routing Tricks, In Host We Trust, Belt and Suspenders and Placement Classes.

Safe Hosts in a Hostile Environment: Properties of Secure Hosts, Hardware Configuration, Field-Stripping a Host, Loading New Software and Administering a Secure Host. **Intrusion Detection:** Where to Monitor, Types of IDSs, Administering an IDS and IDS Tools.

Text Book

1. William R. Cheswick, Steven M. Bellovin, Aviel D. Rubin, Firewalls and Internet Security, Second Edition, Addison-Wesley, 2003.

Reference Books

1. William Stallings, Cryptography and Network security, Seventh Edition, Pearson, 2017
2. Nicholas J. Daras, Michael Th. Rassias (eds.), Computation, Cryptography, and Network Security, Springer International Publishing, 2015.
3. Atul Kahate, Cryptography and network security, Tata McGraw-Hill, 2006

SOFTWARE ENGINEERING (PEC-I)

B. Tech III Year I Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	Professional Elective-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

Course Objectives of Software Engineering are to:

1. Identify an appropriate Process Model.
2. Deliberate Software Requirements-functional and nonfunctional.
3. Design various system models for a given scenario.
4. Elaborate about different testing techniques.
5. Describe role of risk management in Software Engineering.

Course Outcomes

At the end of this Software Engineering course, students will be able to:

1. Analyze process models.
2. Emphasize Software Requirements -functional and nonfunctional.
3. Appreciate the system models.
4. Compare and contrast various testing techniques.
5. Identify various risk strategies.

UNIT I

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Software myths. A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI).

Process models: The waterfall model, Incremental process models, Evolutionary process model. [TB:1, CH:1,2,3]

UNIT II

Agile process Model: Agile principles, Extreme programming, Dynamic System Development Methods, Feature Driven Development, Scrum framework, Sprint, Scrum master, Roles of Scrum Master, Implementing Scrum - A case study. [TB:1, CH:4]

Software Requirements: Functional and non-functional requirements, the software requirements document. Requirements engineering process: Feasibility studies, Requirement's elicitation and analysis, Requirement's validation, Requirements management. [TB:2, CH:6,7]

UNIT III

System Models: Context Models, Behavioral models, Data models, Object models, structured methods. [TB:2, CH:8]

Design Engineering: Design process and Design quality, Design concepts, the design model. Modeling component level design: design class-based components, conducting component level design. Performing User interface design: Golden rules. [TB:1, CH:9,11]

UNIT IV

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing.

Product metrics: Software Quality, Metrics for Analysis Model- function based metrics, Metrics for Design Model-object oriented metrics, class-oriented metrics, component design metrics, Metrics for source code, Metrics for maintenance. [TB:1, CH:13,14,15]

UNIT V

Risk Management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

Quality Management: Quality concepts, Metrics for Software Quality, Software Reviews, Formal Technical Reviews, Software Reliability, The ISO 9000 quality standards. [TB:1, CH:25, 26]

Text Books

1. Roger S. Pressman, Software Engineering - A practitioner's Approach, 6th edition. McGraw Hill International Edition, 2005.
2. Somerville, Software Engineering, 7th Edition, Pearson Education, 2009.

Reference Books

1. K.K. Agarwal & Yogesh Singh, Software Engineering, New Age International Publishers,3rd edition, 2008.
2. Pankaj Jalote, An Integrated Approach to Software Engineering, Narosa Publishing House, 3rd edition, 2005.
3. James F. Peters, Witold Pedrycz, Software Engineering - an Engineering approach, JohnWiely, 2007.
4. Waman S Jawadekar, Software Engineering Principles and Practice, The McGraw-Hill Companies, 2013.
5. https://nptel.ac.in/courses/106/105/106105182/

ARTIFICIAL INTELLIGENCE (PEC-I)

B. Tech III Year I Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	Professional Elective-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

Course Objectives of Artificial Intelligence are to:

1. Summarize overview of artificial concepts.
2. Discuss uniform search and informed search.
3. Demonstrate how to solve the zero-sum gain problem.
4. Describe the logic in artificial intelligence and knowledge representation.
5. Elaborate notion of different production and expert systems in AI.

Course Outcomes

At the end of the Artificial Intelligence course, students will be able to:

1. Describe the concepts and applications of artificial intelligence.
2. Compare uniform search and informed search algorithms.
3. Solve problems using Zero Sum Game algorithms.
4. Represent logic for given problems using facts and rules.
5. Summarize functionalities of production and expert systems.

UNIT I

Overview of Artificial Intelligence: Introduction. The Turing Test, Strong AI Versus Weak AI, Identifying Problems Suitable for AI, Applications and Methods, Early History of AI, Recent History of AI to the Present, AI in the New Millennium.

UNIT II

Uninformed Search: Introduction: Search in Intelligent Systems, State-Space Graphs, Generate-and-Test Paradigm, Blind Search Algorithms, Implementing and Comparing Blind Search Algorithms.

Informed Search: Introduction, Heuristics, Informed Search Algorithms – Finding Any Solution, The Best-First Search, The Beam Search, Additional Metrics for Search Algorithms, Informed Search – Finding an Optimal Solution.

UNIT III

Search Using Games: Introduction, Game Trees and Minimax Evaluation, Minimax with Alpha-Beta Pruning, Variations and Improvements to Minimax, Games of Chance and the Expect minimax Algorithm.

UNIT IV

Logic in Artificial Intelligence: Introduction, Logic and Representation, Propositional Logic, Predicate Logic – Introduction, Several Other Logics, Uncertainty and Probability.

Knowledge Representation: Introduction, Graphical Sketches and the Human Window, Graphs and the Bridges of Königsberg Problem, Search Trees, Representational Choices, Production Systems, Object Orientation, Frames, Semantic Networks.

UNIT V

Production Systems: Introduction, Background, Production Systems and Inference Methods, Production Systems and Cellular Automata, Stochastic Processes and Markov Chains, Basic Features and Examples of Expert Systems.

Text Book

1. Stephen Lucci, Danny Kopec, Artificial Intelligence in the 21st Century-A Living Introduction, Mercury Learning and Information, Second Edition, 2016.

Reference Books

1. Russell, Norvig: Artificial Intelligence, A Modern Approach, Pearson Education, Second Edition, 2004.
2. Rich, Knight, Nair: Artificial Intelligence, Tata McGraw Hill, Third Edition, 2009
3. Saroj Kaushik. Artificial Intelligence. Cengage Learning, 2011.

FORMAL LANGUAGES AND AUTOMATA THEORY (PEC-I)

B. Tech III Year I Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	Professional Elective-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

Course Objectives of Formal Languages and Automata Theory are to:

1. Summarize the concepts of Formal Languages and different kinds of finite automata.
2. Interpret capabilities of context free grammar.
3. Identify the significance of pushdown automata.
4. Categorize various grammars of regular language.
5. Outline the importance of Turing Machines.

Course Outcomes

At the end of this Formal Languages and Automata Theory course, students will be able to:

1. Design of regular expressions for language constructs and conversions of NFA to DFA.
2. Demonstrate the derivations and properties of context free grammars.
3. Analyze the applications of pushdown automata.
4. Construct DFA for Right Linear Grammar and Left Linear Grammar.
5. Appreciate the role of the Turing machine as a computational and universal machine.

UNIT I

Fundamental concepts: Strings, Alphabets, Language operations, Regular Expressions, Regular Languages: Finite automata, Types of finite automata (FA)-Non deterministic Finite Automata (NFA), Deterministic Finite Automata (DFA), NFA with ε-Moves, regular expression representation; Regular expressions to NFA; NFA with ε-Moves to NFA without ε-Moves; NFA to DFA Conversions; Minimization of DFA (Proofs Not Required) [TB:1, CH:1]

UNIT II

DFA with more than two outputs: Moore and Melay machines, Pumping Lemma for Regular Sets: Closure properties of Regular Sets (Proofs Not Required): Context Free Grammars (CFG), Right most, Leftmost –derivations, Parse Trees; Operator Grammar: Unit productions; Chomsky normal forms; (Proofs Not Required) [TB:2, CH:2,3] [TB-1, CH:5,7]

UNIT III

Left recursion and Elimination of left recursion in CFG: Elimination of useless symbols and unit productions; Greibach Normal Form, Push Down automata (PDA): Types of PDA: Design of a PDA for a given CFG. (Proofs Not Required) [TB:2, CH:5,6] [TB:1, CH:6]

UNIT IV

Regular Grammars (RG), Design of DFA for a given RG: Right linear and left linear Grammars and conversions: Definition of Context Sensitive Grammar (CSG) and Linear bounded automata (LBA) (Proofs Not Required). [TB:2, CH:4,5]

UNIT V

Definition of unrestricted Grammar and Turing Machine (TM): Chomsky hierarchy on Languages, Grammars and recognizers; Design of TM as recognizer; Types of TM: Computational problems of TM with multiple tracks; Decidability Problem; Churches hypothesis (Proofs Not Required) [TB:2, CH:4]

Text Books

1. John Hopcroft, Rajeev Motwani, Jeffrey Ullman, Introduction to Automata Theory, Languages and Computation, Third Edition, Pearson, 2013.
2. Vivek Kulkarni, Theory of Computation, Oxford University press 2013, Fifth Edition, 2018.

Reference Books

1. Daniel I. A. Cohen, Introduction to Computer Theory, Second Edition, John Wiley, 1996.
2. John C Martin, Introduction to languages and the theory of Computation, Third Edition, TATA McGraw Hill, 2014.

OPERATING SYSTEMS

B. Tech III Year I Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

Course Objectives of Operating System are to:

1. Introduce basic concepts of operating system and process management.
2. Discuss various CPU scheduling algorithms and problems of process. Synchronization.
3. Demonstrate different methods for handling deadlock.
4. Describe about memory management Techniques.
5. Explore the File system, system security and protection mechanisms.

Course Outcomes

At the end of the Operating System course, students will be able to:

1. Summarize operating system and process management concepts.
2. Apply process scheduling and synchronization related issues.
3. Outline Deadlock Prevention, Avoidance, Detection and recovery mechanisms.
4. Analyze effectively memory management concepts.
5. Illustrate various protection and security measures.

UNIT I

Operating Systems Overview and Process Management: Introduction-What operating systems do, uni-programmed and multi-programmed, Operating System operations, Operating system services, System calls, Types of System calls, Operating System structure.

Process Management: Process concepts, Operations on processes, Inter process communication. Threads: overview, Multithreading models.

UNIT II

Process Scheduling and Synchronization: Process Scheduling – Basic concepts, Scheduling criteria, Scheduling algorithms, Thread scheduling.

Process Synchronization: Background, The critical section problem, Peterson's solution, Synchronization hardware, Semaphore, Classical problems of synchronization, Monitors.

UNIT III

Deadlocks: System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Detection and avoidance, Recovery from deadlock.

UNIT IV

Memory Management: Swapping, Contiguous memory allocation, Paging, Segmentation.

Virtual memory management - Demand paging, copy-on-write, page-replacement, Thrashing.

UNIT V

File System, System Protection and Security: Storage management – File concept, Access methods, Directory and disk structure, File-system mounting. System protection- Goals of protection, principles of protection, Domain of protection, Access matrix.

System Security – Security problem, Program threats, System and Network threats.

Text Book

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, 9th Edition, John Wiley, 2016.

Reference Books

1. D. M. Dharmdhere, Operating Systems – A Concept based Approach, 2nd Edition, TMH, 2007.
2. Andrew S Tanenbaum, Modern Operating Systems, Third Edition, PHI, 2008.
3. Behrouz A. Forouzan, Richard F. Gilberg, Unix and Shell programming, Cengage Learning, 2009.

ENTREPRENEURSHIP DEVELOPMENT

B. Tech III Year I Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	HSS&MC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

The objective of this course is to familiarize the student with entrepreneurship, the issues involved in it, the potential of entrepreneurship and intrapreneurship, the legal environment and statutory issues and explore various funding opportunities.

Course Outcomes

At the end of this Entrepreneurship Development course, students will be able to:

1. Interpret the concepts of Entrepreneurship and Intrapreneurship.
2. Apply the opportunity identification techniques
3. Differentiate needs of different segments
4. Develop business model and MVP
5. Recognize organizational forms, IPR concerns and funding opportunities for startups.

UNIT I

Introduction to Entrepreneurship: Entrepreneurship and Intrapreneurship, Business Incubators, Rural entrepreneurship, Social Entrepreneurship, women entrepreneurs, Role of entrepreneurs in economic development, Types of entrepreneurs. Entrepreneurial mind set and stress, Causes of failure.

UNIT II

Opportunity identification: Myths and realities of entrepreneurship, Opportunity identification, Problem worth solving, idea generation techniques, Design thinking.

UNIT III

Customer analysis: Market segmentation, consumer persona, Product market fit, Unique Value proposition.

UNIT IV

Business model and MVP: Business model canvas, MVP, Risks and assumptions, Importance of financial planning.

UNIT V

Organizational forms Funding Opportunities: Organizational forms - Partnership, Sole proprietorship, Corporation. Intellectual Property Rights- Copyrights, Trademarks, Patents. Law Vs. Ethics, Informal capital- Friends and Family, Angels, Venture Capitalists, Idea/ Patent, Growth strategies

Text Books

1. D F Kuratko and T V Rao “Entrepreneurship- A South-Asian Perspective “Cengage Learning, 2012
2. Vasant Desai, Small Scale Industries and Entrepreneurship, HPH, 2012

Reference Books

1. Rajeev Roy, Entrepreneurship, Oxford University Press, 2/e, 2012
2. Dhruv Nath, Sushanto Mitra, Funding Your Startup: And Other Nightmares, 2020
3. V Srinivasa Rao, Lean Digital Thinking: Digitalizing Businesses in a New World Order, Bloomsbury India, 2021
4. S. K. Mohanty, Fundamentals of Entrepreneurship, PHI, 1/e,2005
5. MOOCS by Wadhwani Foundation

CRYPTOGRAPHY LAB

B. Tech III Year I Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Course Outcomes

At the end of this Cryptography lab course, students will be able to:

1. Perform Encryption and Decryption Algorithms.
2. Demonstrate Double Transposition Cipher.
3. Implement Shared key using Diffie Hellman algorithm.
4. Evaluate RSA Encryption and Decryption model.
5. Construct El-Gamal Cryptographic Algorithm.

List of Experiments

Week 1- 2

1. Introduction of Caesar Cipher.
2. Implementation of Encryption using CAESAR CIPHER.
3. Implementation of Decryption using CAESAR CIPHER.

Week 3

Implementation of One time Pad.

Week 4

Implementation of Hill Cipher.

Week 5-6

1. Implementation of Transposition Cipher.
2. Implementation of Double Transposition Cipher.

Week 7

Implementation of Stream Cipher RC4.

Week 8-9

1. Implementation of Diffie Hellman Algorithm.
2. Implementation of RSA Algorithm.

Week 10

Implementation of El-Gamal Cryptographic Algorithm.

Week 11-12

Implementation of DES Algorithm.

Week 13-14

Implementation of SHA-1, SHA-2 and SHA-3 Algorithms.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

NETWORK SECURITY LAB

B. Tech III Year I Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

At the end of this Network Security lab course, students will be able to:

1. Perform secure data transmission using digital signatures (GnuPG).
2. Build a honey pot & installation of rootkits.
3. Imitate reconnaissance tools and packet sniffer tools.
4. Demonstrate the installation process of Intrusion Detection System- IDS (e.g., SNORT).
5. Implement VPN (Virtual Private Network).

List of Experiments

Week 1

Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG).

Week 2

Setup a honeypot and monitor the honeypot on network (KF Sensor).

Week 3

Installation of rootkits and study about the variety of options.

Week 4

Defeating Malware:
a) Building Trojans.
b) Rootkit Hunter.

Week 5

Study the use of network reconnaissance tools like WHOIS, dig, traceroute, nslookup to gather information about networks and domain registrars.

Week 6

Study of packet sniffer tools like Wireshark, ethereal, tcpdump etc. Use the tools to do the following

a) Observer performance in promiscuous as well as non-promiscuous mode.

b) Show that packets can be traced based on different filters.

Week 7

Download and install nmap. Use it with different options to scan open ports, perform OS fingerprinting, do a ping scan, tcp port scan, udp port scan, etc.

Week 8

1. Install IDS (e.g., SNORT) and study the logs.
2. Use of iptables in Linux to create firewalls.

Week 9

Write a program to study the steps of implementation of Virtual Private Network

(VPNs) using Packet tracer or GNS3.

Week 10

Perform an experiment to grab a banner with telnet and perform the task using Netcat.

Week 11-12

Perform an experiment for Port Scanning with nmap, super scan or any other equivalent Using nmap

a) Find Open ports on a system.

b) Find machines which are active.

c) Find the version of remote OS on other systems.

d) Find the version of s/w installed on other system (using nmap or any other software).

Week 13

Install Rootkits and study variety of options.

Week 14

1. Generate minimum 10 passwords of length 12 characters using OpenSSL command.
2. wireless audit on an access point or a router and decrypt WEP and WPA (Net Stumbler).

Week 15

Review

All Software / Tools used in this lab are open source,

1. GnuPG, KF Sensor, WHOIS, dig, traceroute, nslookup.
2. Wireshark, ethereal, tcpdump.
3. Packet tracer / GNS3
4. nmap, Rootkits, Net Stumbler.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

QUANTITATIVE APTITUDE AND REASONING

B. Tech III Year I Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	BSC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

UNIT I

Number System: Speed Maths, Numbers, Factors, Prime and Coprimes, LCM & HCF, Divisibility rules, Finding the unit digit and applications, Remainder theory.

Ratio and Proportion with Ages: Definition of ratio and proportion, finding the resultant ratio. Problems based on ratios and ages.

Percentages: Introduction to percentages, Percentage Increase /Decrease, Results on Population, Results on Depreciation, Variations, Applications of Percentage.

Profit and Loss: Classification of Profit and Loss, Profit/ Loss Percentages, Successive Discount.

UNIT II

Time and Distance: Difference between the average, Relative and Effective speed, reaching the destination late and early, stoppage time per hour, problems based on Trains and problems based on Boats.

Time and Work: Calculating Efficiency, alternate days concept, work and wages, Chain rule, problems based on Pipes and cisterns.

Simple and Compound Interest: Simple interest, Principle, Rate, Amount, Applications of Simple interest, Compound interest, compounded annually, Compounded Half yearly, Compounded Quarterly, Difference between simple and compound interest.

UNIT III

Permutations and Combinations: Fundamental rules, Problems on Permutations and Combinations.

Probability: Definition, Notations and Problems based on Probability.

Mean, Median and Mode: Introduction and problems on Mean, Median and Mode.

Partnership: Relation between Partners, Period of Investments and Shares.

Averages: Average of different groups, change in average by adding, deleting and replacement of objects.

Flow Charts: Introduction of symbols and problems on flow charts.

UNIT IV

Seating Arrangement: Circular, Row, Column, Square and Double row arrangement.

Puzzles: Paragraph puzzles, incomplete puzzles and problems on them.

Number Series: Number, Alphabet and Letter Series.

Analogy: Simple, Double, Word and Number Analogy.

Coding and Decoding: Classifications and Problems on Coding and Decoding.

UNIT V

Clocks: Relation between minute and hour hand, angle between hands of a clock, exceptional cases in clocks. Gaining and loosing of time.

Calendars: Classification of years, finding the day of any random calendar date, repetition of calendar years.

Direction Sense Test: Sort of directions in puzzle, distance between two points, Problems on shadows.

Blood Relations: Defining the various relations among the members of a family, solving blood relation puzzles by using symbols and notations. Problems on coded relations.

Text Books

1. R.S Agarwal, Verbal and Non-Verbal Reasoning, New Edition, S. Chand.
2. R.S Agarwal, Quantitative Aptitude, New Edition, S. Chand.

Reference Book

1. Abhijeet Guha, Quantitative Aptitude, New Edition, Mc Graw Hill.

NATIONAL SPORTS ORGANIZATION &

NATIONAL SERVICE SCHEME

B. Tech III Year I Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Mandatory	L	T	P	C	CIE	SEE	Total
		2	0	0	0	--	--	--

Course Outcomes

At the end of this NSO & NSS course, students will be able to:

1. Apply knowledge of physical education, growth and development, sports and games knowledge, history of physical education and yoga to explain aim and objectives of physical education.
2. Learn health education, personal hygiene, health problems-prevention and control, physical fitness and wellness, health and first aid management.
3. Develop a broad understanding of NSS and Volunteerism for more involvement.
4. Understand the working of community service model for their all-round personality development.
5. Understand the entrepreneurship and its implementation to solve the community identified problems and work on a project by using learned skills on identified problem of the society.

UNIT I

HEALTH AND WELLNESS: Dimensions of Health: Physical, Mental and Social. Objectives of Health Education. Definition and Dimensions of Wellness – Physical, Emotional, Social, Spiritual, Intellectual and Environmental Wellness. Achieving Wellness.

Practical: Basketball, Cricket, Kho-Kho (Any Two) & Badminton (Mandatory), Layout of Courts / Fields, Skills, Rules & Lead-up Games.

UNIT II

FITNESS AND BODY COMPOSITION: Physical Fitness Components: Body Composition, Muscular Endurance, Strength, Cardiovascular Fitness and Flexibility, Importance of Cardio-Respiratory Endurance. Obesity and Health Risk Factors. Body Composition Indicators and Measurements.

Practical: Football, Kabaddi, Volleyball (Any Two) & Table Tennis (Mandatory) Layout of Courts / Fields, Skills, Rules & Lead-up Games.

UNIT III

Introduction and Basic Concepts of NSS: History, Philosophy, Aims & Objectives of NSS. Emblem, Flag, Motto, Song, Badge, Organizational Structure, Roles and Responsibilities of Various NSS functionaries. NSS Programs and Activities, Volunteerism and Shramdan.

UNIT IV

Personality Development Through Community Service: Importance and Role of Youth Leadership, Life Competencies, Social Harmony and National Integration, Youth Development Programs in India, Citizenship, Health, Hygiene and Sanitation, Environment Issues, Disaster Management, Life Skills.

UNIT V

Vocational and Entrepreneurship Skills Development: Definition and meaning of Entrepreneurship, Qualities of good entrepreneur, Steps /ways in operating an Enterprise and role of financial and support service Institutions. Project Cycle Management, Resource Mobilization and Documentation and Reporting.

Project work/ Practical: Conducting Surveys on Special Theme, Involving in Shramadan, Swachh Bharat, Blood Donation, Tree Plantation, Awareness Programs, Identify the Community Problems and List out the all-Possible Solutions, Educate the Villagers on Health, Hygiene, Sanitation and Environment Protection. Self-Review of the Students on their Improvements by Participating in the Community Service Programs.

References

NSO:

1. The Soul of Wellness: 12 holistic principles for achieving a healthy body, mind, heart and spirit, Rajiv Parti, Select book incorporation, New York.
2. H. & Walter, H., (1976). Turners School Health Education. Saint Louis: The C.Y. Mosby Company.
3. Nemir, A. (n.d.). The School Health Education. New York: Harber and Brothers.
4. Health Fitness Instructor's Handbook, Edward T Howley, Human Kinetics, USA.

NSS:

1. About NSS: National Service Scheme Manual by Government of India Ministry of Youth Affairs & Sports, New Delhi.
2. Robert N Lussier, Management Fundamentals - Concepts, Applications, Skill Development, Cengage Learning, First Edition, 2012.
3. Handbook of Personality Development – Mroczek Little (eds), 2006.
4. Richard Blundel, Exploring Entrepreneurship Practices and Perspectives, Oxford, 2011.

WEB APPLICATION SECURITY

B. Tech III Year II Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

Course Objectives of Web Application Security are to:

1. Summarize History of Software Security and the Structure of a Modern Web Application.
2. Identifying methods for Secure Web Applications and Cross-Site Scripting (XSS).
3. Differentiate various types of SQL Injections and Exploiting Third-Party Dependencies.
4. Sketch the Software Architecture and Secure Application Architecture.
5. Distinguish various types of defending methods against XSS Attacks, Dos Attacks.

Course Outcomes

At the end of this Web Application Security course, students will be able to:

1. Discuss the History of Software Security.
2. Identify the Weak Points in Application Architecture and explore the techniques for Hacking Web Applications.
3. Describe the use of SQL injections.
4. Demonstrate different types of Injections and Reviewing Code for Security methods and can sketch the Architectures for Software and Secure Application.
5. Explore various types of XSS Attacks, Dos Attacks.

UNIT I

Introduction: The History of Software Security: The Origins of Hacking, Automated Enigma Code Cracking, Circa 1940, Telephone “Phreaking,” Circa 1950, Anti-Phreaking Technology, Circa 1960.The Origins of Computer Hacking, Circa 1980, The Rise of the World Wide Web, Circa 2000, Hackers in the Modern Era, Circa 2015+.

Introduction to Web Application Reconnaissance: Information Gathering, Web Application Mapping.

The Structure of a Modern Web Application: Modern Versus Legacy Web Applications, REST APIs, JavaScript Object Notation, JavaScript. SPA Frameworks,

Authentication and Authorization Systems, Web Servers, Server-Side Databases, Client-Side Data Stores. **Finding Subdomains.**

UNIT II

API Analysis: Endpoint Discovery, Authentication Mechanisms, Endpoint Shapes.

Identifying Third-Party Dependencies: Detecting Client-Side Frameworks, Detecting Server-Side Frameworks. **Identifying Weak Points in Application Architecture:** Secure Versus Insecure Architecture Signals, Multiple Layers of Security, Adoption and Reinvention.

Cross-Site Scripting (XSS): XSS Discovery and Exploitation, Stored XSS, Reflected XSS, DOM-Based XSS, Mutation-Based XSS.

Cross-Site Request Forgery (CSRF): Query Parameter Tampering, Alternate GET Payloads. CSRF against POST Endpoints.

UNIT III

XML External Entity (XXE) : Direct XXE , Indirect XXE.

Injection: SQL Injection, Code Injection, Command Injection.

Denial of Service (DoS): regex DoS (ReDoS), Logical DoS Vulnerabilities, Distributed DoS.

Exploiting Third-Party Dependencies: Methods of Integration, Package Managers, Common Vulnerabilities and Exposures Database.

UNIT IV

Securing Modern Web Applications: Defensive Software Architecture, Comprehensive Code Reviews, Vulnerability Discovery, Vulnerability Analysis, Vulnerability Management, Regression Testing, Mitigation Strategies, Applied Recon and Offense Techniques.

Secure Application Architecture: Analyzing Feature Requirements, Authentication and Authorization, PII and Financial Data, Searching.

Reviewing Code for Security: How to Start a Code Review, Archetypical Vulnerabilities Versus Custom Logic Bugs, Where to Start a Security Review, Secure-Coding Anti-Patterns.

Vulnerability Discovery, Vulnerability Management.

UNIT V

Defending Against XSS Attacks: Anti-XSS Coding Best Practices, Sanitizing User Input, CSS, Content Security Policy for XSS Prevention. **Defending Against CSRF Attacks:** Header Verification, CSRF Tokens, Anti-CRSF Coding Best Practices. **Defending Against XXE:** Evaluating Other Data Formats, Advanced XXE Risks. **Defending Against Injection:** Mitigating SQL Injection, Generic Injection Defenses. **Defending Against DoS:** Protecting Against Regex DoS, Protecting Against Logical DoS Protecting Against DDoS. **Securing Third-Party Dependencies.**

Text Book

1. Andrew Hoffman, Web Application Security Exploitation and Countermeasures for Modern Web Applications, O'Reilly Media,2020.

Reference Book

1. Sanjib Sinha, Bug Bounty Hunting for Web Security: Find and Exploit Vulnerabilities in Web Sites and Applications, Springer, 2019.

WRITING SECURE CODE

B. Tech III Year II Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

Course Objectives of Writing Secure Code are to:

1. Demonstrate the need of secure systems.
2. Analyze the different secure coding techniques.
3. Explain access control mechanism and storing secretes.
4. Describe different types of attacks in networking applications.
5. Illustrate security in web-based applications.

Course Outcomes

At the end of this Writing Secure Code course, students will be able to:

1. Analyze the need of secure systems.
2. Explore the different Secure coding techniques.
3. Describe about how to run the code with least privileges.
4. Demonstrate different types of attacks in networking applications.
5. Design and develop Security applications to provide security in web-based applications.

UNIT I

The need for Secure Systems: Applications on the World Wide Web, Some Ideas for Instilling a Security Culture. **Designing Secure Systems:** Two Common Security Mistakes, Security Principles to Live By, Security Design by Threat Modeling, Security Techniques.

UNIT II

Secure Coding Techniques:

Public Enemy #1: The Buffer Overrun: Static Buffer Overruns, Heap Overruns, Array Indexing Errors, Format String Bugs, Unicode and ANSI Buffer Size Mismatches, Preventing Buffer Overruns. **Determining Good Access Control:** Why ACLs Are Important. What Makes Up an ACL? A Method of Choosing Good ACLs, Creating ACLs, NULL DACLs and Other Dangerous ACE Types, Other Access Control Mechanisms.

UNIT III

Secure Coding Techniques:

Running with Least Privilege: Least Privilege in the Real World, Brief Overview of Access Control, Brief Overview of Privileges, Brief Overview of Tokens**,** How Tokens, Privileges, SIDs, ACLs, and Processes Relate, A Process for Determining Appropriate Privilege, Low-Privilege Service Accounts in Windows XP and Windows .NET Server, Debugging Least-Privilege Issues.

Storing Secrets: Attack Methods, Sometimes You Don't Need to Store a Secret, Getting the Secret from the User, Raising the Security Bar, An Idea: Using External Devices to Encrypt Secret Data.

UNIT IV

Network-Based Application Considerations

Socket Security: Avoiding Server Hijacking, Choosing Server Interfaces, Accepting Connections, Writing Firewall-Friendly Applications, Spoofing and Host-Based and Port-Based Trust. **Securing RPC, ActiveX Controls, and DCOM:** Secure RPC Best Practices, Secure DCOM Best Practices, Secure ActiveX Best Practices. **Protecting Against Denial-of-Service Attacks:** Application Failure Attacks, CPU Starvation Attacks, Memory Starvation Attacks, Resource Starvation Attacks, Network Bandwidth Attacks.

UNIT V

Securing Web-Based Services

Never Trust User Input: User Input Vulnerabilities, User Input Remedies. **Web-Specific Canonicalization Bugs:** 7-Bit and 8-Bit ASCII, Hexadecimal Escape Codes, UTF-8 Variable-Width Encoding, UCS-2 Unicode Encoding, Double Encoding, HTML Escape Codes, Web-Based Canonicalization Remedies. **Other Web-Based Security Topics:** HTTP Trust Issues, ISAPI Applications and Filters, Don't Store Secrets in Web Pages. **Testing Secure Applications:** The Role of the Security Tester, Security

Testing Is Different, Building the Security Test Plan, Testing Clients with Rogue Servers, Should a User See or Modify That Data? Testing with Security Templates, Test Code Should Be of Great Quality, Test the End-to-End Solution, Slightly Off-Topic: Code Reviews.

Text Book

1. Michael Howard and David LeBlanc, Writing Secure Code, Microsoft, 2001.

Reference Book

1. Robert C. Seacord, Secure Coding in C and C++, Second Edition**,** Pearson Education, Inc., 2013.

FUNDAMENTALS OF CYBER SECURITY (PEC-II)

B. Tech III Year II Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	Professional Elective-II	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Fundamentals of Cyber Security are to:

1. Summarize major types of cyber-attacks.
2. Discuss computer malware programs and their impact on the world.
3. Elaborate firewall and password management.
4. Describe major cyber-security prevention mechanisms.
5. Outline Cyber-Security aspects of wireless networks and routers.

Course Outcomes

At the end of this Fundamentals of Cyber Security course, students will be able to:

1. 1. Analyze the cyber security needs of an organization.
2. 2. Design operational and strategic cyber security strategies and policies.
3. 3. Demonstrate various network security applications.
4. 4.Analyze software vulnerabilities and security solutions to reduce the risk of exploitation.
5. 5. Design and develop a security architecture for an organization.

UNIT I

Introduction to Cyber Security Basics, Importance of Cyber Security, Cyber- attacks, objectives of cyber- attacks, Types of Cyber-attacks, Denial of Service (DoS), Distributed Denial of Service (DDoS), Man-in-the-Middle (MITM) Attacks, Crypto jacking, SQL Injection, Spamming, Cyber-terrorism, Digital Property Misappropriation, zero-day exploitation, phishing, digital vandalism, cyber-stalking, cyber frauds and forgery.

UNIT II

Introduction to Cyber-attacks and their impact, Equifax Data Theft, VPNFilter Cyber-attack, WannaCry Ransom Attack, Peta Cyber-attack, US Election Manipulation, Power Grid Hacking, Shadow Network attack, GitHub DDoS Attack, Under Armor Account Hacking, Types of Computer Malware, Viruses, Trojan Horse, Rootkit, Spyware, Worms, Adware, Scare-ware, Browser Hijacker.

UNIT III

Introduction to Computer Security, Firewall Settings, Antivirus Software, Anti-Spyware Software, Anti-Spam Software, Security Updates, Secure Browsing Settings, Scan Devices before Data Transfer, Social Engineering Attack Precautions. Password Management, Basics of Passwords, Threats to Passwords, Good and Bad about Passwords, Hacking Password, Effective Password Management, Creating and Managing Secure Passwords, Strong Password, Use of Biometrics, Two-Factor Authentication, Multi-Factor Authentication, Password Manager Tools.

UNIT IV

Prevention from Cyber-attacks, Algorithms and Techniques, Cyber-attack Detection, Cyber-attack Prediction, Cyber-attack Prevention , Firewalls, Activating Windows Firewall, Windows 10 firewall, Windows 7 firewall, Enabling Windows 7 firewall, Enabling Windows firewall service, Traffic Issues and rules , firewall settings, Intrusion Detection/Prevention Systems, Intrusion Detection System (IDS) , Intrusion Prevention System (IPS),,Authentication Using Hash, Message Digest , Secure Hash Algorithm ., Multi-Factor Authentication, Activating Two-Factor Authentication, Creating Application Specific Passwords , What If Your Phone with All Apps Enabled Is Lost?, Mac Computer Firewall Configuration, Virtual Private Network.

UNIT V

Introduction to Wireless Security, LAN Vulnerabilities, Reconnaissance Vulnerability, Resource Stealing and Invasion, Rogue Access Points (APs), STA and AP Plain Text Transaction, Denial of Service (DoS), Default AP Configuration, Rogue Insiders, Protocol Vulnerabilities, Ad Hoc Network Mode Security Problems ,Wireless WAN Vulnerabilities ,IoT Vulnerabilities, Wireless Network Security Measures, Modify Default Configuration, Wireless Router Location, Update Router Software, Stronger Encryption Algorithms, MAC Address Filtering ,Useful Tips on Safe Use of Wireless Network.

Text Book

1. Dr Kutub Thakur Dr Al-Sakib Khan Pathan, Cyber-security Fundamentals Real-World Perspective, first edition published 2020 by CRC Press, © 2020 Taylor & Francis Group, LLC.

Reference Books

1. Rajkumar Singh Rathore, Aatif Jamshed, Mayank Bhusan, Fundamental of Cyber Security Principles and Theory and Practices, BPB Publications, 01-Jun-2018.
2. J. Pieprzyk, T. Hardjono and J. Seberry, Fundamentals of computer security, Springer, 2003.

ELLIPTICAL CURVE CRYPTOGRAPHY (PEC-II)

B. Tech III Year II Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Professional Elective-II	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Elliptical Curve Cryptography are to:

1. Describe the need for Elliptic curve cryptography.
2. Differentiate Groups and Rings.
3. Outline the terms Elliptic curves and fields.
4. Summarize the arithmetic operations on elliptic curves.
5. Discuss Hardware and software security Implementation.

Course Outcomes

At the end of this Elliptical Curve Cryptography course, students will be able to:

1. Identify some of the factors driving the need for Elliptic curves.
2. Classify Groups and Rings.
3. Summarize arithmetic operations on elliptic curves.
4. Apply elliptic curves operations in real world applications.
5. Outline Hardware and Software security using Elliptic curves.

UNIT I

Finite Field Arithmetic: Introduction to finite fields, Prime field arithmetic, Binary field arithmetic and Optimal extension field arithmetic. **Elliptic Curve Arithmetic:** Introduction to elliptic curves, Point representation and the group law, Point multiplication, Koblitz curves, Curves with efficiently computable endomorphisms, Point multiplication using halving and Point multiplication costs.

UNIT II

Cryptography basics: Public-key cryptography: RSA systems, Discrete logarithm systems, Elliptic curve systems, Why elliptic curve cryptography?

Cryptographic Protocols: The elliptic curve discrete logarithm problem, Domain parameters, Key pairs, Signature schemes, Public-key encryption, Key establishment.

UNIT III

Elliptic Curve Arithmetic: Introduction to elliptic curves, Point representation and the group law, Point multiplication, Koblitz curves, Curves with efficiently computable endomorphisms, Point multiplication using halving, Point multiplication costs.

UNIT IV

Elliptic Curves over Finite Fields: Number of Rational Points, The Weil Conjectures, The Endomorphism Ring and Calculating the Hasse Invariant.

UNIT V

Software implementation: Integer arithmetic, Floating-point arithmetic, SIMD and field arithmetic, Platform miscellany and Timings. **Hardware implementation:** Design criteria and Field arithmetic processors. **Secure implementation:** Power analysis attacks, Electromagnetic analysis attacks, Error message analysis, Fault analysis attacks and Timing attacks.

Text Book

1. Darrel Hankerson, Alfred Menezes,Scott Vanstone, Guide to Elliptic Curve Cryptography, Springer, 2004.

Reference Books

1. Joseph H. Silverman, Advanced Topics in the Arithmetic of Elliptic Curves, Springer, 1994.
2. Joseph H. Silverman, The Arithmetic of Elliptic Curves, Second Edition, Springer, 2000.

DIGITAL FORENSICS (PEC-II)

B. Tech III Year II Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	Professional Elective-II	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Digital Forensics are to:

1. Provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
2. Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
3. Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools.
4. Describes Cellular Networks, Operating Systems, Cell Phone Evidence, Cell Phone Forensic Tools and global Positioning Systems.
5. Explores Image Capturing, Authenticating Evidence, Hidden Data Extraction, Data Storage, File Systems, Recovery of deleted files, Cracking Passwords, Internet Crime Investigations, Web Attack Investigations.

Course Outcomes

At the end of this Digital Forensics course, students will be able to:

1. Discuss rapidly changing and fascinating field of computer forensics.
2. Describe technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
3. Explore Network security tools, Network attacks, inside threat, incident response, Network Evidence and Investigations.
4. Summarize Cellular Networks, Operating Systems, Cell Phone Evidence, Cell Phone Forensic Tools and global Positioning Systems.
5. Describe Image Capturing, Authenticating Evidence, Hidden Data Extraction, Data Storage, File Systems, Recovery of deleted files, Cracking Passwords, Internet Crime Investigations, Web Attack Investigations.

UNIT I

Introduction: What is digital forensics, uses of digital forensics, the digital forensic process, scientific process, role of the forensic examiner in the judicial system.
Labs and Tools: Forensic laboratories, policies and Procedures, quality assurance, digital forensic tools.

UNIT II

Collecting Evidence: Crime Scenes and Collecting Evidence, Protecting Cell Phones from Network Signals, Alert, Documenting the Scene, cloning, more advanced, final report.

Anti-Forensics: Hiding data, Password attacks, Data Destruction, Defragmentation as Anti-Forensic Technique.

UNIT III

Legal: Criminal Law—searches without a Warrant, Consent Forms, Cell Phone Searches: The Supreme Court Weighs In, Searching with a Warrant, Electronic Discovery, Expert Testimony.
Network Forensics: Introduction, Network security tools, Network attacks, inside threat, incident response, Network Evidence and Investigations, Training and Research.

UNIT IV

Mobile device forensics: Cellular Networks, Operating Systems, Cell Phone Evidence, Cell Phone Forensic Tools, Global Positioning Systems.
Internet and E-mail: Internet Overview, Additional Resources, Web Browsers, More advanced, E-mail, Shared E-Mail Accounts, Tracing E-Mail, Reading E-Mail Headers, Social Networking Sites.

UNIT V

Looking Ahead: Challenges and Concerns: Standards and Controls, Cloud Forensics, Additional Resources, Cloud Persistence-Dropbox.
Image Capturing, Authenticating Evidence, Hidden Data Extraction, Data Storage, File Systems, Recovery of deleted files, Cracking Passwords, Internet Crime Investigations, Web Attack Investigations.

Text Book

1.John Sammons, The Basics of Digital Forensics, Elsevier, 1st Edition, 2015.

Reference Books

1. Davidoff, S. and Ham, J., Network Forensics Tracking Hackers through Cyberspace, Prentice Hall, 2012.
2. Michael G. Solomon, K Rudolph, Ed Tittel, Broom N., and Barrett D., Computer Forensics Jump Start, Willey Publishing, Inc., 2011.
3. Marcella, Albert J., Cyber forensics: A field manual for collecting, examining and preserving evidence of computer crimes, New York, Auerbach publications, 2008.

4. Davidoff, Sherri, Network forensics: Tracking hackers through cyberspace, Pearson education India private limited, 2017.

CYBER LAW AND SECURITY POLICY (PEC-III)

B. Tech III Year II Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	Professional Elective-III	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Cyber Law and Security Policy are to:

1. Describe legal and jurisdictional issues regarding Cyber Security.
2. Discuss legal and ethical implications involving Social Networks and Virtual Worlds.
3. Summarize Legal and Ethical Implications in Cyberspace: An International Perspective.
4. Outline Security Policy Sets without Frameworks**,** Information Security Policy Sets with Frameworks.
5. Explain Information Security Procedures and Standards.

Course Outcomes

At the end of this Cyber Law and Security Policy course, students will be able to:

1. Identify relevant Legal and Jurisdictional issues regarding Cyber Security.
2. Discuss Legal and Ethical Implications Involving Social Networks and Virtual Worlds.
3. Describe Legal and Ethical Implications in Cyberspace: An International Perspective.
4. Explore Security Policy Sets without Frameworks**,** Information Security Policy Sets with Frameworks.
5. Explore Information Security Procedures and Standards.

UNIT I

Legal and Jurisdictional Issues Regarding Cyberspace: Responsibility, Jurisdiction, and the Future of "Privacy by Design", Hacking: Legal and Ethical Aspects of an Ambiguous Activity, Emerging Cybercrime Trends: Legal, Ethical, and Practical Issues, Law and Technology at Crossroads in Cyberspace: Where Do We Go From Here?, Cyber Law, Cyber Ethics and Online Gambling. **[TB-1]**

UNIT II

Legal and Ethical Implications Involving Social Networks and Virtual Worlds: An Overview of Child Abuses in 3D Social Networks and Online Video Games, Ethics and

Legal Aspects of Virtual Worlds, Narbs as a Measure and Indicator of Identity Narratives, Cloud Based Social Network Sites: Under Whose Control? **[TB-1]**

UNIT III

Legal and Ethical Implications in Cyberspace: An International Perspective: Al-Qaeda on Web 2.0: Radicalization and Recruitment Strategies, Google in China: Corporate Responsibility on a Censored Internet, All's WELL that Ends WELL: A Comparative Analysis of the Constitutional and Administrative Frameworks of Cyberspace and the United Kingdom, A UK Law Perspective: Defamation Law as it Applies on the Internet, The Hellenic Framework for Computer Program Copyright Protection Following the Implementation of the Relative European Union Directives, Internet Advertising: Legal Aspects in the European Union. **[TB-1]**

UNIT IV

Introduction: Information Security Policy Types, Information Security Policy Sets without Frameworks**,** Information Security Policy Sets with Frameworks, Common Information SPFs, Tailoring Information SPFs, deriving a Policy Set from a Framework, Policy Statements, Specific Information Security Policies, Policy Document Examples. **[TB-2]**

UNIT V

Information Security Procedures and Standards, Scoping the Project, Information Security Policy Project Roles, Information Security Policy Project Phases, Information Security Policy Revision Project, Information Security Policy Project Application. **[TB-2]**

Text Books

1. Alfreda Dudley, James Braman, Giovanni Vincenti, Investigating Cyber Law and Cyber Ethics: Issues, Impacts and Practices, Information Science Reference, 2011.
2. Douglas J Landoll, Information security policies, procedures and standards practitioner's Reference, CRC Press, 2016,

Reference Books

1. Anthony Reyes, Richard Brittson, Kevin O'Shea, James Steele, Cybercrime investigations: bridging the gaps between security professionals, law enforcement, and prosecutors, Syngress Publishing, 2007
2. Jennifer L. Bayuk, Jason Healey, Paul Rohmeyer, Marcus Sachs, Jeffrey Schmidt, Joseph Weiss, Cyber security policy guidebook, Wiley, 2012

SECURITY ASSESSMENT AND RISK ANALYSIS (PEC-III)

B. Tech III Year II Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Professional Elective-III	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Security Assessment and Risk Analysis are to:

1. Describe the concepts of risk management, Contingency Planning and Its Components.
2. summarize IR Planning Process, Developing the Incident Response Policy.
3. Illustrate Digital Forensics Methodology, eDiscovery and Anti-Forensics.
4. Explore Disaster Classifications, Forming the Disaster Recovery Team, Disaster Recovery Planning Functions.
5. Demonstrate BC Plan, Continuous Improvement of the BC Process, Maintaining the BC Plan.

Course Outcomes

At the end of this Security Assessment and Risk Analysis course, students will be able to:

1. Explore Risk Management, Contingency Planning and Its Components.
2. Develop the Incident Response Policy using IR planning process.
3. Explore Digital Forensics Methodology, eDiscovery and Anti-Forensics.
4. Summarize Disaster Classifications, Forming the Disaster Recovery Team, Disaster Recovery Planning Functions.
5. Design BC Plan, Continuous Improvement of the BC Process, Maintenance of BC Plan.

UNIT I

Introduction: Information Security, Overview of Risk Management, Contingency Planning and Its Components, Role of Information Security Policy in Developing Contingency Plans.

Planning for Organizational Readiness: Beginning the Contingency Planning Process, Elements Required to Begin Contingency Planning, Business Impact Analysis, BIA Data Collection, Budgeting for Contingency Operations.

UNIT II

Incident Response: Planning: Introduction, The IR Planning Process, Developing the Incident Response Policy, Incident Response Planning, Information for attack success end case, planning for "Before the Incident", The CCDC, Assembling and Maintaining the Final IR Plan.
Incident Response: Detection and Decision Making: Introduction, Detecting Incidents, Technical Details: Rootkits, Intrusion Detection and Prevention Systems, Technical Details: Processes and Services, Incident Decision Making.

UNIT III

Incident Response: Organizing and Preparing the CSIRT: Introduction, Building the CSIRT, A Sample Generic Policy and High-Level Procedures for Contingency Plans, Outsourcing Incident Response.
Incident Response: Response Strategies: Introduction, IR Response Strategies, The Cuckoo's Egg, Incident Containment and Eradication Strategies for Specific Attacks, Handling Denial of Service (DoS) Incidents.
Incident Response: Recovery and Maintenance: Introduction, Recovery, Maintenance, Incident Forensics, Digital Forensics Methodology, eDiscovery and Anti-Forensics.

UNIT IV

Disaster Recovery: Preparation and Implementation: Introduction, Disaster Classifications, Forming the Disaster Recovery Team, Disaster Recovery Planning Functions, Information Technology Contingency Planning Considerations, Sample Disaster Recovery Plans.
Disaster Recovery: Operation and Maintenance: Introduction, Facing Key Challenges, Preparation: Training the DR Team and the Users, Disaster Response Phase, Recovery Phase, Resumption Phase, Restoration Phase.

UNIT V

Business Continuity Planning: Introduction, Business Continuity Team, Business Continuity Policy a Plan Functions, Implementing the BC Plan, Continuous Improvement of the BC Process, Maintaining the BC Plan.
Crisis Management and International Standards in IR/DR/BC: Introduction, Crisis Management in the Organization, Preparing for Crisis Management, International Standards in IR/DR/BC.

Text Book

1. Whitman & Mattord, Principles of Incident Response and Disaster Recovery, Course Technology, 2013.

Reference Books

1. http://www.cnss.gov/Assets/pdf/nstissi_4011.pdf
2. Michael E. Whitman, Herbert J. Mattord, Principles of Information Security Fifth Edition, 2014, Cengage Learning.

SECURITY FOR CYBER PHYSICAL SYSTEMS (PEC-III)

B. Tech III Year II Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	Professional Elective-III	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Security of Cyber Physical Systems are to:

1. Describe the challenges and scientific foundation of cyber-security in various domains and networks.
2. Discuss metrics for information in cyber-security.
3. Summarize national security legal aspects and Privacy laws.
4. Compare different types key management strategies and challenges.
5. Outline Secure Registration and Remote Attestation of IoT Devices.

Course Outcomes

At the end of this Security of Cyber Physical Systems course, students will be able to:

1. Discuss the standards and Topologies of Cyber Physical Systems.
2. Explain outsourcing in Cyber Physical Systems.
3. Describe Cyber Physical Systems security and safety aspects.
4. Design Security keys for Cyber Physical Systems.
5. Design Registration and Remote Attestation of IoT Devices.

UNIT I

Introduction to security in cyber physical System, Defining Security and Privacy, Defining Cyber-Physical Systems, Examples of Security and Privacy in Action, Approaches to Secure Cyber-Physical Systems, Ongoing Security and Privacy Challenges for CPSs. Network Security and privacy for cyber-physical systems, Security and Privacy Issues in CPSs, Local Network Security for CPSs, Secure Local Communication, Internet-Wide Secure Communication, Security and Privacy for Cloud-Interconnected CPSs.

UNIT II

Information Theoretic Metrics Quantifying Privacy in Cyber-Physical Systems, Social Perspective and Motivation, Information Theoretic Privacy Measures, Privacy Models

and Protection, Smart City Scenario: System Perspective, Conclusion and Outlook.

UNIT III

Cyber-Physical Systems and National Security Concerns, National Security Concerns Arising from Cyber-Physical Systems, National Security Implications of Attacks on Cyber- Physical Systems, Legal Considerations of Cyber-Physical Systems and the Internet of Things, Privacy and Technology in Recent History, Privacy Law, Future Challenges.

UNIT IV

Key Management in CPSs, Security Goals and Threat Model, CPS Key Management Design Principles, CPS Key Management, Dynamic versus Static, Public Key versus Symmetric Key, Public Key Cryptography, Symmetric Key Cryptography, Centralized versus Distributed, Deterministic versus Probabilistic, Standard versus Proprietary, Key Distribution versus Key Revocation, Key Management for SCADA Systems, CPS Key Management Challenges and Open Research Issues.

UNIT V

Case Study: Secure Registration and Remote Attestation of IoT Devices, Joining the Cloud, Cloud Integration with IoT, Security and Privacy in Cloud and IoT, Technologies, Web Connectivity, Reference Scenario and Motivation, Stack4Things Architecture, Capabilities for Making IoT Devices Secure Over the Cloud, Adding Security Capabilities to Stack4Things, Conclusions.

Text Book

1. Houbing Song, Glenn A. Fink, Sabina Jeschke, Security and Privacy in Cyber-Physical Systems Foundations, Principles, and Applications, First edition, IEEE PRESS Wiley, 2017.

Reference Books

1. Song, Houbing, et al., eds. Cyber-physical systems: foundations, principles and applications. Morgan Kaufmann, 2016.
2. William Stallings, Cryptography and Network Security: Principles and Practice, 7th Edition, Pearson edition, 2016.

WEB APPLICATIONS SECURITY LAB

B. Tech III Year II Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Core	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

At the end of this Web Applications Security Lab course, students will be able to:

1. Design static web pages and validate using JavaScript.
2. Build a dynamic web page using Servlets and JSP.
3. Implement database connectivity using JDBC.
4. Demonstrate N-STALKER based Web Application Security solutions and JCrypt tool.
5. Implement a case for Cross-Site Scripting (XSS) and Secure API access.

List of Experiments

Week 1

Practice Basic HTML Programs:

- Basic Tags
- Lists
- Tables
- Frames
- Forms

Week 2

Design the following static web pages required for online book store application.

- Registration page
- Login page
- User profile page
- Shopping page
- Catalog page

Apply internal and external CSS (Cascading Style Sheets) for “Online Book Store Application”.

Week 3

Implement Alert Box, Confirm Box, Prompt Box. & Control Structures, Conditional Statements using JavaScript.

Week 4

Write JavaScript to validate the following fields of registration page [Book Store Application]: for the fields like Username, Password, Phone Number, Email-id.

Week 5-6

Apache Tomcat Installation Procedure.

Write a program to display the HELLO WORLD message using Java servlet.

Develop a Java Servlet application to implement and demonstrate get() and post()

methods (Using HTTPServlet Class)

Week 7

Write a Java Servlet program to implement a dynamic HTML using servlet (Username and password should be accepted using HTML and displayed using Servlet)

Write a JAVA Servlet to track HttpSession by accepting user name and password using HTML and display the profile page on successful login.

Week 8

Write a program to display the HELLO WORLD message using JSP.

Write a JSP program which uses jsp:include and jsp:forward action to display a Webpage.

Write a Java JSP program which uses <jsp:plugin> tag to run a applet.

Week 9

Perform Data Definition Language (DDL) and Data Manipulation Language (DML) commands using MySql.

Week 10

Implement Database connectivity using JDBC and perform the following:

- Table creation

- Data Manipulation.

Week 11

A case study using N-STALKER in Web Application Security solutions.

Week 12

Install JCrypt tool (or any other equivalent) and demonstrate Symmetric, Asymmetric crypto algorithms.

Week 13

Implement a case for Cross-Site Scripting (XSS)

Week 14

Implementation of Secure API access (Authentication Mechanisms).

Week 15

Review

All Software / Tools used in this lab are open source, like

- HTML, JAVA, Servlets, JSP etc.
- Snort , OSSEC , Suricata.
- CSS, nmap, N-STALKER.
- https://www.nstalker.com/about/nstalker/
- https://www.cryptool.org/en/jct/
- https://www.netfilter.org/

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

WRITING SECURE CODE LAB

B. Tech III Year II Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

At the end of this Writing Secure Code lab course, students will be able to:

1. Write Secure Code for a software application.
2. Appreciate security vulnerabilities and how they are exploited.
3. Explore various tools to implement secure code.
4. Develop skills to provide high secured security-oriented software techniques.

List of Experiments

Week 1

1. Writing Secure Code – An introduction.

Week 2

2. Introduction to various Tools and Libraries to write secure code.
3. Secure Software Tools Installation.

Week 3-4

4. Write a program to handle Array Indexing Errors.
5. Write a program to Safe String Handling.

Week 5

6. Implement a program to Avoiding Server Hijacking.
7. Write a program to Limiting the Domain Usage.
8. Write a program to test User Input Vulnerabilities.

Week 6-7

9. Implement SQL Injection technique.
10. Implement X-Frame options.

Week 8-9

11. Write a program to implement HTTP security headers.
12. Write a program to implement HTTP Cookies.

Week 10-11

13. Write a program for Testing Sockets-Based Applications.
14. Write a program for Testing HTTP-Based Applications.

Week 12-15

15. Write a program for Testing File-Based Applications.
16. Write a program for Testing Command Line Arguments.
17. Write a program for Testing Cross-Site Scripting and Script-Injection Bugs.

Week 16

Review.

TEXT BOOK:

1. Michael Howard and David LeBlanc, Writing Secure Code, Microsoft, 2001.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

VERBAL ABILITY AND CRITICAL REASONING

B. Tech III Year II Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	BSC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

UNIT I

Data Interpretation: Tabular, Pie-charts, Bar and line graphs and Problems on all models.
Data Sufficiency: Introduction and Problems based on all Quant and logical topics.

Allegations and Mixtures: Allegation rule, mean value of the mixture, Replacement of equal quantity of mixtures.

UNIT II

Geometry: Line, line segment, angle, Triangles and Polygons with their Properties.

Mensuration: Area and perimeter of Triangle, Rectangle, Square, Parallelogram, Trapezium, Surface area & Volume of 3D figures.

Logarithms: Formulas and Problems based on Logarithms.

Progressions and Quadratic Equations: Arithmetic, Geometric and Harmonic Progressions and their relations. General forms of Quadratic equations and finding the roots and their nature.

UNIT III

Syllogisms: Statements and Conclusions by using vein diagrams.

Odd One Out: Classification and problems based of Odd one out.

Cubes and Dice: Types of cubes and dice with Examples.

Statement and Conclusions: Introduction, Types of conclusions and different cases.

UNIT IV

Tenses: Types, usages, question solving.
Vocabulary: Types, usage and error spotting**.**

Inference: Conclusion reached on the basis of evidence and reasoning, question solving.
Para jumbles: Arranging the jumbled sentences by using the strategies.
Sentence completion: Completing a sentence by filling the gaps by understanding & analyzing the meaning of the sentence along with the approaches.

UNIT V

Subject Verb Agreement: Rules and examples for finding the right subject and verb.

Sentence Correction: Error spotting and correcting the sentence.

Reading Comprehension: Understanding Meaning. Understanding the meaning of a text means figuring out what the passage is trying to tell you. ...Drawing Connections. ...Summarizing and Synthesizing.
Direct & Indirect Speeches: What is Direct & Indirect Speech? reporting the message of the speaker in the exact words as spoken by the speaker and examples.

Active Voice & Passive Voice: Types of active and passive voice, rules and examples.

Text Books

1. R.S Agarwal, Verbal and Non-Verbal Reasoning, New Edition, S. Chand.
2. R.S Agarwal, Quantitative Aptitude, New Edition, S. Chand.

Reference Book

1. Abhijeet Guha, Quantitative Aptitude, New Edition, Mc Graw Hill.

PROFESSIONAL SKILLS LAB

B. Tech III Year II Semester					Cyber Security			
Code	Category	Hours / Week			Credits	Marks		
	HSS & MC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Introduction

The world needs skillful employees who can contribute towards organizational growth. The professionals are expected to be confident and maintain amicable relations with clients and customers. With this backdrop, this course helps the students understand the importance of various aspects of professional life.

The course aims at making the students familiar with the corporate world and grooms them accordingly. This course is designed to improvise communication principles, interpersonal communication and public speaking of learners.

Course Objectives

Course Objectives of Professional Skills Lab are to:

4. Prepare the students to understand and acquire different personality traits.
5. Mould the students for global challenges and international careers.
6. Excel the students in areas of self - management and ethics at the workplace.

Course Outcomes

At the end of this Professional Skills Lab course, students will be able to:

6. Demonstrate their listening skills and effectively use verbal and non-verbal communication.
7. Identify and analyze their self-discovery skills.
8. Develop their efficient work habits and self-management skills in the workplace.
9. Exhibit their leadership, empowering and influencing skills to promote change and innovation.
10. Analyze their professional interests' qualifications and other required skills for their career development.

EXERCISE- I: Self – Improvement

Self Esteem – SWOT Analysis – Attitude - Image Matters.

EXERCISE – II: Communication Essentials

Communication Basics - Barriers to Communication - Listening Skills - Communication Styles - Fitting in and Getting Along - Communicating Electronically.

EXERCISE – III: Work Skills

Self - Management Tools - Efficient Work Habits - Our Diverse Society - Understanding Other Cultures - Fairness in the Workplace - Right and Wrong in the Workplace.

EXERCISE – IV: Leadership Skills

What Makes a Leader - Empowering and influencing others - Leading change and Innovation.

EXERCISE – V: Career Planning

Analyse your interest and qualifications- Networking and other sources of Job Leads- Job Search Documents- the Job Interview- Planning your Career - Networking – It never stops.

Minimum Requirement of infrastructural facilities for Professional Skills Lab

A Spacious room with movable chairs, Public Address System, etc.

References

1. Carnegie, Dale. How to win friends & Influence People. Maanu Graphics Publishers.
2. Covey, Stephen. Seven Habits of Highly Effective People. New York: Simon and Schuster, Inc., 1989.
3. Peale, Norman.V. The Power of Positive Thinking. New York: Simon and Schuster, 2002.
4. Sharma, Robin. The Monk Who Sold His Ferrari. Jaico.
5. Wallace, Masters. Personal Development for Life and Work. CENGAGE Learning.

Dept. of Mechanical Engineering

ANURAG UNIVERSITY

DEPARTMENT OF MECHANICAL ENGINEERING

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Minutes of BoS Meeting of Mechanical Engineering (UG&PG)

held on 1st and 3rd April, 2021

The meeting of all the members of Board of Studies - **Mechanical Engineering,** Anurag University, was held on 01.04.2021 at 11:00 A.M. and on 03.04.2021 at 2:00 pm in virtual mode on Google Meet.

The following members were Present/Absent for the meeting:

S. No.	Name & Details of Members	Designation	Present/ Absent
1	Dr. A.V. Sita Rama Raju Professor, Dept. of Mechanical Engineering, A.U.	Chairman	Present
2	Dr.S.Madhu Professor & Head, Dept. of Mechanical Engineering, A.U.	Head of Mech. Engg. & Member	Present
3	Dr Venkatesham B Associate Professor Dept. of Mechanical & Aerospace Engineering, Indian Institute of Technology Hyderabad.	Member - Outside Subject Expert	Present
4	Dr. Srinivasa Prakash Regalla Dean (Institute-wide), Practice School Division Professor, Department of Mechanical Engineering, BITS, Hyderabad Campus	Member - Outside Subject Expert	Present
5	Mr Krishna Prasad B S Delivery Head, Automotive OEMs	Member – Industry Expert	Present on

	Tech Mahindra, Hyderabad		03.04.2021
6	Mr.B.Venkatram Reddy, Senior Manager, CYIENT, Hyderabad	Member – Industry Expert	Absent
7	Dr. R. Venkat Reddy Professor, Dept. of Mechanical Engineering, A.U.	Member	Present
8	Dr Ravikanth Raju Associate Professor, Dept. of Mechanical Engineering, A.U.	Member	Present
9	Dr. Sikindar Baba Associate Professor, Dept. of Mechanical Engineering, A.U.	Member	Present
10	Mr. K. Srinivasa Chalapathi Associate Professor, Dept. of Mechanical Engineering, A.U.	Member	Present
11	Mr. Manish Kumar Madal Partner Pipe Supports Company	Member – Alumni	Absent

At the start of the meeting, Chairman welcomed Hon'ble members of the Board of Studies.

With the permission of the chairman, the proceedings of BoS started.

Item No: 1

To discuss and approve syllabi of II, III & IV year of B.Tech. as per R20 regulations:

1.1 Members have discussed the syllabi of II, III & IV year of B.Tech. as per R20 regulations, proposed by the Department and **approved** with the following suggestions:

(i) Suggested that in courses like **Kinematics of Machines** and **Dynamics of Machines**, the assessment of internal marks should include making of working models as a part of assignment, which helps in understanding of course in depth

(ii) In **Kinematics of Machines** course, the name of the **Unit - IV "Higher Pairs"** is to be changed as **"Gears"**

(iii) Advised to introduce text book on **"Theory Mechanisms and Machines"** by **Amitabh Ghosh** keeping in view the GATE syllabus

(iv) In laboratory courses, objectives must be based on the actual equipment

(v) Advised to introduce uploading of 2 to 3 minutes of video on their understanding about the experiment done by each student

(vi) In the syllabus of **"Manufacturing Processes"**, in **Unit - IV**, heading is to be changed as **"Metal forming"** only instead of **"Metal forming and working"**.

Also advised to introduce some unconventional machining processes, as everyone may not opt for the "Unconventional Machining Processes" course which is an elective

(vii) Advised to introduce modelling software in addition to drafting package **AUTOCAD**. Also suggested to introduce one programming course like **MATLAB, PYTHON etc.** so that student can write his own program

(viii) Suggested to have an exclusive robotic lab., where in actual construction of robots can be practiced

(ix) The syllabus for the course **"Mechanical Vibrations"** is to be elaborated

The modified syllabi as per the above suggestions is enclosed in the consolidated file in word format.

1.2 Internal members of BoS is authorized to make necessary minor changes as per the guidelines of Academic Council.

Item No: 2

(a) To discuss and approve open elective courses to be offered for the Department by other Departments as per R20 regulations.

(b) To discuss and approve the syllabi of the open elective courses to be offered by the Department to other Departments.

2.1 Members have discussed the draft copy of structure and syllabi of open electives to be offered at B.Tech. level as per R20 regulations and **approved** with the following suggestions:

(i) In **Open Elective - I**, **"Logical Reasoning and Quantitative Ability (LRQA)"** may be renamed as **"Arithmetic Methodology"**. **"Technical Business Communication"** may be renamed as **"Technical and Business Communication"**. In **Open Elective - II**, the title **"Entrepreneurship Development"** is to be changed to **"Introduction to Entrepreneurship"**

(ii) The members felt that guest lectures can also be arranged by industry experts for open elective courses to make the courses more interesting

(iii) The members opined that open elective courses should reflect the latest advancements in the respective branch of engineering and should be generic in nature and the title of the course also should be attractive

(iv) The open elective course viz. **"Basics of Mechanisms"** can be renamed as **"Introduction to Machines and Mechanisms"**. In third unit, the title **"Straight line motion mechanisms"** can be renamed as **"Motion mechanisms"**. The unit V is to be changed entirely with **"Robotic mechanisms"**

(v) The title of the open elective course viz. **"Green Engineering Systems"** can be renamed as **"Green technologies"** and unit V can be renamed as **"Sustainable materials for buildings"**

(vi) In the open elective course viz. **"Smart materials"**, it is better to add laboratory component

The modified syllabi as per the above suggestions is enclosed in the consolidated file in word format.

2.2 Internal members of BoS is authorized to make necessary minor changes as per the guidelines of Academic Council.

Item No: 3

To discuss and approve the minor & honors course structure and syllabi as per R20 Regulations:

3.1 Members have discussed the draft copy of structure and syllabi of minor and honors degrees to be offered at B.Tech. level as per R20 regulations and **approved** with the following suggestions:

(i) The title of Honors course is to be changed from **"3D-Printing"** to **"Additive Manufacturing"**. All the courses in Minor and Honors must be given only 3 credits and the project can be given 6 credits. If the student is not interested to carry out the project, he/she has to take two more courses each of 3 credits in an online mode. Laboratory component is to be introduced in **"Fundamentals of CAD"** course of B. Tech Minor and **"Materials and Applications of 3D printing"** course of B. Tech Honors

The modified syllabi as per the above suggestions is enclosed in the consolidated file in word format.

3.2 Internal members of BoS is authorized to make necessary minor changes as per the guidelines of Academic Council.

Item No: 4

To discuss and approve M.Tech. (Machine Design) course structure and syllabi as per R21 Regulations:

4.1 Members have discussed the draft copy of structure & syllabi of M.Tech. (Machine Design) for R21 regulations based on AICTE model curriculum and **approved** with the following suggestions:

(i) For the course "Engineering Noise Control", the title of unit IV is to be changed as "Noise Control Strategies". The text book "Noise and Vibration Control "by Manohar Lal Munjal is to be included

(ii) For the course "Advanced mechanics of solids", a text book by L.S. Srinath is to be included

(iii) For the course, “Vibration analysis of Mechanical systems”, unit IV can be renamed as “Experimental modal analysis”. The text book “Mechanical vibrations” by W.T.Thomson is to be included

(iv) For the course “Tribology in Design”, a text book “Engineering Tribology” by A. W Batchelor and G. W. Stachowiak is to be included

(v) For the course “Advanced Mechanics of Composite Materials” include “Principles of Composite Material Mechanics” by Ronald F. Gibson as text book

(vi) In the First year II Sem the professional core course, “Analysis and Synthesis of mechanisms” is to be swapped with professional elective course, “Vehicle Dynamics” and also rename the title as Multibody dynamics. Also include the topic of “Tyre Dynamics”

(vii) It is suggested to change the title of unit V in Advanced Finite Element Analysis course as 3D and Non-linear problems

(viii) For the course “Product Design and Development”, in unit V, replace “Design for manufacturing” topic with “Ergonomics”

(ix) For the course “Design and Analysis of Experiments”, in Unit I, include “Error analysis” and in Unit 4, replace the word “regression” as “linear regression”

(x) For the course, “Signal Analysis and Condition Monitoring” the title is to be changed as “Condition Monitoring of Mechanical Systems”. The word “practical” in II, III and IV units is to be removed.

The modified syllabi as per the above suggestions is enclosed in the consolidated file in word format.

4.2 Internal members of BoS is authorized to make necessary minor changes as per the guidelines of Academic Council.

Item No: 5

To discuss about adopting GATE syllabus for Ph.D admission test from time to time and approve:

Approved with a suggestion that, as the GATE syllabus is based on UG program, interview should be based on PG standard with due weightage.

Minutes of BoS Meeting of Mechanical Engineering held on 6th April, 2022

The meeting of all the members of Board of Studies - **Mechanical Engineering,** Anurag University, was held on 06.04.2022 at 02:00 P.M. in virtual mode on Zoom. on Google Meet.

The following members were Present/Absent for the meeting:

S. No.	Name & Details of Members	Designation	Present/ Absent
1	Dr. T. Krishnaiah, Associate Professor, Dept. of Mechanical Engineering, AU	Chairperson	Present
2	Dr.S.Madhu Professor & Head, Dept. of Mechanical Engineering, A.U.	Head of Mech. Engg. & Member	Present
3	Dr Venkatesham B Associate Professor Dept. of Mechanical & Aerospace Engineering, Indian Institute of Technology Hyderabad.	Member - Outside Subject Expert	Present
4	Dr. Srinivasa Prakash Regalla Dean (Institute-wide), Practice School Division Professor, Department of Mechanical Engineering, BITS, Hyderabad Campus	Member - Outside Subject Expert	Present
5	Mr Krishna Prasad B S Delivery Head, Automotive OEMs Tech Mahindra, Hyderabad	Member – Industry Expert	Present
6	Mr.B.Venkatram Reddy, Senior Manager, CYIENT, Hyderabad	Member – Industry Expert	Present
7	Dr Ravikanth Raju Associate Professor, Dept. of Mechanical Engineering, A.U.	Member	Present
8	Dr. Sikindar Baba Associate Professor, Dept. of Mechanical Engineering, A.U.	Member	Present
9	Dr. L Venugopal, Associate Professor, Dept. of Mechanical Engineering, AU	Member	Present
10	Mr. K. Srinivasa Chalapathi Associate Professor, Dept. of Mechanical Engineering, A.U.	Member	Present
11	Mr. Manish Kumar Madal Partner Pipe Supports Company	Member – Alumni	Present

At the start of the meeting, Chairperson welcomed Hon'ble members of the Board of Studies.

With the permission of the chairperson, the proceedings of BoS started.

To discuss and approve Vision & Mission Statements, PEO's, PO's, PSO's of the Department of Mechanical Engineering and CO-PO Mapping for selected courses in R20 regulations:

1. Members have discussed the draft copy of Vision & Mission Statements, PEO's, PO's, PSO's of the Department of Mechanical Engineering and CO-PO Mapping for selected courses in R20 regulations. Following are the suggestion given by members.

i) Board of members have suggested minor modification in Vision & Mission Statements and same has been incorporated.
ii) CO-PO mapping has been discussed on selected courses. Few inputs are given by all BoS members to follow while preparing CO-PO mapping, same should be followed for remaining courses to prepare CO-PO mapping.
iii) It is advised in the BoS Meeting to prepare justification for each CO-PO Mapping.

The modified Vision & Mission Statements, and also PEO's, PO's, PSO's of Department of Mechanical Engineering and CO-PO Mapping for all courses as per R20 Regulations and as per the above suggestions is enclosed in the file (Apendix-1 & Apendix-2) .

Vision:

To be a global hub of learning in pursuit of excellence in Mechanical Engineering Education by promoting Innovation and Entrepreneurship with an exposure to multi-disciplinary knowledge.

Mission:

- To educate the students towards tomorrow's innovators, entrepreneurs and leaders across the globe.
- To create an interdisciplinary ambience by encouraging the students in developing the multi-disciplinary skill set and research abilities, there by contributing for the societal growth.
- To promote quality research by providing industrial connect and adopting best practices in Mechanical Engineering programmes.

Program Outcomes:

PO1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

PO2: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

PO4: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.

PO6: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

P**O7:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and **design** documentation, make effective presentations, and give and receive clear instructions.

PO11: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes:

PSO-1: Work in the domain of manufacturing, thermal and fluid sciences to solve engineering problems by utilizing advanced technologies.

PSO-2: Design the mechanical equipment and processes with the help of domain specific software tools.

PSO-3: Apply the knowledge of design and production processes to work effectively on multidisciplinary research areas for the benefit of society.

Program Educational Outcomes:

PEO1: To provide students thorough understanding of basic sciences, Mathematics and in the field of Mechanical Engineering to demonstrate their ability both in theory and practicals, which help to build up their careers and to impart the knowledge in the interdisciplinary areas.

PEO2: To encourage students to acquire and analyze in depth and real time knowledge of contemporary industrial practices, and to carry their projects with Institution-Industry Collaboration. To provide platform for lifelong learning and inculcate the culture of R & D.

PEO3: To facilitate the learning of software technology, modelling and analysis techniques to solve the Mechanical Engineering problems and to acquire knowledge of various production practices essential for Mechanical Design to innovate new products and become entrepreneurs through which they can demonstrate their environmental, social and ethical responsibilities.

PEO4: To encourage students to develop team work, leadership and communication skills by participating in group discussions and Conferences/ Symposia so as to make learning process more interesting and informative.

ANURAG UNIVERSITY

B. TECH III YEAR I SEMESTER

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PCC	Design of Machine Elements-I	2	1	0	3
2		PCC	Manufacturing Technologies	3	0	0	3
3		PCC	Engineering Metrology & Surface Engineering	3	0	0	3
4		PCC	Applied Thermodynamics-II	2	1	0	3
5		PEC - I	1. Automation in Manufacturing 2. Industrial Engineering and Product Life Cycle Management 3. Renewable Energy and Waste Heat Recovery Systems	3	0	0	3
6		HSMC	Quantitative Aptitude and Reasoning Lab.	0	0	3	1.5
7		HSMC	Soft Skills for Success Lab.	0	0	3	1.5
8		PCC	Manufacturing Technologies Lab.	0	0	2	1
9		PCC	Applied Thermodynamics Lab.	0	0	2	1
			TOTAL	13	2	10	20

B. TECH III YEAR II SEMESTER

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		PCC	Design of Machine Elements-II	2	1	0	3
2		PCC	Finite Element Method	2	1	0	3
3		PCC	AI for Mechanical Engineering	3	0	0	3
4		PCC	Heat Transfer	2	1	0	3
5		OEC -I	1. Entrepreneurship Development 2. Technical and Business Communication 3. Industrial Relations and Employment Laws	3	0	0	3
6		PEC - 2	1. Automotive Mechanics and Hybrid Vehicles 2. Production Planning and Control 3. Refrigeration and Air Conditioning	3	0	0	3
7		MC	NSS/NSO	0	0	2	0
8		PCC	Heat Transfer Lab.	0	0	2	1
9		HSMC	Skill Integrated Language Lab.	0	0	2	1
Total				**15**	**3**	**6**	20
NOTE: Students are required to do Mini Project/ Summer Internship at the end of this semester and its evaluation will be done in IV Year I Sem. (7th Semester)							

ANURAG UNIVERSITY

DESIGN OF MACHINE ELEMENTS-I

B. Tech III Year I Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
	PCC	L	T	D/P	C	CIE	SEE	Total
		2	1	-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. provide the knowledge of failure of members when subjected to static and fatigue loads
2. learn about the design procedure of riveted and welded joints for various loading conditions
3. know the various failures of bolts, keys, cotters and knuckle joints
4. impart the knowledge on designing of shafts and couplings subjected to twisting and bending
5. impart the knowledge of various springs and their design parameters

Course Outcomes

After completion of this course, the students will be able to:

1. propose the safe design parameters for structural elements by predicting the failure of members subjected to static and fatigue loads
2. a) design the longitudinal and circumferential rivetted joints for boiler applications
   b) determine the size of weld for various joints under different loading conditions
3. a) estimate the size of bolt against static and eccentric loading conditions
   b) design various cotter joints and knuckle joint for the practical applications
4. a) design the shafts subjected to axial, twisting, bending and combined situations
   b) design the shaft couplings for lateral and angular misalignments
5. predict the stresses and deflections of helical, torsional and leaf springs under various loading conditions

Unit I

Introduction: General considerations in Engineering Design – Steps involved in Machine Design – Engineering materials properties and their selection – Manufacturing consideration in design

Stresses in Machine Members: Simple stresses – Complex stresses – Impact stresses – Stress strain relations – Static theories of failures – Factor of safety

Stresses due to Fatigue Loading: Stress concentration – Theoretical stress Concentration factor – Fatigue stress concentration factor – Notch sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Fatigue theories of failure – Goodman and Soderberg

Unit II

Riveted joints: Modes of failure of riveted joints – Strength equations – Efficiency of riveted joints – Design of boiler joints – Longitudinal and circumferential Joints – Eccentrically loaded riveted joints

Welded Joints: Design of fillet welds subjected to axial loads – Circular fillet welds subjected to bending and torsion – Eccentrically loaded welded joints

Unit III

Bolted Joints: Design of bolts with pre-stresses – Design of joints under eccentric loading– Bolt of uniform strength – Cylinder cover joints

Axially Loaded Joints: Design of keys – Stresses in keys – Cotter joints – Spigot and socket, Sleeve and cotter, Gib and cotter joints (for square rods) – Knuckle joint

Unit IV

Design of Shafts: Shaft Sizes – Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined loads – Axial, Torsion, Bending

Design of Shaft Couplings: Rigid couplings – Muff, Split muff and Flange couplings – Flexible couplings – Bushed pin type, Universal and Oldham couplings

Unit V

Mechanical Springs: Classifications of springs – End connections for tension and compression helical springs – Stresses and deflections of helical springs – Design of helical springs subjected to static and fatigue loading – Surge phenomenon – Energy stored in helical springs – Design of leaf springs

Text Books

1. Machine Design / V. Bandari /Tata McGraw-Hill Publishing Company Ltd.
2. Machine Design / R.S.Khurmi / S.Chand and Company Ltd.
3. Machine Design/ R.L.Norton / McGraw-Hill

Reference Books

1. Mechanical Engineering Design / Bahi and Goel / Standard Publications
2. Machine Design / Schaum Series / McGraw Hill-Education

3. Machine Design / Pandya and Shah / Charoater publisher
4. Design Data Book/ S.MD.Jalaluddin / Anuradha Agencies Publishers
5. Machine Design/ Timothy H. Wenzell PE /Cengage Publications

NOTE: DESIGN DATA BOOK IS PERMITTED.

Manufacturing Technologies

B. Tech III Year I Semester				Dept. of Mechanical Engineering				
Code	Category	Hours/Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	-	-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. understand about the importance of metal cutting and its theory
2. study the working principle of various machine tools
3. impart the knowledge on design and construction of various machine tools
4. discuss the applications of different machine tools
5. differentiate various machine tools for different machining operations

Course Outcomes

At the end of this course, students will be able to:

1. explain theory of metal cutting, mechanism of chip formation and use different cutting tools
2. select suitable machine tool for different purposes of manufacturing
3. identify various operations on different machine tools
4. design and manufacturing of jigs and fixtures
5. choose the appropriate finishing operations as per the requirement

Unit I

Elementary Treatment of Metal Cutting Theory: Element of cutting process, geometry of single point tool and angles chip formation and types of chips, built up edge and its effects chip breakers, Mechanics of orthogonal cutting, Merchant's Force diagram, cutting forces, cutting speeds, feed, depth of cut, tool life, coolants, machinability, tool materials

Unit II

Engine Lathe: Principle of working, specification of lathe, types of lathe, work holders and tool holders, box tools, taper turning and thread turning, for lathes and attachments
Turret and Capstan Lathes: Collet chucks, other work holders, tool holding devices, box and tool layout
Principal Features of Automatic Lathes: Classification, Single Spindle and Multi-spindle automatic lathes

Unit III

Shaping Slotting and Planning Machines: Principles of working, principal parts, specification classification, operations performed, machining time calculations

Drilling and Boring Machines: Principles of working, specifications, types, operations performed, tool holding devices, twist drill, boring machines, fine boring machines, jig Boring machine, deep hole drilling machine

Unit IV

Milling Machines: Principles of working, specifications, classifications of milling machines, principal features of horizontal, vertical and universal milling machines, machining operations and geometry of milling cutters, method of indexing, accessories to milling machines

Unit V

Grinding Machines: Fundamentals, theory of grinding, classification of grinding machine, cylindrical and surface grinding machines, tool and cutter grinding machine, special types of grinding machines, different types of abrasives, bonds, specification and selection of a grinding wheel

Finishing Operations: Lapping, honing and broaching machines, comparison to grinding, lapping and honing processes, broaching Machines, constructional features of speed and feed units, machining time calculations

Jigs & Fixtures: Principles of design of jigs and fixtures and uses, classification of jigs and fixtures, principles of location and clamping, types of clamping and work holding devices, typical examples of jigs and fixtures

Text Books

1. Workshop Technology, HazraChoudary, Vol. II, Media Publications
2. Manufacturing Technology – Metal Culling & Machine Tools, P.N. Rao, Vol. 2, Tata McGraw-Hill Education Pvt. Ltd.
3. Production Technology, R. K. Jain, Khanna Publications

Reference Books

1. Machine Tools, C.Elanchezhian and M.Vijayan, Anuradha Agencies Publishers
2. Metal Cutting Principles, M.C. Shaw, Clarendon Press, Oxford
3. Modern Machining Process, P.C.Pandey and Shan HS, Tata McGraw-Hill Education
4. Principles of Machine Tools, Bhattacharya A and Sen.G.C., New Central Book Agency
5. Metal Cutting Theory and Practice, A. Bhattacharya, New Central Book Agency (P) Ltd.
6. Manufacturing Science, Amitabh Ghosh and Mallick, Associate East West Press Pvt. Ltd.

ENGINEERING METROLOGY & SURFACE ENGINEERING

B. Tech III Year I Semester				Dept. of Mechanical Engineering				
Code	Category	Hours/Week			Credits	Marks		
	PCC	L	T	D/P	C	CIE	SEE	Total
		3	-	-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. impart the various concepts of system of limits and fits
2. discuss the measurement of linear and angular dimensions using various tools
3. study the Tool maker's microscope and various optical measuring devices
4. determine the surface roughness values by using various methods
5. describe the importance of surface cleaning and surface treatments

Course Outcomes

At the end of this course, students will be able to:

1. explain different limits and fits
2. select and use a suitable measuring tool for linear and angular dimensions
3. evaluate the various parameters of screw thread and measure flatness
4. represent the surface roughness symbols and values in technical drawings
5. apply the various suitable surface treatment techniques in industry

Unit I

Systems of Limits and Fits: Introduction, nominal size, limits, deviations, tolerance, unilateral and bilateral tolerance systems, fits and their types, allowances, hole and shaft basis systems, interchangeability and selective assembly, Indian standard institution system – British standard system

Unit II

Linear Measurement: Length standard, line and end standard, slip gauges – calibration of the gauges, Dial indicator, micrometers

Measurement of Angles and Tapers: Different methods – Bevel protractor – angle gauges – spirit levels – sine bar – sine plate, rollers and spheres used to determine the tapers

Limit Gauges: Taylor's principle – design of Go and No-Go gauges, plug, ring, snap, gap, taper. Usage of profile and position gauges

Unit III

Optical Measuring Instruments: Tool maker's microscope and its uses – collimators, optical projector – optical flats and their uses, interferometer

Flat Surface Measurement: Measurement of flat surfaces – instruments used – straight edges – surface plates – auto collimator

Screw Thread Measurement: Elements of measurement – errors in screw threads – measurement of effective diameter by using two wire, three wire and best wire, angle of thread and pitch of the thread and usage of profile thread gauges

Unit IV

Comparators: Introduction to mechanical, electrical and electronic & pneumatic comparators – classification, working and their applications

Coordinate Measuring Machines (CMM): Introduction to CMM- types, working and applications

Surface Roughness Measurement: Surface roughness and surface waviness – numerical assessment of surface finish – CLA, RMS and R_z values, methods of measurement of surface finish – profilograph, Talysurf & Talyrond, ISI, symbols for indication of surface finish

Unit V

Surface Engineering: Surface texture and properties, Surface cleaning techniques, Surface integrity, Wear and its measurements, Lubricants and its selection for reducing wear, Laser applications for surface modifications

Surface Treatments: Mechanical surface treatment and coating, Electroless plating and Electro forming, Ceramic, organic and Diamond coating

Text Books

1. Engineering Metrology / R. K. Jain / Khanna Publishers
2. Metrology and Measurement / Anand K Bewoor and Vinay A Kulkarni / Tata McGraw Hill Education
3. Manufacturing Engineering and Technology / Serope Kalpakjian and Steven R. Schmid / Pearson Publication

Reference Books

1. Engineering Metrology and Measurement / Raghavendra and Krishnamurthy / Oxford University Press, India
2. Engineering Metrology / I. C. Gupta / Dhanpat Rai & Co. Ltd.
3. Surface Engineering for Corrosion and Wear Resistance / J. R. Davis / ASM International
4. Applied Metrology for Manufacturing Engineering / Ammar Grous / John Wiley & Sons Publisher
5. Fundamentals of Dimensional Metrology / Connie L Dotson / Cengage Learning

APPLIED THERMODYNAMICS-II

B. Tech III Year I Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
	PCC	L	T	D/P	C	CIE	SEE	Total
		2	1	-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. know the Rankine cycle, summarize various methods to improve its performance and study the working principles of different types of steam generators
2. calculate the draught and understand the analysis of steam nozzles
3. know the types of steam turbines and evaluate their performance
4. classify steam condensers and gas turbines and study various methods to improve the performance of open cycle gas turbine
5. acquire basic knowledge in various types of propulsive systems

Course Outcomes

At the end of this course, students will be able to:

1. analyze the Rankine cycle, various methods to improve the performance and understand the working principles of different types of steam generators
2. evaluate the draught and analyze the steam nozzles
3. classify the steam turbines and analyze their performance
4. a) understand the requirement and working principles of steam condensers and evaluate their performance
   b) classify the gas turbines and describe the methods to improve their performance
5. classify the propulsive engines and evaluate the performance of turbo jet engines

Unit I

Basic concepts of Rankine cycle: Introduction − Schematic layout of steam power plant − Thermodynamic analysis − Methods to improve the cycle performance − Regeneration & reheating cycles − Numerical problems

Steam generators: Classification − Working principles − Mountings and accessories − equivalent evaporation − Efficiency − Numerical problems

Unit II

Draught: Classification of draught − Natural draught − Height of chimney for given draught and discharge − Condition for maximum discharge − Efficiency of chimney − Artificial draught − Numerical problems

Steam nozzles: Introduction − Types − Thermodynamic analysis − Velocity of flow at exit of the nozzle − Ideal and actual expansion in nozzle − Condition for maximum discharge − Critical pressure ratio − Criteria

Unit III

Steam turbines: Classification
Impulse turbine: Velocity diagrams − Power developed − Axial thrust − Blade or diagram efficiency − Condition for maximum efficiency − Methods to reduce rotor speed: velocity compounding, pressure compounding & pressure - velocity compounding − two row velocity compounded impulse turbine − Numerical problems
Reaction turbine: Principle of operation − Thermodynamic analysis of a stage − Degree of reaction − Velocity diagrams − Parson's reaction turbine − Condition for maximum efficiency − Numerical problems

Unit IV

Steam condensers: Requirements of steam condensing plant − Classification of condensers − Working principle − Vacuum efficiency and condenser efficiency − Air leakage − Sources and its affects − Air pump − Cooling water requirement − Numerical problems

Gas turbines: Classification − Open cycle gas turbine − Methods for improvement of thermal efficiency of open cycle gas turbine − Closed cycle gas turbine analysis − Numerical problems

Unit V

Jet propulsion: Principle of operation − Classification of jet propulsive engines − Turbo jet engines− Working principles with schematic diagrams and representation on T-s diagram − Thrust − Thrust Power − Propulsive power − Thermal efficiency − Thrust specific fuel consumption − Propulsive efficiency − Numerical problems

Rockets: Applications − Working principle − Classification − Types of propellants − Specific impulse − Solid and liquid propellant rocket engines

Text Books

1. Thermal Engineering / R.K Rajput / Lakshmi Publications
2. Thermal Engineering / Mahesh M Rathore / Tata McGraw-Hill Publishing Company Ltd.
3. Heat Engineering / V P Vasandani and D S Kumar / Metropolitan Book Co.

Reference Books

1. Thermodynamics and Heat Engines / RYadav / Central Book Depot.
2. Gas Turbines and Propulsive Systems / P Khajuria and S PDubey / Dhanpatrai and Co.
3. Gas Turbines/ Cohen Rogers and Saravana Muttoo / Addison Wesley – Longman
4. Thermal Engineering / R S Khurmi and J S Gupta / S Chand Publications
5. Gas Turbines / V Ganesan / Tata McGraw−Hill Publishing Company Ltd.

NOTE: Steam Tables with Mollier Diagram are permitted.

ANURAG UNIVERSITY

AUTOMATION IN MANUFACTURING

B. Tech III Year I Semester				Dept. of Mechanical Engineering.				
Code	Category	Hours/Week			Credits	Marks		
	PEC	L	T	D/P	C	CIE	SEE	Total
		3	-	-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. understand the types and strategies of automation
2. define automated flow lines and flow line behaviour with and without buffer storage
3. solve line balancing problems
4. classify automated material handling systems
5. understand the importance of PLC, SCADA and microcontrollers in industrial automation

Course Outcomes

At the end of this course, students will be able to:

1. define automation, classify types and understand strategies of automation
2. analyse automated flow lines and transfer lines with and without buffer storage
3. evaluate line balancing, assembly systems and methods of improving
4. classify automated material handling systems, automated storage and retrieval systems
5. demonstrate the importance of PLC, SCADA and microcontrollers in industrial automation

Unit I

Introduction: Types and Strategies of Automation – Pneumatic and Hydraulic components circuits – Automation in Machine Tools: NC, CNC, DNC, Mechanical feeding and Automatic tool changing – automation in current trends – CAD, CAM and CIM

Unit II

Automated Flow Lines: Configurations of automated flow line – Methods of work part transport – Mechanical buffer storage control function design and fabrication considerations

Analysis of Automated Flow Lines: General terminology and analysis of transfer lines without and with buffer storage – partial automation – implementation of automated flow lines

Unit III

Assembly System and Line Balancing: Assembly process and systems assembly line – line balancing methods – ways of improving line balance – flexible assembly lines

Unit IV

Automated Material Handling: Types of equipment, functions, design and analysis of material handling systems, conveyor systems, automated guided vehicle systems

Automated storage systems: Automated storage and retrieval systems – Work in Progress storage, interfacing handling and storage with manufacturing

Unit V

Role of PLC, SCADA and Micro Controllers in Automation: PLC, background, significance of PLC in Automation, Advantages & Limitations, Basic Architecture, Input/output devices, basic PLC programming, logic gates, Applications – Introduction to SCADA and its importance, applications. Introduction to Micro Controllers and Micro Processors, differences, applications

Text Books

1. Automation, Production Systems and Computer Integrated Manufacturing / M. P. Groover / PHI Publisher
2. Industrial Process Automation Systems / B.R. Mehta and Y. Jaganmohan Reddy / Butterworth - Heinemann imprints
3. Advanced Machining Processes / V. K. Jain / Allied Publishers

Reference Books

1. Computer Aided Manufacturing / Tien-Chien Chang, Richard A Wysk and Hsu-Pin Wang / Pearson
2. Modern Machining Process / Pandey P. C. and Shah H. S. / Tata McGraw-Hill Education
3. New Technology / Bhattacharya A / The Institution of Engineers, India
4. Unconventional Machining Processes / C. Elanchezhian, B. Vijaya Ramnath and M. Vijayan / Anuradha Publications
5. Advanced Manufacturing Technology / Springer
6. Microprocessor Architecture, Programming and Applications with the 8085 6/e / Ramesh Gaonkar
7. Industrial Automation with SCADA: Concepts, Communications and Security / K. S. Manoj

ANURAG UNIVERSITY

INDUSTRIAL ENGINEERING AND PRODUCT LIFE CYCLE MANAGEMENT

B. Tech III Year I Semester				Dept. of Mechanical Engineering.				
Code	Category	Hours/Week			Credits	Marks		
	PEC	L	T	D/P	C	CIE	SEE	Total
		3		-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. introduce Industrial Engineering, its history and over view
2. explain project management techniques
3. impart knowledge on various practices of management prevailing in the industry
4. emphasize on the Product Life Cycle Management concepts
5. understand the characteristics of PLM, elements and drivers of PLM

Course Outcomes

After completion of this course, the students will be able to:

1. apply the concepts of industrial engineering and organization in industry
2. evaluate project management techniques and identify critical paths
3. compare between different plant layouts, methods of production and contemporary practices in industry
4. differentiate the stages in PLM
5. design and develop PLM in real time applications

Unit I

Introduction to industrial engineering – Introduction – Definition and Examples related to Industrial Engineering – Models - Historical Overview – and Impact of Globalization of Industrial Engineering

Organization - Definition – Development – Examples of Organizational Structures

Unit II

Project management (PERT / CPM) – Network Analysis – Program Evaluation and Review Technique (PERT) – Critical Path Method (CPM) – Identifying critical path – Probability of Completing the project within given time – Project Crashing (simple problems)

Unit III

Operations management – Principles and Types of Plant Layout – Methods of production (job, batch and Mass Production) - Work Study – Basic procedure involved in Method Study and Work Measurement

Contemporary practices in the industry – Basic concepts of Just – In Time (JIT) system –Capability Maturity Model (CMM) Levels – Enterprises Resource Planning (ERP) – Business Process outsourcing (BPO) – Business Process Re-engineering – 5S Model –Deming's PDCA – Kaizen, Poka – Yoke, Munda - Benchmarking – Balanced Score Card

Unit IV

Introduction to product life cycle management (PLM) – Definition – PLM Lifecycle model – Threads of PLM – Need for PLM – Opportunities and benefits of PLM – Views – Components and Phases of PLM –PLM feasibility study, PLM visioning

Unit V

PLM Concepts, processes and workflow – Characteristics of PLM – Environment driving PLM – Elements of PLM -Drivers of PLM – Conceptualization – Design, Development and Validation – Production support of PLM

Text Books

1. Management Science / Aryasri
2. Product Lifecycle Management / Grieves Michael / McGraw-Hill, 2006
3. Industrial Engineering / M.I.Khan / New Age International Publishers

Reference Books

1. Introduction to Industrial Engineering / Edition 2, Avraham Shtub, Yuval Cohen, Dec 2015 / CRC press
2. Handbook of Industrial Engineering: Technology and Operations Management, third Edition / GavrielSalvendy
3. Industrial Engineering and Management / Pravin Kumar / Pearson Publications
4. Industrial Management / Dr B Narayan / A P H Publishing corporations
5. A Text Book of Industrial Management / A.P.Verma and N.Mohan
6. Industrial Engineering and Production Management / Mart and Telsang / S Chand

ANURAG UNIVERSITY

RENEWABLE ENERGY AND WASTE HEAT RECOVERY

B. Tech III Year I Semester				Dept. of Mechanical Engineering				
Code	Category	Hours/Week			Credits	Marks		
	PEC	L	T	D/P	C	CIE	SEE	Total
		3	-	-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. know the concepts of solar radiation, measurement and outline utilization of solar energy
2. discuss about the methods of extracting energy from wind, geothermal and bio-mass
3. outline the potential of ocean, tidal and wave energy also know the need and principle of direct energy conversion
4. identify the waste heat sources and introduce waste heat recovery technologies
5. describe various heat recovery system

Course Outcomes

After completion of this course, the students will be able to:

1. understand the basic concepts of solar radiation, measurement, collection, storage techniques and its applications
2. identify the methods of tapping wind, geothermal and bio-mass energy
3. summarize the concepts of harnessing the ocean, tidal and wave energy, also understand the direct energy conversion techniques for power generation
4. explore the waste heat sources and get acquainted with waste heat recovery technologies
5. appraise various heat recovery systems and their functionality

Unit I

Principles of solar radiation: Role and potential of renewable energy sources − Physics of the sun − The solar constant − Extraterrestrial and terrestrial solar radiation − Environmental impact of solar power − Solar radiation on tilted surface − Instruments for measuring solar radiation and sun shine

Solar energy storage and applications: Solar energy collectors: classification − Different storage methods − Solar applications: solar heating, cooling techniques, solar distillation and drying − photovoltaic energy conversion

Unit II

Wind energy: Sources and potential − Horizontal and vertical axis windmills − Performance characteristics
Geothermal energy: Sources − Types of wells − Methods of harnessing the energy
Bio-mass: Principles of bio-mass conversion − Aerobic and anaerobic digestion − Types of bio-gas digesters − Gas yield − Combustion characteristics of bio-gas − Utilization for cooking − IC Engine operation − Economic aspects

Unit III

Ocean energy: Ocean thermal energy conversion (OTEC) principles − Utilization − Setting up of OTEC plants
Tidal and wave energy: Potential and conversion techniques
Mini - hydel power plants: Potential and concept of power generation
Direct energy conversion (DEC): Need for DEC− Principles of magneto hydro dynamic (MHD) power generators − Hall effect − Magnetic flux − Fuel cells: principles and its thermodynamic aspects

Unit IV

Waste heat sources: Guidelines to identify waste heat − Sources of waste heat: solid, liquid and gas − Grading of waste heat − Feasibility study of waste heat recovery
Introduction to waste heat recovery technologies: Electric turbo compounding systems (ETC) − Thermodynamic organic Rankine cycle (ORC) − Thermoelectric generators (TEG) − Hydrogen generation by using exhaust gas heat energy − Hybrid pneumatic power systems (HPPS) − Selection criteria for waste heat recovery technologies

Unit V

Waste heat recovery systems: Air preheater − Recuperators − Regenerators − Economizers − Plate heat exchangers − Thermic fluid heaters − Waste heat boilers: Classification, location, service conditions, design Considerations − Fluidized bed heat exchangers − Heat pipes – Heat pumps – Sorption systems

Text Books

1. Non – Conventional Energy Sources / G D Rai / Khanna Publishers
2. Non-Conventional Energy Sources and Utilisation / Er. R K Rajput / S. Chand & Company
3. Renewable Energy Sources and Emerging Technologies / D P Kothari, K C Sangal and Rakesh Ranja / Prentice Hall India Learning Private Limited

Reference Books

1. Renewable Energy Resources / John Twidell and Tony Weir / Routledge Publisher
2. Renewable Energy Resources / G N Tiwari and M K Ghosal / Narosa Publishing House
3. Renewable Energy Engineering and Technology / V V N Kishore / The Energy and Resources Institute, TERI
4. Power Plant Engineering / P K Nag / Tata McGraw-Hill, New Delhi, 2001
5. Heat Recovery Systems / D A Reay/ London : E. & F.N. Spon

QUANTITATIVE APTITUDE AND REASONING

B. Tech III Year I Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
	HSMC	L	T	D/P	C	CIE	SEE	Total
		-	-	3	1.5	50	50	100

Course Objectives

The objectives of this course are to:

1. Enhance the problem solving ability of the students with focusing on basic concepts of speed math's, percentage and some fundamental rules.
2. Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
3. Calculate *speed*, *distance* and *time* using the speed equation. Examine and interpret speed *time* and distance.
4. Quick decision making and exploring possibilities.
5. Enhance the adequate problem solving and analytical skills.

Course Outcomes

After completion of this course, the students will be able to:

1. Formulate the problem quantitatively and use appropriate arithmetical and statistical methods to solve the problem.
2. Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
3. By the end of this lesson, students will be able to: identify the work rate formula. apply the work rate formula to solve real-life ...
4. Critically evaluate various real life situations by resorting to analysis of key issues and factors.
5. Enable students to critically analyze material (information) to order to evaluate evidence, construct reasoned arguments, and communicate inferences and conclusions.

Unit I

Number System : Speed Math's , Numbers , Factors ,Prime and co primes , LCM & HCF , Divisibility rules , Finding the unit digit and applications , remainder theory.

Ratio and Proportion with Ages: Definition of ratio and Proportion, Finding the resultant ratio. Problems based on Ratios and ages.

Percentages: Introduction to percentages, Percentage Increase /Decrease, Results on Population, Results on Depreciation, Variations, Applications of Percentage

Profit and Loss: Classification of Profit and Loss, Profit/ Loss Percentages, Successive Discount.

Unit II

Time and Distance: Difference between the average,Relative and Effective speed , reaching the destination late and early , stoppage time per hour, problems based on Trains and problems based on Boats.

Time and Work: Calculating Efficiency,alternate days concept, work and wages ,Chain rule , problems based on Pipes and cisterns .

Simple and Compound Interest : Simple interest ,Principle , Rate, Amount , Applications of Simple interest , Compound interest , Compounded annually , Compounded Half yearly , Compounded Quarterly , Difference between simple and compound interest .

Unit III

Permutations and Combinations: Fundamental rules, Problems on Permutations and Combinations

Probability: Definition, Notations and Problems based on Probability.

Mean, Median and Mode : Introduction and problems on mean, median and mode

Partnership: Relation between Partners, Period of Investments and Shares

Averages: Average of different groups, change in average by adding, deleting and replacement of objects

Flow Chart : Introduction of symbols and problems on flow charts.

Unit IV

Seating Arrangement: Circular, Row, Column, Square and Double row arrangement

Puzzles : Paragraph, incomplete puzzles and problems on them.

Number Series: Number, Alphabet and Letter Series.

Analogy: Simple, Double, Word and Number Analogy

Coding and Decoding: Classifications and Problems on Coding and Decoding.

Unit V

Clocks: Relation between minute and hour hand, angle between hands of a clock,exceptional cases in clocks. Gaining and loosing of time.

Calendars: Classification of years,finding the day of any random calendar date, repetition of calendar years.

Direction Sense Test: Sort of directions in puzzle, distance between two points, Problems on shadows.

Blood Relations: Defining the various relations among the members of a family, Solving blood relation puzzles by using symbols and notations. Problems on coded relations.

Text Books

1. Verbal and Non Verbal Reasoning – R.S Agarwal, New Edition -2020, S. Chand.
2. Quantitative Aptitude – R.S Agarwal, New Edition- 2020, S. Chand.

Reference Books

1. Quantitative Aptitude: Abhijeet Guha, New Edition-2020, Mc Graw Hill.

ANURAG UNIVERSITY

SOFT SKILLS FOR SUCCESS LAB

B. Tech III Year I Semester				Dept. of Mechanical Engineering				
Code	Category	Hours/Week			Credits	Marks		
	HSMC	L	T	D/P	C	CIE	SEE	Total
		-	-	3	1.5	50	50	100

Introduction:

The primary focus of the course is to highlight various categories and applications of Soft Skills through various cases taken from the real field and other research case studies. The fundamental concepts and distinctions between Soft Skills and Hard Skills are discussed. The course is tailored very effectively to introduce various Soft Skill application examples.

Course Objectives

The objectives of this course are to:

1. To identify and participate in meaningful conversations analytical skills.

Course Outcomes

After completion of this course, the students will be able to:

1 exhibit communication skills in various situations
2 handle the emotions with peers and classmates
3 demonstrate respect for the opinions, personal space, and beliefs of others
4 connect and work with others to achieve a set task
5 assess and identify the requirements and strengths within the team

Unit I

Soft Skills Development: An Introductory Overview - Self-Discovery & Goal Setting - Johari Window

Unit II

Personality Development - Body Language - Etiquette & Manners

Unit III

Presentation Skills (Individual & Team) Oral & Written - Teamwork & Leadership Qualities

Unit IV

Debates - Group Dynamics - Dos & Don'ts - Techniques to Participate and Conclude

Unit V

Emotional Intelligence - Conflict Management - Stress Management

Minimum requirements of infrastructural facilities for "Soft Skills for Success" Laboratory:

A spacious room with movable chairs, a Public Address System, and a Digital Stereo-Audio & Video system

Reference Books

1. **Soft Skills for Everyone** by Butterfield, Jeff. New Delhi: Cengage Learning. 2010.
2. **Soft Skills** by Chauhan, G.S. & Sangeeta Sharma. New Delhi: Wiley. 2016.
3. **Working with Emotional Intelligence** by Goleman, Daniel. London: Banton Books. 1998.
4. **Theories of Personality** by Hall, Calvin S. et al. New Delhi: Wiley. 2011.
5. **Corporate Conversations** by Holtz, Shel. New Delhi: PHI. 2007.

ANURAG UNIVERSITY

MANUFACTURING TECHNOLOGIES LAB

B.Tech III Year I Semester				Dept. of Mechanical Engineering				
Code	Category	Hours/Week			Credits	Marks		
	PCC	L	T	D/P	C	CIE	SEE	Total
		-	-	2	1	50	50	100

Course Objectives

The objectives of this Lab. are to:

1. impart the knowledge of various machine tools and their parts
2. understand various machining operations to be performed on different machine tools
3. learn about the geometry of single point and multi point cutting tools and their measurement by different measuring instruments
4. practice linear and angular measurements
5. gain knowledge on various surface finishing operations

Course Outcomes

At the end of this Lab. students will be able to:

1. explain the basic concepts of geometrical measurements by using various measuring devices
2. understand the phenomena of tool wear and measure the parameters of thread by using Tool maker's microscope
3. measure the surface roughness of work piece and know the operation of Talysurf
4. modify the ingots into desired components, using various machines
5. explain the various kinematic mechanisms in machine tools

LIST EXPERIMENTS

SECTION – A:

1. Measurement of lengths, heights, diameters by Vernier calipers, micrometers
2. Measurement of bores by internal micrometers and dial bore indicators
3. Use of gear teeth Vernier calipers and checking the chordal addendum and chordal height of spur gear
4. Thread element measurement by tool makers microscope
5. Angle and taper measurements by bevel protractor & sine bars
6. Use of spirit level in finding the flatness of surface plate
7. Thread measurement by three wire method
8. Surface roughness measurement by Talysurf

SECTION – B

1. Perform step turning and taper turning operations on lathe machine
2. Practice of thread cutting and knurling operations on lathe machine
3. Practice of Drilling and tapping operations on drilling machine

Practice of various machining operations on the following machine tools:

4. Shaping machine
5. Planning machine
6. Slotting machine
7. Milling machine
8. Cylindrical Grinding machine
9. Surface grinding machine

REFERENCE BOOKS

1. Metal Cutting & Machine Tools / P.N. Rao / Tata McGr aw-Hill Education Pvt. Ltd.
2. Production Technology / R. K. Jain / Khanna Publications
3. Workshop Technology / Hazra Choudary, Vol. II / Media Publications
4. Metal Cutting Principles / M.C. Shaw / Clarendon Press, Oxford
5. Manufacturing Science / Amitabh Ghosh and Mallick / Associate East West Press Pvt. Ltd.

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APPLIED THERMODYNAMICS LAB

B.Tech III Year I Semester				Dept. of Mechanical Engineering				
Code	Category	Hours/Week			Credits	Marks		
	PCC	L	T	D/P	C	CIE	SEE	Total
		-	-	2	1	50	50	100

Course Objectives

The objectives of this course are to give hands on experience in operating the various test rigs, acquire the required data and:

1. perform experiments on various types of I.C. engines and two stage reciprocating air compressor
2. draw heat balance sheet for 4-stroke CI engine
3. differentiate the actual valve timing and port timing diagrams from theoretical and dissect typical IC engines
4. illustrate various components of steam boilers
5. know the working principle & operation of vapor compression refrigeration test rig

Course Outcomes

At the end of this course, students will be able to demonstrate the operation of the test rig, acquire the required data and:

1. evaluate the performance of internal combustion engines and two stage reciprocating air compressor
2. estimate the energy distribution by conducting heat balance test on IC engines
3. compare actual and theoretical valve and port timing diagrams and demonstrate the construction of typical IC engines
4. demonstrate different types of boilers
5. analyze the performance of vapor compression refrigeration test rig

List of Experiments

LIST OF EXPERIMENTS

1. Conduct performance test on two stroke single cylinder SI engine
2. Conduct performance test on four stroke single cylinder CI engine
3. Draw heat balance sheet on four stroke four cylinder diesel engine
4. Conduct Performance test on two stage reciprocating air compressor
5. Evaluation of frictional power by conducting Morse test on four stroke SI engine

6. Evaluation of engine frictional power by conducting retardation test on four stroke single cylinder diesel engine
7. Evaluation of frictional power by conducting motoring test on four stroke single cylinder petrol engine
8. Draw the valve timing diagram for IC engine and compare with theoretical valve timing diagram and comment on deviations if any
9. Draw the port timing diagram for IC engine and compare with theoretical port timing diagram and comment on deviations if any
10. Assembly and disassembly of multi-cylinder engine and identify parts with respective diagrams and their function in the report
11. Assembly and disassembly of single-cylinder engine and identify parts with respective diagrams and their function in the report
12. Study different types of boilers
13. Determine COP of the vapor compression refrigeration system

REFERENCE BOOKS

1. Internal Combustion Engines / V Ganesan / Tata McGraw-Hill Education
2. Thermal Engineering / R.K Rajput / Lakshmi Publications
3. Thermal Engineering / Mahesh M Rathore / Tata McGraw-Hill Education
4. Internal Combustion Engine Fundamentals / John B Heywood / Tata McGraw-Hill Education
5. Internal Combustion Engines / M L Mathur and R P Sharma / Dhanpat Rai Publications

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DESIGN OF MACHINE ELEMENTS-II

B. Tech III Year II Semester				Dept. of Mechanical Engineering				
Code	Category	Hours/Week			Credits	Marks		
	PCC	L	T	D/P	C	CIE	SEE	Total
		2	1	-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. gain knowledge about the selection of the sliding contact and rolling contact bearings based on the application
2. be aware of the various parameters involved in the design of brakes and clutches based on load applied
3. understand the transmission of power by belt, rope and chain drives and their efficiencies
4. understand the design procedure for spur, helical and bevel gears based on Lewi's equation
5. design the worm gears based on the strength and wear ratings & design the various parts of power screws

Course Outcomes

At the end of this course, students will be able to:

1. select the sliding contact and rolling contact bearings based on the application
2. design various types of brakes and clutches based on load applied
3. understand the transmission of power by belt, rope and chain drives and their efficiencies
4. design spur, helical and bevel gears based on Lewi's equation
5. design the worm gears based on strength and wear ratings & also design power screws

Unit I

SLIDING CONTACT BEARINGS: Types of Journal bearings – basic modes of Lubrication – Bearing construction – bearing design – bearing materials – Selection of lubricants

ROLLING CONTACT BEARINGS: Types of rolling contact bearings – selection of bearing type – selection of bearing life – Design for cyclic loads and speeds – Static and dynamic loading of ball & roller bearings

Unit II

BRAKES: Simple block brakes, internal expanding brake, band brake of vehicle

CLUTCHES: Friction clutches – Single Disc or plate clutch, Multiple Disc clutch, Cone clutch, Centrifugal clutch

Unit III

BELT, ROPE & CHAIN DRIVES: Transmission of power by Belt and Rope drives, Transmission efficiencies, Belts – Flat and V types – Ropes – Pulleys for belt and rope drives, Materials, Chain drives

Unit IV

SPUR AND HELICAL GEAR DRIVES: Spur and Helical gears – Load concentration factor – Dynamic load factor, Surface compressive strength – Bending strength – Design analysis of Spur and Helical gears – Estimation of centre distance, module and face width, check for plastic deformation, Check for dynamic and wear considerations

BEVEL GEAR DRIVES: Bevel gears – Load concentration factor – Dynamic load factor, Surface compressive strength – Bending strength – Design analysis of Bevel gears – Estimation of centre distance, module and face width, check for plastic deformation, Check for dynamic and wear considerations

Unit V

DESIGN OF WORM GEARS: Worm gears – Properties of worm gears – Selection of materials – Strength and wear rating of worm gears – force analysis – Friction in worm gears – thermal considerations

DESIGN OF POWER SCREWS: Design of screw, Square ACME, Buttress screws, design of nut, compound screw, differential screw, ball screw – possible failures

Text Books

1. Design of Machine Elements / Kulkarni /Mc Graw Hill
2. Machine Design / T. V. Sundarajan Murthy and N, Shanmugam / Anuradha Publications
3. Design Data Books / Mahadevan / P.S.G College of Technology

Reference Books

1. Machine Design / V. Bandari / TMH Publishers
2. Machine Design / R. N. Norton
3. Mechanical Engineering Design / J. E. Shigley
4. Design of machine elements / Pandya and Shah

NOTE: DESIGN DATA BOOK IS PERMITTED

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FINITE ELEMENT METHOD

B. Tech III Year II Semester				Dept. of Mechanical Engineering				
Code	Category	Hours/Week			Credits	Marks		
	PCC	L	T	D/P	C	CIE	SEE	Total
		2	1	-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. familiarize with the basics of FEM to relate stresses and strains
2. formulate and solve the heat transfer problems with the application of FEM
3. solve 1D and 2D problems using finite element analysis approach
4. impart the knowledge of how to formulate the stiffness matrix of 2D elements
5. solve the dynamic problems of bars and beams

Course Outcomes

At the end of this course, students will be able to:

1. determine the approximate solutions for various elements using numerical methods
2. evaluate the displacements, stresses and strains of a bar element
3. distinguish the stress-strain displacement relations among the various elements
4. solve the nodal displacements for two-dimensional elements
5. a) analyze the thermal behavior of various elements
   b) examine the dynamic analysis of bars and beams

Unit I

Introduction to FEM: Basic concepts – Historical back ground – Application of FEM– General description – Comparison of FEM with other methods – Basic equations of elasticity – Stress- strain and strain- displacement relations – Rayleigh-Ritz method – Weighted residual methods

Unit II

One dimensional problem: Stiffness equations for a axial bar element in local co-ordinates using potential energy approach and virtual energy principle – Finite element analysis of uniform, stepped and tapered bars subjected to mechanical and thermal

loads – Assembly of global stiffness matrix and load vector – Quadratic shape functions – Properties of stiffness matrix

Unit III

Analysis of trusses: Stiffness equations for a truss bar element oriented in 2D plane – Finite element analysis of trusses – Plane truss element – Methods of assembly

Analysis of beams: Hermite shape functions – Element stiffness matrix – Load vector – Problems

Unit IV

2-D structural problems: CST – Stiffness matrix and load vector – Isoparametric element representation – Shape functions – Convergence requirements – Problems

Two dimensional four noded isoparametric elements- Finite element modeling of axisymmetric solids subjected to axisymmetric loading with triangular elements

Unit V

Analysis of heat transfer problems: 1D heat conduction – 1D fin elements – 2D heat Condution – Analysis of thin plates – Composite slabs – Problems

Dynamic analysis: Dynamic equations – Lumped and consistent mass matrices – Eigen Values and eigen vectors – Mode shapes – Modal analysis for bar and beams

Text Books

1. Introduction to Finite Elements In Engineering / Tirupathi K. Chandrupatla and Ashok D. Belagundu / Pearson Education Limited
2. Introduction of Finite Element Analysis / S. Md. Jalaludeen / Anuradh publications
3. The Finite Element Methods In Engineering / S.S.Rao / Elsevier

Reference Books

1. Finite Element Methods / Alavala / Tata McGraw-Hill Publishing Company Ltd.
2. An Introduction to Finite Element Methods / J.N. Reddy / McGraw Hill Education
3. The Finite Element Method in Engineering Science / O.C. Zienkoitz / McGraw Hill Education
4. Concepts and Applications of Finite Element Analysis / Robert Cook / Wiley-Interscience
5. Finite Element Method-Its Application in Engineering / Y.M.Desai, T.I ElDHO, A.H.Shah / Pearson Publications

AI FOR MECHANICAL ENGINEERING

B. Tech III Year II Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		3	-	-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. Understand basic concepts of artificial intelligence
2. Learn various search and strategies used in artificial intelligence
3. Know about basic operating systems and robot hardware components
4. Understand basic concepts of AI in manufacturing processes
5. Identify the use of AI in modern machining processes

Course Outcomes

At the end of this course, students will be able to:

1. Explain the importance of artificial intelligence in engineering applications
2. Apply the search and strategies of AI in engineering industry
3. Describe basic robot operating systems and their hardware components
4. Use the AI concepts in manufacturing industry
5. Demonstrate the importance of AI in modern machining processes

Unit I

Introduction: History, Definition of AI and Emulation of human cognitive process, Agents: types. An abstract view of modelling and Elementary knowledge, Computational and Predicate logic, Analysis of compound statements using simple logic connectives, Nature of Environments.

Unit II

Problem Solving: Problem Definition, formulating problems and Searching for solutions, Examples using production rules, Search /Strategies: Uninformed or Blinded search and Breadth first search, Uniform cost search: Depth first search, Depth limited

search, comparing uniformed search strategies and Informed search strategies, Heuristic information and Hill climbing methods.

Unit III

Artificial Intelligence in Robotics: AI in robotics and their applications. Introduction to Robot Operating Systems (ROS), Basic robot sensing techniques (Vision and Listening), Beam Models of Range Finders, sensor models. Object Recognition Using Neural Networks and Supervised Learning. Reinforcement learning and Genetic Algorithms.

Unit IV

AI in Manufacturing: Introduction to AI and Machine learning (ML) in Manufacturing Processes and Application. ML algorithms and case studies used in machining operations: SVM approach in Turning and SVR approach in Milling.

Unit V

AI concepts in Advanced Manufacturing: Surface roughness prediction in AWJ machining using ANN approach. Genetic algorithm approach for optimization of machining parameters in EDM Process, Simulation-based ML approach in manufacturing. Significance of Machine learning role in product quality assessment.

Text Books

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A modern approach”. Prentice Hall, New Jersey, 1995

2. Francis X. Govers, Artificial Intelligence for Robotics: Build intelligent robots that perform human tasks using AI techniques, Birmingham, UK : Packt Publishing Ltd, 2018

3. Bose, G.K., Pain, P. “Machine Learning Applications in Non-Conventional Machining Processes” (2021) United States: IGI Global

Reference Books

1. Schalkoff, R.J., “Artificial Intelligence: An Engineering Approach”, McGraw-Hill, 1990

2. Elaine Rich and Kelvin Knight, “Artificial Intelligence”, Tata McGraw Hill, New Delhi, 1991

3. Murphy, Robin, and Robin R. Murphy. Introduction to AI robotics. MIT press, 2000

4. Benkedjouh, T., Medjaher, K., Zerhouni, N. et al. Health assessment and life prediction of cutting tools based on support vector regression. J Intell Manuf 26, 213–223 (2015) https://doi.org/10.1007/s10845- 013-0774-6

5. Advances in Manufacturing and Industrial Engineering: Select Proceedings of ICAPIE 2019. (2020) Germany: Springer Singapore

6. Amal Saadallah, Felix Finkeldey, Katharina Morik, Petra Wiederkehr, Stability prediction in milling processes using a simulation-based Machine Learning approach, Procedia CIRP, Volume 72, 2018, Pages 1493-1498, ISSN 2212-8271,https://doi.org/10.1016/j.procir.2018.03.062

HEAT TRANSFER

B. Tech III Year II Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
	PCC	L	T	P	C	CIE	SEE	Total
		2	1	-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. Understand the fundamentals of heat transfer modes and their applications
2. Apply the one-dimensional steady state and transient heat conduction concepts for simple geometries
3. Classify the convective heat transfer processes and apply correlations for simple geometries to evaluate the heat transfer coefficients
4. Study the heat transfer in phase change and understand the principles of radiation
5. Classify and evaluate the performance of heat exchangers

Course Outcomes

After completion of this course, the students will be able to:

1. distinguish between different modes of heat transfer and solve for general heat conduction equation in different coordinate systems
2. analyze one dimensional steady state and transient heat conduction for simple geometries
3. categorize convective heat transfer process and evaluate the heat transfer coefficients in forced and free convection by applying correlations for different geometries
4. analyze the heat transfer during phase change process and understand the elementary treatment of radiation heat transfer
5. assess the heat exchanger performance by using LMTD and NTU methods

Unit I

Introduction: Modes of heat transfer – Fundamental laws of heat transfer – General discussion about applications of heat transfer

Conduction heat transfer: General heat conduction equation in Cartesian, cylindrical and spherical coordinates – Simplification and forms of the heat conduction equation – Steady and unsteady heat transfer – Initial and boundary conditions – Numerical problems

Unit II

One dimensional steady state conduction heat transfer: Homogeneous slabs – Hollow cylinders and spheres – Electrical analogy – Composite systems – Critical radius of insulation – Extended surfaces (fins) –Systems with heat generation – Variable thermal conductivity

Transient heat conduction: Systems with negligible internal resistance (lumped heat analysis) – Chart solutions of transient heat conduction systems – Numerical problems

Unit III

Convective heat transfer: Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow – Dimensional analysis as a tool for experimental investigation – Buckingham π-theorem and method – Application for developing semi-empirical non-dimensional correlations for convection heat transfer – Significance of non-dimensional numbers – Use of empirical correlations for convective heat transfer

Forced convection: External flows – flat plates and horizontal pipes – Flow through pipes – Development of hydrodynamic and thermal boundary layer

Free convection: Vertical plates and pipes – Concepts about hydrodynamic and thermal boundary layer along a vertical plate – Numerical problems

Unit IV

Heat transfer in phase change:

Boiling: Pool boiling – Nucleate boiling, critical heat flux and film boiling

Condensation: Film wise and drop wise condensation – Film condensation on a vertical and horizontal cylinder using empirical correlations

Radiation heat transfer: Emission characteristics and laws of black body radiation – Total and monochromatic quantities – Radiation from non-black surfaces – Emissivity

Radiation heat exchange between two black surfaces – Radiation shape factor – Heat exchange between non-black (gray) bodies – Concept of radiation shields – Numerical problems

Unit V

Heat exchangers: Classification of heat exchangers – Overall heat transfer coefficient –concepts of LMTD and NTU methods for different types of heat exchangers – Multi pass and cross flow heat exchangers – Fouling in heat exchangers – Numerical problems

Text Books

1. Fundamentals of Engineering Heat and Mass Transfer / R C Sachdeva / New age Publisher

2. Heat Transfer / P K Nag / Tata McGraw-Hill Publishing Company Ltd.

3. Heat and Mass Transfer / Domkundwar & Arora / Dhanpatrai & Co. Publications

Reference Books

1. Heat Transfer / J P Holman / Tata McGraw-Hill Education
2. Heat and Mass Transfer/ Yunus Cengel, McGraw Hill Education
3. Heat Transfer-A Basic approach, M N Ozisik, McGraw Hill Education
4. Fundamentals of Heat Transfer & Mass Transfer, Incropera & Dewitt, John Wiley & Sons
5. Heat and Mass Transfer, D S Kumar, S K Kataria & Sons

NOTE: Heat and mass transfer data book is permitted

ENTREPRENEURSHIP DEVELOPMENT

B.Tech III Year II Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
	OEC-I	L	T	D/P	C	CIE	SEE	Total
		3	-	-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. To provide insights into basic characteristics and process of entrepreneurship
2. To develop a business idea and prepare a bankable project report
3. To identify the methods to initiate ventures and the sources of finance
4. To create awareness about the legal challenges of entrepreneurship and IPR
5. To know and apply the various strategic and managerial concerns in the growth stage of the firms.

Course Outcomes

After completion of this course, the students will be able to:

1. Interpret concepts and process of entrepreneurship.
2. Apply idea development strategies and prepare a bankable project report
3. Analyse various opportunities towards initiating ventures.
4. Recognize legal challenges of entrepreneurship.
5. Assess the strategic perspectives of entrepreneurship.

Unit I

Introduction: Introduction to Entrepreneurship – Characteristics, Qualities, Key Elements and Skills of an Entrepreneur, entrepreneurial stress, Corporate entrepreneurship, Entrepreneurial process.

Unit II

Business Plan Preparation: Search for business idea, project identification, project formulation and development, contents of business plan and Preparation of a Bankable Project Report.

Unit III

Launching Entrepreneurial Venture: Opportunities identification, Methods to initiate Ventures, Creating new ventures, Acquiring existing ventures, Franchising. Sources of finance, Forms of capital requirements, funding agencies and supporting institutions.

Unit IV

Legal challenges of Entrepreneurship: Intellectual Property Protection – Patents, Copyrights, Trademarks and Trade Secrets. The challenges of new Venture Startups- Poor financial understanding, critical factors for new venture development, Evaluation process, Feasibility criteria approach.

Unit V

Strategic perspectives in Entrepreneurship: Strategic planning- Strategic Action, Strategic Positioning, Business Stabilization, Building the adaptive firms, understanding the growth stage, unique managerial concern of growing ventures.

Text Books

1. D F Kuratko and T V Rao "Entrepreneurship- A South-Asian Perspective "Cengage Learning, 2012

2. Vasant Desai, Small Scale Industries and Entrepreneurship, HPH, 2012.

Reference Books

1. Rajeev Roy, Entrepreneurship, 2e, Oxford, 2012.
2. B.Janakiram and M.Rizwana, Entrepreneurship Development:Text & Cases, Excel Books,
2011.
3. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.
4. Robert Hisrich et al, Entrepreneurship, 6e, TMH, 2012.
5. Nandan H, Fundamentals of Entrepreneurship, PHI, 2013
6. Shejwalkar, Entrepreneurship Development, Everest, 2011
7. Khanka, Entrepreneurship Development, S.Chand, 2012

ANURAG UNIVERSITY

TECHNICAL AND BUSINESS COMMUNICATION SKILLS

B.Tech III Year II Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
	OEC-I	L	T	D/P	C	CIE	SEE	Total
		3	-	-	3	40	60	100

Introduction

The course is intended to expose the students to learn and practice the five communication skills thinking, listening, speaking reading, and writing in English, the global language of communication. It reflects some of the approaches in English language teaching and learning currently in practice around the world.

Course Objectives

The objectives of this course are to:

To help the students to develop effective communication skills in all communicative contexts for professional advancement

Course Outcomes

After completion of this course, the students will be able to:

1. communicate technical and business correspondence
2. reflect on the themes discussed
3. recognize ethical implications of technical communication in professional contexts
4. identify the contemporary issues in engineering from environmental, societal, economic, and global perspectives
5. demonstrate ethical decisions in complex situations

Unit I

E-World & E-Communication

E-language **-** E-governance **-** E-commerce/E-business **-** E-banking **-** E-waste

Unit II

Business Establishment & Infrastructure Development

Power Supply **-** Industrial Park **-** Business Correspondence: Follow-up letters - Acceptance & Rejections **-**Persuasive letters **-** Resignation letters

Unit III

Technology and Society

Robot Soldiers **-** For a Snapshot of a Web **-** Placing an order - Proposal Writing **-** Patents & Rights (National & International) **-** Intellectual Property - Nanotechnology

Unit IV

Ethics in Business Communication

Ethical issues involved in Business Communication - Ethical dilemmas facing managers **-** Ethical Code & Communication - Standards in Daily Life - Total Quality Management - World University Ranking

Unit V

Management Information System

Corporate Governance **-** Business Process Outsourcing **-** Project Management Communication **-** Marketing Communication

Text Books

1. **English and Communication Skills for Students of Science and Engineering** by S P Dhanavel. Orient Black Swan. 2009.

Reference Books

1. **Business Communication** (Second Edition) by Meenakshi Raman & Prakash Singh by Oxford University Press. 2012.
2. **Language and Communication skills for Engineers** by Sanjay Kumar & Pushp Lata by Oxford University Press. 2018.
3. **Business Communication** by Anjali Kalkar, et.al. Orient BlackSwan. 2010.
4. **Technical Communication** by Paul V. Anderson. Cengage. 2014.
5. **Engineering Communication** by Charles W. Knisely & Karin I. Knisely. Cengage. 2015.

ANURAG UNIVERSITY

INDUSTRIAL RELATIONS & EMPLOYMENT LAWS

B.Tech III Year II Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
	OEC-I	L	T	D/P	C	CIE	SEE	Total
		3	-	-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. To understand the basic concepts and approaches to Industrial Relations.
2. To study the role and functions of the Trade Unions in Industrial Relations.
3. To understand the importance of Collective bargaining and negotiations for Industrial Harmony.
4. To explain different approaches to Grievance Procedure and Discipline Management.
5. To understand the basic concepts of various labour legislations.

Course Outcomes

After completion of this course, the students will be able to:

1. Gain the insights of IR concepts and practices to design programs for better industrial relations and peace.
2. Develop the approaches to create peaceful environment between Trade unions-Management.
3. Handle the conflicts with the help of collective bargaining and negotiations
4. Design the Grievance Handling mechanism to solve the disputes in the organization.
5. Apply the appropriate employment policies in the organization in regards to different legislations.

Unit I

Introduction: Background of Industrial Relations – Definition, scope, objectives, factors affecting IR, participants of IR, importance of IR. Approaches to Industrial relations, system of IR in India, Code of Discipline and historical initiatives for harmonious IR, Government policies relating to labour, ILO and its influence on Legal enactments in India

Unit II

Trade Unions: Meaning, trade union movement in India, Objective, role and functions of the Trade Unions in Modern Industrial Society of India, Procedure for registration of Trade Unions, Grounds for the withdrawal and cancellation of registration, union structure, Rights and responsibilities of TUs, Problems of trade unions

Unit III

Collective Bargaining: Definition, Meaning, Nature and importance,functions of collective bargaining collective bargaining process, prerequisites for collective bargaining, implementation and administration of agreements.
Negotiations-Types of Negotiations- Negotiation Process, Tactics of negotiation, Essential skills for negotiation,

Unit IV

Grievance Handling:- Meaning and forms, sources of grievance, approaches to grievance machinery, Grievance redressal mechanisms. Disciplinary procedures, approaches to manage discipline in Industry, Principles of Hot stove rule.

Unit V

Employment Laws: Factories Act 1948, Industrial Employment (Standing orders) Act, 1946,Employees' State Insurance (ESI) Act, 1948,Maternity Benefit Act, 1961,Contract Labour Act, Act, 1986, Industrial disputes act of 1947, Minimum Wages Act, 1948,Employees' Provident Fund and Miscellaneous Provisions Act 1952.

Text Books

1.C S Venkataratnam, Manoranjan Dhal, Industrial Relations, Oxford UniversityPress,2/e,2017.

2. Memorial P.Subba Rao, Dynamics of Industrial Relations, Himalaya,16/e. 2016

Reference Books

1. Industrial Relations and labor laws, Arun Monappa, Ranjeet Nambudiri, Patturaju Selvaraj, TMH, 2012

2. BD Singh, Industrial Relations & Labour Laws, Excel, 2009.
3. Sinha, Industrial Relations, Trade Unions and Labour Legislation, Pearson, 2009.
4. P.K.Padhi, Labour and Industrial Laws, PHI, 2009.

ANURAG UNIVERSITY

AUTOMOTIVE MECHANICS AND HYBRID VEHICLES

B.Tech III Year II Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
	PEC	L	T	D/P	C	CIE	SEE	Total
		3	-	-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. study the components of conventional automobile in general
2. identify the importance of ignition, electrical and transmission systems
3. know the function of the suspension, steering and braking systems
4. realize the importance of hybrid vehicles and drive train configurations
5. choose the energy storage systems of hybrid vehicles and examine the emissions

Course Outcomes

After completion of this course, the students will be able to:

1. understand the vehicle construction, chassis, lubrication system and cooling system
2. appraise the significance of ignition, electrical and transmission systems
3. dissect the suspension, steering and braking systems in automobiles
4. recognize the importance of hybrid vehicles and understand drive trains
5. assess energy storage systems for vehicle applications and study the engine emission controls

Unit I

Introduction: Types of automobiles – Components of four-wheeler automobiles: chassis, frame and body – Types of layouts: rear wheel drive, front wheel drive and 4-wheel drive – Engine lubrication: splash and pressure lubrication systems – Oil filters and oil pumps
Cooling system: Cooling requirements – Types of cooling: air cooling and water cooling – Components: types of radiator, cooling fans, water pumps, thermostat

Unit II

Ignition systems: Functions of an ignition system – Types of ignition systems: battery ignition system, magneto ignition system, transistor based coil ignition system and capacitive discharge ignition system – Components of battery ignition system: battery, contact breaker points, condenser and spark plug

Electrical systems:

Charging circuit – Generator – Current-voltage regulator – Starting system – Bendix drive mechanisms – Solenoid switch – Lighting systems – Horn – Wiper – Temperature indicator – Oil pressure gauge – Fuel gauge

Transmission systems: Clutches: principle, types, fluid fly wheel – Types of gear boxes – Torque converter – Propeller shafts – Hotchkiss drive and torque tube drive – Universal joint – Differential – Rear axle: types – Wheels and tyres

Unit III

Suspension systems: Objectives of suspension system – Rigid axle suspension system – Independent suspension system – Torsion bar – Shock absorber

Steering systems: Steering geometry : camber, castor, king pin, rake-combined angle, toe-in and toe-out – Center point steering – Types of steering mechanisms – Types of steering gears – Steering linkages

Braking systems: Mechanical brake system – Hydraulic brake system: tandem master cylinder, wheel cylinder – Requirement of brake fluid – Pneumatic and vacuum brakes

Unit IV

Introduction to hybrid vehicles: History of hybrid vehicles – Social and environmental importance of hybrid vehicles – Classification – Comparison with internal combustion engine – Benefits and Challenges

Hybrid electric drive-trains: Basic concept of hybrid traction – Introduction to various hybrid drive-train topologies – Power flow control in hybrid drive-train topologies – fuel efficiency analysis

Unit V

Energy storage: Introduction to energy storage requirements in hybrid and electric vehicles – Battery based energy storage and its analysis – Fuel cell based energy storage and its analysis – Hybridization of different energy storage devices

Engine emission control: Introduction – Types of pollutants – Mechanism of formation – Concentration measurement – Methods of controlling: Engine modification, exhaust gas treatment: thermal and catalytic converters

Text Books

1. Kirpal Singh, Automotive Engineering, Vol. I & II, Standard Publishers, New Delhi, 2002
2. Electric & Hybrid Vehicles – Design Fundamentals – Iqbal Hussain, Second Edition, CRC Press, 2011
3. James Larminie, John Lowry, “Electric Vehicle Technology”, Wiley publications, 1st Edition, 2003

Reference Books

1. Automotive Mechanics / G.B.S.Narang/Khanna Publishers, 1st Edition
2. Automotive Mechanics / Heitner /CBS Publishers, 2nd Edition
3. Automotive Mechanics/ Crouse & Anglin/Tata McGrawHill, New Delhi, 10th Edition 2007
4. Chris Mi, M. Abul Masrur, David Wenzhong Gao, Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives, John Wiley & Sons Ltd., 2011
5. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design / Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi / CRC Press, 2004

PRODUCTION PLANNING AND CONTROL

B.Tech III Year II Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
	PEC	L	T	D/P	C	CIE	SEE	Total
		3	-	-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. understand the necessity of forecasting in production planning
2. develop the optimum usage of inventory by using inventory techniques
3. choose the proper bills of material and route sheet
4. prepare the schedule and aggregate planning for production activities
5. prepare dispatching documents and follow up functions

Course Outcomes

After completion of this course, the students will be able to:

1. apply the concepts of production planning & control and forecasting techniques for industrial applications
2. implement the concepts of inventory management, ABC analysis, VED analysis, EOQ models in real time problems
3. prepare the bills of material, route sheets, material requirement planning and enterprise resource planning, suitable for proper functioning of company
4. generate the production schedule, line of balance and aggregate planning as per resources available
5. organize the dispatching functions, dispatching procedure and functions of follow up as per the requirement of industry applications

Unit I

Introduction: Definition of production planning and control – Objectives of production planning and control – Functions of production planning and control – Elements of production control – Types of production systems – Organization of production planning and control – Internal organizations department

Forecasting: Definition of forecasting – Importance of forecasting – Types of forecasting, their uses – General principles of forecasting techniques – Qualitative methods and quantitative methods

Unit II

Inventory: Definition of Inventory – Terminology used in inventory - Functions of inventory – ABC analysis – VED analysis – EOQ model problems – Inventory control systems,P-Systems and Q- Systems

Unit III

Routing : Definition of routing – Routing procedure – Route sheets – Bill of material – Factors affecting routing procedure
Introduction to Materials Requirement Planning (MRP): Inputs and outputs of MRP – Implementation of MRP – Advantages and Disadvantages of MRP– Enterprise resource planning (ERP) – Line of balance (LOB)– Just in Time (JIT)

Unit IV

Scheduling: Definition of scheduling – Definition of loading –Difference between scheduling and loading –Terminology used in scheduling – Techniques, standard scheduling methods – Job shop, Flow shop
Line balancing – Aggregate planning –Definition of aggregate planning– Importance of aggregate planning –Aggregate planning strategies – Aggregate planning methods/techniques

Unit V

Dispatching: Definition of dispatching – Functions of dispatcher –Activities of dispatcher – Forms used in dispatching department / dispatching procedure
Follow up / Expediting: Definition of follow up – Need for follow up – Functions of follow up – Types of follow up – Applications of computers in production planning control

Text Books

1. Production Planning and Control/ M.Mahajan , Dhanpatirai Co / 2015
2. Elements of Production Planning and Control / Samuel Eilon, macmilan / 1972
3. Production Planning and Control /Dr. V. Jayakumar,lakshmi Publications / 7th edition / 2015

Reference Books

1. Production Planning and Control – Text, cases / SK Mukhopadhyaya, PHI / 3rd edition, 2015
2. Production and operations Management / R.PaneerSelvam / PHI / 2015
3. Operations Management by Chase /Phi / 12th edition

4. Management Science /A.R.Aryasri / 4e / TMH 2009
5. Operations Management /Heizer / Pearson, 10th edition
6. The Fundamentals of Production Planning and Control / Stephen N. Chapman

ANURAG UNIVERSITY

REFRIGERATION AND AIR CONDITIONING

B.Tech III Year II Semester				Dept. of Mechanical Engineering				
Code	Category	Hours/Week			Credits	Marks		
	PEC	L	T	D/P	C	CIE	SEE	Total
		2	1	-	3	40	60	100

Course Objectives

The objectives of this course are to:

1. identify the necessity of refrigeration and know about air refrigeration systems and refrigerants
2. derive expression for COP of vapor compression refrigeration system and discuss about refrigeration equipment
3. summarize vapor absorption refrigeration system and know about non -conventional refrigeration systems
4. calculate loads on air conditioning system by using psychrometric charts
5. appraise human comfort conditions by air conditioning and discuss about air conditioning equipment

Course Outcomes

After completion of this course, the students will be able to:

1. appraise fundamentals of refrigeration, analyze air refrigeration systems and study new refrigerants
2. evaluate performance of vapor compression refrigeration systems and dissect the refrigeration equipment
3. distinguish between vapor compression and vapor absorption refrigeration systems and discuss about non-conventional refrigeration systems
4. determine thermal loads on air conditioning systems by making use of psychrometric charts
5. elaborate working of different air conditioning systems and explain about air conditioning equipment

Unit I

Introduction of Refrigeration: Necessity and applications – Unit of refrigeration and C.O.P – Mechanical Refrigeration – Types of ideal cycles of refrigeration

Air Refrigeration: Bell Coleman cycle – Open and Dense air systems – Actual air refrigeration system – Refrigeration needs of Aircrafts

Refrigerants: Desirable properties – classification of refrigerants – Nomenclature – Eco-friendly Refrigerants

Unit II

Vapor Compression Refrigeration System: Working principle and essential components of the plant – simple vapor compression refrigeration cycle – COP – Representation of cycle on T-s and p-h charts – effect of sub cooling and super heating – effect of condenser and evaporator pressures – cycle analysis – Actual cycle – influence of various parameters on system performance – use of p-h charts – numerical problems – elementary treatment of two stage compressor and evaporator systems

Refrigeration Equipment: Compressors – Condensers – Evaporators – Expansion Devices –Working principle and applications

Unit III

Vapor Absorption Refrigeration System: Description and working of NH_3 - Water system –

LiBr - water (Two shell & four shell) system – Maximum COP – Principle of operation of three fluid absorption system – Salient features

Non-Conventional Refrigeration Systems: working principle, applications and limitations of Steam jet, Thermoelectric and Vortex tube refrigeration systems

Unit IV

Introduction to Air Conditioning: Psychometric Properties – Sling psychrometer – psychrometric Processes – Characterization of sensible and latent heat loads – Need for ventilation – Consideration of infiltration – Load concepts of RSHF, GSHF – Numerical problems – Concept of ESHF and ADP – Comfort conditions: requirement of human comfort and concept of Effective Temperature, comfort chart – Fundamentals of HVAC

Unit V

Air Conditioning Systems: Comfort air conditioning system: summer air conditioning system, winter air conditioning system and year round air conditioning system – Industrial air conditioning system –– Unitary air conditioning – Central air conditioning system –Numerical problems

Air Conditioning Equipment and Applications: Humidifiers – Dehumidifiers – Air filters – fans and blowers – grills and registers – Ducts : supply ducts, outlet and return ducts – Heat pump – Different heat pump circuits – Applications

Text Books

1. Refrigeration and Air Conditioning / C P Arora / Tata McGraw-Hill Education
2. A Course In Refrigeration And Air Conditioning / S C Arora & Domkundwar / Dhanpat Rai & Co. Ltd.
3. Refrigeration and Air Conditioning / W F Stoecker and J WJones / Tata McGraw-Hill Education

Reference Books

4. Refrigeration and Air Conditioning / Manohar Prasad / New Age Publishers
5. Principles of Refrigeration / Dossat/Pearson Education
6. Basic Refrigeration and Air Conditioning / Ananthanarayanan / TataMcGraw-Hill Publishing Company Ltd.
7. Refrigeration and Air Conditioning / P L Bellaney / Khanna Publications
8. Refrigeration And Air Conditioning / R S Khurmi & J K Gupta / S Chand Eurasia Publishing House (P)Ltd.

NSS (NATIONAL SERVICE SCHEME) / NSO (NATIONAL SPORTS ORGANIZATION)

B.Tech III Year II Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
	MC	L	T	D/P	C	CIE	SEE	Total
		0	0	2	0	-	-	-

Course Objectives

The objectives of this course are to:

1. Wholesome development of personality of an individual which means making an individual physical fit, mentally alert, emotionally balanced, socially well adjusted, morally true and spiritually uplifted.
2. To develop skill, interest and the appreciation for the need of life-long movement, activity, and recreation.
3. To provide an overview of NSS and to know Volunteerism.
4. To understand personality development by doing community service model
5. To study the entrepreneurship and its implementation process and develop a project on their learned skills

Course Outcomes

After completion of this course, the students will be able to:

1. Increased health awareness through health screenings, activities, materials, demonstrations, and information.
2. Evaluation and application of fitness and wellness concepts to individual lifestyle.
3. To develop a broad understanding of NSS and Volunteerism for more involvement.
4. To understand the working of community service model for their all-round personality development.
5. To understand the entrepreneurship and its implementation to solve the community identified problems and work on a project by using learned skills on identified problem of the society.

Unit I

HEALTH AND WELLNESS

Dimensions of Health: Physical, Mental and Social. Objectives of Health Education. Definition and Dimensions of Wellness – Physical, Emotional, Social, Spiritual, Intellectual and Environmental Wellness. Achieving Wellness.

Practical: Basketball, Cricket, Kho-Kho (Any Two) & Badminton (Mandatory)

Layout of Courts / Fields, Skills, Rules & Lead-up Games.

Unit II

FITNESS AND BODY COMPOSITION

Physical Fitness Components: Body Composition, Muscular Endurance, Strength, Cardiovascular Fitness and Flexibility, Importance of Cardio-Respiratory Endurance. Obesity and Health Risk Factors. Body Composition Indicators and Measurements.

Practical: Football, Kabaddi, Volleyball (Any Two) & Table Tennis (Mandatory)

Layout of Courts / Fields, Skills, Rules & Lead-up Games.

Unit III

INTRODUCTION AND BASIC CONCEPTS OF NSS

History, Philosophy, Aims & Objectives of NSS. Emblem, Flag, Motto, Song, Badge, Organizational Structure, Roles and Responsibilities of Various NSS functionaries. NSS Programmes and Activities, Volunteerism and Shramdan.

Unit IV

PERSONALITY DEVELOPMENT THROUGH COMMUNITY SERVICE

Importance and Role of Youth Leadership, Life Competencies, Social Harmony and National Integration, Youth Development Programmes in India, Citizenship, Health, Hygiene and Sanitation, Environment Issues, Disaster Management, Life Skills.

Unit V

VOCATIONAL AND ENTREPRENEURSHIP SKILLS DEVELOPMENT

Definition and meaning of Entrepreneurship, Qualities of good entrepreneur, Steps /ways in operating an Enterprise and role of financial and support service Institutions. Project Cycle Management, Resource Mobilisation and Documentation and Reporting.

Project work/ Practical: Conducting Surveys on Special Theme, Involving in Shramadan, Swachh Bharat, Blood Donation, Tree Plantation, Awareness Programmes, Identify the Community Problems and List out the all Possible Solutions, Educate the Villagers on Health, Hygiene, Sanitation and Environment Protection. Self-Review of the Students on their Improvements by Participating in the Community Service Programmes.

Reference Books

1. ***The Soul of Wellness:*** 12 holistic principles for achieving a healthy body, mind, heart and spirit, Rajiv Parti, Select book incorporation, New York.
2. H. & Walter, H., (1976). ***Turners School Health Education.*** Saint Louis: The C.Y. Mosby Company
3. Nemir, A. (n.d.). ***The School Health Education***. New York: Harber and Brothers.
4. ***Health Fitness Instructors Handbook***, Edward T Howley, Human Kinetics, USA.
5. ***About NSS:*** National Service Scheme Manual by Government of India Ministry of Youth Affairs & Sports,New Delhi.
6. Robert N Lussier, Management Fundamentals - Concepts, Applications, Skill Development, Cengage Leaning, First Edition, 2012.
7. Handbook of Personality Development – Mroczex& Little (eds).2006.
8. Richard Blundel" Exploring Entrepreneurship Practices and Perspectives, Oxford, 2011.
9. WWW.NIRD.ORG
10. WWW.NIRD.ORG-SAGY-SAMANVAYSTATES-TELANGANA
11. WWW.VIKASPEDIA.IN
12. WWW.RGNIYD.GOV.IN
13. WWW.CASHLESSINDIA.GOV.IN
14. WWW.SWACHHBHARAT.MYGOV.IN

HEATTRANSFER LAB

B.Tech III Year II Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
	PCC	L	T	D/P	C	CIE	SEE	Total
		-	-	2	1	50	50	100

Course Objectives

The objectives of this course are to give hands on experience in operating the various experimental setups, acquire the required data and to:

1. estimate the thermal conductivity of various materials with different configurations
2. determine the convective heat transfer coefficient and heat transfer rate in natural and forced convection with different configurations
3. find Stefan Boltzmann constant and emissivity of given material
4. estimate the performance of parallel flow and counter flow heat exchangers
5. conduct experiments to know phenomena of boiling and condensation with different setups

Course Outcomes

At the end of this course, students will be able to have the hands on experience in operating the experimental setups, acquire the required data and to:

1. evaluate the thermal conductivity of various materials with different configurations
2. calculate the convective heat transfer coefficient and heat transfer rate in natural and forced convection with different configurations
3. verify Stefan Boltzmann constant experimentally and evaluate emissivity of given material
4. analyze the performance of parallel flow and counter flow heat exchangers
5. conduct experiments to understand phenomena of boiling and condensation with different setups

List of Experiments

1. Thermal conductivity of a brass bar
2. Thermal conductivity of a lagged pipe
3. Thermal conductivity of insulating powder
4. Overall heat transfer coefficient of a composite wall
5. Effectiveness of a metallic pin-fin
6. Rate of cooling of the hot metal bar under transient conditions

7. Heat transfer coefficient and the rate of heat transfer by forced convection through a horizontal pipe
8. Heat transfer coefficient and the rate of heat transfer by free convection from a vertical tube
9. Stefan-Boltzmann's Constant
10. Emissivity of a given surface
11. Logarithmic mean temperature difference (LMTD), effectiveness in a parallel flow and counter flow heat exchanger
12. Critical heat flux in pool boiling of water and compare experimental and theoretical values
13. Heat transfer coefficient for drop wise, film wise condensation and compare experimental and theoretical values
14. Study of the variation of heat sink temperature and longitudinal temperature distribution for heat pipe made of stainless steel and copper

Reference Books

1. Fundamentals of Engineering Heat and Mass Transfer / R C Sachdeva / New age Publisher
2. Heat Transfer / P K Nag / Tata McGraw-Hill Publishing Company Ltd.
3. Heat and Mass Transfer / Domkundwar & Arora / Dhanpatrai & Co Publications
4. Heat Transfer / J P Holman / Tata McGraw-Hill Education
5. Heat and Mass Transfer/ Yunus Cengel / McGraw Hill Education

NOTE: Heat and mass transfer data book is permitted

ANURAG UNIVERSITY

SKILL INTEGRATED LANGUAGE LAB

B.Tech III Year II Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
	HSMC	L	T	D/P	C	CIE	SEE	Total
		-	-	2	1	50	50	100

Introduction

The Skill Integrated Language Lab is intended to make the students proficient communicators in English. It aims to develop in the learners the ability to understand English in a wide range of contexts. The Lab focuses on preparing the learners to face globalized world.

Course Objectives

1. To improve the students' fluency in English, through a well-developed vocabulary
2. To enable them to respond them appropriate socio-cultural and professional contexts.
3. They will be able to communicate their ideas relevantly and coherently in writing.

Course Outcomes

At the end of this course, students will be able to

1. make oral presentations effectively
2. participate in group discussions
3. develop vocabulary
4. write project/Business reports
5. take part in social and professional communication

List of Experiments

Exercise I

Presentation Skills:

Oral presentations (individual and group) / JAM sessions/Seminar - Power point presentations - Body Language-kinesics - Haptics

Exercise II

Group Discussion:

Dynamics of Group Discussion - Dos and Don'ts – Intervention - Summarizing - Modulation of Voice - Relevance - Fluency and Coherence

Exercise III

Vocabulary Building:
synonyms and antonyms - Word Roots - One-Word Substitutes, - Prefixes and Suffixes - study of Word Origin- -Analogy -Idioms and Phrases

Exercise IV

Writing Skills:
Structure and presentation of different types of writing - Resume Writing /E-Correspondence/Statement of Purpose - Report Writing - Business Report Writing - Research Abilities/Data Collection/Organizing Data/Tools/Analysis

Exercise V

Interview Skills:
Concept and Process - Pre-Interview Planning - Opening Strategies - Answering Strategies - Interview through Telephone and Videoconferencing.

A mini project should be given for the students to work in teams and the Assessment is done.

Minimum Requirements:
The English Language Lab shall have two parts:

i) The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.

ii) The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a digital stereo –audio & video system.

System Requirement (Hardware component): *Computer network with Lan with minimum 60* multimedia systems with the following specifications:
i) P – IV Processor
a) Speed – 2.8 GHZ
b) RAM – 512 MB Minimum
c) Hard Disk – 80 GB
ii) Headphones of High quality

References:

1. *Dr. Rao, A. Ramakrishna., Dr. G. Natanam and Prof SA Sankaranarayana. English Language Communication: A Reader cum Lab Manual. Chennai: Anuradha Publications, 2008.*
2. *English Vocabulary in Use series*. Cambridge University Press, 2008.
3. Nicholls, Anne. *Master Public Speaking.* JAICO Publishing House, 2006.
4. Sen, Leena. *Communication Skills.* New Delhi: PHI Learning Pvt Ltd, 2009.

Item 6:

Presentation of the Amendments of the following courses in B. Tech program

- **Engineering Drawing and**
- **Java Programming course name change**

(a).Engineering Graphics – Amendment

Existing	Amendment
"For the courses having Design/Drawing (such as Engineering Graphics, Engineering Drawing, Machine Drawing) the evaluation is as follows: (a) CIE: 50 marks The breakup of CIE is as follows: - Day to day activities: 30 marks - Internal examination: 20 marks (b) SEE: 50 marks.	For the courses having Design/Drawing (such as Engineering Graphics, Engineering Drawing, Machine Drawing) the evaluation is as follows: I. For Mechanical Engg., Civil Engg. and Chemical Engg. : (a) CIE: 40 marks - Day to day activities: 20 marks - Mid Term: 20 marks (b) SEE: 60 marks as theory course. II. For other than Mechanical Engg., Civil Engg. and Chemical Engg. branches : (a) CIE: 50 marks - Day to day activities: 30 marks - Internal examination: 20 marks (b) SEE: 50 marks.

(b). Java Programming

The course entitled Java Programming of B. Tech in Electronics and Communication Engineering (R20) is amended as under:

Existing	**Amendment**
A53023 – Java Programming	A53023 – Object Oriented Programming through Java

Item 7:

School of Pharmacy

Presentation of the minutes of the Board of Studies (BoS) including course structure and syllabi for the programs proposed to be offered from the Academic Year 2022-23.

BOARD OF STUDIES MEETING

SCHOOL OF PHARMACY, ANURAG UNIVERSITY

Date: 11th March 2022 at 11:00 am

The Board of studies meeting of School of Pharmacy was conducted online due to Pandemic situation. BOS members both internal as well as external members were present in the virtual mode for the meeting and discussed elaborately the course structure and curriculum of UG, PG and PhD program of Pharmacy.

AGENDA:

1. **To review the UG third year B Pharm course structure and approve the changes in the syllabus.**
2. **To consider and approve the panel of examiners for theory and practical examinations of UG/PG courses for the academic year 2022-23.**
3. **To discuss and approve the list of journals (Indexed in Scopus and UGC/Elsevier/SCI journal) to publish their research work in various conferences.**
4. **To consider change of internal BOS member from Dr.A.Madhu Babu to Dr.G.Kiran**

BOS MEMBERS

1. Dr Vasudha Bakshi-Chairman, BOS.
2. Dr A. Madhu Babu-Head of the Department
3. Dr M .Ram Mohan-Associate Professor-SOP, AU.
4. Ms Swapna-Assistant Professor-SOP, AU.
5. Dr Yogeshwari-Professor-BITS, Hyderabad-Subject Expert
6. Dr Chandraiah Godugu-Associate Professor-NIPER-Hyderabad-Subject Expert
7. Dr Praveen Bommu-Industry Expert
8. Dr Vure Prasad-Industry Expert
9. Dr Rajesh-Alumni-AU

The Chairman BOS initiated the meeting by presenting the course curriculum of B Pharmacy Courses of School of Pharmacy, Anurag University. Chairman emphasized the strength of the courses and their curriculum structure as per the Pharmacy Council of India guidelines. The members discussed and put a note about the curriculum

structure that the syllabi covered in B Pharm is on par with the standards set by Pharmacy Council of India.

The Members discussed elaborately the following

Item 1: To confirm and approve the syllabus of UG Third year B. Pharm program under regulation 2020

The BOS members reviewed the proposed course structure and syllabus of UG program which is based on Pharmacy council of India curriculum.

Following suggestions of BOS were incorporated

1. In Industrial Pharmacy subject, some topics were already covered and required to remove.
2. In Medicinal Chemistry III subject, the contents of the subtopics were concised.
3. In Pharmacognosy & Phytochemistry some of topics were repeated and removed.
4. In Herbal Drug Technology subject, the prescribed syllabus is more and could not be completed in allocated classes.
5. In Bio-Pharmaceutics & Pharmacokinetics subject, few units are rearranged.
6. In Biotechnology, few topics from unit-I are moved in Unit-II.

Item 2: To consider and approve the panel of examiners for theory and practical examinations of UG/PG courses for the academic year 2022-23.

The BOS members approved the proposed list of examiners for theory and practical examinations of UG and PG courses for the academic year 2022-23. Further, the members authorized the chairman BOS to change the examiners as per requirement.

Item 4: To consider change of internal BOS member from Dr.A.Madhu Babu to Dr.G.Kiran

The BOS considered and approved the change of internal BOS member to Dr.G.Kiran

Finally the meeting was concluded by vote of thanks by Dr. A. Madhu Babu.

B.PHARMACY: III YEAR I SEMESTER (R18 Regulation) **COURSE STRUCTURE**

Course Code	Category	Course name	Lectures	T/P	Credits
A65001	PC	Medicinal Chemistry II	4	1	4
A65002	PC	Industrial Pharmacy - I	4	1	4
A65003	PC	Pharmacology II	4	1	4
A65004	PC	Pharmacognosy and Phytochemistry - II	4	1	4
A65005	PS	Pharmaceutical Jurisprudence	4	0	4
A65006	MC	Human Values and Professional Ethics	1	0	0
A65201	PC	Industrial PharmacyI – Practical	0	4	2
A65202	PC	Pharmacology II – Practical	0	4	2
A65203	PC	Pharmacognosy and Phytochemistry II – Practical	0	4	2
		Total	21	16	26

B.PHARMACY: III YEAR II SEMESTER **COURSE STRUCTURE**

Course Code	Category	Course name	Lectures	T/P	Credits
A66001	PC	Medicinal Chemistry - III	4	1	4
A66002	PC	Pharmacology - III	4	1	4
A66003	PC	Herbal Drug Technology	3	1	3
A66004	PC	Biopharmaceutics and Pharmacokinetics	3	1	3
A66005	PS	Pharmaceutical Biotechnology	3	1	3
A66006	PC	Quality Assurance	3	1	3
A66201	PC	Medicinal chemistry III – Practical	0	4	2
A66202	PC	Pharmacology III – Practical	0	4	2
A66203	PC	Herbal Drug Technology – Practical	0	4	2
		Total	20	18	26

Note: All the end examinations (Theory and Practical) are of Three hours duration.
T – Tutorial **P – Practical**

A Student shall be promoted from III Year to IV Year only if he/she fulfills the academic requirements of securing 60% of average credits (76 I-I,I-II,II-I,II-II and III-I) from all the examinations, whether or not the candidate takes the examination.

Dean

P 22.4. VISION & MISSION STATEMENTS

Vision & Mission Statements of Pharmacy Department

VISION

Nurturing pharmacy professionals with academic and industrial exposure to equip them to face the global challenges in the health care system

&

MISSION

Develop the institute of excellence in education, research and train them in the cutting edge technologies for the promotion of pharmaceutical education.

P 22.2. PROGRAMME OUTCOMES (PO'S)

PO1	**Pharmacy Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.
PO2	**Planning Abilities:** Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines
PO3	**Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions
PO4	**Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
PO5	**Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfilment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.
PO6	**Professional Identity:** Understand, analyse and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).
PO7	**Pharmaceutical Ethics:** Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions
PO8	**Communication:** Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
PO9	**The Pharmacist and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
PO10	**Environment and sustainability:** Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO11	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

P 22.3. PROGRAMME EDUCATIONAL OBJECTIVES (PEO'S)

Programme Educational Objectives ***(Pharmacy Department)***	
PEO1	Pharmacists are expected to serve the health care system of the society, who can provide medicines, counselling for the patients and acts as bridge between doctor and patient.
PEO2	Pharmacist assists the Pharmaceutical Industry using their basic knowledge, practical experience and skills to develop the best quality of medicine with acceptable formulations at an affordable price.
PEO3	Promote R & D activities of academia and Pharmaceutical Industry with an innovative approach to contribute to the existing knowledge.

P 23. Correlation of program outcomes with the PEOs

Programme Educational Objectives (PEOs)	***Program Outcomes (POs)***										
	PO1	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***
PEO1	***3***				***2***	***3***	***3***	***3***	***3***		***2***
PEO2	***3***	***3***	***3***	***2***	***2***	***2***	***2***		***2***	***2***	***2***
PEO3	***3***	***2***	***2***	***2***			***2***		***2***		***2***

Note: *Correlation Levels 1, 2 Or 3 as defined below:*

1: Slight (Low) *2: Moderate (Medium)* *3: Substantial (High*)

School of Pharmacy: Presentation of the minutes of the Board of Studies (BoS) including course structure and syllabi for the programs proposed to be offered from the Academic Year 2022-23, for discussion and approval.

Program Structure and Syllabus of

B. Pharm III Year

Pharmacy

R20 Regulations

B.PHARM III YEAR I SEMESTER **[5 T + 3 P + 1 M]**

Course Code	Category	Course name	L	T	P	Credits
	PC	Medicinal Chemistry II	4	1	0	4
	PC	Industrial Pharmacy - I	4	1	0	4
	PC	Pharmacology II	4	1	0	4
	PC	Pharmacognosy and Phytochemistry - II	4	1	0	4
	PS	Pharmaceutical Jurisprudence	4	0	0	4
	MC	Human Values and Professional Ethics	1	0	0	0
	PC	Industrial PharmacyI – Practical	0	0	4	2
	PC	Pharmacology II – Practical	0	0	4	2
	PC	Pharmacognosy and Phytochemistry II – Practical	0	0	4	2
		Total	21	04	12	26

B.PHARM III YEAR II SEMESTER **[6 T + 3 P]**

Course Code	Category	Course name	L	T	P	Credits
	PC	Medicinal Chemistry - III	4	1	0	4
	PC	Pharmacology - III	4	1	0	4
	PC	Herbal Drug Technology	3	1	0	3
	PC	Biopharmaceutics and Pharmacokinetics	3	1	0	3
	PS	Pharmaceutical Biotechnology	3	1	0	3
	PC	Quality Assurance	3	1	0	3
	PC	Medicinal chemistry III – Practical	0	0	4	2
	PC	Pharmacology III – Practical	0	0	4	2
	PC	Herbal Drug Technology – Practical	0	0	4	2
		Total	20	06	12	26

MEDICINAL CHEMISTRY II

B. Pharm III Year I Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		4	1	0	4	40	60	100

Course Objectives

Course Objectives of Medicinal Chemistry II are to:

1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. Know the Structural Activity Relationship of different class of drugs
4. Study the chemical synthesis of selected drugs

Course Outcomes

At the end of this Medicinal Chemistry II course, students will be able to:

1. Demonstrate the classification, mechanism of action, structure activity relationship and uses of Antihistamine and Antineoplastic drugs.
2. Explain the chemistry of drugs acting on Cardiovascular System and Diuretics.
3. Discuss the category of drugs acting on hemopoietic and endocrine system.
4. Outline the principles of medicinal chemistry of antidiabetic drugs and local anaesthetics.

UNIT I

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

Antihistaminic agents: Histamine, receptors and their distribution in the human body

H_1–antagonists: Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines cuccinate, Clemastine fumarate, Diphenylphyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine

hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium

H_2-antagonists: Cimetidine*, Famotidine, Ranitidine.

Gastric Proton pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole

Anti-neoplastic agents:

Alkylating agents: Meclorethamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa

Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine

Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin

Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate

Miscellaneous: Cisplatin, Mitotane.

UNIT II

Anti-anginal & **Vasodilators:** Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole.

Calcium channel blockers: Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine.

Diuretics:

Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide.

Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide,

Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid.

Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride.

Osmotic Diuretics: Mannitol

Anti-hypertensive Agents: Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.

UNIT III

Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol.

Anti-hyperlipidemic agents: Clofibrate, Lovastatin, Cholesteramine and Cholestipol

Coagulant & Anticoagulants: Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel

Drugs used in Congestive Heart Failure: Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.

UNIT IV

Drugs acting on Endocrine system

Nomenclature, Stereochemistry and metabolism of steroids

Sex hormones: Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol.

Drugs for erectile dysfunction: Sildenafil, Tadalafil.

Oral contraceptives: Mifepristone, Norgestril, Levonorgestrol

Corticosteroids: Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone

Thyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole

UNIT V

Antidiabetic agents: Insulin and its preparations

Sulfonyl ureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride.

Biguanides: Metformin.

Thiazolidinediones: Pioglitazone, Rosiglitazone.

Meglitinides: Repaglinide, Nateglinide.

Glucosidase inhibitors: Acrabose, Voglibose.

Local Anesthetics: SAR of Local anesthetics

Benzoic Acid derivatives; Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine.

Amino Benzoic acid derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate.

Lidocaine/Anilide derivatives: Lignocaine, Mepivacaine, Prilocaine, Etidocaine.

Miscellaneous: Phenacaine, Diperodon, Dibucaine.*

Text Book

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1to 5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

INDUSTRIAL PHARMACY– I

B. Pharm III Year I Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		4	1	0	4	40	60	100

Course Objectives

Course Objectives of Industrial Pharmacy– I are to:

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms
3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

Course Outcomes

At the end of this Industrial Pharmacy– I course, students will be able to:

1. Apply Pre-formulation concepts in development of various dosage forms and determine their impact on stability.
2. Understand the Various formulation Techniques and Quality control test of tablets, capsules liquid Orals and Pellets
3. Know various techniques in the development of Parenteral and Ophthalmic product and their evaluation study
4. Know the formulation and evaluation of various Cosmetics , Aerosols Products and understand the importance of packaging material from stability aspect

UNIT I

Pre-formulation Studies: Introduction to pre-formulation, goals and objectives, study of physicochemical characteristics of drug substances.

a. Physical properties: Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism

b. Chemical Properties: Hydrolysis, oxidation, reduction, racemization, polymerization. BCS classification of drugs & its significant

Application of pre-formulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

UNIT II

Tablets: Introduction, ideal characteristics of tablets, classification of tablets. Excipients, formulation of tablets, granulation methods, compression and processing problems. Equipment's and tablet tooling.

Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating.

Quality control tests: In process and finished product tests

Liquid orals: Formulation suspensions and emulsions; evaluation of liquid orals official in pharmacopoeia.

UNIT III

Capsules:

Hard gelatin capsules: Introduction, Production of hard gelatin capsule shells. Size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.

Soft gelatin capsules: Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.

Pellets: Introduction, formulation requirements, pelletization process, and equipment's for manufacture of pellets

UNIT IV

Parenteral Products:

Definition, types, advantages and limitations. Pre-formulation factors and essential requirements, vehicles, additives, importance of isotonicity. Production procedure, production facilities and controls, aseptic processing. Formulation of injections and sterile powders. Containers and closures selection, filling and sealing of ampoules. Quality control tests of parenteral products.

Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations

UNIT V

Cosmetics: Formulation and preparation of the following cosmetic preparations: Anti-dandruff shampoos, cold cream and vanishing cream and tooth pastes.

Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.**Packaging Materials Science:** Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.

Text Book

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman & J.B.Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

PHARMACOLOGY-II

B. Pharm III Year I Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		4	1	0	4	40	60	100

Course Objectives

Course Objectives of Pharmacology-I are to:

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases
2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
3. Demonstrate the various receptor actions using isolated tissue preparation
4. Appreciate correlation of pharmacology with related medical sciences

Course Outcomes

At the end of this Pharmacology-I course, students will be able to:

1. Explain basic terminology of pharmacology, toxicology and basic concepts of drug actions and interactions.
2. Perceive knowledge on various drugs acting on peripheral nervous system.
3. Demonstrate the pharmacology of CNS drugs.
4. Explain the role of autocoids and drugs used to treat inflammatory disorders.

UNIT I

Pharmacology of drugs acting on cardio vascular system

Introduction to hemodynamic and electrophysiology of heart.

Drugs used in congestive heart failure

Anti-hypertensive drugs. Anti-anginal drugs. Anti-arrhythmic drugs. Anti-hyperlipidemic drugs

UNIT II

Pharmacology of drugs acting on cardio vascular system

Drug used in the therapy of shock.Hematinics, coagulants and anticoagulants.

Fibrinolytics and anti-platelet drugs Plasma volume expanders

Pharmacology of drugs acting on urinary system

Diuretics

Anti-diuretics.

UNIT III

Autocoids and related drugs

Introduction to autacoids and classification

Histamine, 5-HT and their antagonists.

Prostaglandins, Thromboxanes and Leukotrienes.

Concept of Vasoactive Peptides.

Non-steroidal anti-inflammatory agents

Drug therapy of Migraine

Anti-gout drugs

Antirheumatic drugs

UNIT IV

Pharmacology of drugs acting on endocrine system

Basic concepts in endocrine pharmacology.

Anterior Pituitary hormones- analogues and their inhibitors.

Thyroid hormones- analogues and their inhibitors.

Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D.

Insulin, Oral Hypoglycemic agents and glucagon.

ACTH and corticosteroids.

UNIT V

Pharmacology of drugs acting on endocrine system

Androgens and Anabolic steroids.

Estrogens, progesterone and oral contraceptives.

Drugs acting on the uterus.

Bioassay

a. Principles and applications of bioassay.
b. Types of bioassay

c. Bioassay of insulin, oxytocin, vasopressin, d-tubocurarine, digitalis, histamine

Text Book

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier

2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.

3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics

4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins.
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology.

6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.

7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert.

9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.

10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakasha

PHARMACOGNOSY AND PHYTOCHEMISTRY II

B. Pharm III Year I Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		4	1	0	4	40	60	100

Course Objectives

Course Objectives of Pharmacognosy and Phytochemistry II are to:

1. To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
2. To understand the preparation and development of herbal formulation.
3. To understand the herbal drug interactions
4. To carryout isolation and identification of phytoconstituents

Course Outcomes

At the end of this Pharmacognosy and Phytochemistry II course, students will be able to:

1. Explain the significance of metabolic pathways in production of secondary metabolites.
2. Demonstrate the pharmacognosy of secondary metabolites.
3. Identify, isolate, analyze and utilize the phytoconstituents.
4. Discuss latest techniques in extraction, isolation, purification and identification of crude drugs

UNIT I

Metabolic pathways in higher plants and their determination

Formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway.

Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.

UNIT II

Bio-sources, therapeutic uses and commercial applications of following secondary metabolites:

Alkaloids: Vinca, Rauwolfia, Belladonna, Opium,

Flavonoids: Tea, Ruta

Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis

Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander,

Tannins: Catechu, Pterocarpus

Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony

Glycosides: Senna, Aloes, Bitter Almond

UNIT III

Isolation, Identification and Analysis of Phytoconstituents

a) Terpenoids: Menthol, Citral, Artemisin

b) Glycosides: Glycyrhetinic acid & Rutin

c) Alkaloids: Atropine,Quinine,Reserpine,Caffeine

d) Resins: Podophyllotoxin, Curcumin

UNIT IV

Industrial production, estimation and utilization of the following phytoconstituents:

Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine

UNIT V

Basics of Phytochemistry

Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.

Text Book

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.\
4. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
5. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor
10. The formulation and preparation of cosmetic, fragrances and flavours.
11. Remington's Pharmaceutical sciences.
12. Text Book of Biotechnology by Vyas and Dixit.
13. Text Book of Biotechnology by R.C. Dubey.

PHARMACEUTICAL JURISPRUDENCE

B. Pharm III Year I Semester					Dept. of Pharmacy			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Core	L	T	P	C	CIE	SEE	Total
		4	0	0	4	40	60	100

Course Objectives

Course Objectives of Pharmaceutical Jurisprudence are to:

1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. The code of ethics during the pharmaceutical practice

Course Outcomes

At the end of this Pharmaceutical Jurisprudence course, students will be able to:

1. Demonstrate the acts and rules for import and manufacture of drugs as per Drugs and Cosmetics Act 1940 and its Rules 1945.
2. Explain the acts and rules for sale, labeling, packaging of drugs and administration of acts and rules as per Cosmetics Act 1940 and its Rules 1945 and Pharmacy Act 1948.
3. Summarize the acts and rules of Medicinal and Toilet Preparation Act 1955, Narcotic Drugs and Psychotropic Substances Act 1985, Drugs and Magic Remedies Act, Prevention of Cruelty to Animals Act 1960 and Drugs Price Control Order 2013.
4. Discuss the importance of Pharmaceutical legislations, Code of Pharmaceutical ethics, Medical Termination of Pregnancy Act, RTI and IPR.

UNIT I

Drugs and Cosmetics Act, 1940 and its rules 1945:

Objectives, Definitions, Legal definitions of schedules to the Act and Rules

Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties**.**

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs,

Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

UNIT II

Drugs and Cosmetics Act, 1940 and its rules 1945.

Detailed study of Schedule G, H, M, N, P, T, U, V, X, Y, Part XII B, Sch F & DMR (OA) Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties

Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors

UNIT III

Pharmacy Act –1948: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and Penalties.

Medicinal and Toilet Preparation Act –1955: Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties.

Narcotic Drugs and Psychotropic substances Act-1985 and Rules: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties

UNIT IV

Study of Salient Features of Drugs and Magic Remedies Act and its rules: Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties

Prevention of Cruelty to animals Act-1960: Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties.

National Pharmaceutical Pricing Authority: Drugs Price Control Order (DPCO)-2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)

UNIT V

Pharmaceutical Legislations – A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee

Code of Pharmaceutical ethics D efinition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath

Medical Termination of Pregnancy Act

Right to Information Act

Introduction to Intellectual Property Rights (IPR)

Text Book

1. Forensic Pharmacy by B. Suresh
2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-by M.L. Mehra.
4. A text book of Forensic Pharmacy by N.K. Jain
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
7. Narcotic drugs and psychotropic substances act by Govt. of India publications
8. Drugs and Magic Remedies act by Govt. of India publication

HUMAN VALUES AND PROFESSIONAL ETHICS

B. Pharm III Year I Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Mandatory	L	T	P	C	CIE	SEE	Total
		1	0	0	1	--	--	--

Course Objectives

Course Objectives of Human Values and Professional Ethics are to:

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existance. Such a holistic perspective forms the basis of Value based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.

UNIT I

Course Introduction - Need, basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self Exploration - what is it? - its content and process; 'Natural Acceptance' and Experiential Validation - as the mechanism for self exploration. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities - the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT II

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

UNIT III

Understanding Harmony in the Family and Society - Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astiva as comprehensive Human Goals. Visualizing a universal harmonious order in society - Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!

UNIT IV

Understanding Harmony in the nature and Existence - Whole existence as Co-existence: Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature - recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astiva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT V

Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order,
b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
c. Ability to identify and develop appropriate techologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order.

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
b. At the level of society: as mutually enriching institutions and organizations.

Text Book

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

Reference Book

1. Ivan IIlich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E. F. Schumancher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
3. A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak
4. Sussan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986, 1991.
5. P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.
6. A. N. Tripathy, 2003, Human Values, New Age International Publishers.
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth - Club of Rome's report, Universe Books.
9. E G Seebauer & Robert L.Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
10. M Govindrajan, S Natrajan & V. S Senthil kumar, Engineering Ethics (including Humna Values), Eastern Economy Edition, Prentice Hall of India Ltd

Relevant CDs, Movies, Documentaries & Other Literature

1. value Education website, http://www.uptu.ac.in
2. Story of Stuff, http://www.storyofstuff.com
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charle Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology - the Untold Story

INDUSTRIAL PHARMACY-I LAB

B. Pharm III Year I Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Outcomes

- Prepare and evaluate tablets, capsules, creams and Parenterals

List of Experiments

1. Prepare and evaluate tablets, capsules, creams and Parenterals
2. Preformulation studies on paracetamol/asparin/or any other drug
3. Preparation and evaluation of Paracetamol tablets
4. Preparation and evaluation of Aspirin tablets
5. Coating of tablets- film coating of tables/granules
6. Preparation and evaluation of Tetracycline capsules
7. Preparation of Calcium Gluconate injection
8. Preparation of Ascorbic Acid injection
9. Qulaity control test of (as per IP) marketed tablets and capsules
10. Preparation of Eye drops/ and Eye ointments
11. Preparation of Creams (cold / vanishing cream)
12. Evaluation of Glass containers (as per IP)

Text Book

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman & J.B.Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5th edition, 2005

9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

PHARMACOLOGY-II LAB

B. Pharm III Year I Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Outcomes

- Determine the pharmacological effects and apply bioassay techniques of drugs on animals.

List of Experiments

1. Introduction to *in-vitro* pharmacology and physiological salt solutions.
2. Effect of drugs on isolated frog heart
3. Effect of drugs on blood pressure and heart rate of dog
4. Study of diuretic activity of drugs using rats/mice
5. DRC of acetylcholine using frog rectus abdominis muscle.
6. Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.
7. Bioassay of histamine using guinea pig ileum by matching method
8. Bioassay of oxytocin using rat uterine horn by interpolation method
9. Bioassay of serotonin using rat fundus strip by three point bioassay
10. Bioassay of acetylcholine using rat ileum/colon by four point bioassay
11. Determination of PA_2 value of prazosin using rat anococcygeus muscle (by Schilds plot method).
12. Determination of PD_2 value using guinea pig ileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity of drug using central and peripheral methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos

Text Book

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology.
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert.
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.

PHARMACOGNOSY AND PHYTOCHEMISTRY II LAB

B. Pharm III Year I Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Outcomes

- Apply isolation, characterization and identification techniques on crude drugs.

List of Experiments

1. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander
2. Exercise involving isolation & detection of active principles
    a. Caffeine - from tea dust.
    b. Diosgenin from Dioscorea
    c. Atropine from Belladonna
    d. Sennosides from Senna
3. Separation of sugars by Paper chromatography
4. TLC of herbal extract
5. Distillation of volatile oils and detection of phytoconstitutents by TLC
6. Analysis of crude drugs by chemical tests: **(**i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh

Text Book

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
4. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.

5. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007

6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.

7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.

8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
10. The formulation and preparation of cosmetic, fragrances and flavours.
11. Remington's Pharmaceutical sciences.

12. Text Book of Biotechnology by Vyas and Dixit.

13. Text Book of Biotechnology by R.C. Dubey

MEDICINAL CHEMISTRY – III

B. Pharm III Year II Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		4	1	0	4	40	60	100

Course Objectives

Course Objectives of Medicinal Chemistry II are to:

1. Understand the importance of drug design and different techniques of drug design.
2. Understand the chemistry of drugs with respect to their biological activity.
3. Know the metabolism, adverse effects and therapeutic value of drugs.
4. Know the importance of SAR of drugs.

Course Outcomes

At the end of this Medicinal Chemistry II course, students will be able to:

1. Understand the chemistry of antibiotics with respect to their biological activity.
2. Apply the concepts of prodrug design; explain the chemistry of anti-malarial and anti-tubercular drugs.
3. Discuss the chemistry of anti-infective drugs, sulphonamides and sulphones.
4. Understand the importance of Drug design and different techniques of drug design.

UNIT I

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted by (*)

Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation, classification and important products of the following classes.

β-Lactam antibiotics: Penicillin, Cephalosporins, β- Lactamase inhibitors, Monobactams

Aminoglycosides: Streptomycin, Neomycin, Kanamycin

Tetracyclines: Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline

UNIT II

Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation, classification and important products of the following classes.

Macrolide: Erythromycin Clarithromycin, Azithromycin.

Miscellaneous: Chloramphenicol*, Clindamycin.

Antimalarials: Etiology of malaria.

Quinolines: SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine.

Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil.

Miscellaneous: Pyrimethamine, Artesunete, Artemether, Atovoquone

UNIT III

Anti-tubercular Agents

Synthetic anti tubercular agents: Isoniozid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.*

Anti tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine, Streptomycine, Capreomycin sulphate.

Urinary tract anti-infective agents

Quinolones: SAR of quinolones, Nalidixic Acid,Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin

Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine.

Antiviral agents: Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.

UNIT IV

Antifungal agents:

Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.

Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconozole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.

Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine.

Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin.

Sulphonamides and Sulfones

Historical development, chemistry, classification and SAR of Sulfonamides, Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*, Sulphapyridine, Sulfamethoxaole*, Sulphadiazine, Mefenide acetate, Sulfasalazine.

Folate reductase inhibitors: Trimethoprim*, Cotrimoxazole.

Sulfones: Dapsone*.

UNIT V

Introduction to Drug Design

Various approaches used in drug design. Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammet's electronic parameter, Tafts steric parameter and Hansch analysis. Pharmacophore modeling and docking techniques.

Combinatorial Chemistry: Concept and applications of combinatorial chemistry: solid phase and solution phase synthesis.

Text Book

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.

6. Martindale’s extra pharmacopoeia
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel

PHARMACOLOGY-III

B. Pharm III Year II Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		4	1	0	4	40	60	100

Course Objectives

Course Objectives of Pharmacology-III are to:

1. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
2. Comprehend the principles of toxicology and treatment of various poisonings
3. Appreciate correlation of pharmacology with related medical sciences.

Course Outcomes

At the end of this Pharmacology-III course, students will be able to:

1. Classify and explain the pharmacology of drugs acting on respiratory system and digestive system.
2. Demonstrate the chemotherapy of antibacterial, antitubercular and antileprotic drugs.
3. Describe the chemotherapy of antifungal, antiviral, antimalarial, antimalignancy drugs and immunopharmacology.
4. Discuss the principles of toxicology and chronopharmacology.

UNIT I

Pharmacology of drugs acting on Respiratory system

Anti -asthmatic drugs

Drugs used in the management of COPD

Expectorants and antitussives

Nasal decongestants

Respiratory stimulants

Pharmacology of drugs acting on the Gastrointestinal Tract

Antiulcer agents.

Gastroesophageal reflux disease (GERD)

Drugs for constipation and diarrhoea.

Digestants and carminatives.

Emetics and anti-emetics

UNIT II

Chemotherapy

General principles of chemotherapy.

Sulfonamides and cotrimoxazole.

Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides

UNIT III

Chemotherapy

Antitubercular agents

Antileprotic agents

Antifungal agents

Antiviral drugs

Anthelmintics

Antimalarial drugs

Antiamoebic agents

UNIT IV

Chemotherapy

Urinary tract infections and sexually transmitted diseases.

Chemotherapy of malignancy.

Immunopharmacology

Immunostimulants

Immunosuppressant

Protein drugs, monoclonal antibodies, biosimilars

UNIT V

Principles of toxicology

Definition and basic knowledge of acute, subacute and chronic toxicity.

Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity.

General principles of treatment of poisoning

Clinical symptoms and management of barbiturates, morphine, organophosphosphorus compound and lead, mercury and arsenic poisoning.

Chronopharmacology

Definition of rhythm and cycles.

Biological clock and their significance leading to chronotherapy.

Text Book

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert,
8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata,
9. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,
10. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.

HERBAL DRUG TECHNOLOGY

B. Pharm III Year II Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	3	40	60	100

Course Objectives

Course Objectives of Herbal Drug Technology are to:

1. Understand raw material as source of herbal drugs from cultivation to herbal drug product
2. Know the WHO and ICH guidelines for evaluation of herbal drugs
3. Know the herbal cosmetics, natural sweeteners, nutraceuticals
4. Appreciate patenting of herbal drugs, GMP .

Course Outcomes

At the end of this Herbal Drug Technology course, students will be able to:

1. Understand the scope of herbs as raw materials, biodynamic agriculture and Indian systems of medicine.
2. Describe Nutraceutical products, Herbal-drug, Herbal –Food interactions, herbal cosmetics and herbal excipients.
3. Evaluate the herbal drugs, understand the patenting and regulatory requirements of herbal drugs and regulatory issues.
4. Discuss about herbal drug industry and Schedule-T of GMP.

UNIT I

Herbs as raw materials: Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation, Source of Herbs, Processing of herbal raw material.

Biodynamic Agriculture: Good agricultural practices in cultivation of medicinal plants including Organic farming.

Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

Indian Systems of Medicine: Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy, Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika,Churna, Lehya and Bhasma.

UNIT II

Nutraceuticals: Introduction to Nutraceuticals, Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases.

Study of following herbs as health food: Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina

Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic.

UNIT III

Herbal Cosmetics: Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

Herbal excipients: Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

Herbal formulations: Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

UNIT IV

Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs.

Patenting and Regulatory requirements of natural products: Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy**.** Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.

Regulatory Issues - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.

UNIT V

General Introduction to Herbal Industry: Present scope and future prospects. A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.

Schedule T – Good Manufacturing Practice of Indian systems of medicine:
Components of GMP (Schedule – T) and its objectives, Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records

Text Book

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari
5. Pharmacognosy & Phytochemistry by V.D.Rangari
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

BIOPHARMACEUTICS AND PHARMACOKINETICS

B. Pharm III Year II Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	3	40	60	100

Course Objectives

Course Objectives of Biopharmaceutics and Pharmacokinetics are to:

1. Understand the basic concepts in bio-pharmaceutics and pharmacokinetics and their significance.
2. Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
3. To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
4. Understand various pharmacokinetic parameters, their significance & applications.

Course Outcomes

At the end of this Medicinal Chemistry II course, students will be able to:

1. Explain the importance of drug absorption and distribution.
2. Describe the concepts of drug elimination and bioavailability.
3. Apply knowledge of pharmacokinetics of single compartment and multi-compartment models.
4. Illustrate the concepts of non-linear pharmacokinetics.

UNIT I

Introduction to Bio-pharmaceutics

Absorption; Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from Non per oral extra-vascular routes,

UNIT II

Distribution Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs

Elimination: Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs

UNIT III

Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters - K_E ,t1/2,Vd,AUC,Ka, Clt and CL_R- definitions methods of eliminations, understanding of their significance and application

UNIT IV

Multi compartment models: Two compartment open model. IV bolus Kinetics of multiple dosing, steady state drug levels, calculation of loading and maintenance doses and their significance in clinical settings.

UNIT V

Nonlinear Pharmacokinetics: a. Introduction, b. Factors causing Non-linearity. c. Michaelis-menton method of estimating parameters, Explanation with example of drugs.

Bioavailability and Bioequivalence: Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, *in-vitro* drug dissolution models, *in-vitro-in-vivo* correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

Text Book

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.
2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition,Prentice-Hall Inernational edition.USA
4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal,Vallabh Prakashan Pitampura, Delhi
5. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.
6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
7. Biopharmaceutics; By Swarbrick
8. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and
9. Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
10. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company,Pennsylvania 1989.

11. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987.
12. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvnia

PHARMACEUTICAL BIOTECHNOLOGY

B. Pharm III Year II Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	3	40	60	100

Course Objectives

Course Objectives of Pharmaceutical Biotechnology are to:

1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries
2. Genetic engineering applications in relation to production of pharmaceuticals
3. Importance of Monoclonal antibodies in Industries
4. Appreciate the use of microorganisms in fermentation technology

Course Outcomes

At the end of this Pharmaceutical Biotechnology course, students will be able to:

1. Understand the importance of Immobilized enzymes in Pharmaceutical Industries.
2. Evaluate Genetic engineering applications in relation to production of pharmaceuticals.
3. Analyze the Importance of Monoclonal antibodies in Industries.
4. Appreciate the use of microorganisms in fermentation technology.

UNIT I

Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.

Enzyme Biotechnology- Methods of enzyme immobilization and applications.

Biosensors- Working and applications of biosensors in Pharmaceutical Industries.

Brief introduction to Protein Engineering. Use of microbes in industry.

Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease,Penicillinase.

UNIT II

Basic principles of genetic engineering.

Study of cloning vectors, restriction endonucleases and DNA ligase. Recombinant DNA technology. Application of genetic engineering in medicine. Application of r DNA technology and genetic engineering in the production of: Interferon ii) Vaccines-hepatitis- B iii) Hormones-Insulin. Brief introduction to PCR

UNIT III

Types of immunity- humoral immunity, cellular immunity. Structure of Immunoglobulins. Structure and Function of MHC. Hypersensitivity reactions, Immune stimulation and Immune suppressions. General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity. Storage conditions and stability of official vaccines. Hybridoma technology- Production, Purification and Applications.

UNIT IV

Immuno blotting techniques- ELISA, Western blotting, Southern blotting. Genetic organization of Eukaryotes and Prokaryotes. Microbial genetics including transformation, transduction, conjugation, plasmids and transposons. Introduction to Microbial biotransformation and applications. Mutation: Types of mutation/mutants.

UNIT V

Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring. Large scale production fermenter design and its various controls. Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,

Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substituties.

Text Book

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
2. RA Goldshy et. al., Kuby Immunology.
3. J.W. Goding: Monoclonal Antibodies.
4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry.
5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.
6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi

PHARMACEUTICAL QUALITY ASSURANCE

B. Pharm III Year II Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	3	40	60	100

Course Objectives

Course Objectives of Pharmaceutical Quality Assurance are to:

1. Understand the cGMP aspects in a pharmaceutical industry
2. Appreciate the importance of documentation
3. Understand the scope of quality certifications applicable to pharmaceutical industries
4. Understand the responsibilities of QA & QC departments

Course Outcomes

At the end of this Pharmaceutical Quality Assurance course, students will be able to:

1. Explain the importance of Total Quality Management and ICH guidelines.
2. Discuss the cGMP aspects and quality control tests for packing materials.
3. Describe the GLP and handling of complaints and documents.
4. Demonstrate the calibration of instruments and validation of analytical methods.

UNIT I

Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP

Total Quality Management (TQM): Definition, elements, philosophies

ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines

Quality by design (QbD): Definition, overview, elements of QbD program, tools

ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration

NABL accreditation: Principles and procedures

UNIT II

Organization and personnel: Personnel responsibilities, training, hygiene and personal records. **Premises:** Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.

Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials

UNIT III

Quality Control: Quality control test for containers, rubber closures and secondary packing materials.

Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities

UNIT IV

Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.

Document maintenance in pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

UNIT V

Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.

Warehousing: Good warehousing practice, materials management

Text Book

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications.

4. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total Quality Management – Sadhank G Ghosh
7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
8. Good laboratory Practices – Marcel Deckker Series
9. ICH guidelines, ISO 9000 and 14000 guidelines

MEDICINAL CHEMSTRY- III LAB

B. Pharm III Year II Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Outcomes

- Prepare drugs and intermediates, perform assay of drugs, draw structures and reactions, and determine physicochemical properties using Chem draw.

List of Experiments

I Preparation of drugs and intermediates

1. Sulphanilamide
2. 7-Hydroxy, 4-methyl coumarin
3. Chlorobutanol
4. Triphenyl imidazole
5. Tolbutamide
6. Hexamine

II Assay of drugs

1. Isonicotinic acid hydrazide
2. Chloroquine
3. Metronidazole
4. Dapsone
5. Chlorpheniramine maleate
6. Benzyl penicillin

III Preparation of medicinally important compounds or intermediates by Microwave irradiation technique

IV Drawing structures and reactions using chem draw®

6. Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)

Text Book

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.

7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel

PHARMACOLOGY-III LAB

B. Pharm III Year II Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Outcomes

- Determine the pharmacological effects of drugs on animals and apply biostatistical methods in experimental pharmacology.

List of Experiments

1. Dose calculation in pharmacological experiments
2. Antiallergic activity by mast cell stabilization assay
3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.
4. Study of effect of drugs on gastrointestinal motility
5. Effect of agonist and antagonists on guinea pig ileum
6. Estimation of serum biochemical parameters by using semi- autoanalyser
7. Effect of saline purgative on frog intestine
8. Insulin hypoglycemic effect in rabbit
9. Test for pyrogens (rabbit method)
10. Determination of acute oral toxicity (LD50) of a drug from a given data
11. Determination of acute skin irritation / corrosion of a test substance
12. Determination of acute eye irritation / corrosion of a test substance
13. Calculation of pharmacokinetic parameters from a given data
14. Biostatistics methods in experimental pharmacology(student's t test, ANOVA)
15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

Experiments are demonstrated by simulated experiments/videos

Text Book

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale' Pharmacology, Churchil Livingstone Elsevier.
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics.
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams & Wilkins.
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology.

6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert.
8. Ghosh, MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
9. Kulkarni, SK. Handbook of experimental pharmacology. VallabhPrakashan.
10. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.

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HERBAL DRUG TECHNOLOGY LAB

B. Pharm III Year II Semester					Dept. of Pharmacy			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Outcomes

- Formulate and evaluate crude drugs and herbal formulations.

List of Experiments

1. To perform preliminary phytochemical screening of crude drugs.
2. Determination of the alcohol content of Asava and Arista
3. Evaluation of excipients of natural origin
4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.
5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
6. Monograph analysis of herbal drugs from recent Pharmacopoeias
7. Determination of Aldehyde content
8. Determination of Phenol content
9. Determination of total alkaloids

Text Book

1. Textbook of Pharmacognosy by Trease & Evans
2. Textbook of Pharmacognosy by Tyler, Brady & Robber
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari
5. Pharmacognosy & Phytochemistry by V.D.Rangari.
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

Item 8:

School of Managment:

Presentation of the minutes of the Board of Studies (BoS) including course structure and syllabi for the programs proposed to be offered from the Academic Year 2022-23.

School of Management

BoS Meeting-15.03.2022

MINUTES

The Meeting of School of Management, Anurag University Hyderabad was

held on 15.03.2022 at G- Block BoM room of Anurag University.

7. The following members were present:

- Dr Utla Balaji, Dean, School of Management, Chairman, BoS, AU
- Mr Karthik Raina, Proprietor, Learning Facilitator, External BoS Member
- Prof Nageshwar Rao, Department of Business Management, OU, External BoS Member
- Dr Prasad Tegalapally (Mandi), Faculty Advisor, Associate Professor, NITIE, Mumbai, External BoS Member
- Prof B Raja Shekhar, School of Management, University of Hyderabad, External BoS Member
- Mr Ravi Kumar Peesapati, VP- Corporate Affairs, M/S RA Chem Pharma Ltd, External BoS Member
- Mr Srinivas Reddy Vudumula, Chief People Officer, Bharath Financial Inclusion Ltd, External BoS Member
- Mr Sriram Papani, Co-Founder & CEO, Techforce.ai, External BoS Member

- Mr Shashi Kumar, Executive Director, Yugantar (NGO), Former Director of Satyam Foundation, Hyderabad, External BoS Member
- Dr V Vishnu Vandana, Head, School of Management, AU, Convenor, BoS
- Prof P S S Murthy, School of Management, AU, Special Invitee
- Prof Ajay Ramanuja, School of Management, AU, Special Invitee
- Dr K Mamatha, Associate Professor, School of Management, AU, Internal BoS Member
- Dr Syed Mansoor Pasha, Assistant Professor, School of Management, AU, Internal BoS Member
- Dr K Suresh, Assistant Professor, School of Management, AU, Internal BoS Member

2. Mr Srinivasa Kakarlamudi, C-Suite Strategy, Management and Business Development Expert, External BoS Member and Dr C Mallesha, Assistant Professor, School of Management, AU, Internal BoS Member could not attend the meeting due to their prior commitments and unavoidable reasons and were granted leave of absence:

Call for order:

The Chairman Dr. Balaji Utla called the meeting to order at 2.00 P.M in G-Block BoM Room of Anurag University.

The Chairman welcomed and introduced the BoS members.

After this, the Agenda was taken up for discussion.

Items for Discussion, Reporting & Ratification

Item 1. MBA in Trimester

Dr. V. Vishnu Vandana, Head School of Management presented the background and need for proposal to shift MBA from the current semester mode to trimester mode from the next academic year. The committee has accepted the trimester system and curriculum for MBA with specialization in Systems and Operations management along with regular HR, Marketing & Finance. It is suggested to adapt innovative, industry relevant and case method teaching pedagogy.

The board has suggested designing the duration and credits accordingly. It was suggested that empty subject space is to be left vacant to adopt the market changes in the curriculum which is referred to as add on course. Courses of design thinking, Aesthetics, Selling, Negotiations to be introduced as common courses to all.

Placements are internship based in the current scenario and hence pre placement talk and internship for students are to be accommodated in the course.

Titles of few subjects are to be reframed that reflect the content
Four week foundation course can be designed before the beginning of the first trimester for all technical and non-commerce background students, if required.

Item 2. Introduction of Open Electives

The committee noted and suggested that new open electives can be introduced as per the requirement and BoS approval is not required for every inclusion

Item 3. MBA Business Analytics, MMS Data Sciences and MBA Vernacular

The board accorded approval for offering MBA in Business Analytics & MMS in Data Sciences for technical and Science background students. MBA Vernacular (Telugu & Urdu) was been suggested for the benefit of other language speaking people

Item 4. PG Diploma/Certification Courses

The board gave the approval for offering the following courses

- Diploma and certification courses
- Executive MBA for working class.
- PG Diploma shall be for two years and other diploma courses can be offered for one year.

Item 5. B.Tech Minors Specialization in Management

B.Tech Minors in Management has been approved with specialization in Entrepreneurship Development and Digital Marketing. It was suggested to offer courses in combination of both offline and online courses for minors.

Item 6. Ph.D. Course Work

Ph.D. course work can be offered for 3+1 credit i.e 3 credits for course work and 1 credit for presentations and assignments. It was approved that electives of specializations can also be offered as course work courses for Ph.D. are were suggested to add any other relevant courses as required.

The meeting was concluded by the Chair with the above resolutions.

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Course Structure

Bachelor of Business Administration

(Business Analytics)

School of Management

ANURAG UNIVERSITY

Hyderabad, Medchal (Dist),

Telangana– 500 088

www.anurag.edu.in

BBA II YEAR I SEMESTER [5 L + 5 T + Mini Project]

S.No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A23001	Core	Business Research	3	1	0	4
2	A23002	Core	Business Analytics	3	1	0	4
3	A23003	Core	Organizational Behavior	3	1	0	4
4	A23004	General Elective	1. Business Statistics-II 2. Tax Management 3. Innovation and Technology Management	3	1	0	4
5	A23005 /BA	Elective	Data Base Concepts-I (RDBMS)	3	1	0	4
6	A23201	SEC	Mini Project and Report Writing	0	0	4	2
			TOTAL	15	5	4	22

BBA II YEAR II SEMESTER [4 L + 4 T + 2P+1 Seminar]

S.No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A24001	Core	Business Law & Environment	3	1	0	4
2	A24002	Core	Production & Operations Management	3	1	0	4
3	A24003	Core	Project Management	3	1	0	4
4	A24004 /BA	Elective	Introduction to Python and R- Programming	3	0	0	3
5	A 24203	Elective Lab	Python and R Programming Lab	0	0	2	1
6	A24201	SEC	Data Analysis and Visualization	0	0	4	2
7	A24202	SEC	Business Plan Preparation Seminar	0	0	6	3
			TOTAL	15	5	12	21

BBA III YEAR I SEMESTER

[5 L + 5 T +1P+1 Internship]

S.No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A25001	Core	E-Commerce	3	1	0	4
2	A25002	Core	Management Information System	3	1	0	4
3	A25003	General Elective	A. Business Forecasting B. International Business C. Sales and Distribution Management	3	1	0	4
4	A25004 /BA	Elective	Predictive Analytics & Decision Making	3	1	0	4
5	A25005 /BA	Elective	Data Warehousing and Data Mining	3	0	0	3
6	A25202 /BA	Elective Lab	Data Warehousing and Data Mining Lab	0	0	2	1
6	A25201	Intern	Internship	0	0	6	3
TOTAL				15	5	6	23

BBA III YEAR II SEMESTER

[3 L + 3 T + 1 Project + 1Viva]

S.No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A26001	Core	Fundamentals of Entrepreneurship	3	1	0	4
2	A26002	Elective	A. Quantitative Financial Analytics B. Elements of Actuarial Science C. Health Care Analytics	3	1	0	4
3	A26003 /BA	Elective	Data Base Concepts (Big Data)	3	1	0	4
4	A26201	Project	Project	0	0	20	10
	A26202	Viva	Comprehensive Viva-Voce	0	0	0	2
TOTAL				9	3	20	24

BBA-Business Analytics
Summary of Courses with Credits for BBA

S.No.	Course Type	No of Courses	Credits Per Course	Credits
1	**Ability Enhancement Courses (AECC)** (Human Values of Professional Ethics, Gender sensitization)	2	0	0
2	**Skill Enhancement Courses (SEC)** (Productive Tools-lab, LRQA, Mini Project and Report Writing, Business Plan Preparation Seminar, Data Analysis and Visualization)	5	4*2 1*3	11
3	**Language Courses (LC)** (English for Empowerment, English Language Skills lab, The Power of Data Storytelling, Art of Articulation Lab	4	2*3 2*1	8
4	**Core Courses (CC)**	17	4	68
5	**Discipline Specific Electives (DSE)**	6	4	24
6	**Generic Electives (GE)**	2	4	8
7	**Project (PROJ)**	1	10	10
8	**Comprehensive Viva-voce**	1	2	2
9	**Internship**	1	3	3
		39		**134**

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BUSINESS RESEARCH

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Research are to:

- Familiarize students with the concepts of research, types and design
- Familiarize students with various data analysis tools and techniques
- Enable students conduct research and prepare a basic research report

Course Outcomes:

At the end of this Business Research course, students will be able to:

- Demonstrate an understanding of need for research and research process.
- Develop a understanding of sampling and types of samples
- Apply relevant scaling techniques in preparation of questionnaires.
- Have an understanding of various data analysis techniques of research
- Prepare a basic research report

Unit I:

Nature and Scope of Business Research: Role of business research in decision making. The Research process, Management decision problem Vs. Business Research objective, Exploratory, Descriptive, Causal research.

Unit II:

Sampling and Data Collection Methods : Population, Sampling, Sampling errors, Probability and non-probability sampling types. Types of data, Secondary Data, Primary Data, Methods of Data collection for qualitative and quantitative research.

Unit III:

Measurement & Scaling: Primary scales of Measurement - Nominal, Ordinal, Interval & Ratio. Scaling techniques, Likert Scale. Questionnaire design – Types of questions, Content, Wording and Placement.

Unit IV:

Data Analysis: Data preparation, Descriptive statistics, Inferential statistics, Parametric and Non- Parametric tests. Introduction Factor Analysis and Discriminant Analysis.

Unit V:

Research Report Writing: Introduction, Types of research reports, Elements of research report, Referencing.

Textbooks:

1. Donald R. Cooper & Pamela S. Schindler, Business Research Methods, McGraw-Hill Education, India, 2016.
2. C. R. Kothari & Gaurav Garg, Research Methodology: Methods and Techniques, 4th edn, New age International Publishers, 2019.

References:

1. Deepak Chawla and Neena Sondhi, Research Methodology: Concepts and Cases, Vikas Publishing House, India, 2012
2. Bryman A, Business Research Methods, 3rd Edition, Oxford Press, 2011
3. Das Satya Bhushan & Malhotra Naresh K, Marketing Research: An applied Orientation, 7th edn, revised, Pearson India, 2019.

Journals:

1. Business Research
2. Experimental Business Research
3. Business Research Projects

BUSINESS ANALYTICS

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23002	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objective:

Course Objectives of Business Analytics are to:

- To help students recognize and understand the applications of business analytics
- To familiarize about concepts of descriptive and predictive analytics
- To help student develop an analytical approach to business decision making

Course Outcome:

At the end of this Business Analytics course, students will be able to:

- Recognize the role of Analytics in business
- Identify and apply descriptive statistical measures for analysis
- Apply basic Statistical inferences for data.
- Understand Data Mining scope and applications
- Develop decision making skill under uncertainty

Unit - I:

Introduction to Data Analytics: Introduction to Business Analytics, Components of Business Analytics, Modeling stages, Population, Samples, Data Set, Variables and Observations, Types of Data, Data Visualization tools.

Unit - II:

Descriptive Statistical Measures: Descriptive measures for categorical variables, Numerical variables, Relationships among variables. Probability and Probability distributions.

Unit - III:

Statistical Inference: Sampling and sampling distributions, Hypothesis testing, Karl Pearson Correlation Techniques. Simple and Multiple Regression. Regression by the method of least squares, Regression with categorical independent variables .

Unit - IV:

Data Mining: Scope of Data Mining, Data Exploration and Reduction, Unsupervised learning – cluster analysis, Association rules, Supervised learning- Partition Data, Classification Accuracy, prediction Accuracy, k-nearest neighbors, Classification and Regression trees, Logistics Regression.

Unit - V:

Simulation: Random Number Generation, Monte Carlo Simulation, What if Analysis, Verification and Validation, Advantages and Disadvantages of Simulation, Risk Analysis, Decision Tree Analysis.

Text Books:

1. James Evans, Business Analytics, Pearson, 2017,2/e.
2. Albright, Winston, Business Analytics – Data Analysis and Decision Making, Cengage Learning, 2015, 5/e.
3. Camm, Cochran, Fry, Ohlmann, Anderson, Sweeney, Williams Essential of Business Analytics, Cengage Learning.

References:

1. Thomas Eri, Wajid Khattack & Paul Buhler : Big Data Fundamentals, Concepts, drivers and Techniques by Prentice Hall of India, New Delhi, 2015.
2. Akil Maheswari: Big Data, Upskill ahead by Tata McGraw Hill, New Delhi, 2016.
3. Seema Acharya & Subhashini Chellappan: Big Data and Analytics, Wiley Publications, New Delhi, 2015.

Journals:

1. International Journal of Data science and Analytics.
2. International Journal of Data Science (IJDS).
3. International Journal of Data Analytics (IJDA).

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ORGANIZATIONAL BEHAVIOR

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23003	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Organizational Behaviour are to:

- To familiarize to the organizational environment and behaviour.
- To help students understand influence of individual and group behaviours on organizational behaviour.
- To identify role of culture in OB.

Course Outcomes: At the end of the course students will be able to

At the end of this Organizational Behaviour course, students will be able to:

- Identify the relevance of various theories to understand organizational behaviour
- Assess the influence of different persnalities on organizational behaviour.
- Demonstrate an understanding of motivation and attitude
- Display understanding of interdependencies in groups and organization.
- Appreciate need for strong organizational culture and need for change.

Unit-1:

Introduction to OB: Organizational Behavior – Nature and Scope of OB, Significance of OB, Organizational Behavior and its significance in other Disciplines, Contribution of Hawthorne studies to OB, Theories of Organizational Behavior, Challenges and Opportunities.

Unit-II:

Foundations of Individual Behavior: Personality, Personality Determinants, Personality Traits, The Big Five Model, Theories of Personality. Values – Types of Values. Perception- Perceptual Process, Perception and Individual Decision- making.

Unit-III:

Motivation and Learning: Theories of Motivation, Hierarchy Needs Theory, Two-Factor Theory, Expectancy Theory. Attitudes -Types of Attitudes, Attitudes and Consistency, Cognitive Dissonance Theory. Learning- Theories of Learning.

Unit-IV:

Foundations of Group Behavior: Groups – Nature, Types, Stages of Groups, Group decision making. Leadership - Theories of leadership. Conflict Management- Conflict process, Conflict Management, Stress – Causes and Consequences of Stress, Stress Management.

Unit-V:

Organizational Culture and Change Management Nature of Culture, Creating and Sustaining Organizational Culture. Change - Forces for Change, factors affecting resistance to Change, approaches to manage change – Lewin's Model, Kotter's Plan for Implementing Change. Organizational Development.

Text book:

1. Robbins, Stephen, Timothy, A & Vohra, N. "Organizational Behavior",Pearson Education, 14/e, 2012.

References:

1. Mc Shane & Von Glinow, "Organizational Behavior", 7/e. Mc Graw Hill Publications, New Delhi, 2014.
2. Fred Luthans, Organizational Behaviour, 12/e, Prentice Hall, 2011.
3. Jerald Greenberg & Robert A Baron, Behavior in Organizations, 9/e, Printice Hall India, 2010.
4. Quick, Nelson & Khandelwal, Organizational Behavior – A South-Asian Perspective, 7/e, Cengage Learning, 2013.

Journals:

1. International Journal of Human Resource Management: Cambridge University Press.
2. The International Journal of Management Education.
3. Asian Journal of Management –Quarterly

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BUSINESS STATISTICS-II

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23004/A	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Statistics -II are to:

- To enable student to understand in detail about the application of probability, estimation and hypothesis testing.
- To familiarize with the concepts of Statistical Quality Control and Control Charts.

Course Outcomes:

At the end of this Business Statistics -II course, students will be able to:

- Know the applications of Probability in business.
- Understand concept of estimation and Testing of Hypothesis of few unknown statistical parameters.
- Interpret statistical test results of small sample tests and large sample tests.
- Know types of Statistical Quality Control
- Recognize and interpret control charts for attributes.

Unit-I:

Probability: Basic concepts of Probability, Deterministic and random experiments, Basic Terminology of Probability, Mathematical, Statistical and Axiomatic definitions of probability, their merits and demerits. Conditional Probability and independence of events, Addition and Multiplication theorems for two events. Bayes' theorem and it's applications.

Unit-II:

Estimation: Concept of Point Estimation**,** Interval Estimation, Maximum Error and Confidence Interval Examples.
Testing of Hypothesis: Null Hypothesis and Alternative Hypothesis, Critical Region, Critical Value, Type-I and Type-II errors, Level of Significant, One Tailed and Two Tailed Test.

Unit-III:

Small Sample Tests: t-test for Single Mean, Difference between Two Means (unpaired) and Paired t-test, F - test for equality of population variances, Chi-Square test for Independence of Attributes.
Large Sample Tests: Test for Single Mean, Difference between Two Means, Test for Single Proportion, Difference between two Proportions

Unit-IV:

Statistical Quality Control: Importance of SQC in industry. Dimensions of quality, Statistical basis of Shewart control charts. Construction of control charts for variables (mean, range and standard deviation) and attributes (p, np with fixed and varying sample sizes) and their Interpretation.

Unit-V:

Control Charts: Control charts for attributes (C and U charts with fixed and varying sample sizes) and their Interpretation. Construction of control charts for Natural tolerance limits and specification limits, process capability index and modified control charts.

Text Books:

1. J.K Sharma (2013), Business statistics, New Delhi: Pearson Education.
2. Gupta SC: “Fundamental of Statistics” 6th Ed, Himalaya Publishers House, 2004.
3. D.C. Montgomary: Introduction to Statistical Quality Control. Wiley

Reference Books:

1. S.C. Gupta & Indra Gupta (2012), Business Statistics, Hyderabad:Himalaya Publishing House.
2. S.P. Gupta :” Statistical methods” , Sultan Chand & Sons, New Delhi.
3. Parimal Mukhopadhyay : Applied Statistics . New Central Book agency
4. R.C.Gupta: Statistical Quality Control.

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23004/B	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

TAX MANAGEMENT

Course Objectives:

Course Objectives of Tax Management are to:

- To familiarize with the basic concepts of income tax for individual and managers..
- To create an awareness on Tax planning with reference to New Industrial Establishment and Investment.
- To give an overview of tax incentives and GST.

Course Outcomes: At the end of the course students will be able to

At the end of this Tax Management course, students will be able to:

- Know on Income tax basics and direct taxes.
  Understand individual tax planning features.
- Identify role of tax planning will help in managerial decisions.
- Have basic knowledge of tax planning in New Industrial Establishment and investments.
- Have Aware of tax planning concepts in exports and the GST.

Unit-I:

Introduction to Direct Taxes: Features of Direct Taxes - Types of Direct Taxes. Overview of Income Tax Act 1961, Basic Concepts: Person – Assessee - Previous Year and Exceptions, Assessment Year Income, Gross Total Income, Taxable Total Income, Residential Status, Incidence of Tax, Permanent Account Number (PAN), Tax Account Number (TAN) . Income Tax Authorities - Functions.

Unit-II:

Tax Planning Individuals: Planning with reference to all five heads of Income for individuals: Salaries, House property, Profits from Business & Profession, Capital gains and Other Sources. Tax Planning with reference to Relief, Concessions, Rebates, Deductions and Incentives.

Unit-III:

Tax Planning for Managerial Decisions: Tax considerations arising with regard to specific management decisions: Make/buy, Own/lease, Installment/hire purchase, Retain/replace, Export/local sale, Shut down/continue, Expand or Contract, Merger and Amalgamations. Advance Tax, Payment of Advance Tax , Filing of Returns, Refunds, Penalties for non-compliance.

Unit-IV:

Tax Planning-New Industrial Establishments & Investments: Tax planning with reference to New Industrial Establishment, Location, Form, Nature and Capital Structure, Short term loans, Term loans, Public Deposits, Bonus Issues, Dividend Policies.

Unit-V:

Tax Planning – Incentives: Schemes for encouraging exports - Salient features of Software Technology Park (STP), Electronic Hardware Technology Park (EHTP) - Other export promotion schemes under EXIM policy. Overview of Goods and Service Tax (GST).

Text Books:

1. Vinod K. Singhania: - Indirect Tax Laws, Taxmann Publications.
2. Madhukar N Hiregange: Goods and Services Tax, Wolters Kluwer.

References:

1. Mahesh Chandra &Shukla, D.C. Income Tax Law & Practice Pragati Publications.
2. Singhania, V.K .Student Guide to Income Tax. (University ed.). Taxmann Publications Pvt. Ltd.
3. Bhagawati Prasad: Direct Tax Laws and Practice.

Journals:

1. International Journal of Accounting and Taxation.
2. Journal of International Accounting, Auditing and Taxation.

INNOVATION AND TECHNOLOGY MANAGEMENT

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23004/C	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Innovation and Technology Management are to:

- To provide an exposure to the needs of technology innovation and creativity.
- To give an overview of various issues connected with Management of Technology in Organizations.
- To appreciate the role of technology in gaining competitive advantage
- To be aware of concepts of technology identification, technology forecasting.
- To enable the role technology diffusion and technology absorption in development.

Course Outcomes:

At the end of Innovation and Technology Management course students will be able to

- Interpret the relationships between technology and Innovation in organization.
- Analyze the impact of technology on business
- Know the process of product Development and linkage between technology Development and Competition.
- Analyze the necessity of technology Forecasting and common mistakes of forecasting.
- Understand the various challenges faced by Technology Diffusion and absorption.
-

Unit I:

Innovation Technology: Introduction, Innovation Technology Relationship, Types of Innovation, Innovation and Changes in Organization, Technology based innovation and Management, Innovation performance, factors, principles, measures, characteristics of Innovative Work Environment**.**

Unit II:

Introduction to Technology Management: Concept and Meaning of Technology, Evolution and Growth of Technology, Role and significance of management of technology, Impact of technology on society and business, Forms of Technology- Process Technology and Product Technology.

Unit III:

Competitive Advantage through New Technologies: Product development stages, linkage between technology development and competition. Managing research and development (R&D), Managing intellectual property.

Unit IV:

Technological Forecasting: Technology Forecasting, Need and role, technology forecasting approaches, technological forecasting methods, and common mistakes in forecasting.

Unit V:

Technology Diffusion and Absorption: Technology Adoption, Technology Diffusion, role and perspectives of innovation diffusion process, technology diffusion curve, technology absorption, benefits of technology absorption, constraints. Issues involved in the management of technology absorption. Government initiatives for technology absorption. Technology life cycle.

Text Books:

1. Rohtagi P K, Rohtagi K and Bowonder B: Technological Forecasting, Tata McGraw Hill,
2. Tarek Khalil:, Management of Technology, McGraw Hill International, 2009.
3. John Ziman, Technological Innovation as an Evolutionary Process, Cambridge University Press, Cambridge, 2000.
4. Dr.Urvashi Makkar, Soni Sharma, Prachi Agarwal Innovation, Technology and Development: A Road Map for Achieving Global Competitiveness, January 2017

References

1. Dasgupta. S: Technology and Creativity & Creativity, Oxford University Press, New York,1996.
2. Proctor. T: The Essence of Management Creativity, Prentice - Hall, New Delhi, 1997.
3. Richards. T: Creativity and Problem Solving Network, Gower, Hampshire, 1997.
4. Ceserani. J & Greatwood. P: Innovation & Creativity, Kogan Page, London, 1995.

Journals:

1. International Journal of Innovation and Management.(Quarterly)
2. International Journal of Technology Management. (Quarterly)

Data Base Concepts-I (RDBMS)

BBA II Year I Semester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
A23005/BA	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Data Base Concepts-I (RDBMS) is to:

Enable students to outline systemic database design approaches.

To give awareness of techniques related to concurrency and recovery manager explore the File organizations, indexing and hashing mechanisms.

Course Outcomes

At the end of this Data Base Concepts-I (RDBMS) course, students will be able to:

1. Model Entity-Relationship diagrams for enterprise level databases
2. Formulate Queries using SQL and Relational Formal Query Languages
3. Apply different normal forms to design the database
4. Summarize concurrency control protocols and recovery algorithms
5. Identify suitable Indices and Hashing mechanisms for effective storage and retrieval of data

UNIT I

Introduction to Database System Concepts: Database-System Applications, Purpose of Database Systems, View of Data, Database Language, Database Design, Database Architecture, Database Users and Administrators.

Introduction to the Relation Models and Database Design using ER Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations Overview of the Design Process, The Entity-Relationship Model, Constraints, Entity-Relationship Diagrams- Unary, Binary, ternary, Aggregation.

UNIT II

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Aggregate Functions, Nested Sub queries.

Formal Relational Query Languages: The Relational Algebra, Tuple Relational Calculus.

UNIT III

Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Functional Dependencies, Closure set of Functional dependencies, Procedure for Computing $F^{+,}$ Boyce Codd Normal form, BCNF Decomposition Algorithm, Third Normal Form, Third Normal Form Decomposition Algorithm

Transactions: Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Serializability.

UNIT IV

Concurrency Control: Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols.

Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, ARIES, Remote Backup Systems.

UNIT V

File Organization: Fixed and variable length records, Sequential file organization, Data Dictionary, Buffer manager.

Indexing and Hashing: Basic Concepts, Ordered Indices, B+-Tree Index Files, B+-Tree Extensions, Multiple-Key Access, Static Hashing, Extendible Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices.

Text Book

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGraw Hill, 2021,7/e

Reference Books

1. P Raja Sekhar Reddy, AMallikarjunaReddy, Foundations of Database Management Systems, Lambert Academic Publishing, 2020 (e-Book)
2. Raghu Ramakrishna, Johannes Gchrke, Database Management System, 3/e, Tata McGraw-Hill, 2003.
3. C J Date, AKannan, S Swamynathan, An Introduction to Database Systems, 8/e, Pearson 2006

MINI PROJECT & REPORT WRITING

Aim: The aim of Mini projects is to enable students to generate ideas or identify the problem/issues by understanding the remote, non-remote areas or surrounding of their society and apply their practical knowledge and provide the solutions.

Suggested contents of the Mini Project Report are:

● Topic of the Project

● Chapter I

Brief Introduction Review of Literature Research Gaps Research Questions

Objectives of the Study

Scope of the Study

Period of the Study

Sample Data Collection Primary Data Secondary Data ●

Chapter II

Data Interpretation, Suggestions Conclusion References to be enclosed

BUSINESS LAW AND ENVIRONMENT

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Law and Environment are to:

- To provide awareness on fundamental concepts of business law and Indian Contract.
- To familiarize with Acts and Laws essential for business managers role.

Course Outcomes:

At the end of the Business Law and Environment Course students will be able to

- Identify essential elements of a contract.
- Describe key point of Sale of Goods Act and Negotiable instruments Acts
- Interpret concepts of Law of Agency
- Have awareness of formation of company and MoA.
- Gain insights about laws related to consumer protection.

Unit I:

Indian Contract Act: Meaning and kinds of Contract – Essentials of a Contract, Offer and Acceptance, Free Consent, Capacity of the Parties, Lawful Consideration, Legality of Object, Performance of Contract, Discharge of Contract, Quasi Contract

Unit II:

Sale of Goods Act: Sale and Agreement to Sell, Conditions and Warranties, Transfer of Property, Rights of Unpaid Seller.
Negotiable Instruments Act: Meaning of Negotiable Instruments, Type of Negotiable Instruments, Promissory Note, Bill of Exchange, Cheque.

Unit III:

Law of Agency: Definition, Kinds of Agents, Creation of Agency, Rights and Duties of Agent and Principal, Termination of Agency.

Unit IV:

Company Law: Definition and Kinds of Companies, Formation and Advantages of Incorporation of a Company, Memorandum of Association, Articles of Association, Promoter, Prospectus, Winding up of a Company.

Unit V:

Consumer Protection and Cyber law: Rights of Consumers, Consumer Protection Councils, Redressal Machinery, Cyber Law, Intellectual Property Law-Copyright, Patent, Trademark, Trade Secret

Text Books:

1. Gulshan S.S, Business Law, New Delhi, Excel Books, 2012
2. Balachandran V., Legal Aspects of Business, Tata McGraw Hill, 2012
3. N.D.Kapoor, Mercantile Law, Sultan Chand & Sons, 2006

References :

1. Avatar Singh, Principles of Mercantile Law, Lucknow: Eastern Book Company, 2011
2. Pathak, Legal Aspects of Business, Tata Mcgraw- Hill Publishing Company Limited, New Delhi, 2010.
3. P. P. S. Gogna, Mercantile Law, S. Chand & Co. Ltd., India, 4/e, 2008
4. Ravinder Kumar, Legal Aspect of Business, Cengage Learning, 2/e,2011.
5. Maheswari & Maheswari, Mercantile Law, Himalaya Publishing House, Mumbai
6. Rudder dutt & Sundaram, Indian Economy, Vikas Publishing House, New Delhi.

PRODUCTION AND OPERATIONS MANAGEMENT

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24002	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Production and Operations Management are to:

- Provide awareness on fundamentals of operations management
- Familiarize with concepts of capacity planning and inventory management.
- To develop an awareness of the supply chain management and quality management concepts.

Course Outcomes:

At the end of the Production and Operations Management course students will be able to

- Describe the process and factors influencing the operations management.
- Understand capacity planning and facility layout in the organization
- Understand applications of inventory management techniques
- Identify techniques of supply chain planning
- Explain quality control techniques and standards to reduce quality errors

Unit I:

Operations Management: Operations as a source of competitive advantage; Trade-offs and combinations, Process Analysis, Difference between Manufacturing and Service Operations, Product Process Matrix.

Unit -II

Capacity planning: Process Selection and Facility layout, designing product and process layouts and line balancing, Forecasting and types of forecasting.

Unit -III

Inventory Management: Deterministic demand model, EOQ, ABC, Continuous and Periodic review Inventory models.

Unit -IV

Supply chain management; Lean vs Agile supply chains; Aggregate Production Planning; Master Production Schedule and MRP, Project Management.

Unit -V

Quality Management: Quality Assurance, Inspection and Quality Control, Acceptance Sampling, Total Quality Management and ISO 9000 Series Standards, Six Sigma.

Text Books:

1. Nigel Slack, Alistair Brandon-Jones.Operations management, Pearson Education, 9/e, 2019.
2. Panneerselvam ,Production and Operations Management‖ PHI, 2012
3. S.N.Chary, Production and Operations Mangement, 2019, 6/e.

References:

1. Danny Samson, Operations Management: Integrated Approach, Cambridge, 2012.
2. Kenneth K. Boyer, Rohit Verma, Operations Management, Cengage Learning, 2011.
3. Dipak Kumar Bhattacharyya, Production and Operations Management, Universities Press, 2012.
4. Prof. L.C. Jhamb, Production Operations Management, x, Everest Publishing House,18/e 2013.

PROJECT MANAGEMENT

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24003	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Project Management are to:

- To familiarize with the concepts of project mangement and planning
- To provide insights on project execution parameters and teams.
- To enable application of project performance measurement techniques.

Course Outcomes:

At the end of the Project Management course students will be able to

- Describe the life cycle and concepts of Project Management.
- Apply different approaches to project screening and planning
- Analyze different risk factors in project execution
- Demonstrate team skills
- Understand project performance evaluation techniques.

Unit I:

Introduction: Meaning, Need, Principles Project Lifecycle and its Phases, Project Management Research in brief, Project Management today, Organization strategy and structure and culture, Format of organization structure, Stake holder Management, Organization Culture, creating a culture for Project Management.

Unit-II

Project Identification and Planning: Defining the project, Project Identification Process, Approaches to Project Screening and Selection, Project Planning, Work Breakdown Structure, Financial Module, Getting Approval and Compiling a Project Charter, setting up a Monitoring and Controlling Process.

Unit-III

Project Execution: Initiating the Project, Controlling and Reporting Project Objectives, conducting project evaluation, Risk, Risk Management Factors, Project Management,

Four Stage Process, Risk Management an Integrated Approach, Cost Management, Creating a Project Budget

Unit IV:

Leading Project Teams: Building a Project Team, Characteristics of an effective Project Team, achieving Cross- Functional Co-operation, Virtual Project Teams, Conflicts Management, Negotiations.

Unit V:

Performance Measurement and Evaluation: Monitoring Project Performances, Project Control Cycles, Earned Value Management, Human factors in Project Evaluation and Control, Project Termination, Types of Project Terminations, Project Follow-up. Current and Future Trends in Project Management.

Text books:

1. Larson, Gray, Project Management- The Managerial Process, McGraw Hill, 2017,6/e
2. Jeffery K. Pinto, Project Management, Pearson Education, 2015

References:

1. Enzo Frigenti, Project Management, Kogan, 2015
2. R. Panneerselvam & P. Senthil Kumar, Project Management, PHI, 2015
3. Thomas M. Cappels, Financially Focused Project Management, SPD, 2008.

Introduction to Python and R Programming

BBA II Year II Semester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
A24004/BA	Elective	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

Course Objectives of Introduction to Python and R Programming are to:

The course is designed to provide Basic knowledge of Python. Python programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the Python programming language

Course Outcomes

At the end of this Introduction to Python and R Programming course, students will be able to:

1. To acquire programming skills in core Python.
2. To acquire object oriented skills in Python.
3. To develop the skill of designing graphical user interfaces in Python.
4. To understand and practical experience in the data analysis and using R.
5. To apply practical project work on learned concepts.

UNIT I

Introduction to Python: Features of python, History of python**,** Future of the python**,** Python functions, Writing and executing First python Program, Types of application, algorithm, Flow chart,

UNIT II

Features of python: Data Types, operator and expression. Need for function, Functions of control structure, Module packages. Decision control system, Selection/Conditional Branching statement.

UNIT III

File handling: Introduction, File path, Types of file Spring Built-in function, Regular expression, Standard Input and output.

UNIT IV

Introduction to R: Introduction to R and R studio, Installing R and R studio, R data types, Functions Working with Descriptive Static's Vectors life, Lists, Matrix, and Data frames in R.

UNIT V

Introduction to Plots: Scatter plot, Add the plot main and Axis, Label text, lines on the plot, Make plot Colorful, Times series plot. Box and whisker plot.

Text Books

1. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
2. R Programing: A beginner's Guide to Data Visualization Statistical analysis and programming on R. R Publishing, 2019

Reference Books

1. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010
2. Layfe de Micheaux, Pierre, Drouihet, Remy, Liquet, Benoit, The R Software Fundamentals of Programming & Statistical Analysis. 2013
3. Dhavalmaheta, Statistical Analysis using R Software, Excel Books, 2017
4. Vishwas R Pawgi, Statistical Computing Using R software, Niralipraksan, 2016

Python and R Programming Lab

MBA I Year II Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
A24203	Elective Lab	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Course Outcomes

After completion of Python and R Programming Lab course student will be able to:

1. Develop programs on data types, operators and expressions
2. Apply the data structures in real time scenarios
3. Write the programs on strings and functions
4. Implement functions with R .
5. Use of R for graphical representation of Plots.

Week 1

1. Installation and Environment set up of Python & Programs on Data types
2. Programs on Standard I/O, Operators and Expressions.

Week 2

3. Programs on Functions, lists and Tuples.

Week 3

4. Programs on Dictionaries, Strings and string operations

Week 4

5. Programs on Regular Expressions, Inheritance and Polymorphism.

Week 5

6. Programs on Exception Handling, Demonstration of Numpy Package.

Week 6

7. Demonstration of Pandas Package, matplotlib Package and Tkinter Package.

Week 7

8. Demonstration of Date and Time Packages.

Week 8

9. P Overview.

Week 9

10. C Overview.

Week 10

11. R overview

Week11

12. Apply functions

Week12

13. Plots

DATA ANALYSIS AND VISUALISATION

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A24201	SEC	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Objectives:

Course Objectives of Data Analysis and Visualisation are to:

- To prepare the data for analysis and develop meaningful Data Visualizations.
- Familiarize students with the basic and advanced techniques of information visualization and scientific visualization,
- A detailed view of visual perception, the visualized data and the actual visualization, interaction and distorting techniques

Course Outcomes:

After completion of the Data Analysis and Visualisation course students will be able to

- Able to extract the data for performing the Analysis.
- Analyze the different techniques for visualizing the data.
- Demonstrate key techniques to interpret the data.
- Analyze the data by using the visualization techniques.
- Use visualization techniques for volumetric data

Unit I:

Data Gathering and Preparation: Data formats, parsing and transformation, Scalability and real-time issues, Data Cleaning: Consistency checking, Heterogeneous and missing data, Data Transformation and segmentation.

Unit II:

Exploratory Analysis: Descriptive and comparative statistics, Clustering and association, Hypothesis generation

Unit III:

Visual perception: Introduction, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

Unit IV:

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents. Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

Unit V:

Visualization of volumetric data: Vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations

Textbooks:

1. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications, A K Peters / CRC Press, 2015, 2/e
2. Cole Nussbaumer Knaflic, Storytelling of Data visualization, Guide for business professionals, Willey, 2015

References:

1. Nathan Yau, Data Points: Visualization That Means Something, Wiley, 2013
2. Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2007.

Business Plan preparation
(Seminar)

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A24202	SEC	0	0	6	3	100	-	100

Course Objective:

- To acquire the knowledge regarding various components in developing a business plan and give a seminar at the end of the semester.

Course Outcomes: At the end of the course students will be able to

- Analyze the various components pertaining to Business plan
- Identify the various sources to initiate new venture
- Develop the business plan for the business ideas

Suggested contents of the Business plan:

1. Analyze the market
2. Identify various sources of funds
3. Viability of the product
4. Cost
5. Customer
6. Competition
7. Team
8. Revenue
9. Channels

E- COMMERCE

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of E-Commerce are to:

- To provide students with an overview of E-Commerce.
- To make them understand B2B E-Commerce.
- To make them understand B2C E-Commerce.
- To know the elements of E-Commerce.
- To know and understand E-Business.

Course Outcomes:

At the end of the E-Commerce course students will be able to

- Understand concepts of E-Commerce and E-Business.
- Gain awareness of B2B E-Commerce business processes.
- Have knowledge on B2C E-Commerce business processes.
- Identify the elements of E-Commerce
- Know the application areas of E-Business

Unit I:

Introduction to Electronic Commerce: Introduction, need, significance – scope, unique features of E-Commerce. Difference between E-Commerce and E-Business. Pros and Cons of E-Commerce, electronic commerce vs. traditional commerce, prospects of E-Commerce in India.

Unit II:

Business to Business (B2B) E-Commerce: Inter Organization Transactions: Credit Transactions and Trade Cycle, Variety of Transactions; Electronic Markets: Usage of Electronic Markets, Pros and Cons. Inter Organizational E-Commerce.

Unit III:

Business to Consumer (B2C) Electronic Commerce: Consumer Trade Transactions: Internet E-Commerce, Internet Shopping and Trade Cycle, Pros and Cons.

Unit IV:

The Elements of E-Commerce: Elements, E-Visibility, The E-shop, Online Payments, Delivering the Goods, After-Sales Service, Internet E-Commerce Security.

Unit V:

E-BUSINESS: Introduction, Internet Books Shop, Grocery Supplies, Software Supplies and Support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing E-delivery.

Text Books:

1. David Whiteley, E-Commerce, Strategy, Technologies and Applications, McGraw-Hill Edition, 2017
2. S.J.P.T. Joseph, E-Commerce, An Indian Perspective, PHI Learning Pvt. Ltd. 2019, 6/e

References:

1. C.S.V.Murthy, E-Commerce Concepts, Models, Strategies, Himalaya Publishing House, 2015
2. Ward Hanson and Kirthi Kalyanan, Internet Marketing and e-Commerce, Cengage, 2012, 2/e

ANURAG UNIVERSITY

MANAGEMENT INFORMATION SYSTEM

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25002	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Management Information System are to:

- Familiarize students with the role of information systems at organizations
- To provide insights on SDLC and system design
- To have knowledge on IS Security and control
- To obtain knowledge on ERP models for various functions
- To introduce to ERP implementation strategies

Course Outcomes:

At the end of the Management Information System course, student will be able to

- Recognize the role of Information systems in organizations
- Describe the stages of SDLC and system design
- To have knowledge on IS Security and control
- Have awareness of ERP
- Understand factors influencing successful ERP implementation strategies

Unit I:

Organization and Information Systems: The Organization Structure, Managers and Activities - Data, Information and its Attributes. Introduction to IS Models and types of Information Systems, Nolan Stage Hypothesis, IS Strategic Grid. Critical Success Factors, Socio-Technical Systems Approach (Mumford).

Unit II:

Building of Information Systems: SDLC - System Development Stages, Approaches, System Analysis and Design – Requirement Determination, Strategies, Structure Analysis Tools. System Design- Design Objectives, Conceptual Design, Design Methods.

Unit-III:

IS Security and Control: System Vulnerability and Abuse Business Value of Security and Control Need for Security, Computer Crime – Hacking, Cyber Theft, and Unauthorized use at work. Piracy – Software and Intellectual Property. Privacy – Issues

and the Internet Privacy, Challenges – Working Condition, Individuals, Health and Social Issues

Unit-IV:

ERP Models : Evolution of ERP, Integrated Management Systems, Integrated Data Model. ERP Modules - Finance, Accounting System, Manufacturing and Production Systems, Sales and Distribution Systems, Human Resource Systems, Materials Management System, ERP System Options and Selection, ERP Proposal Evaluation, ERP benefits.

Unit-V:

ERP Implementation and Maintenance: Implementation Strategy Options, Features of Successful ERP Implementation, Strategies to attain success, User Training, Maintaining ERP & IS.

Text Books:

1. C.S.V.Murthy: Management Information System, Himalaya,2009
2. Alexis Leon: ERP (Demystified), 5/e, Tata McGraw-Hill, 2009.

References

1. Gordon B. Davis & Margrethe H.Olson: Management Information Systems, TMH, 2009.
2. C Laudon and Jane P.Laudon, et al: Management Information Systems, Pearson Education, 2009.
3. D P Goyal, Management Information Systems – Managerial Perspective, Macmillan, 3/E, 2010.
4. James A. Obrein: Management Information Systems, TMH, 2009

ANURAG UNIVERSITY

BUSINESS FORECASTING

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25003/A	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Forecasting are to:

- To know various business forecasting techniques**.**
- Learn about categories of regression analysis
- To know about logistic regression models
- To study about Moving Average models
- To learn about seasonal models

Course Outcomes:

At the end of the Business Forecasting course the student able to

- Describe business forecasting models.
- Understand Dummy variables and Regression Models.
- Interpret logistic regression models..
- Understand Forecasting Using an ARMA Models.
- Describe characteristics of Conditional Heteroscedastic Models

Unit-I:

Introduction: Business forecasting models**,** Linear Regression, Building a Regression Model, Making inferences using the estimated model, Using the Regression model to make predictions, Errors, Residuals and R-square, Hypothesis testing in a Linear Regression, 'Goodness of Fit' measures (R-square, Adjusted R-square).

Unit-II:

Regression Analysis: Dummy variable Regression (using Categorical variables in a Regression), Multicollinearity in Regression Models, Mean centering of variables in a Regression model, Building confidence bounds for predictions using a Regression model, Interaction effects in a Regression, Transformation of variables

Unit-III:

Logistic Regression: Introduction of Logistic regression, building of logistic regression model. Linear Time Series Analysis and Its Applications: Stationarity, Correlation and Autocorrelation Function, White Noise and Linear Time Series, Simple Autoregressive Models, Properties of AR Models, Identifying AR Models in Practice, Goodness of Fit, Forecasting.

Unit-IV:

Moving Average Models: Simple Moving-Average Models, Forecasting Using MA Models, Simple ARMA Models, Properties of ARMA, Three Model Representations for an ARMA Model.

Unit-V:

Conditional Heteroscedastic Models: Characteristics of Volatility, Structure of a Model, Model Building. Seasonal Models, Seasonal Differencing, Multiplicative Seasonal Models, Regression Models with Time Series Errors, Consistent Covariance Matrix Estimation, Long-Memory Models.

Text Books:

1. Gupta, S.C., Kapoor V. K., Fundamentals of Applied Statistics, Sultan Chand & Sons; 4/e, 2014
2. Len Tashman, Udo Sglavo, Business Forecasting: Practical Problems and Solutions, 2016, Wiley

References:

1. Douglas C Montgomery, Statistical Quality Control: A Modern Introduction, 6/e, Wiley, 2010
2. B. L. Agarwal, Basic Statistics

INTERNATIONAL BUSINESS

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A25003/B	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of International Business are to:

- To facilitate knowledge on concepts related to International Trade and business
- To create awareness on theories of international trade
- To be aware of factors influencing international business environment
- To provide conceptual knowledge on FDI
- To create awareness on International Financial Institutions

Course outcomes:

At the end of the International Business course student will be able to

- Understand concepts of international trade and business.
- Identify contents of various international trade theories
- Know the factors influencing international business environment
- Appreciate the role of FDI.
- Have an understanding of various financial institutions and their roles.

Unit I:

International Business: An Overview – Evolution of International Business, Drivers of Globalization, Influences of International Business, Stages of Internationalization, Differences between Domestic and International Business, International Business Approaches, Advantages of International Business.

Unit II:

Theories of International Trade: Mercantilism, Theory of absolute cost advantage, Comparative cost advantage theory, Relative factor endowment theory, Country similarity theory, Product life cycle theory.

Unit III:

International Business Environment: Social and Cultural Environment, Technological Environment, Economic Environment, Political Environment .Modes of Entering International Business – Modes of Entry, Exporting, licensing, franchising, contract manufacturing, management contracts, turnkey projects.

Unit IV:

Foreign Direct Investment: Factors Influencing FDI, Reasons for FDI, Costs and Benefits of FDI, Trends in FDI, Foreign Direct Investment in India.

Unit V:

International Financial Institutions and Liquidity: IMF, World Bank, International Development Association, International Liquidity and SDR International Finance Cooperation.

Text Books:

1. Cherunilam Francis, International Business, Text and Cases,6/e ,Prentice-Hall of India Private Limited, 2020.
2. K. Aswathappa, International Business, 7 Edition , Tata McGraw Hill, New Delhi, 2020, 7/e

References :

1. John Daniels, Lee Radebaugh, et al, International Business, Pearson Education, 2018, 16/e
2. James H. Taggart and Michael C. Mcdormitt, The Essentials of International Business, Prentice Hall of India, 2000

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SALES AND DISTRIBUTION MANAGEMENT

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25003/C	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course objective:

Course Objectives of Sales and Distribution Management are to:

- TO introduce to the concepts of sales and distribution management
- To various concepts of sales planning and budgeting
- To identify sales force management concepts
- To give a knowledge on distribution channels
- To give channel designing strategies

Course Outcomes:

At the end of the Sales and Distribution Management Course students will be able to

- Explain the concepts of sales and distribution management.
- Know the concepts of sales planning and budgeting
- Describe the process and managing of the sales force
- Evaluate different techniques of sales analytics
- Apply sales force compensation methods effectively in an organization.

Unit I :

Introduction: Evolution of Sales Management, Nature and Importance , Roles, Types and Skills of Sales Managers, Sales Objectives, Strategies and Tactics, Emerging Trends, Linking, Sale and Distribution Management, Buying Decision, Sales Knowledge and Sales Related, Marketing Policies, Sales Process, Transactional and Relationship Selling

Unit II:

Sales Planning and Budgeting: Strategic Planning, Role of Marketing & Sales, Marketing & Personal Selling Strategies, Sales Strategy, Developing Sales Forecast, Forecasting Approaches, Sales Budget, Defining Sales Territories, Procedures, Assigning Territories, Managing Territories, Sales Quotas.

Unit-III:

Sales Force Management: Concepts of Sales Organization, Types of Sales Organization, Structures, , Sizing and Staffing the Sales Force, Training and Motivating Sales Force, Compensating and Leading Sales Force, Evaluating and Controlling the performance of Sales Force.

Unit-IV:

Distribution Management: Definition, Need for Distribution Management, Need for Distribution Channels, , Relationship of Flows to Service Levels, Channel Levels, Service Channels, Retailer as a Salesman, Trading /Retail Formats, E-Tailing, Wholesale – Functions & Classification, Major Wholesaling decisions.

Unit-V:

Designing Channel Systems: Channel Design Factor, Channel Planning Process, , Training, Motivating & Evaluating Channel members, Channel Design Comparison, Implementation, Vertical Integration, Channel Management, Power & Conflict, Principles of Channel Management.

Textbooks:

1. Krishna K. Havaldar, Vasant M. Cavale) Sales and Distribution Management, McGrawHill, 3/e, 2017
2. Tapan K. Panda and Sunil Sahadev, Sales and Distribution Management, Oxford University Press, 2019

References:

1. Still, Cundiff, Govoni, Sales Management, Pearson, 2017, 6/e,
2. Pingali Venugopal, Sales and Distribution Management- An Integrative Approach, Sage, 2020,2/e

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PREDICTIVE ANALYTICS AND DECISIONMAKING

BBA III Year I Semester					SCHOOL OF MANAGEMENT			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A25004/BA	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course objectives of Predictive Analytics and Decision Making are to:

1. Understand and apply linear and logistic regression in business decision making
2. Learn the concepts of nonlinear modelling methods for data analysis
3. Comprehend time series analysis to forecast future data.
4. Learn to prepare the data and select the variables.
5. To understand goodness with dependent and independent variables.

Course Outcomes:

At the end of this Predictive Analytics and Decision Making course, students will be able to:

1. Apply the linear and logistic regressions for decision making
2. Apply the nonlinear modeling methods to analyze the data
3. Use the time series analysis to forecast the future data
4. Prepare the data and also select the variables
5. Measure the goodness with dependent and independent variables

UNIT I

Linear Modeling and Regression: Properties of Maximum Likelihood, Linear Regressions, Fischer's Linear Discriminant Analysis, Principle component Regression, Factor Analysis, Least Squares Regression, Logistic Regression

UNIT II

Nonlinear Modeling: Naïve Bayesian Classifier, Neutral Network, Segmentation and Tree Models, Additive Models, Support Vector Machine, Fuzzy Logic System, Clustering.

UNIT III

Time Series Analysis: Fundamentals of Forecasting, ARIMA models, Survival Data Analysis, Exponential weighted Moving Average.

UNIT IV

Data Preparation and Variable Selection: Data Quality and Exploration, Variable Scaling and Transformation, Bin Variables, Interpolation in One and Two Dimensions, Weight of Evidence Transformation, variable selection, missing Data Imputation, Selection Methods.

UNIT V

Goodness Measure: Training, Testing, Validation, Continuous dependent Variable, Binary Dependent Variable (Two-Group Classification), Population Stability Index Using Relative Entropy

Text books:

1. James Wu, Stephen Coggeshall, Foundations of Predictive Analytics, CRC Press, 2012.
2. Curtis Seare, Simple Predictive Analytics: Using Excel to Solve Business Problems, Independently Published, 2019

References Books:

1. Bruce L. Bowerman, Richard T.O'Connell, Emily S. Murphree, Business Statistics in practice, New Delhi: McGraw Hill Education (India) Private Ltd., 2015
2. David M.Levine, david Stephan Timothy C.Krehbiel, Mark l Berenson, Statistics for managers using Microsoft Excel, New Delhi:Prentice Hall India Pvt, 2015
3. Amir D.Aczel, Jayavel Sounderpandian, Complete Business Statistics, New Delhi:Tata McGraw Hill., 2015
4. S.P. Gupta &M.P. Gupta (2015), *Business Statistics*, New Delhi: Sultan Chand & Sons.

Journals:

1. International Journal of Operations and Quantitative Management, College of Business, Prairie View A&M University, USA
2. Journal of Applied Statistics, Routledge, Taylor & Francis Group, UK

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Data Warehousing and Data Mining

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25005/BA	Elective	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objective

Course Objective of Data Warehousing and Data Mining is to:

Familiarizes students with the data mart, associations, clustering and recent trends in data mining

Course Outcomes

At the end of this Data Warehousing and Data Mining course, students will be able to:

1. Design a data mart or data warehouse for any organization
2. Apply Association and classification knowledge to different data sets
3. Apply the clustering Techniques for different data sets
4. Explore recent trends in data mining such as web mining, spatial-temporal mining
5. To explore applications of time series and multimedia data mining.

UNIT I

Data Warehouse and OLAP Technology: what is a Data Warehouse, Multidimensional Data Model, OLAP Operations on Multidimensional Data, Data Warehouse Architecture
Cube computation: Multiway Array Aggregation, BUC

UNIT II

Introduction to Data Mining: Fundamentals of data mining, Data Mining Functionalities, Data Mining Task Primitives, Major issues in Data Mining. **Data Preprocessing**: Needs for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction

UNIT III

Mining Frequent Pattern: Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules,

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification.

UNIT IV

Cluster Analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods-K-means, PAM, Hierarchical Methods-BIRCH, Density-Based Methods-DBSCAN, Outlier Detection.

UNIT V

Pattern Discovery in real world data: Mining Time-Series Data, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web, Data Mining Applications

Text Book

1. Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, 2/e, Elsevier, 2007.

Reference Books

1. Alex Berson and Stephen J. Smith, Data Warehousing, Data Mining & OLAP, Tata McGraw Hill, Tenth Reprint, 2007.
2. Arun K.Pujari , Data Mining Techniques, 2/e, Universities press.

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Data Warehousing and Data Mining Lab

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25202/BA	Elective Lab	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Course Outcomes

At the end of this Data Warehousing and Data Mining Lab course, students will be able to:

1.Understand the data mining process and important issues around data cleaning, pre-processing and integration**.**

2. Explore the algorithms and techniques used in data mining, such as clustering, association mining, classification and prediction.

WEEK 1

Design multi-dimensional data models namely star, snowflake and Fact constellation schemas for an enterprise using open source tools like Pentaho Data Integration and Pentaho Business Analytics.

WEEK 2-4

Apply below preprocessing techniques on given dataset. Handling Missing Values, Remove records having a NULL value, Replace Numeric attributes by mean value, Remove Nominal attributes having null value, Sampling, Discretization (Binning), Normalization.

WEEK 5-8

Demonstrate performing association rule mining on data sets using Aprori and FP growth algorithms with different support and confidence values. Compare association rule mining results of Aprori and FP growth for given dataset, and deduce which algorithms is performing best and poor for each dataset and justify.

WEEK 9-10

Demonstrate performing classification on data sets using Id3, J48 classification algorithm. Compare classification results of ID3, J48 and Naïve-Bayes classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.

WEEK 11-13

Demonstrate performing clustering on given data sets using k-means clustering algorithm with different values of k (number of desired clusters). Compare with other clustering techniques available in Weka. Explore visualization features of Weka to visualize the clusters. Derive interesting insights and explain.

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INTERNSHIP

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25201	Intern	L	T	P	C	CIE	SEE	Total
		0	0	6	3	100	-	100

Course Objective:

The Objective of this course is to introduce students by allowing them to discuss and solve real business challenges by associating with any enterprise.

Course Outcomes: At the end of the course the students will be able to

1. Demonstrate their ability to apply learned skills and also students push boundaries
2. Propose and explore much needed solutions across disciplines and cultures.
3. Improve the personality and become confident to face the employment process.

Exercise:

1. Apply Business Concepts and Theories to Real-World Decision-Making.
2. Address the Specific Business Disciplines; such as Human Resources Management, Operations Management, Marketing, Accounting, Statistics, Economics, Finance, and Business Law.
3. Observe and Participate in Business Operations and Decision-Making.

FUNDAMENTALS OF ENTREPRENEURSHIP

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A26001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Fundamental of Entrepreneurship are to:

- To explain the concepts of entrepreneurship and the role in economic development
- To create awareness about the entrepreneur mindset and support system.
- To understand business plan development process.
- To enable understanding of the financial aspects of entrepreneurship.
- To impart the knowledge of growth strategies for new venture.

Course Outcomes:

At the end of the Fundamental of Entrepreneurship course students will be able to

- Describe the role of Entrepreneurship in the Economy and the support system.
- Interpret the Entrepreneurial Mindset and the Challenges.
- Design a business plan for a Startup Venture.
- Relate the startup venture and the financial aspects applicable.
- Analyze growth strategies for a new venture.

Unit I:

Introduction to Entrepreneurship: Meaning and Concept of Entrepreneurship, the History of Entrepreneurship Development, Role of Entrepreneurship in Economic Development, Agencies in Entrepreneurship Management, Emerging issues in Entrepreneurship.

Unit II:

The Entrepreneur: Skills required to be an Entrepreneur, Entrepreneurial Stress Entrepreneurial Motivation, Entrepreneurial Decision Process, and Role models, Mentors and Support System.

Unit III:

Business Opportunity Identification and Business Plan: Business Ideas, Methods of Generating Ideas, and Opportunity Recognition, Meaning and Significance of a Business Plan, Components of a Business Plan, and Feasibility Study.

Unit IV:

Financing the New Venture*:* Importance of New Venture Financing, Types of Ownership, Securities, Venture Capital, Types of Debt Securities, Determining Ideal Debt-Equity Mix, and Financial Institutions and Banks.

Unit V:

Launching the New Venture and Growth: Choosing the Legal form of New Venture, Protection of Intellectual Property, Marketing the New Venture, Characteristics of High Growth New Ventures, Strategies for Growth, and Building the New Venture Capital, Exit Strategies for Entrepreneurs, Bankruptcy, and Succession and Harvesting Strategy.

Text books:

1. D.F. Kuratko and T.V.Rao, Entrepreneurship-A South Asian Perspective, Cengage Learning,2012.
2. Hisrich, Peters ,Sheperd, Entrepreneurship, Mc.Graw Hill, 11/e, 2020.

References:

1. Vasant Desai, Entrepreneurship Development, Himalayan Publishing House, 2019.
2. Nandan H, Fundamentals of Entrepreneurship, PHI, 2013

QUANTITATIVE FINANCIAL ANALYTICS

BBA III Year I Semester					SCHOOL OF MANAGEMENT			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A26002/BA-A	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

1. To understand the concept of financial statistics
2. To explain the financial securities, mergers and data importing
3. To understand the data analytics and risk management
4. To understand the application of Sharpe Ration
5. To explain the application of mean –variance analysis

Course Outcomes:

At the end of the course, the students are able to

1. Apply the statistics for financial data for decision making
2. Import the financial data of a company, cleansing and quoting it.
3. Analyze the price movements and take decisions to manage the risk
4. Analyze the company status using the Sharpe ration
5. Apply the mean-variance analysis to risky assets and measures the return

UNIT I:

Financial Statistics: Probability, Mathematical Expectation, Sample Mean, SD, Variance, Sample Skewness and Kurtosis, Sample Covariance and Correlation, Financial returns, CAPM.

UNIT II:

Financial Securities: Bond Investments, Stock Investments, The Euro crisis, Securities Datasets and Visualization, Adjusting for Stock Splits, Adjusting for Mergers, Plotting Multiple Series, Securities Data Importing, Data Cleansing and Quoting

UNIT III:

Dataset Analytics and Risk Management: Generating Prices from Log Returns, Normal Mixture Models of Price movements, Currency Price Movements.

UNIT IV:

The Sharpe Ratio: Sharpe Ratio Formula, Time Periods and Annualizing, Ranking Investment Candidates, The Quant mod Package, measuring Income Statement Growth, Sharpe Ratios for Income Statement Growth.

UNIT V:

Markowitz mean-Variance Optimization: Optimal Portfolio of Two Risky Assets, Quadratic Programming, Data Mining with Portfolio Optimization, constraints, Penalization and the Lasso.

Text books;

1. Mark J. Bennett, Dirk L. Hugen, Financial Anlaytics with R, Cambridge University Press, 2016.
2. Simon Benninga, Financial Modeling, 2nd edition, MIT Press, 2000

Reference books:

1. Michael Samonas (2015), Financial Forecasting, Analysis and Modelling: A Framework for Long-Term Forecasting, New Delhi: Wiley Publishing.
2. Chandan Sengupta (2011), Financial Analysis and Modeling using Excel and VBA, New Delhi: Wiley India.
3. Scott Proctor K (2010), Building Financial Models with Microsoft Excel, New Delhi: Wiley India

ELEMENTS OF ACTUARIAL SCIENCE

BBA III Year I Semester					SCHOOL OF MANAGEMENT			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A26002/BA-B	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

1. To understand the concept of loss distributions
2. To explain and understand the risk concept in decision makings
3. To understand the credibility theories
4. To explain the generalized linear models
5. To explain the game theory applications

Course Outcomes:

At the end of the course, the students are able to

1. Apply the loss distributions and reinsurance for decision making
2. Apply the risk techniques to estimate the return.
3. Apply the Bayesian Approach to Credibility Theory
4. Select the linear model and find the deviances
5. Apply the game theory for decision making

UNIT I:

Loss Distributions: Introduction, Classical loss distributions, Fitting loss Distributions, Mixture Distributions, Loss Distributions and reinsurance.

UNIT II:

Risk Theory: Risk models for aggregate claims, collective risk models, individual risk models for S.

UNIT III:

Credibility Theory: Introduction, classical credibility theory, the Bayesian Approach to Credibility Theory, Greatest Accuracy Credibility Theory, Empirical Bayes Approach to Credibility Theory

UNIT IV:

Generalized Linear Models: Introduction to Linear and Generalized Linear Models, Multiple Linear Regressions and The Normal Models, The Structure of Generalized Linear Models, Model Selection and Deviance.

UNIT V:

Decision and Game Theory: Introduction, Game Theory, Decision Making and Risk, Utility and Expected Monetary Gain.

Text books:

1. Philip J Boland, Statistical and Probabilistic methods in actuarial Science, Chapman & Hall/CRC, 2007.
2. S. David Promislow, Fundamentals of Actuarial Mathematics, 3rd Edition, Wiley, 2014.

Reference books:

1. Arthur Charpentier, Computational Actuarial Science with R, Chapman and Hall/CRC, 2015.
2. Edward W Frees, Regression Modeling with Actuarial and Financial Applications (International Series on Actuarial Science), Cambridge University Press, 2009.
3. Stuart A. Klugman, Harry H. Panjer), Gordon E. Willmot, Loss Models: From Data to Decisions (Wiley Series in Probability and Statistics), Wiley–Blackwell, 2012.

HEALTHCAREANALYTICS

BBA III Year I Semester					SCHOOL OF MANAGEMENT			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A26002/BA-C	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

1. To understand the healthcare analytics foundations and history
2. To demonstrate the SQL language and its uses in healthcare
3. To give basics of python and the libraries that are important for performing analytics
4. To describe the information contained in publicly available clinical dataset
5. To review the current progress being made in healthcare predictive analytics

Course Outcomes:

At the end of the course, the students are able to

1. Download, install and use the software for healthcare analytics
2. Apply SQL language in healthcare with a predictive analytics
3. Apply Python to perform analytics
4. Make predictive models with the downloaded data, using Python
5. Apply predictive analytics for select diseases and comparing the results to those obtained by using traditional methods

UNIT I:

Introduction to Healthcare Analytics: Definition, foundations, History, Examples, Exploring the software, Healthcare Foundations.

UNIT II:

Computing Foundations- Databases: Introduction to databases, data engineering with SQL, starting an SQLite, one table at a time with SQL.

UNIT III:

Computing Foundations- Python:

Introduction to Python Variables and Types, Data Structures and Containers, Programming in Python,

UNIT IV:

Measuring Healthcare Quality: Introduction to healthcare measures, the hospital Value-Based Purchasing, Hospital Readmission Reduction, Hospital-Acquired Conditions.

UNIT V:

Predictive Models in Healthcare: Introduction to predictive analytics in healthcare, importing the dataset, making the response variable, splitting the data into train and test sets, preprocessing the predictor variables, make predictions improving models.

Text books:

1. Vikas Kumar, Techniques in healthcare computing using machine learning and Python, Packt Publishing Ltd., 2018
2. Trevor L. Strome, Healthcare Analytics for Quality and Performance Improvement, Wiley, 2013

Reference books:

1. Hui Yang, Eva K Lee, Healthcare Analytics: From Data to Knowledge to Healthcare improvement, Wiley, 2018
2. Chandan K Reddy, Charu C Aggarwal, Healthcare Data Analytics, A Champan & hall Book, 2015
3. Craig Dickstein, Renu Gehring, Administrative Healthcare Data: A guide to its origin, SAS, 201

DATA BASE CONCEPTS – II (BIG DATA)

BBA III Year I Semester					SCHOOL OF MANAGEMENT			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A26003/BA	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objective:

Course objective of Data Base Concepts -II (Big Data) is to enable student to understand the Big Data platform and its Use cases, Overview of Apache Hadoop, HDFS interfacing, structures and unstructured data .

Course Outcomes:

The students will be able to:

1. Identify Big Data and its business implications.
2. List the components of Hadoop and Hadoop Eco-System
3. Access and process data on distributed file system
4. Manage job execution in Hadoop Environment
5. Develop Big Data solutions using Hadoop Eco System

Pre- requisites : Practice of SQL (queries and subqueries), exposure to Linux Environment.

UNITI:

Introduction to Big data and Hadoop: Types of Digital Data, Introduction to Big Data Big Data Analytics, Challenges of Big Data, Technologies used in Big Data Environment, Basically Available Soft State Eventual Consistency (BASE).

UNIT II:

Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics; Developing an Analytic Team; Understanding Text Analytics; Analytical Approach and Tools to Analyze Data: Analytical Approaches; Introducing Popular Analytical Tools; Comparing Various Analytical Tools.

UNIT III:

Big Data Technology Landscape and Hadoop: Hadoop, RDBMS versus Hadoop; Hadoop Overview, Hadoop Distributors, Processing of Data with Hadoop. Introduction of HDFS, Architecture, HDFS Daemons, read, write, Replica, HDFS Files.

Unit IV:

Understanding MapReduce Fundamentals and HBase: The MapReduce Framework; Techniques to Optimize MapReduce Jobs, Uses of MapReduce, Role of HBase in Big Data Processing.

Introducing HBase: Architecture, Storing Big Data with HBase, Interacting with the Hadoop Ecosystem; HBase in Operations Programming with HBase.

UNIT V:

Social Media Analytics: Introducing Social Media, Key elements of Social Media; Text mining, Understanding Text Mining Process, Sentiment Analysis, Performing Social Media Analytics.

TextBooks

1. Seema Acharya, Subhasini Chellappan, Big Data and Analytics, Wiley 2019, 2/e.

Reference books:

1. Rajiv Sabherwal, Irma Becerra- Fernandez, Business Intelligence –Practice, Technologies and Management, John Wiley 2011.
2. Lariss T. Moss, ShakuAtre, Business Intelligence Roadmap, Addison-Wesley It Service.

PROJECT

BBA III Year II Semester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A26201	Project	L	T	P	C	CIE	SEE	Total
		0	0	20	10	50	50	100

Course Objectives

1. Aim: The aim of multi stage evaluation is to enable students to do original work on their own so that they can get the benefit in terms of gaining practical knowledge and possible employment

The following is the suggested checklist for the project.

Brief Introduction, Review of Literature, Research Gaps, Research Questions, Objectives of the Study, Hypothesis, Scope of the Study, Period of the Study, Data collectionLiterature Review and Data Analysis and Interpretations, Findings, Suggestions and Conclusion, Appendices.

An internal evaluation will be conducted through progress review seminar by the students.

A Viva Voce will be conducted by the external examiner after completion of the Project and submission of Project report.

COMPREHENSIVE VIVA-VOCE

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A26202	Viva	L	T	P	C	CIE	SEE	Total
		0	0	0	2	100	-	100

A comprehensive viva will be conducted at the end of the semester covering all the courses .

Program Structure & Syllabus of BBA II & III Year (Digital Marketing)

School of Management

R21 Regulations

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.), Hyderabad, Telangana, INDIA

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II BBA I Semester

(5L+5T+1P)

Sl. No	Code	Category	Course Name	Hours per week			Credits
				L	T	P	
1	A23001	Core	Business Research	3	1	0	4
2	A23002	Core	Business Analytics	3	1	0	4
3	A23003	Core	Organizational Behavior	3	1	0	4
4	A23004	General Elective	A. Business Statistics-II B. Tax Management C. Innovation & Technology Management	3	1	0	4
5	A23005/DM	Elective	Social Media Marketing	3	1	0	4
6	A23201	Project	Mini Project and Report Writing	0	0	4	2
Total				15	5	4	22

II BBA II Semester

(4L+4T+1P+1 Seminar)

Sl. No	Code	Category	Course Name	Hours per week			Credits
				L	T	P	
1	A24001	Core	Business Law & Environment	3	1	0	4
2	A24002	Core	Production & Operations Management	3	1	0	4
3	A24003	Core	Project Management	3	1	0	4
4	A24004/DM	Elective	Digital Marketing	3	1	0	4
5	A24201	Lab	Data Analysis and Visualization	0	0	4	2
6	A24202	Seminar	Business Plan Preparation Seminar	0	0	6	3
Total				9	4	10	21

III BBA I Semester (5L+5T+1 Internship)

Sl. No	Code	Category	Course Name	Hours per week			Credits
				L	T	P	
1	A25001	Core	E-Commerce	3	1	0	4
2	A25002	Core	Management Information System	3	1	0	4
3	A25003	General Electives	A. Business Forecasting B. International Business C. Sales & Distribution Management	3	1	0	4
4	A25004/DM	Elective	Digital Advertising Strategy	3	1	0	4
5	A25005/ DM	Elective	B2B Marketing	3	1	0	4
6	A25201	Intern	Internship	0	0	6	3
			Total	15	4	4	23

III BBA II Semester (3L+3T+1 Project + 1 Viva)

Sl. No	Code	Category	Course Name	Hours per week			Credits
				L	T	P	
1	A26001	Core	Fundamentals of Entrepreneurship	3	1	0	4
2	A26002 /DM	Elective	A. Marketing Analytics B. Web Analytics C. Content Marketing	3	1	0	4
3	A26003/DM	Elective	Customer Analytics	3	1	0	4
4	A26201	Project	Project	0	0	20	10
5	A26202	Viva	Comprehensive Viva-Voce	0	0	0	2
			Total	9	3	20	24

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Summary of Courses with Credits for BBA

S.No.	Course Type	No of Courses	Credits Per Course	Credits
1	**Ability Enhancement Courses (AECC)** **(**Human Values of Professional Ethics, Gender sensitization)	2	0	0
2	**Skill Enhancement Courses (SEC)** (Productive Tools-lab, QALR, Mini Project and Report Writing, Business Plan Preparation Seminar, Data Analysis and Visualization)	5	4*2 1*3	11
3	**Language Courses (LC)** **(**English for Empowerment, English Language Skills lab, The Power of Data Storytelling, Art of Articulation Lab	4	2*3 2*1	8
4	**Core Courses (CC)**	17	4	68
5	**Discipline Specific Electives (DSE)**	6	4	24
6	**Generic Electives (GE)**	2	4	8
7	**Project (PROJ)**	1	10	10
8	**Comprehensive Viva-voce**	1	2	2
9	**Internship**	1	3	3
		39		**134**

BUSINESS RESEARCH

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Research are to:

- Familiarize students with the concepts of research, types and design
- Familiarize students with various data analysis tools and techniques
- Enable students conduct research and prepare a basic research report

Course Outcomes:

At the end of this Business Research course, students will be able to:

- Demonstrate an understanding of need for research and research process.
- Develop a understanding of sampling and types of samples
- Apply relevant scaling techniques in preparation of questionnaires.
- Have an understanding of various data analysis techniques of research
- Prepare a basic research report

Unit I:

Nature and Scope of Business Research: Role of business research in decision making. The Research process, Management decision problem Vs. Business Research objective, Exploratory, Descriptive, Causal research.

Unit II:

Sampling and Data Collection Methods : Population, Sampling, Sampling errors, Probability and non-probability sampling types. Types of data, Secondary Data, Primary Data, Methods of Data collection for qualitative and quantitative research.

Unit III:

Measurement & Scaling: Primary scales of Measurement - Nominal, Ordinal, Interval & Ratio. Scaling techniques, Likert Scale. Questionnaire design – Types of questions, Content, Wording and Placement.

Unit IV:

Data Analysis: Data preparation, Descriptive statistics, Inferential statistics, Parametric and Non- Parametric tests. Introduction Factor Analysis and Discriminant Analysis.

Unit V:

Research Report Writing: Introduction, Types of research reports, Elements of research report, Referencing.

Textbooks:

1. Donald R. Cooper & Pamela S. Schindler, Business Research Methods, McGraw-Hill Education, India, 2016.
2. C. R. Kothari & Gaurav Garg, Research Methodology: Methods and Techniques, 4th edn, New age International Publishers, 2019.

References:

1. Deepak Chawla and Neena Sondhi, Research Methodology: Concepts and Cases, Vikas Publishing House, India, 2012
2. Bryman A, Business Research Methods, 3rd Edition, Oxford Press, 2011
3. Das Satya Bhushan & Malhotra Naresh K, Marketing Research: An applied Orientation, 7th edn, revised, Pearson India, 2019.

Journals:

1. Business Research
2. Experimental Business Research
3. Business Research Projects

BUSINESS ANALYTICS

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23002	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objective:

Course Objectives of Business Analytics are to:

- To help students recognize and understand the applications of business analytics
- To familiarize about concepts of descriptive and predictive analytics
- To help student develop an analytical approach to business decision making

Course Outcome: At the end of this course the students will be able to

At the end of this Business Analytics course, students will be able to:

- Recognize the role of Analytics in business
- Identify and apply descriptive statistical measures for analysis
- Apply basic Statistical inferences for data.
- Understand Data Mining scope and applications
- Develop decision making skill under uncertainty

Unit - I:

Introduction to Data Analytics: Introduction to Business Analytics, Components of Business Analytics, Modeling stages, Population, Samples, Data Set, Variables and Observations, Types of Data, Data Visualization tools.

Unit - II:

Descriptive Statistical Measures: Descriptive measures for categorical variables, Numerical variables, Relationships among variables. Probability and Probability distributions.

Unit - III:

Statistical Inference: Sampling and sampling distributions, Hypothesis testing, Karl Pearson Correlation Techniques. Simple and Multiple Regression. Regression by the method of least squares, Regression with categorical independent variables .

Unit - IV:

Data Mining: Scope of Data Mining, Data Exploration and Reduction, Unsupervised learning – cluster analysis, Association rules, Supervised learning- Partition Data, Classification Accuracy, prediction Accuracy, k-nearest neighbors, Classification and Regression trees, Logistics Regression.

Unit - V:

Simulation: Random Number Generation, Monte Carlo Simulation, What if Analysis, Verification and Validation, Advantages and Disadvantages of Simulation, Risk Analysis, Decision Tree Analysis.

Text Books:

1. James Evans, Business Analytics, Pearson, 2017,2/e.
2. Albright, Winston, Business Analytics – Data Analysis and Decision Making, Cengage Learning, 2015, 5/e.
3. Camm, Cochran, Fry, Ohlmann, Anderson, Sweeney, Williams Essential of Business Analytics, Cengage Learning.

References:

1. Thomas Eri, Wajid Khattack & Paul Buhler : Big Data Fundamentals, Concepts, drivers and Techniques by Prentice Hall of India, New Delhi, 2015.
2. Akil Maheswari: Big Data, Upskill ahead by Tata McGraw Hill, New Delhi, 2016.
3. Seema Acharya & Subhashini Chellappan: Big Data and Analytics, Wiley Publications, New Delhi, 2015.

Journals:

1. International Journal of Data science and Analytics.
2. International Journal of Data Science (IJDS).
3. International Journal of Data Analytics (IJDA).

ORGANIZATIONAL BEHAVIOR

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23003	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Organizational Behaviour are to:

- To familiarize to the organizational environment and behaviour.
- To help students understand influence of individual and group behaviours on organizational behaviour.
- To identify role of culture in OB.

Course Outcomes: At the end of the course students will be able to

At the end of this Organizational Behaviour course, students will be able to:

- Identify the relevance of various theories to understand organizational behaviour
- Assess the influence of different persnalities on organizational behaviour.
- Demonstrate an understanding of motivation and attitude
- Display understanding of interdependencies in groups and organization.
- Appreciate need for strong organizational culture and need for change.

Unit-1:

Introduction to OB: Organizational Behavior – Nature and Scope of OB, Significance of OB, Organizational Behavior and its significance in other Disciplines, Contribution of Hawthorne studies to OB, Theories of Organizational Behavior, Challenges and Opportunities.

Unit-II:

Foundations of Individual Behavior: Personality, Personality Determinants, Personality Traits, The Big Five Model, Theories of Personality. Values – Types of Values. Perception- Perceptual Process, Perception and Individual Decision- making.

Unit-III:

Motivation and Learning: Theories of Motivation, Hierarchy Needs Theory, Two-Factor Theory, Expectancy Theory. Attitudes -Types of Attitudes, Attitudes and Consistency, Cognitive Dissonance Theory. Learning- Theories of Learning.

Unit-IV:

Foundations of Group Behavior: Groups – Nature, Types, Stages of Groups, Group decision making. Leadership - Theories of leadership. Conflict Management- Conflict process, Conflict Management, Stress – Causes and Consequences of Stress, Stress Management.

Unit-V:

Organizational Culture and Change Management Nature of Culture, Creating and Sustaining Organizational Culture. Change - Forces for Change, factors affecting resistance to Change, approaches to manage change – Lewin's Model, Kotter's Plan for Implementing Change. Organizational Development.

Text book:

1. Robbins, Stephen, Timothy, A & Vohra, N. "Organizational Behavior",Pearson Education, 14/e, 2012.

References:

1. Mc Shane & Von Glinow, "Organizational Behavior", 7/e. Mc Graw Hill Publications, New Delhi, 2014.
2. Fred Luthans, Organizational Behaviour, 12/e, Prentice Hall, 2011.
3. Jerald Greenberg & Robert A Baron, Behavior in Organizations, 9/e, Printice Hall India, 2010.
4. Quick, Nelson & Khandelwal, Organizational Behavior – A South-Asian Perspective, 7/e, Cengage Learning, 2013.

Journals:

1. International Journal of Human Resource Management: Cambridge University Press.
2. The International Journal of Management Education.
3. Asian Journal of Management –Quarterly

BUSINESS STATISTICS-II

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23004/A	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Statistics -II are to:

- To enable student to understand in detail about the application of probability, estimation and hypothesis testing.
- To familiarize with the concepts of Statistical Quality Control and Control Charts.

Course Outcomes:

At the end of this Business Statistics -II course, students will be able to:

- Know the applications of Probability in business.
- Understand concept of estimation and Testing of Hypothesis of few unknown statistical parameters.
- Interpret statistical test results of small sample tests and large sample tests.
- Know types of Statistical Quality Control
- Recognize and interpret control charts for attributes.

Unit-I:

Probability: Basic concepts of Probability, Deterministic and random experiments, Basic Terminology of Probability, Mathematical, Statistical and Axiomatic definitions of probability, their merits and demerits. Conditional Probability and independence of events, Addition and Multiplication theorems for two events. Bayes' theorem and it's applications.

Unit-II:

Estimation: Concept of Point Estimation**,** Interval Estimation, Maximum Error and Confidence Interval Examples.

Testing of Hypothesis: Null Hypothesis and Alternative Hypothesis, Critical Region, Critical Value, Type-I and Type-II errors, Level of Significant, One Tailed and Two Tailed Test.

Unit-III:

Small Sample Tests: t-test for Single Mean, Difference between Two Means (unpaired) and Paired t-test, F - test for equality of population variances, Chi-Square test for Independence of Attributes.
Large Sample Tests: Test for Single Mean, Difference between Two Means, Test for Single Proportion, Difference between two Proportions

Unit-IV:

Statistical Quality Control: Importance of SQC in industry. Dimensions of quality, Statistical basis of Shewart control charts. Construction of control charts for variables (mean, range and standard deviation) and attributes (p, np with fixed and varying sample sizes) and their Interpretation.

Unit-V:

Control Charts: Control charts for attributes (C and U charts with fixed and varying sample sizes) and their Interpretation. Construction of control charts for Natural tolerance limits and specification limits, process capability index and modified control charts.

Text Books:

1. J.K Sharma (2013), Business statistics, New Delhi: Pearson Education.
2. Gupta SC: “Fundamental of Statistics” 6th Ed, Himalaya Publishers House, 2004.
3. D.C. Montgomary: Introduction to Statistical Quality Control. Wiley

Reference Books:

1. S.C. Gupta & Indra Gupta (2012), Business Statistics, Hyderabad:Himalaya Publishing House.
2. S.P. Gupta :” Statistical methods” , Sultan Chand & Sons, New Delhi.
3. Parimal Mukhopadhyay : Applied Statistics . New Central Book agency
4. R.C.Gupta: Statistical Quality Control.

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23004/B	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

TAX MANAGEMENT

Course Objectives:

Course Objectives of Tax Management are to:

- To familiarize with the basic concepts of income tax for individual and managers..
- To create an awareness on Tax planning with reference to New Industrial Establishment and Investment.
- To give an overview of tax incentives and GST.

Course Outcomes: At the end of the course students will be able to

At the end of this Tax Management course, students will be able to:

- Know on Income tax basics and direct taxes.
  Understand individual tax planning features.
- Identify role of tax planning will help in managerial decisions.
- Have basic knowledge of tax planning in New Industrial Establishment and investments.
- Have Aware of tax planning concepts in exports and the GST.

Unit-I:

Introduction to Direct Taxes: Features of Direct Taxes - Types of Direct Taxes. Overview of Income Tax Act 1961, Basic Concepts: Person – Assessee - Previous Year and Exceptions, Assessment Year Income, Gross Total Income, Taxable Total Income, Residential Status, Incidence of Tax, Permanent Account Number (PAN), Tax Account Number (TAN) . Income Tax Authorities - Functions.

Unit-II:

Tax Planning Individuals: Planning with reference to all five heads of Income for individuals: Salaries, House property, Profits from Business & Profession, Capital gains and Other Sources. Tax Planning with reference to Relief, Concessions, Rebates, Deductions and Incentives.

Unit-III:

Tax Planning for Managerial Decisions: Tax considerations arising with regard to specific management decisions: Make/buy, Own/lease, Installment/hire purchase, Retain/replace, Export/local sale, Shut down/continue, Expand or Contract, Merger and Amalgamations. Advance Tax, Payment of Advance Tax , Filing of Returns, Refunds, Penalties for non-compliance.

Unit-IV:

Tax Planning-New Industrial Establishments & Investments: Tax planning with reference to New Industrial Establishment, Location, Form, Nature and Capital Structure, Short term loans, Term loans, Public Deposits, Bonus Issues, Dividend Policies.

Unit-V:

Tax Planning – Incentives: Schemes for encouraging exports - Salient features of Software Technology Park (STP), Electronic Hardware Technology Park (EHTP) - Other export promotion schemes under EXIM policy. Overview of Goods and Service Tax (GST).

Text Books:

1. Vinod K. Singhania: - Indirect Tax Laws, Taxmann Publications.
2. Madhukar N Hiregange: Goods and Services Tax, Wolters Kluwer.

References:

1. Mahesh Chandra &Shukla, D.C. Income Tax Law & Practice Pragati Publications.
2. Singhania, V.K .Student Guide to Income Tax. (University ed.). Taxmann Publications Pvt. Ltd.
3. Bhagawati Prasad: Direct Tax Laws and Practice.

Journals:

1. International Journal of Accounting and Taxation.
2. Journal of International Accounting, Auditing and Taxation.

INNOVATION AND TECHNOLOGY MANAGEMENT

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23004/C	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Innovation and Technology Management are to:

- To provide an exposure to the needs of technology innovation and creativity.
- To give an overview of various issues connected with Management of Technology in Organizations.
- To appreciate the role of technology in gaining competitive advantage
- To be aware of concepts of technology identification, technology forecasting.
- To enable the role technology diffusion and technology absorption in development.

Course Outcomes:

At the end of Innovation and Technology Management course students will be able to

- Interpret the relationships between technology and Innovation in organization.
- Analyze the impact of technology on business
- Know the process of product Development and linkage between technology Development and Competition.
- Analyze the necessity of technology Forecasting and common mistakes of forecasting.
- Understand the various challenges faced by Technology Diffusion and absorption.
-

Unit I:

Innovation Technology: Introduction, Innovation Technology Relationship, Types of Innovation, Innovation and Changes in Organization, Technology based innovation and Management, Innovation performance, factors, principles, measures, characteristics of Innovative Work Environment**.**

Unit II:

Introduction to Technology Management: Concept and Meaning of Technology, Evolution and Growth of Technology, Role and significance of management of technology, Impact of technology on society and business, Forms of Technology- Process Technology and Product Technology.

Unit III:

Competitive Advantage through New Technologies: Product development stages, linkage between technology development and competition. Managing research and development (R&D), Managing intellectual property.

Unit IV:

Technological Forecasting: Technology Forecasting, Need and role, technology forecasting approaches, technological forecasting methods, and common mistakes in forecasting.

Unit V:

Technology Diffusion and Absorption: Technology Adoption, Technology Diffusion, role and perspectives of innovation diffusion process, technology diffusion curve, technology absorption, benefits of technology absorption, constraints. Issues involved in the management of technology absorption. Government initiatives for technology absorption. Technology life cycle.

Text Books:

1. Rohtagi P K, Rohtagi K and Bowonder B: Technological Forecasting, Tata McGraw Hill,
2. Tarek Khalil:, Management of Technology, McGraw Hill International, 2009.
3. John Ziman, Technological Innovation as an Evolutionary Process, Cambridge University Press, Cambridge, 2000.
4. Dr.Urvashi Makkar, Soni Sharma, Prachi Agarwal Innovation, Technology and Development: A Road Map for Achieving Global Competitiveness, January 2017

References

1. Dasgupta. S: Technology and Creativity & Creativity, Oxford University Press, New York,1996.
2. Proctor. T: The Essence of Management Creativity, Prentice - Hall, New Delhi, 1997.
3. Richards. T: Creativity and Problem Solving Network, Gower, Hampshire, 1997.
4. Ceserani. J & Greatwood. P: Innovation & Creativity, Kogan Page, London, 1995.

Journals:

1. International Journal of Innovation and Management.(Quarterly)
2. International Journal of Technology Management. (Quarterly)

SOCIAL MEDIA MARKETING

BBA II Year I Semester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A23005/DM	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objective

- To familiarize the fundamental concepts of Social Media Marketing
- To provide awareness on concepts of social media marketing goals & strategies
- To explain the effectiveness of SMM platforms of Twitter
- To understand the effectiveness of SMM on social network platforms
- To gain the skills for monitoring and measuring social media using metrics.

Course Outcomes:

After completion of the course students will be able to

- Recognize the trends in the Social Media Marketing.
- Analyze the goals and strategies used in Social Media Marketing.
- Analyze the blogging and twitter media strategies..
- Understand applications of marketing with social networks
- Identify measures to monitor social media performance.

UNIT I

Foundations of Social Media Marketing: Social Media Marketing, Characteristics of SMM, Online Communities, Brands and Social Media, Business and Social Media.

UNIT II

Goals and Strategies: Social Media Marketing- Plan, Planning Cycle, Listen and observe, Setting Goals, Determining Strategies, Strategic Planning and SMM, Linking goals with a Call to Action.

UNIT III

Blogging and Twitter: Blogging – Protocol, Platforms, Content Strategies, Building an audience, Twitter- Protocol, Clients, Tips for Brand building with Twitter, Crafting an effective Twitter Channel.

UNIT IV

Marketing with Social Networks (Facebook & LinkedIn): Marketing with Social Networks - Protocol, Benefits, Facebook-Understanding FB Ads, Managing FB Ads, FB Marketing tools, LinkedIn- Understanding LinkedIn Ads, LinkedIn Groups and Prospecting.

UNIT V

Monitoring and Measurement: Tracking, Measuring, Measurement Basics, Selecting Social Media Monitoring Tools,

Metrics: Website, Twitter, Facebook and LinkedIn, Qualitative KPIs, ROI, Evaluation, The Future of Social Media Monitoring.

TEXT BOOKS:

1. Dan Zarrella, the Social Media Marketing Book, O'Reilly Media, Inc, 2009.
2. Melissa Barker, Donald I. Barker, Nicholas F. Bormann, Krista E. Neher, Social Media Marketing: A Strategic Approach, Cengage Learning, 2012.
3. Stephen Johnson, SOCIAL MEDIA MARKETING: Secret Strategies for Advertising Your Business and Personal Brand on Integra, YouTube, Twitter, and Facebook, Andrea Astemio, 2020.

REFERENCES:

1. Tom Funk, Advanced Social Media Marketing: How to Lead, Launch, and Manage a Successful Social Media Program, Apress, 2014.
2. Tracy L. Tuten, Michael R. Solomon, Social Media Marketing, SAGE, 2014.
3. Aleksej Heinze, Gordon Fletcher, Tahir Rashid, Ana Cruz, Digital and Social Media Marketing: A Results-Driven Approach, Routledge, 2016.

MINI PROJECT & REPORT WRITING

Aim: The aim of Mini projects is to enable students to generate ideas or identify the

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A23201	SEC	L	T	P	C	CIE	SEE	Total
		0	0	4	2	100	-	100

problem/issues by understanding the remote, non-remote areas or surrounding of their society and apply their practical knowledge and provide the solutions.

The Contents of the Community Project Report are:

● Topic of the Project

● Chapter I

Brief Introduction Review of Literature Research Gaps Research Questions

Objectives of the Study

Scope of the Study

Period of the Study

Sample Data Collection Primary Data Secondary Data ●

Chapter II

Data Interpretation, Suggestions Conclusion References to be enclosed

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BUSINESS LAW AND ENVIRONMENT

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Law and Environment are to:

- To provide awareness on fundamental concepts of business law and Indian Contract.
- To familiarize with Acts and Laws essential for business managers role.

Course Outcomes:

At the end of the Business Law and Environment Course students will be able to

- Identify essential elements of a contract.
- Describe key point of Sale of Goods Act and Negotiable instruments Acts
- Interpret concepts of Law of Agency
- Have awareness of formation of company and MoA.
- Gain insights about laws related to consumer protection.

Unit I:

Indian Contract Act: Meaning and kinds of Contract – Essentials of a Contract, Offer and Acceptance, Free Consent, Capacity of the Parties, Lawful Consideration, Legality of Object, Performance of Contract, Discharge of Contract, Quasi Contract

Unit II:

Sale of Goods Act: Sale and Agreement to Sell, Conditions and Warranties, Transfer of Property, Rights of Unpaid Seller.
Negotiable Instruments Act: Meaning of Negotiable Instruments, Type of Negotiable Instruments, Promissory Note, Bill of Exchange, Cheque.

Unit III:

Law of Agency: Definition, Kinds of Agents, Creation of Agency, Rights and Duties of Agent and Principal, Termination of Agency.

Unit IV:

Company Law: Definition and Kinds of Companies, Formation and Advantages of Incorporation of a Company, Memorandum of Association, Articles of Association, Promoter, Prospectus, Winding up of a Company.

Unit V:

Consumer Protection and Cyber law: Rights of Consumers, Consumer Protection Councils, Redressal Machinery, Cyber Law, Intellectual Property Law-Copyright, Patent, Trademark, Trade Secret

Text Books:

1. Gulshan S.S, Business Law, New Delhi, Excel Books, 2012
2. Balachandran V., Legal Aspects of Business, Tata McGraw Hill, 2012
3. N.D.Kapoor, Mercantile Law, Sultan Chand & Sons, 2006

References :

1. Avatar Singh, Principles of Mercantile Law, Lucknow: Eastern Book Company, 2011
2. Pathak, Legal Aspects of Business, Tata Mcgraw- Hill Publishing Company Limited, New Delhi, 2010.
3. P. P. S. Gogna, Mercantile Law, S. Chand & Co. Ltd., India, 4/e, 2008
4. Ravinder Kumar, Legal Aspect of Business, Cengage Learning, 2/e,2011.
5. Maheswari & Maheswari, Mercantile Law, Himalaya Publishing House, Mumbai
6. Rudder dutt & Sundaram, Indian Economy, Vikas Publishing House, New Delhi.

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PRODUCTION AND OPERATIONS MANAGEMENT

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24002	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Production and Operations Management are to:

- Provide awareness on fundamentals of operations management
- Familiarize with concepts of capacity planning and inventory management.
- To develop an awareness of the supply chain management and quality management concepts.

Course Outcomes:

At the end of the Production and Operations Management course students will be able to

- Describe the process and factors influencing the operations management.
- Understand capacity planning and facility layout in the organization
- Understand applications of inventory management techniques
- Identify techniques of supply chain planning
- Explain quality control techniques and standards to reduce quality errors

Unit I:

Operations Management: Operations as a source of competitive advantage; Trade-offs and combinations, Process Analysis, Difference between Manufacturing and Service Operations, Product Process Matrix.

Unit -II

Capacity planning: Process Selection and Facility layout, designing product and process layouts and line balancing, Forecasting and types of forecasting.

Unit -III

Inventory Management: Deterministic demand model, EOQ, ABC, Continuous and Periodic review Inventory models.

Unit -IV

Supply chain management; Lean vs Agile supply chains; Aggregate Production Planning; Master Production Schedule and MRP, Project Management.

Unit -V

Quality Management: Quality Assurance, Inspection and Quality Control, Acceptance Sampling, Total Quality Management and ISO 9000 Series Standards, Six Sigma.

Text Books:

1. Nigel Slack, Alistair Brandon-Jones.Operations management, Pearson Education, 9/e, 2019.
2. Panneerselvam ,Production and Operations Management‖ PHI, 2012
3. S.N.Chary, Production and Operations Mangement, 2019, 6/e.

References:

1. Danny Samson, Operations Management: Integrated Approach, Cambridge, 2012.
2. Kenneth K. Boyer, Rohit Verma, Operations Management, Cengage Learning, 2011.
3. Dipak Kumar Bhattacharyya, Production and Operations Management, Universities Press, 2012.
4. Prof. L.C. Jhamb, Production Operations Management, x, Everest Publishing House,18/e 2013.

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PROJECT MANAGEMENT

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24003	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Project Management are to:

- To familiarize with the concepts of project mangement and planning
- To provide insights on project execution parameters and teams.
- To enable application of project performance measurement techniques.

Course Outcomes:

At the end of the Project Management course students will be able to

- Describe the life cycle and concepts of Project Management.
- Apply different approaches to project screening and planning
- Analyze different risk factors in project execution
- Demonstrate team skills
- Understand project performance evaluation techniques.

Unit I:

Introduction: Meaning, Need, Principles Project Lifecycle and its Phases, Project Management Research in brief, Project Management today, Organization strategy and structure and culture, Format of organization structure, Stake holder Management, Organization Culture, creating a culture for Project Management.

Unit-II

Project Identification and Planning: Defining the project, Project Identification Process, Approaches to Project Screening and Selection, Project Planning, Work Breakdown Structure, Financial Module, Getting Approval and Compiling a Project Charter, setting up a Monitoring and Controlling Process.

Unit-III

Project Execution: Initiating the Project, Controlling and Reporting Project Objectives, conducting project evaluation, Risk, Risk Management Factors, Project Management, Four Stage Process, Risk Management an Integrated Approach, Cost Management, Creating a Project Budget

Unit IV:

Leading Project Teams: Building a Project Team, Characteristics of an effective Project Team, achieving Cross- Functional Co-operation, Virtual Project Teams, Conflicts Management, Negotiations.

Unit V:

Performance Measurement and Evaluation: Monitoring Project Performances, Project Control Cycles, Earned Value Management, Human factors in Project Evaluation and Control, Project Termination, Types of Project Terminations, Project Follow-up. Current and Future Trends in Project Management.

Text books:

1. Larson, Gray, Project Management- The Managerial Process, McGraw Hill, 2017,6/e
2. Jeffery K. Pinto, Project Management, Pearson Education, 2015

References:

1. Enzo Frigenti, Project Management, Kogan, 2015
2. R. Panneerselvam & P. Senthil Kumar, Project Management, PHI, 2015
3. Thomas M. Cappels, Financially Focused Project Management, SPD, 2008.

DIGITAL MARKETING

BBA II Year II Semester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
A24004/DM	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objective

- To explain the fundamental concepts of Digital Marketing
- To explain how marketing is taken place in modern era.
- To understand the behavior of and managing digital consumer.
- To evaluate the vital drivers of business in the digital world
- To know the emerging key trends in Digital Marketing.

Course Outcomes

After completion of the course students will be able to

- Explore the opportunities of digital marketing in present era
- Estimate key elements of marketing in digital era.
- Effectively analyze the digital consumer and his/her behavior.
- Critically evaluate the key drivers of the Digital Marketing.
- Describe the current trends and opportunities in Digital Marketing world.

UNIT I

Basics of Digital Marketing: Introduction to Digital Marketing- Evolution of Digital Marketing, Why Digital Marketing, Applications of Digital Marketing, Digital Marketing vs. Traditional Marketing, Digital Marketing Framework.

UNIT II

Marketing in the Digital Era: E-Marketing, The online Marketing Mix, Factors impacting Digital Marketplace, Value Chain Digitization, The Online Marketing Mix, Issues of Online Marketing.

UNIT III

The Consumer in the Digital World: The Online Consumer, Consumer Behavior on the Internet, Managing Consumer Demand, Integrated Marketing Communications (IMC), Impact of Digital Channels on IMC, CRM in a Web 2.0 World

UNIT IV

Business Drivers in the Virtual World: Social Media, Online Branding, Traffic Building, Web Business Models, E-Commerce, Email Marketing, Mobile Marketing, Viral Marketing, Establishing Online Brand Identity

UNIT V

The Contemporary Digital Revolution: Online Communities and Co-creation, Role of Games and apps in marketing, The world of Facebook, Emerging Trends and Concepts, Emerging opportunities in Digital Marketing.

TEXT BOOKS

1. Puneet Bhatia, Fundamentals of Digital Marketing, Pearson Education India, 2e, 2019.
2. **Vandana Ahuja, Digital Marketing, Oxford University Press, 2015.**

Reference Books

1. Ian Dodson, the Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns, John Wiley & Sons, 2016.
2. Damian Ryan, Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page, 2014.
3. Dave Chaffey / Fiona Ellis-Chadwick, Digital Marketing: Strategy, Implementation and Practice, Pearson

DATA ANALYSIS AND VISUALISATION

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A24201	SEC	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Objectives:

Course Objectives of Data Analysis and Visualisation are to:

- To prepare the data for analysis and develop meaningful Data Visualizations.
- Familiarize students with the basic and advanced techniques of information visualization and scientific visualization,
- A detailed view of visual perception, the visualized data and the actual visualization, interaction and distorting techniques

Course Outcomes:

After completion of the Data Analysis and Visualisation course students will be able to

- Able to extract the data for performing the Analysis.
- Analyze the different techniques for visualizing the data.
- Demonstrate key techniques to interpret the data.
- Analyze the data by using the visualization techniques.
- Use visualization techniques for volumetric data

Unit I:

Data Gathering and Preparation: Data formats, parsing and transformation, Scalability and real-time issues, Data Cleaning: Consistency checking, Heterogeneous and missing data, Data Transformation and segmentation.

Unit II:

Exploratory Analysis: Descriptive and comparative statistics, Clustering and association, Hypothesis generation

Unit III:

Visual perception: Introduction, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

Unit IV:

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents. Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

Unit V:

Visualization of volumetric data: Vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations

Textbooks:

1. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications, A K Peters / CRC Press, 2015, 2/e
2. Cole Nussbaumer Knaflic, Storytelling of Data visualization, Guide for business professionals, Willey, 2015

References:

1. Nathan Yau, Data Points: Visualization That Means Something, Wiley, 2013
2. Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2007.

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Business Plan preparation
(Seminar)

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24202	SEC	L	T	P	C	CIE	SEE	Total
		0	0	6	3	100	-	100

Course Objective:

- To acquire the knowledge regarding various components in developing a business plan.

Course Outcomes: At the end of the course students will be able to

- Analyze the various components pertaining to Business plan
- Identify the various sources to initiate new venture
- Develop the business plan for the business ideas

Suggested contents of the Business plan:

1. Analyze the market
2. Identify various sources of funds
3. Viability of the product
4. Cost
5. Customer
6. Competition
7. Team
8. Revenue
9. Channels

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E- COMMERCE

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of E-Commerce are to:

- To provide students with an overview of E-Commerce.
- To make them understand B2B E-Commerce.
- To make them understand B2C E-Commerce.
- To know the elements of E-Commerce.
- To know and understand E-Business.

Course Outcomes:

At the end of the E-Commerce course students will be able to

- Understand concepts of E-Commerce and E-Business.
- Gain awareness of B2B E-Commerce business processes.
- Have knowledge on B2C E-Commerce business processes.
- Identify the elements of E-Commerce
- Know the application areas of E-Business

Unit I:

Introduction to Electronic Commerce: Introduction, need, significance – scope, unique features of E-Commerce. Difference between E-Commerce and E-Business. Pros and Cons of E-Commerce, electronic commerce vs. traditional commerce, prospects of E-Commerce in India.

Unit II:

Business to Business (B2B) E-Commerce: Inter Organization Transactions: Credit Transactions and Trade Cycle, Variety of Transactions; Electronic Markets: Usage of Electronic Markets, Pros and Cons. Inter Organizational E-Commerce.

Unit III:

Business to Consumer (B2C) Electronic Commerce: Consumer Trade Transactions: Internet E-Commerce, Internet Shopping and Trade Cycle, Pros and Cons.

Unit IV:

The Elements of E-Commerce: Elements, E-Visibility, The E-shop, Online Payments, Delivering the Goods, After-Sales Service, Internet E-Commerce Security.

Unit V:

E-BUSINESS: Introduction, Internet Books Shop, Grocery Supplies, Software Supplies and Support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing E-delivery.

Text Books:

1. David Whiteley, E-Commerce, Strategy, Technologies and Applications, McGraw-Hill Edition, 2017
2. S.J.P.T. Joseph, E-Commerce, An Indian Perspective, PHI Learning Pvt. Ltd. 2019, 6/e

References:

1. C.S.V.Murthy, E-Commerce Concepts, Models, Strategies, Himalaya Publishing House, 2015
2. Ward Hanson and Kirthi Kalyanan, Internet Marketing and e-Commerce, Cengage, 2012, 2/e

MANAGEMENT INFORMATION SYSTEM

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25002	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Management Information System are to:

- Familiarize students with the role of information systems at organizations
- To provide insights on SDLC and system design
- To have knowledge on IS Security and control
- To obtain knowledge on ERP models for various functions
- To introduce to ERP implementation strategies

Course Outcomes:

At the end of the Management Information System course, student will be able to

- Recognize the role of Information systems in organizations
- Describe the stages of SDLC and system design
- To have knowledge on IS Security and control
- Have awareness of ERP
- Understand factors influencing successful ERP implementation strategies

Unit I:

Organization and Information Systems: The Organization Structure, Managers and Activities - Data, Information and its Attributes. Introduction to IS Models and types of Information Systems, Nolan Stage Hypothesis, IS Strategic Grid. Critical Success Factors, Socio-Technical Systems Approach (Mumford).

Unit II:

Building of Information Systems: SDLC - System Development Stages, Approaches, System Analysis and Design – Requirement Determination, Strategies, Structure Analysis Tools. System Design- Design Objectives, Conceptual Design, Design Methods.

Unit-III:

IS Security and Control: System Vulnerability and Abuse Business Value of Security and Control Need for Security, Computer Crime – Hacking, Cyber Theft, and Unauthorized use at work. Piracy – Software and Intellectual Property. Privacy – Issues

and the Internet Privacy, Challenges – Working Condition, Individuals, Health and Social Issues

Unit-IV:

ERP Models : Evolution of ERP, Integrated Management Systems, Integrated Data Model. ERP Modules - Finance, Accounting System, Manufacturing and Production Systems, Sales and Distribution Systems, Human Resource Systems, Materials Management System, ERP System Options and Selection, ERP Proposal Evaluation, ERP benefits.

Unit-V:

ERP Implementation and Maintenance: Implementation Strategy Options, Features of Successful ERP Implementation, Strategies to attain success, User Training, Maintaining ERP & IS.

Text Books:

1. C.S.V.Murthy: Management Information System, Himalaya,2009
2. Alexis Leon: ERP (Demystified), 5/e, Tata McGraw-Hill, 2009.

References

1. Gordon B. Davis & Margrethe H.Olson: Management Information Systems, TMH, 2009.
2. C Laudon and Jane P.Laudon, et al: Management Information Systems, Pearson Education, 2009.
3. D P Goyal, Management Information Systems – Managerial Perspective, Macmillan, 3/E, 2010.
4. James A. Obrein: Management Information Systems, TMH, 2009

BUSINESS FORECASTING

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25003/A	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Forecasting are to:

- To know various business forecasting techniques**.**
- Learn about categories of regression analysis
- To know about logistic regression models
- To study about Moving Average models
- To learn about seasonal models

Course Outcomes:

At the end of the Business Forecasting course the student able to

- Describe business forecasting models.
- Understand Dummy variables and Regression Models.
- Interpret logistic regression models..
- Understand Forecasting Using an ARMA Models.
- Describe characteristics of Conditional Heteroscedastic Models

Unit-I:

Introduction: Business forecasting models**,** Linear Regression, Building a Regression Model, Making inferences using the estimated model, Using the Regression model to make predictions, Errors, Residuals and R-square, Hypothesis testing in a Linear Regression, 'Goodness of Fit' measures (R-square, Adjusted R-square).

Unit-II:

Regression Analysis: Dummy variable Regression (using Categorical variables in a Regression), Multicollinearity in Regression Models, Mean centering of variables in a

Regression model, Building confidence bounds for predictions using a Regression model, Interaction effects in a Regression, Transformation of variables

Unit-III:

Logistic Regression: Introduction of Logistic regression, building of logistic regression model. Linear Time Series Analysis and Its Applications: Stationarity, Correlation and Autocorrelation Function, White Noise and Linear Time Series, Simple Autoregressive Models, Properties of AR Models, Identifying AR Models in Practice, Goodness of Fit, Forecasting.

Unit-IV:

Moving Average Models: Simple Moving-Average Models, Forecasting Using MA Models, Simple ARMA Models, Properties of ARMA, Three Model Representations for an ARMA Model.

Unit-V:

Conditional Heteroscedastic Models: Characteristics of Volatility, Structure of a Model, Model Building. Seasonal Models, Seasonal Differencing, Multiplicative Seasonal Models, Regression Models with Time Series Errors, Consistent Covariance Matrix Estimation, Long-Memory Models.

Text Books:

1. Gupta, S.C., Kapoor V. K., Fundamentals of Applied Statistics, Sultan Chand & Sons; 4/e, 2014
2. Len Tashman, Udo Sglavo, Business Forecasting: Practical Problems and Solutions, 2016, Wiley

References:

1. Douglas C Montgomery, Statistical Quality Control: A Modern Introduction, 6/e, Wiley, 2010
2. B. L. Agarwal, Basic Statistics

INTERNATIONAL BUSINESS

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A25003/B	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of International Business are to:

- To facilitate knowledge on concepts related to International Trade and business
- To create awareness on theories of international trade
- To be aware of factors influencing international business environment
- To provide conceptual knowledge on FDI
- To create awareness on International Financial Institutions

Course outcomes:

At the end of the International Business course student will be able to

- Understand concepts of international trade and business.
- Identify contents of various international trade theories
- Know the factors influencing international business environment
- Appreciate the role of FDI.
- Have an understanding of various financial institutions and their roles.

Unit I:

International Business: An Overview – Evolution of International Business, Drivers of Globalization, Influences of International Business, Stages of Internationalization, Differences between Domestic and International Business, International Business Approaches, Advantages of International Business.

Unit II:

Theories of International Trade: Mercantilism, Theory of absolute cost advantage, Comparative cost advantage theory, Relative factor endowment theory, Country similarity theory, Product life cycle theory.

Unit III:

International Business Environment: Social and Cultural Environment, Technological Environment, Economic Environment, Political Environment .Modes of Entering International Business – Modes of Entry, Exporting, licensing, franchising, contract manufacturing, management contracts, turnkey projects.

Unit IV:

Foreign Direct Investment: Factors Influencing FDI, Reasons for FDI, Costs and Benefits of FDI, Trends in FDI, Foreign Direct Investment in India.

Unit V:

International Financial Institutions and Liquidity: IMF, World Bank, International Development Association, International Liquidity and SDR International Finance Cooperation.

Text Books:

1. Cherunilam Francis, International Business, Text and Cases,6/e ,Prentice-Hall of India Private Limited, 2020.
2. K. Aswathappa, International Business, 7 Edition , Tata McGraw Hill, New Delhi, 2020, 7/e

References :

1. John Daniels, Lee Radebaugh, et al, International Business, Pearson Education, 2018, 16/e
2. James H. Taggart and Michael C. Mcdormitt, The Essentials of International Business, Prentice Hall of India, 2000

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SALES AND DISTRIBUTION MANAGEMENT

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25003/C	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course objective:

Course Objectives of Sales and Distribution Management are to:

- TO introduce to the concepts of sales and distribution management
- To various concepts of sales planning and budgeting
- To identify sales force management concepts
- To give a knowledge on distribution channels
- To give channel designing strategies

Course Outcomes:

At the end of the Sales and Distribution Management Course students will be able to

- Explain the concepts of sales and distribution management.
- Know the concepts of sales planning and budgeting
- Describe the process and managing of the sales force
- Evaluate different techniques of sales analytics
- Apply sales force compensation methods effectively in an organization.

Unit I :

Introduction: Evolution of Sales Management, Nature and Importance , Roles, Types and Skills of Sales Managers, Sales Objectives, Strategies and Tactics, Emerging Trends, Linking, Sale and Distribution Management, Buying Decision, Sales Knowledge and Sales Related, Marketing Policies, Sales Process, Transactional and Relationship Selling

Unit II:

Sales Planning and Budgeting: Strategic Planning, Role of Marketing & Sales, Marketing & Personal Selling Strategies, Sales Strategy, Developing Sales Forecast, Forecasting Approaches, Sales Budget, Defining Sales Territories, Procedures, Assigning Territories, Managing Territories, Sales Quotas.

Unit-III:

Sales Force Management: Concepts of Sales Organization, Types of Sales Organization, Structures, , Sizing and Staffing the Sales Force, Training and Motivating Sales Force, Compensating and Leading Sales Force, Evaluating and Controlling the performance of Sales Force.

Unit-IV:

Distribution Management: Definition, Need for Distribution Management, Need for Distribution Channels, , Relationship of Flows to Service Levels, Channel Levels, Service Channels, Retailer as a Salesman, Trading /Retail Formats, E-Tailing, Wholesale – Functions & Classification, Major Wholesaling decisions.

Unit-V:

Designing Channel Systems: Channel Design Factor, Channel Planning Process, , Training, Motivating & Evaluating Channel members, Channel Design Comparison, Implementation, Vertical Integration, Channel Management, Power & Conflict, Principles of Channel Management.

Textbooks:

1. Krishna K. Havaldar, Vasant M. Cavale) Sales and Distribution Management, McGrawHill, 3/e, 2017
2. Tapan K. Panda and Sunil Sahadev, Sales and Distribution Management, Oxford University Press, 2019

References:

1. Still, Cundiff, Govoni, Sales Management, Pearson, 2017, 6/e,
2. Pingali Venugopal, Sales and Distribution Management- An Integrative Approach, Sage, 2020,2/e

DIGITAL ADVERTISING STRATEGY

BBA III Year I semester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A25004/DM	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

- To acquire the basic knowledge about digital advertising
- To know the concepts of Standard Digital Media
- To understand components of the non-standard Digital Media
- To explain the targeting within the context of digital advertising
- To communicate how digital advertising is optimized & tracked.

Course Outcomes: At the end of the course students will be able to

- Describe the effectiveness of advertising through digital media
- Analyze the concepts of Standard Digital Media.
- Explain the concepts of Non-Standard Digital Media.
- Effectively analyzes the different elements of targeting the Digital Consumer.
- Evaluate decisions based on the optimization metrics

Unit I:

Basics of Digital Advertising: Introduction to Digital Advertising- History of Digital Advertising, The face of Digital Advertising today, Advantages and disadvantages, Characteristics, Ad types.

Unit II:

How it Works 1: Standard Digital Media – Definitions, Features, Forms, and Examples of Search Advertising, Display Advertising & Mobile Advertising.

Unit III:

How it Works 2: Non-Standard Digital Media – Definitions, Features, Forms, and Examples of In-gaming Advertising, Native Advertising & Social Media Advertising.

Unit IV:

Targeting: Definition, Contextual Targeting, Behavioral Targeting, Geo Targeting, Demographic Targeting, Real-time Targeting, Look-alike Targeting, Act-alike Targeting.

Unit V:

Optimization & Tracking: Search Engine Optimization (SEO), Search Engine Marketing (SEM), Tracking – Ad Tracking, Web Tracking, Server based Tracking, Client Based Tracking, Post-click Tracking.

Text Books:

1. Avinash Tiwary, Know Online Advertising: All Information about Online Advertising at One Place, Partridge Publishing, 2016.
2. Gabriela Taylor, Advertising in a Digital Age - Best Practices & Tips for Paid Search and Social Media Advertising, Global & Digital, 2013.

Reference Books:

1. Andrew John McStay, Digital Advertising, Macmillan International Higher Education, 2016.
2. Harry J. Gold, The Digital Advertising Guide, Overdrive Interactive, 2015.

B2B MARKETING

BBA III Year I semester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A25005/DM	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course objective:

To identify the industrial, marketing, and business terms and concepts that is significant within the field of industrial marketing or business-to-business marketing.

Course outcomes: At the end of the course students will be able to

- Identify various marketing concepts involved in organizational buying.
- Comprehend the buying process of business markets.
- Analyze the opportunities for business to marketing
- Apply the marketing mix concepts to B2B markets
- Apply the communication strategies for B2B markets

Unit I:

Introduction to B2B Marketing, Market Opportunity Identification, Analysis & Evaluation, Segmentation, Targeting, and positioning strategies

Unit II:

Customer Analysis, Customer profitability matrix, Customer Relationship Management Strategies for Business Markets

Unit III:

Assessing Market Opportunities, Environmental Changes Impacting Supply Chain Power, Strategic Market Planning,

Unit IV:

Managing Products for Business Markets, Managing Business Marketing Channels, Pricing, Key Account Management

Unit V:

Business Marketing Communication-Business Marketing Communication-B2B Branding

Text Book

1. Vitale, Giglierano, & Pfoerstch, Business to Business Marketing: Analysis and Practice, Pearson/Prentice-Hall, NJ, 2011.

References

1. Dwyer, F. Robert & Tanner, John F. Jr. Business Marketing, McGraw-Hill, 4/e., 2009
2. Myers, Chris A., The Marketing Plan Companion: Analysis and Cases, Kendall Hunt Publishing 2013
3. Michael D Hutt, Dheeraj Sharma, Thomas W Speh, B2B Marketing: A South-Asian Perspective Cengage Learning, 11/e
4. Sharad Sarin, Strategic Brand Management for B2B Markets: A Road Map for Organizational Transformation, SAGE publications.

INTERNSHIP

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25201	Intern	L	T	P	C	CIE	SEE	Total
		0	0	6	3	100	-	100

Course Objective:

The Objective of this course is to introduce students by allowing them to discuss and solve real business challenges by associating with any enterprise.

Course Outcomes: At the end of the course the students will be able to

1. Demonstrate their ability to apply learned skills and also students push boundaries
2. Propose and explore much needed solutions across disciplines and cultures.
3. Improve the personality and become confident to face the employment process.

Exercise:

1. Apply Business Concepts and Theories to Real-World Decision-Making.
2. Address the Specific Business Disciplines; such as Human Resources Management, Operations Management, Marketing, Accounting, Statistics, Economics, Finance, and Business Law.
3. Observe and Participate in Business Operations and Decision-Making.

FUNDAMENTALS OF ENTREPRENEURSHIP

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A26001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Fundamental of Entrepreneurship are to:

- To explain the concepts of entrepreneurship and the role in economic development
- To create awareness about the entrepreneur mindset and support system.
- To understand business plan development process.
- To enable understanding of the financial aspects of entrepreneurship.
- To impart the knowledge of growth strategies for new venture.

Course Outcomes:

At the end of the Fundamental of Entrepreneurship course students will be able to

- Describe the role of Entrepreneurship in the Economy and the support system.
- Interpret the Entrepreneurial Mindset and the Challenges.
- Design a business plan for a Startup Venture.
- Relate the startup venture and the financial aspects applicable.
- Analyze growth strategies for a new venture.

Unit I:

Introduction to Entrepreneurship: Meaning and Concept of Entrepreneurship, the History of Entrepreneurship Development, Role of Entrepreneurship in Economic Development, Agencies in Entrepreneurship Management, Emerging issues in Entrepreneurship.

Unit II:

The Entrepreneur: Skills required to be an Entrepreneur, Entrepreneurial Stress Entrepreneurial Motivation, Entrepreneurial Decision Process, and Role models, Mentors and Support System.

Unit III:

Business Opportunity Identification and Business Plan: Business Ideas, Methods of Generating Ideas, and Opportunity Recognition, Meaning and Significance of a Business Plan, Components of a Business Plan, and Feasibility Study.

Unit IV:

Financing the New Venture*:* Importance of New Venture Financing, Types of Ownership, Securities, Venture Capital, Types of Debt Securities, Determining Ideal Debt-Equity Mix, and Financial Institutions and Banks.

Unit V:

Launching the New Venture and Growth: Choosing the Legal form of New Venture, Protection of Intellectual Property, Marketing the New Venture, Characteristics of High Growth New Ventures, Strategies for Growth, and Building the New Venture Capital, Exit Strategies for Entrepreneurs, Bankruptcy, and Succession and Harvesting Strategy.

Text books:

1. D.F. Kuratko and T.V.Rao, Entrepreneurship-A South Asian Perspective, Cengage Learning,2012.
2. Hisrich, Peters ,Sheperd, Entrepreneurship, Mc.Graw Hill, 11/e, 2020.

References:

1. Vasant Desai, Entrepreneurship Development, Himalayan Publishing House, 2019.
2. Nandan H, Fundamentals of Entrepreneurship, PHI, 2013

MARKETING ANALYTICS

BBA III Year I semester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A25004/DM/A	General Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

- To introduce to marketing process and utilizing data for strategy
- To create awareness on metrics for measuring brand assets
- To design basic experiments so that the marketing efforts and investment is most effective.
- To look at regression and how it's used to understand that relationship.

Course Outcomes: At the end of the Course students will be able to:

1. Understand the concepts of marketing analytcis analytics
2. Know the metrics to measure and track brand value
3. Have knowledge of customer lifetime value and customer retention
4. Understand design of effective experiments
5. Aware of basics of regression for analytics.

Unit I:

The Marketing Process: Introduction, Marketing Strategy with Data, Using Text Analytics, Utilizing Data to Improve Marketing Strategy.

Unit II:

Metrics for Measuring Brand Assets: Brand Value, Developing Brand Personality, Brand Personality, Developing Brand Architecture, Measuring Brand Value, Measuring Brand Value: Key Points, Revenue Premium as a Measure of Brand Equity, Calculating Brand Value.

Unit III:

Customer Lifetime Value: Types of customers, CRM, Customer Lifetime Value (CLV), Calculating CLV, CLV Formula, Using CLV to Make Decisions

Unit IV:

Marketing Experiments: Determining Cause and Effect through Experiments, Designing Basic Experiments, Analyzing an ExperimentPitfalls of Marketing Experiments, Maximizing Effectiveness

Unit V:

Regression Basics: Using Regression Analysis, Interpretation, Regression Outputs, Multivariable Regressions, Using Price Elasticity to Evaluate Marketing, Understanding Log-Log Models, and Marketing Mix Models.

Textbooks:

1. Wayne L. Winston, Marketing Analytics: Data-Driven Techniques with Microsoft Excel, January 2014, Wiley
2. Mike Grigsby, Marketing Analytics: A Practical Guide to Improving Consumer Insights Using Data Techniques, Kogan, 2018

References:

1. Stephan Sorger, Marketing Analytics: Strategic Models and Metrics, 2013
2. Rajkumar Venkatesan, Paul Farris, Ronald Wilcox, Cutting Edge Marketing Analytics: Real World Cases and Data Sets for Hands-On Learning, FT Press Analytics, 2014
3. Mike Grigsby, Marketing Analytics: A practical guide to real marketing science, Kogan 2015

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WEB ANALYTICS

BBA III Year I semester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A25004/DM - B	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

- To understand the role of web analytics within the digital marketing landscape
- To identify, define and interpret commonly used web metrics and KPIs
- To understand and discuss clickstream data collection techniques
- To gain a understanding of common monitoring or analysis tasks and techniques used in web analytics
- To effectively use the resulting insights to support website design decisions, campaign optimization, search analytics

Course Outcomes: At the end of the course students will be able to

- Analyze and interpret web channel data and
- Understand the difficulties and issues involved in web analytics data collection.
- Identify different types of software tools, techniques, and reports that are relevant to web analytics
- Apply the software tools, techniques to draw the reports
- Effectively manage a web metrics program within an organizational context.

Unit I:

Introduction: Definition, Process, Key terms: Site references, Keywords, and Key phrases; building block terms: Visit characterization terms, Content characterization terms, Conversion metrics; Categories: Offsite web, on-site web; Web analytics platform, Web analytics evolution.

Unit II:

Data Collection: Clickstream Data: Weblogs, Web Beacons, JavaScript tags, Packet Sniffing, Outcomes Data, E-commerce, Lead Generation, Brand/Advocacy and Support, Research data: Mindset, Organizational structure, Timing.

Unit III:

Qualitative Analysis: Heuristic evaluations, Site Visits, Surveys, Web Analytic fundamentals. Capturing data: Web logs or JavaScript's tags, Separate data serving and data capture, Type and size of data, Innovation, Integration, Selecting optimal web analytic tool.

Unit IV:

Web Metrics: Common metrics: Hits, Page views, Visits, Unique visitors, Unique page views, Bounce, Bounce rate, Page/visit, Average time on site, New visits; Optimization (e-commerce, non-e-commerce sites): Improving bounce rates, Optimizing ad words campaigns;

Unit V:

Web Analytics 2.0: Limitations of web analytics 1.0, Introduction to analytic 2.0, Competitive intelligence analysis: CI data sources, Toolbar data, Panel data, ISP data, Search engine data, Hybrid data, Website traffic analysis: Comparing long term traffic trends, Analyzing competitive site overlap and opportunities. Google Analytics: Brief introduction and working, Adword.

Textbooks:

1. Clifton B., Advanced Web Metrics with Google Analytics, Wiley Publishing, Inc.2/e.
2. Kaushik A., Web Analytics 2.0, The Art of Online Accountability and Science of Customer Centricity, Wiley Publishing, Inc. 1/e.

References:

1. Sterne J., Web Metrics: Proven Methods for measuring website success, John Wiley and Sons
2. Avinash Kaushik, Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity, Sybex, 2009.

CONTENT MARKETING

BBA III Year I semester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A25004/DM/3	Open Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Content Marketing are

- To familarize with the content marketing ecosystem
- To explore and be able to apply essential elements for creating irresistible content
- To explore the various types of strategic content that goes into an effective content marketing program.

Course Outcomes::

At the end of Content Marketing course, the students will be able to

1. Understand content marketing ecosystem
2. Identify components of 7A Framework
3. Have knowledge on types of content
4. Know the features of strategic content.
5. Recognize the importance of professional ethics in content writing

Unit I:

The Content Marketing Ecosystem: Introduction to content marketing, an overview of the structure for effective content, use of building a professional brand, tips for building a professional brand, The 5 P Approach to Copy, Content Marketing Research.

Unit II:

The Strategic Context (7A Framework): Overview of the 7A Framework, of the Agility & Authenticity, Stealing Headlines for Attention, Capturing Audience Attention, Actions,, Call-to-Action & Risk Reversal, Expanding the Network, "About" Page, Authority & Audience.

Unit III:

Crafting a Content Marketing Strategy: Mapping the Journey, Empathy Maps, 47s, Experience Maps, Two Keys to Creating Irresistible Content, Internet Marketing for Smart People

Unit IV:

The Strategic Types of Content: Attraction Content, Affinity Content, Action Content, Making Action Content Actionable, Authority Content, Create Content That Converts, Write Magnetic Headlines, Create Compelling Content, Email Marketing

Unit V:

Managing the Content: Ethics and Professionalism, Plagiarism and Copyright Law, Introduction to Metrics, Multimedia Content - Visuals, Multimedia Content - Audio and Video, Turn Traffic into Money, Effective Content Promotion.

Text books:

1. Rebecca Lieb, Content Marketing: Think Like a Publisher-how to Use Content to Market online and in social media, Que Publishing, 2012.
2. Pamela Wilson, Master Content Marketing: A Simple Strategy to Cure the Blank Page Blues and Attract a Profitable Audience, BIG Brand Books, 2016.

References:

1. Robert W. Bly, The Content Marketing Handbook: How to Double the Results of Your Marketing Campaigns, Entrepreneur Press, 2020
2. David Meerman Scott, The New Rules of Marketing and PR: How to Use Content Marketing, Podcasting, social media, AI, Live Video, and Newsjacking to Reach Buyers Directly, 7/e, 2020
3. Mathew Sweezey, The Context Marketing Revolution: How to Motivate Buyers in the Age of Infinite Media, Harvard Business Review Press, 2020

ANURAG UNIVERSITY

CUSTOMER ANALYTICS

BBA III Year I semester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A26003/DM	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course objectives of Customer Analytics course are

- To provide basic insights into the basic concepts of customer analytics
- To create awareness about descriptive analytics
- To know the various concepts about predictive analytics
- To understand key elements of prescriptive analytic
- To explain the scientific approach to marketing
-

Course Outcomes:

At the end of the Customer Analytics course student will be able to

- Describe the role and types of Customer Analytics.
- Apply the key concepts of descriptive analytics.
- Identify functions of predictive analytics.
- Describe the applications of prescriptive analytics.
- Recognize various opportunities to implement analytics.

Unit I:

Basics of Customer Analytics: Introduction to Customer Analytics, Defining Customer Analytics, Benefits of Customer Analytics, Importance, Using Customer Analytics, Types of Analytics, Tools of Analytics.

Unit II:

Descriptive Analytics: Definition, Applications, Visualizing the data, Exploring the data, Descriptive Statistical Measures, Probability Distributions and Data Modeling, Sampling, Estimation, Statistical Inference.

Unit III:

Predictive Analytics: Definition, Descriptive Vs. Predictive Analytics, Trendlines, Regression Analysis, Forecasting Techniques, Data Mining-Tools & Applications in Predictive Analytics.

Unit IV:

Prescriptive Analytics: Definition, Linear Optimization, Applications of Linear Optimization, Integer Optimization, Decision Analysis.

Unit V:

Application & Future of Analytics: Introduction to application to analytics, Tips for implementing Analytics, Implementation of Analytics, Application of Analytics, Current State of Analytics, and The Future of Marketing is Business Analytics, Case Studies.

Text Books:

1. Amar Sahay, Business Analytics: A Data-Driven Decision-Making Approach for Business, Volume II**,** BEP, 2020.
2. Amar Sahay, Business Analytics: A Data-Driven Decision-Making Approach for Business, Volume I**,** BEP, 2020.
3. James R. Evans, Business Analytics-Methods, Model and Decisions, 2/e, Pearson, 2016.

References:

1. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Business Analytics Principles, Concepts, and Applications with SAS: What, Why, and How, Pearson Education, 2014
2. Michael Watson, Derek Nelson, Peter Cacioppi, Managerial Analytics: An Applied Guide to Principles, Methods, Tools, and Best Practices, Pearson Education, 2013.
3. Peter Bull, Carlos Centurion, Shannon Kearns, Eric Kelso, Nari Viswanathan, Prescriptive Analytics, Riverlogic

PROJECT

BBA III Year II Semester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A26201	Project	L	T	P	C	CIE	SEE	Total
		0	0	20	10	50	50	100

Course Objectives

1. Aim: The aim of multi stage evaluation is to enable students to do original work on their own so that they can get the benefit in terms of gaining practical knowledge and possible employment

The following is the suggested checklist for the project.

Brief Introduction, Review of Literature, Research Gaps, Research Questions, Objectives of the Study, Hypothesis, Scope of the Study, Period of the Study, Data collectionLiterature Review and Data Analysis and Interpretations, Findings, Suggestions and Conclusion, Appendices.

An internal evaluation will be conducted through progress review seminar by the students.

A Viva Voce will be conducted by the external examiner after completion of the Project and submission of Project report.

COMPREHENSIVE VIVA-VOCE

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A26202	Viva	L	T	P	C	CIE	SEE	Total
		0	0	0	2	100	-	100

A comprehensive viva voce will be conducted at the end of the semester covering all courses

Program Structure & Syllabus of

BBA II & III Year

(FinTech)

School of Management

R21 Regulations

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.), Hyderabad, Telangana, INDIA

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BBA-FinTech
II Year I Semester (5L+5T+1 Mini Project)

Sl. No	Code	Category	Course Name	Hours per week			Credits
				L	T	P	
1	A23001	Core	Business Research	3	1	0	4
2	A23002	Core	Business Analytics	3	1	0	4
3	A23003	Core	Organizational Behavior	3	1	0	4
4	A23004	General Elective	1. Business Statistics-II 2. Tax Management 3. Innovation and Technology Management	3	1	0	4
5	A23005/FT	Elective	Foundations, Payments and Regulations	3	1	0	4
6	A23201	SEC	Mini Project and Report Writing	0	0	4	2
			Total				**22**

BBA-FinTech
II Year II Semester **(4L+4T+2P+1Seminar)**

Sl.No	Code		Course Name	Hours per week			Credits
				L	T	P	
1	A24001	Core	Business Law & Environment	3	1	0	4
2	A24002	Core	Production & Operations Management	3	1	0	4
3	A24003	Core	Project Management	3	1	0	4
4	A24004 /BA	Elective	Introduction to Python and R- Programming	3	0	0	3
5	A 24203	Elective Lab	Python and R Programming Lab	0	0	2	1
6	A24201	SEC	Data Analysis and Visualization	0	0	4	2
7	A24202	SEC	Business Plan Preparation Seminar	0	0	6	3
			Total				**21**

BBA-FinTech

III Year I Semester **(5L+5T+1Seminar)**

Sl. No	Code		Course Name	Hours per week			Credits
				L	T	P	
1	A25001	Core	E-Commerce	3	1	0	4
2	A25002	Core	Management Information System	3	1	0	4
3	A25003	General Elective	1. Business Forecasting 2. International Business 3. Sales and Distribution Management	3	1	0	4
3	A25004 /FT	Elective	Insurtech	3	1	0	4
4	A25005 /FT	Elective	Modern Investing	3	1	0	4
5	A25201	Intern	Internship	0	0	6	3
			Total				**23**

BBA-FinTech

III Year II Semester **(3L+3T+1 Project+1 Viva)**

Sl. No	Code	Category	Course Name	Hours per week			Credits
				L	T	P	
1	A26001	Core	Fundamentals of Entrepreneurship	3	1	0	4
2	A26002	General Elective	A. Block Chain Applications B. Cyber Laws C. International Finance	3	1	0	4
3	A26003/FT	Elective	Financial Markets and Services	3	1	0	4
4	A26201	Project	Project	0	0	20	10
5	A26202	Viva	Comprehensive Viva-Voce	0	0	0	2
			Total				**24**

Summary of Courses with Credits for BBA

S.No.	Course Type	No of Courses	Credits Per Course	Credits
1	**Ability Enhancement Courses (AECC)** **(**Human Values of Professional Ethics, Gender sensitization)	2	0	0
2	**Skill Enhancement Courses (SEC)** (Productive Tools-lab, LRQA, Mini Project and Report Writing, Business Plan Preparation Seminar, Data Analysis and Visualization)	5	4*2 1*3	11
3	**Language Courses (LC)** **(**English for Empowerment, English Language Skills lab, The Power of Data Storytelling, Art of Articulation Lab	4	2*3 2*1	8
4	**Core Courses (CC)**	17	4	68
5	**Discipline Specific Electives (DSE)**	6	4	24
6	**Generic Electives (GE)**	2	4	8
7	**Project (PROJ)**	1	10	10
8	**Comprehensive Viva-voce**	1	2	2
9	**Internship**	1	3	3
		39		**134**

BUSINESS RESEARCH

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Research are to:

- Familiarize students with the concepts of research, types and design
- Familiarize students with various data analysis tools and techniques
- Enable students conduct research and prepare a basic research report

Course Outcomes:

At the end of this Business Research course, students will be able to:

- Demonstrate an understanding of need for research and research process.
- Develop a understanding of sampling and types of samples
- Apply relevant scaling techniques in preparation of questionnaires.
- Have an understanding of various data analysis techniques of research
- Prepare a basic research report

Unit I:

Nature and Scope of Business Research: Role of business research in decision making. The Research process, Management decision problem Vs. Business Research objective, Exploratory, Descriptive, Causal research.

Unit II:

Sampling and Data Collection Methods : Population, Sampling, Sampling errors, Probability and non-probability sampling types. Types of data, Secondary Data, Primary Data, Methods of Data collection for qualitative and quantitative research.

Unit III:

Measurement & Scaling: Primary scales of Measurement - Nominal, Ordinal, Interval & Ratio. Scaling techniques, Likert Scale. Questionnaire design – Types of questions, Content, Wording and Placement.

Unit IV:

Data Analysis: Data preparation, Descriptive statistics, Inferential statistics, Parametric and Non- Parametric tests. Introduction Factor Analysis and Discriminant Analysis.

Unit V:

Research Report Writing: Introduction, Types of research reports, Elements of research report, Referencing.

Textbooks:

1. Donald R. Cooper & Pamela S. Schindler, Business Research Methods, McGraw-Hill Education, India, 2016.
2. C. R. Kothari & Gaurav Garg, Research Methodology: Methods and Techniques, 4th edn, New age International Publishers, 2019.

References:

1. Deepak Chawla and Neena Sondhi, Research Methodology: Concepts and Cases, Vikas Publishing House, India, 2012
2. Bryman A, Business Research Methods, 3rd Edition, Oxford Press, 2011
3. Das Satya Bhushan & Malhotra Naresh K, Marketing Research: An applied Orientation, 7th edn, revised, Pearson India, 2019.

Journals:

1. Business Research
2. Experimental Business Research
3. Business Research Projects

BUSINESS ANALYTICS

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23002	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objective:

Course Objectives of Business Analytics are to:

- To help students recognize and understand the applications of business analytics
- To familiarize about concepts of descriptive and predictive analytics
- To help student develop an analytical approach to business decision making

Course Outcome: At the end of this course the students will be able to

At the end of this Business Analytics course, students will be able to:

- Recognize the role of Analytics in business
- Identify and apply descriptive statistical measures for analysis
- Apply basic Statistical inferences for data.
- Understand Data Mining scope and applications
- Develop decision making skill under uncertainty

Unit - I:

Introduction to Data Analytics: Introduction to Business Analytics, Components of Business Analytics, Modeling stages, Population, Samples, Data Set, Variables and Observations, Types of Data, Data Visualization tools.

Unit - II:

Descriptive Statistical Measures: Descriptive measures for categorical variables, Numerical variables, Relationships among variables. Probability and Probability distributions.

Unit - III:

Statistical Inference: Sampling and sampling distributions, Hypothesis testing, Karl Pearson Correlation Techniques. Simple and Multiple Regression. Regression by the method of least squares, Regression with categorical independent variables .

Unit - IV:

Data Mining: Scope of Data Mining, Data Exploration and Reduction, Unsupervised learning – cluster analysis, Association rules, Supervised learning- Partition Data, Classification Accuracy, prediction Accuracy, k-nearest neighbors, Classification and Regression trees, Logistics Regression.

Unit - V:

Simulation: Random Number Generation, Monte Carlo Simulation, What if Analysis, Verification and Validation, Advantages and Disadvantages of Simulation, Risk Analysis, Decision Tree Analysis.

Text Books:

1. James Evans, Business Analytics, Pearson, 2017,2/e.
2. Albright, Winston, Business Analytics – Data Analysis and Decision Making, Cengage Learning, 2015, 5/e.
3. Camm, Cochran, Fry, Ohlmann, Anderson, Sweeney, Williams Essential of Business Analytics, Cengage Learning.

References:

1. Thomas Eri, Wajid Khattack & Paul Buhler : Big Data Fundamentals, Concepts, drivers and Techniques by Prentice Hall of India, New Delhi, 2015.
2. Akil Maheswari: Big Data, Upskill ahead by Tata McGraw Hill, New Delhi, 2016.
3. Seema Acharya & Subhashini Chellappan: Big Data and Analytics, Wiley Publications, New Delhi, 2015.

Journals:

1. International Journal of Data science and Analytics.
2. International Journal of Data Science (IJDS).
3. International Journal of Data Analytics (IJDA).

ANURAG UNIVERSITY

ORGANIZATIONAL BEHAVIOR

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23003	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Organizational Behaviour are to:

- To familiarize to the organizational environment and behaviour.
- To help students understand influence of individual and group behaviours on organizational behaviour.
- To identify role of culture in OB.

Course Outcomes: At the end of the course students will be able to

At the end of this Organizational Behaviour course, students will be able to:

- Identify the relevance of various theories to understand organizational behaviour
- Assess the influence of different persnalities on organizational behaviour.
- Demonstrate an understanding of motivation and attitude
- Display understanding of interdependencies in groups and organization.
- Appreciate need for strong organizational culture and need for change.

Unit-1:

Introduction to OB: Organizational Behavior – Nature and Scope of OB, Significance of OB, Organizational Behavior and its significance in other Disciplines, Contribution of Hawthorne studies to OB, Theories of Organizational Behavior, Challenges and Opportunities.

Unit-II:

Foundations of Individual Behavior: Personality, Personality Determinants, Personality Traits, The Big Five Model, Theories of Personality. Values – Types of Values. Perception- Perceptual Process, Perception and Individual Decision- making.

Unit-III:

Motivation and Learning: Theories of Motivation, Hierarchy Needs Theory, Two-Factor Theory, Expectancy Theory. Attitudes -Types of Attitudes, Attitudes and Consistency, Cognitive Dissonance Theory. Learning- Theories of Learning.

Unit-IV:

Foundations of Group Behavior: Groups – Nature, Types, Stages of Groups, Group decision making. Leadership - Theories of leadership. Conflict Management- Conflict process, Conflict Management, Stress – Causes and Consequences of Stress, Stress Management.

Unit-V:

Organizational Culture and Change Management Nature of Culture, Creating and Sustaining Organizational Culture. Change - Forces for Change, factors affecting resistance to Change, approaches to manage change – Lewin's Model, Kotter's Plan for Implementing Change. Organizational Development.

Text book:

1. Robbins, Stephen, Timothy, A & Vohra, N. "Organizational Behavior",Pearson Education, 14/e, 2012.

References:

1. Mc Shane & Von Glinow, "Organizational Behavior", 7/e. Mc Graw Hill Publications, New Delhi, 2014.
2. Fred Luthans, Organizational Behaviour, 12/e, Prentice Hall, 2011.
3. Jerald Greenberg & Robert A Baron, Behavior in Organizations, 9/e, Printice Hall India, 2010.
4. Quick, Nelson & Khandelwal, Organizational Behavior – A South-Asian Perspective, 7/e, Cengage Learning, 2013.

Journals:

1. International Journal of Human Resource Management: Cambridge University Press.
2. The International Journal of Management Education.
3. Asian Journal of Management –Quarterly

BUSINESS STATISTICS-II

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23004/A	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Statistics -II are to:

- To enable student to understand in detail about the application of probability, estimation and hypothesis testing.
- To familiarize with the concepts of Statistical Quality Control and Control Charts.

Course Outcomes:

At the end of this Business Statistics -II course, students will be able to:

- Know the applications of Probability in business.
- Understand concept of estimation and Testing of Hypothesis of few unknown statistical parameters.
- Interpret statistical test results of small sample tests and large sample tests.
- Know types of Statistical Quality Control
- Recognize and interpret control charts for attributes.

Unit-I:

Probability: Basic concepts of Probability, Deterministic and random experiments, Basic Terminology of Probability, Mathematical, Statistical and Axiomatic definitions of probability, their merits and demerits. Conditional Probability and independence of events, Addition and Multiplication theorems for two events. Bayes' theorem and it's applications.

Unit-II:

Estimation: Concept of Point Estimation**,** Interval Estimation, Maximum Error and Confidence Interval Examples.
Testing of Hypothesis: Null Hypothesis and Alternative Hypothesis, Critical Region, Critical Value, Type-I and Type-II errors, Level of Significant, One Tailed and Two Tailed Test.

Unit-III:

Small Sample Tests: t-test for Single Mean, Difference between Two Means (unpaired) and Paired t-test, F - test for equality of population variances, Chi-Square test for Independence of Attributes.
Large Sample Tests: Test for Single Mean, Difference between Two Means, Test for Single Proportion, Difference between two Proportions

Unit-IV:

Statistical Quality Control: Importance of SQC in industry. Dimensions of quality, Statistical basis of Shewart control charts. Construction of control charts for variables (mean, range and standard deviation) and attributes (p, np with fixed and varying sample sizes) and their Interpretation.

Unit-V:

Control Charts: Control charts for attributes (C and U charts with fixed and varying sample sizes) and their Interpretation. Construction of control charts for Natural tolerance limits and specification limits, process capability index and modified control charts.

Text Books:

1. J.K Sharma (2013), Business statistics, New Delhi: Pearson Education.
2. Gupta SC: “Fundamental of Statistics” 6th Ed, Himalaya Publishers House, 2004.
3. D.C. Montgomary: Introduction to Statistical Quality Control. Wiley

Reference Books:

1. S.C. Gupta & Indra Gupta (2012), Business Statistics, Hyderabad:Himalaya Publishing House.
2. S.P. Gupta :” Statistical methods” , Sultan Chand & Sons, New Delhi.
3. Parimal Mukhopadhyay : Applied Statistics . New Central Book agency
4. R.C.Gupta: Statistical Quality Control.

ANURAG UNIVERSITY

TAX MANAGEMENT

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23004/B	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Tax Management are to:

- To familiarize with the basic concepts of income tax for individual and managers..
- To create an awareness on Tax planning with reference to New Industrial Establishment and Investment.
- To give an overview of tax incentives and GST.

Course Outcomes: At the end of the course students will be able to

At the end of this Tax Management course, students will be able to:

- Know on Income tax basics and direct taxes.
  Understand individual tax planning features.

- Identify role of tax planning will help in managerial decisions.
- Have basic knowledge of tax planning in New Industrial Establishment and investments.
- Have Aware of tax planning concepts in exports and the GST.

Unit-I:

Introduction to Direct Taxes: Features of Direct Taxes - Types of Direct Taxes. Overview of Income Tax Act 1961, Basic Concepts: Person – Assessee - Previous Year and Exceptions, Assessment Year Income, Gross Total Income, Taxable Total Income, Residential Status, Incidence of Tax, Permanent Account Number (PAN), Tax Account Number (TAN) . Income Tax Authorities - Functions.

Unit-II:

Tax Planning Individuals: Planning with reference to all five heads of Income for individuals: Salaries, House property, Profits from Business & Profession, Capital gains and Other Sources. Tax Planning with reference to Relief, Concessions, Rebates, Deductions and Incentives.

Unit-III:

Tax Planning for Managerial Decisions: Tax considerations arising with regard to specific management decisions: Make/buy, Own/lease, Installment/hire purchase, Retain/replace, Export/local sale, Shut down/continue, Expand or Contract, Merger and Amalgamations. Advance Tax, Payment of Advance Tax , Filing of Returns, Refunds, Penalties for non-compliance.

Unit-IV:

Tax Planning-New Industrial Establishments & Investments: Tax planning with reference to New Industrial Establishment, Location, Form, Nature and Capital Structure, Short term loans, Term loans, Public Deposits, Bonus Issues, Dividend Policies.

Unit-V:

Tax Planning – Incentives: Schemes for encouraging exports - Salient features of Software Technology Park (STP), Electronic Hardware Technology Park (EHTP) - Other export promotion schemes under EXIM policy. Overview of Goods and Service Tax (GST).

Text Books:

1. Vinod K. Singhania: - Indirect Tax Laws, Taxmann Publications.
2. Madhukar N Hiregange: Goods and Services Tax, Wolters Kluwer.

References:

1. Mahesh Chandra &Shukla, D.C. Income Tax Law & Practice Pragati Publications.
2. Singhania, V.K .Student Guide to Income Tax. (University ed.). Taxmann Publications Pvt. Ltd.
3. Bhagawati Prasad: Direct Tax Laws and Practice.

Journals:

1. International Journal of Accounting and Taxation.
2. Journal of International Accounting, Auditing and Taxation.

ANURAG UNIVERSITY

INNOVATION AND TECHNOLOGY MANAGEMENT

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23004/C	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Innovation and Technology Management are to:

- To provide an exposure to the needs of technology innovation and creativity.
- To give an overview of various issues connected with Management of Technology in Organizations.
- To appreciate the role of technology in gaining competitive advantage
- To be aware of concepts of technology identification, technology forecasting.
- To enable the role technology diffusion and technology absorption in development.

Course Outcomes:

At the end of Innovation and Technology Management course students will be able to

- Interpret the relationships between technology and Innovation in organization.
- Analyze the impact of technology on business
- Know the process of product Development and linkage between technology Development and Competition.
- Analyze the necessity of technology Forecasting and common mistakes of forecasting.
- Understand the various challenges faced by Technology Diffusion and absorption.

Unit I:

Innovation Technology: Introduction, Innovation Technology Relationship, Types of Innovation, Innovation and Changes in Organization, Technology based innovation and Management, Innovation performance, factors, principles, measures, characteristics of Innovative Work Environment**.**

Unit II:

Introduction to Technology Management: Concept and Meaning of Technology, Evolution and Growth of Technology, Role and significance of management of

technology, Impact of technology on society and business, Forms of Technology-Process Technology and Product Technology.

Unit III:

Competitive Advantage through New Technologies: Product development stages, linkage between technology development and competition. Managing research and development (R&D), Managing intellectual property.

Unit IV:

Technological Forecasting: Technology Forecasting, Need and role, technology forecasting approaches, technological forecasting methods, and common mistakes in forecasting.

Unit V:

Technology Diffusion and Absorption: Technology Adoption, Technology Diffusion, role and perspectives of innovation diffusion process, technology diffusion curve, technology absorption, benefits of technology absorption, constraints. Issues involved in the management of technology absorption. Government initiatives for technology absorption. Technology life cycle.

Text Books:

1. Rohtagi P K, Rohtagi K and Bowonder B: Technological Forecasting, Tata McGraw Hill,
2. Tarek Khalil:, Management of Technology, McGraw Hill International, 2009.
3. John Ziman, Technological Innovation as an Evolutionary Process, Cambridge University Press, Cambridge, 2000.
4. Dr.Urvashi Makkar, Soni Sharma, Prachi Agarwal Innovation, Technology and Development: A Road Map for Achieving Global Competitiveness, January 2017

References

1. Dasgupta. S: Technology and Creativity & Creativity, Oxford University Press, New York,1996.
2. Proctor. T: The Essence of Management Creativity, Prentice - Hall, New Delhi, 1997.
3. Richards. T: Creativity and Problem Solving Network, Gower, Hampshire, 1997.
4. Ceserani. J & Greatwood. P: Innovation & Creativity, Kogan Page, London, 1995.

Journals:

1. International Journal of Innovation and Management.(Quarterly)
2. International Journal of Technology Management. (Quarterly)

ANURAG UNIVERSITY

FOUNDATIONS, PAYMENTS AND REGULATIONS

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23005/FT	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Foundation, Payments and Regulations course are to:

1. To familiarize with modern-day investment strategies of fintech.
2. To create awareness on complex structure of payment methods and financial regulations.
3. To provide insights on different financial technologies and its regulations

Course Outcomes:

At the end of Foundation, Payments and Regulations course students will be able to:

1. Have an understanding on Fintech and markets.
2. Identify key considerations in Fintech.
3. Have awareness of payments and money transfers
4. Have basic knowledge of concepts of global fintech regulations.
5. Recognize factors influencing Wealthtech.

Unit I:

Overview of FinTech and market size: Introduction to FinTech, Emergence of FinTech, FinTech Growth & Benefits, Issues with FinTech,, Robo-Advising, Defining the Market Size, Attitudes Towards Financial Apps, Assets Under Management of Robo-Advisors, The Insurtech Market, The Global Market.

Unit II:

Key Considerations in Fintech: Introduction, Attitude Towards Financial Advice, Risk Aversion, Millennials and Social Impact, Trust in FinTech, Choice Architecture

Unit III:

Payments, Billing and Money Transfers: History of Payment Methods, Current Global Trends in Payment Methods, Two-Sided Payment Markets, Complexity of Payment Process, Cost Burden for Merchants, Who Pays for Credit Card Reward.

Unit IV:

RegTech: Introduction to Regulation, Credit Regulation of Developed countries, International Credit Regulation, Future of Payment Networks, The Regulation Innovation Trade-off, Issues regulating FinTech, Global FinTech Regulation,

Unit V:

Wealth Tech: Introduction, Digitizing Wealth Management Operations, Digital Business Model for Wealth Management Operations, The Personalization Pillar, Digitizing Wealth Management, Digital Platforms, Products and Ecosystems, Key Success Factors in Gaining Market Share and Scale in Alternative Lending.

Text Books:

1. Kartik Swaminathan, Future Fintech frame , Notion Press; 2021
2. Steven O'Hanlon, FinTech For Dummies **,** 1/e Aug 2020

References:

1. Susanne Chishti and Janos Barberis, The Fintech Book: The Financial Technology Hand Book for Investors, Entrepreneurs and Visionaries, Wiley, 2016
2. Sanjay Phadke, Fintech Future : The Digital Dna Of Finance, Sage Publications, 2020

PROJECT & REPORT WRITING

Aim: The aim of Mini projects is to enable students to generate ideas or identify the problem/issues by understanding the remote, non-remote areas or surrounding of their society and apply their practical knowledge and provide the solutions.

The Contents of the Community Project Report are:

● Topic of the Project

● Chapter I

Brief Introduction Review of Literature Research Gaps Research Questions

Objectives of the Study

Scope of the Study

Period of the Study

Sample Data Collection Primary Data Secondary Data ●

Chapter II

Data Interpretation, Suggestions Conclusion References to be enclosed

BUSINESS LAW AND ENVIRONMENT

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Law and Environment are to:

- To provide awareness on fundamental concepts of business law and Indian Contract.
- To familiarize with Acts and Laws essential for business managers role.

Course Outcomes:

At the end of the Business Law and Environment Course students will be able to

- Identify essential elements of a contract.
- Describe key point of Sale of Goods Act and Negotiable instruments Acts
- Interpret concepts of Law of Agency
- Have awareness of formation of company and MoA.
- Gain insights about laws related to consumer protection.

Unit I:

Indian Contract Act: Meaning and kinds of Contract – Essentials of a Contract, Offer and Acceptance, Free Consent, Capacity of the Parties, Lawful Consideration, Legality of Object, Performance of Contract, Discharge of Contract, Quasi Contract

Unit II:

Sale of Goods Act: Sale and Agreement to Sell, Conditions and Warranties, Transfer of Property, Rights of Unpaid Seller.
Negotiable Instruments Act: Meaning of Negotiable Instruments, Type of Negotiable Instruments, Promissory Note, Bill of Exchange, Cheque.

Unit III:

Law of Agency: Definition, Kinds of Agents, Creation of Agency, Rights and Duties of Agent and Principal, Termination of Agency.

Unit IV:

Company Law: Definition and Kinds of Companies, Formation and Advantages of Incorporation of a Company, Memorandum of Association, Articles of Association, Promoter, Prospectus, Winding up of a Company.

Unit V:

Consumer Protection and Cyber law: Rights of Consumers, Consumer Protection Councils, Redressal Machinery, Cyber Law, Intellectual Property Law-Copyright, Patent, Trademark, Trade Secret

Text Books:

1. Gulshan S.S, Business Law, New Delhi, Excel Books, 2012
2. Balachandran V., Legal Aspects of Business, Tata McGraw Hill, 2012
3. N.D.Kapoor, Mercantile Law, Sultan Chand & Sons, 2006

References :

1. Avatar Singh, Principles of Mercantile Law, Lucknow: Eastern Book Company, 2011
2. Pathak, Legal Aspects of Business, Tata Mcgraw- Hill Publishing Company Limited, New Delhi, 2010.
3. P. P. S. Gogna, Mercantile Law, S. Chand & Co. Ltd., India, 4/e, 2008
4. Ravinder Kumar, Legal Aspect of Business, Cengage Learning, 2/e,2011.
5. Maheswari & Maheswari, Mercantile Law, Himalaya Publishing House, Mumbai
6. Rudder dutt & Sundaram, Indian Economy, Vikas Publishing House, New Delhi.

PRODUCTION AND OPERATIONS MANAGEMENT

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24002	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Production and Operations Management are to:

- Provide awareness on fundamentals of operations management
- Familiarize with concepts of capacity planning and inventory management.
- To develop an awareness of the supply chain management and quality management concepts.

Course Outcomes:

At the end of the Production and Operations Management course students will be able to

- Describe the process and factors influencing the operations management.
- Understand capacity planning and facility layout in the organization
- Understand applications of inventory management techniques
- Identify techniques of supply chain planning
- Explain quality control techniques and standards to reduce quality errors

Unit I:

Operations Management: Operations as a source of competitive advantage; Trade-offs and combinations, Process Analysis, Difference between Manufacturing and Service Operations, Product Process Matrix.

Unit -II

Capacity planning: Process Selection and Facility layout, designing product and process layouts and line balancing, Forecasting and types of forecasting.

Unit -III

Inventory Management: Deterministic demand model, EOQ, ABC, Continuous and Periodic review Inventory models.

Unit -IV

Supply chain management; Lean vs Agile supply chains; Aggregate Production Planning; Master Production Schedule and MRP, Project Management.

Unit -V

Quality Management: Quality Assurance, Inspection and Quality Control, Acceptance Sampling, Total Quality Management and ISO 9000 Series Standards, Six Sigma.

Text Books:

1. Nigel Slack, Alistair Brandon-Jones.Operations management, Pearson Education, 9/e, 2019.
2. Panneerselvam ,Production and Operations Management‖ PHI, 2012
3. S.N.Chary, Production and Operations Mangement, 2019, 6/e.

References:

1. Danny Samson, Operations Management: Integrated Approach, Cambridge, 2012.
2. Kenneth K. Boyer, Rohit Verma, Operations Management, Cengage Learning, 2011.
3. Dipak Kumar Bhattacharyya, Production and Operations Management, Universities Press, 2012.
4. Prof. L.C. Jhamb, Production Operations Management, x, Everest Publishing House,18/e 2013.

PROJECT MANAGEMENT

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24003	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Project Management are to:

- To familiarize with the concepts of project mangement and planning
- To provide insights on project execution parameters and teams.
- To enable application of project performance measurement techniques.

Course Outcomes:

At the end of the Project Management course students will be able to

- Describe the life cycle and concepts of Project Management.
- Apply different approaches to project screening and planning
- Analyze different risk factors in project execution
- Demonstrate team skills
- Understand project performance evaluation techniques.

Unit I:

Introduction: Meaning, Need, Principles Project Lifecycle and its Phases, Project Management Research in brief, Project Management today, Organization strategy and structure and culture, Format of organization structure, Stake holder Management, Organization Culture, creating a culture for Project Management.

Unit-II

Project Identification and Planning: Defining the project, Project Identification Process, Approaches to Project Screening and Selection, Project Planning, Work Breakdown Structure, Financial Module, Getting Approval and Compiling a Project Charter, setting up a Monitoring and Controlling Process.

Unit-III

Project Execution: Initiating the Project, Controlling and Reporting Project Objectives, conducting project evaluation, Risk, Risk Management Factors, Project Management,

Four Stage Process, Risk Management an Integrated Approach, Cost Management, Creating a Project Budget

Unit IV:

Leading Project Teams: Building a Project Team, Characteristics of an effective Project Team, achieving Cross- Functional Co-operation, Virtual Project Teams, Conflicts Management, Negotiations.

Unit V:

Performance Measurement and Evaluation: Monitoring Project Performances, Project Control Cycles, Earned Value Management, Human factors in Project Evaluation and Control, Project Termination, Types of Project Terminations, Project Follow-up. Current and Future Trends in Project Management.

Text books:

1. Larson, Gray, Project Management- The Managerial Process, McGraw Hill, 2017,6/e
2. Jeffery K. Pinto, Project Management, Pearson Education, 2015

References:

1. Enzo Frigenti, Project Management, Kogan, 2015
2. R. Panneerselvam & P. Senthil Kumar, Project Management, PHI, 2015
3. Thomas M. Cappels, Financially Focused Project Management, SPD, 2008.

INTRODUCTION TO PYTHON AND R - PROGRAMMING

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24004/FT	Elective	L	T	P	C	CIE	SEE	Total
		2	1	2	4	40	60	100

Course Objectives:

Course Objectives of Introduction to Python and R -Programming are to:

1.To understand the concept of Python
2.To know the application **of** Decision control system
3.To know the different Types of file Spring Built-in function
4.To explain Python programming is intended for software engineers
5.To understand program managers and user support personnel implementation of Python

Course Outcomes:

At the end of this Introduction to Python and R -Programming course, students will be able to:

1. To acquire programming skills in core Python.
2. To acquire Object Oriented Skills in Python.
3. To develop the skill of designing Graphical user Interfaces in Python.
4. To Understand and practical experience in the data analysis and using R.
5. To apply practical project work on learned concepts

.

Unit I:

Introduction to Python: Features of python, History of python**,** Future of the python**,** Python functions, Writing and executing First python Program, Types of application, algorithm, Flow chart,

Unit II

Features of python: Data Types, operator and expression. Need for function, Functions of control structure, Module packages. Decision control system, Selection / Conditional Branching statement

.

Unit III

File handling: Introduction, File path, Types of file Spring Built-in function, Regular expression, Standard Input and output.

Unit-IV

Introduction to R: Introduction to R and R studio, Installing R and R studio, R data types, Functions Working with Descriptive Static's Vectors life, Lists, Matrix, and Data frames in R.

Unit V:

Introduction to Plots: Scatter plot, Add the plot main and Axis, Label text, lines on the plot, Make plot Colorful, Times series plot. Box and whisker plot.

Text books:

1. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016 Koontz, Weihrich & Aryasri, Principles of Management, TMH, 2007

References:

1. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010
2. R Programing: A beginner's Guide to Data Visualization Stastical analysis and programing on R. R Publishing, 2019

Python and R Programming Lab

MBA I Year II Trimester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A24203	Elective Lab	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Course Outcomes

After completion of Python and R Programming Lab course student will be able to:

1. Develop programs on data types, operators and expressions
2. Apply the data structures in real time scenarios
3. Write the programs on strings and functions
4. Implement functions with R .
5. Use of R for graphical representation of Plots.

Week 1

14. Installation and Environment set up of Python & Programs on Data types
15. Programs on Standard I/O, Operators and Expressions.

Week 2

16. Programs on Functions, lists and Tuples.

Week 3

17. Programs on Dictionaries, Strings and string operations

Week 4

18. Programs on Regular Expressions, Inheritance and Polymorphism.

Week 5

19. Programs on Exception Handling, Demonstration of Numpy Package.

Week 6

20. Demonstration of Pandas Package, matplotlib Package and Tkinter Package.

Week 7

21. Demonstration of Date and Time Packages.

Week 8

22. P Overview.

Week 9

23. C Overview.

Week 10

24. R overview

Week11

25. Apply functions

Week12

26. Plots

DATA ANALYSIS AND VISUALISATION

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A24201	SEC	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Objectives:

Course Objectives of Data Analysis and Visualisation are to:

- To prepare the data for analysis and develop meaningful Data Visualizations.
- Familiarize students with the basic and advanced techniques of information visualization and scientific visualization,
- A detailed view of visual perception, the visualized data and the actual visualization, interaction and distorting techniques

Course Outcomes:

After completion of the Data Analysis and Visualisation course students will be able to

- Able to extract the data for performing the Analysis.
- Analyze the different techniques for visualizing the data.
- Demonstrate key techniques to interpret the data.
- Analyze the data by using the visualization techniques.
- Use visualization techniques for volumetric data

Unit I:

Data Gathering and Preparation: Data formats, parsing and transformation, Scalability and real-time issues, Data Cleaning: Consistency checking, Heterogeneous and missing data, Data Transformation and segmentation.

Unit II:

Exploratory Analysis: Descriptive and comparative statistics, Clustering and association, Hypothesis generation

Unit III:

Visual perception: Introduction, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

Unit IV:

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents. Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

Unit V:

Visualization of volumetric data: Vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations

Textbooks:

1. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications, A K Peters / CRC Press, 2015, 2/e
2. Cole Nussbaumer Knaflic, Storytelling of Data visualization, Guide for business professionals, Willey, 2015

References:

1. Nathan Yau, Data Points: Visualization That Means Something, Wiley, 2013
2. Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2007.

Business Plan preparation
(Seminar)

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24202	SEC	L	T	P	C	CIE	SEE	Total
		0	0	6	3	100	-	100

Course Objective:

- To acquire the knowledge regarding various components in developing a business plan.

Course Outcomes: At the end of the course students will be able to

- Analyze the various components pertaining to Business plan
- Identify the various sources to initiate new venture
- Develop the business plan for the business ideas

Suggested contents of the Business plan:

1. Analyze the market
2. Identify various sources of funds
3. Viability of the product
4. Cost
5. Customer
6. Competition
7. Team
8. Revenue
9. Channels

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E- COMMERCE

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of E-Commerce are to:

- To provide students with an overview of E-Commerce.
- To make them understand B2B E-Commerce.
- To make them understand B2C E-Commerce.
- To know the elements of E-Commerce.
- To know and understand E-Business.

Course Outcomes:

At the end of the E-Commerce course students will be able to

- Understand concepts of E-Commerce and E-Business.
- Gain awareness of B2B E-Commerce business processes.
- Have knowledge on B2C E-Commerce business processes.
- Identify the elements of E-Commerce
- Know the application areas of E-Business

Unit I:

Introduction to Electronic Commerce: Introduction, need, significance – scope, unique features of E-Commerce. Difference between E-Commerce and E-Business. Pros and Cons of E-Commerce, electronic commerce vs. traditional commerce, prospects of E-Commerce in India.

Unit II:

Business to Business (B2B) E-Commerce: Inter Organization Transactions: Credit Transactions and Trade Cycle, Variety of Transactions; Electronic Markets: Usage of Electronic Markets, Pros and Cons. Inter Organizational E-Commerce.

Unit III:

Business to Consumer (B2C) Electronic Commerce: Consumer Trade Transactions: Internet E-Commerce, Internet Shopping and Trade Cycle, Pros and Cons.

Unit IV:

The Elements of E-Commerce: Elements, E-Visibility, The E-shop, Online Payments, Delivering the Goods, After-Sales Service, Internet E-Commerce Security.

Unit V:

E-BUSINESS: Introduction, Internet Books Shop, Grocery Supplies, Software Supplies and Support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing E-delivery.

Text Books:

1. David Whiteley, E-Commerce, Strategy, Technologies and Applications, McGraw-Hill Edition, 2017
2. S.J.P.T. Joseph, E-Commerce, An Indian Perspective, PHI Learning Pvt. Ltd. 2019, 6/e

References:

1. C.S.V.Murthy, E-Commerce Concepts, Models, Strategies, Himalaya Publishing House, 2015
2. Ward Hanson and Kirthi Kalyanan, Internet Marketing and e-Commerce, Cengage, 2012, 2/e

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MANAGEMENT INFORMATION SYSTEM

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25002	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Management Information System are to:

- Familiarize students with the role of information systems at organizations
- To provide insights on SDLC and system design
- To have knowledge on IS Security and control
- To obtain knowledge on ERP models for various functions
- To introduce to ERP implementation strategies

Course Outcomes:

At the end of the Management Information System course, student will be able to

- Recognize the role of Information systems in organizations
- Describe the stages of SDLC and system design
- To have knowledge on IS Security and control
- Have awareness of ERP
- Understand factors influencing successful ERP implementation strategies

Unit I:

Organization and Information Systems: The Organization Structure, Managers and Activities - Data, Information and its Attributes. Introduction to IS Models and types of Information Systems, Nolan Stage Hypothesis, IS Strategic Grid. Critical Success Factors, Socio-Technical Systems Approach (Mumford).

Unit II:

Building of Information Systems: SDLC - System Development Stages, Approaches, System Analysis and Design – Requirement Determination, Strategies, Structure Analysis Tools. System Design- Design Objectives, Conceptual Design, Design Methods.

Unit-III:

IS Security and Control: System Vulnerability and Abuse Business Value of Security and Control Need for Security, Computer Crime – Hacking, Cyber Theft, and Unauthorized use at work. Piracy – Software and Intellectual Property. Privacy – Issues and the Internet Privacy, Challenges – Working Condition, Individuals, Health and Social Issues

Unit-IV:

ERP Models : Evolution of ERP, Integrated Management Systems, Integrated Data Model. ERP Modules - Finance, Accounting System, Manufacturing and Production Systems, Sales and Distribution Systems, Human Resource Systems, Materials Management System, ERP System Options and Selection, ERP Proposal Evaluation, ERP benefits.

Unit-V:

ERP Implementation and Maintenance: Implementation Strategy Options, Features of Successful ERP Implementation, Strategies to attain success, User Training, Maintaining ERP & IS.

Text Books:

1. C.S.V.Murthy: Management Information System, Himalaya,2009
2. Alexis Leon: ERP (Demystified), 5/e, Tata McGraw-Hill, 2009.

References

1. Gordon B. Davis & Margrethe H.Olson: Management Information Systems, TMH, 2009.
2. C Laudon and Jane P.Laudon, et al: Management Information Systems, Pearson Education, 2009.
3. D P Goyal, Management Information Systems – Managerial Perspective, Macmillan, 3/E, 2010.
4. James A. Obrein: Management Information Systems, TMH, 2009

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BUSINESS FORECASTING

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25003/A	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Forecasting are to:

- To know various business forecasting techniques**.**
- Learn about categories of regression analysis
- To know about logistic regression models
- To study about Moving Average models
- To learn about seasonal models

Course Outcomes:

At the end of the Business Forecasting course the student able to

- Describe business forecasting models.
- Understand Dummy variables and Regression Models.
- Interpret logistic regression models..
- Understand Forecasting Using an ARMA Models.
- Describe characteristics of Conditional Heteroscedastic Models

Unit-I:

Introduction: Business forecasting models**,** Linear Regression, Building a Regression Model, Making inferences using the estimated model, Using the Regression model to make predictions, Errors, Residuals and R-square, Hypothesis testing in a Linear Regression, 'Goodness of Fit' measures (R-square, Adjusted R-square).

Unit-II:

Regression Analysis: Dummy variable Regression (using Categorical variables in a Regression), Multicollinearity in Regression Models, Mean centering of variables in a Regression model, Building confidence bounds for predictions using a Regression model, Interaction effects in a Regression, Transformation of variables

Unit-III:

Logistic Regression: Introduction of Logistic regression, building of logistic regression model. Linear Time Series Analysis and Its Applications: Stationarity, Correlation and Autocorrelation Function, White Noise and Linear Time Series, Simple Autoregressive Models, Properties of AR Models, Identifying AR Models in Practice, Goodness of Fit, Forecasting.

Unit-IV:

Moving Average Models: Simple Moving-Average Models, Forecasting Using MA Models, Simple ARMA Models, Properties of ARMA, Three Model Representations for an ARMA Model.

Unit-V:

Conditional Heteroscedastic Models: Characteristics of Volatility, Structure of a Model, Model Building. Seasonal Models, Seasonal Differencing, Multiplicative Seasonal Models, Regression Models with Time Series Errors, Consistent Covariance Matrix Estimation, Long-Memory Models.

Text Books:

1. Gupta, S.C., Kapoor V. K., Fundamentals of Applied Statistics, Sultan Chand & Sons; 4/e, 2014
2. Len Tashman, Udo Sglavo, Business Forecasting: Practical Problems and Solutions, 2016, Wiley

References:

1. Douglas C Montgomery, Statistical Quality Control: A Modern Introduction, 6/e, Wiley, 2010
2. B. L. Agarwal, Basic Statistics

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INTERNATIONAL BUSINESS

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A25003/B	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of International Business are to:

- To facilitate knowledge on concepts related to International Trade and business
- To create awareness on theories of international trade
- To be aware of factors influencing international business environment
- To provide conceptual knowledge on FDI
- To create awareness on International Financial Institutions

Course outcomes:

At the end of the International Business course student will be able to

- Understand concepts of international trade and business.
- Identify contents of various international trade theories
- Know the factors influencing international business environment
- Appreciate the role of FDI.
- Have an understanding of various financial institutions and their roles.

Unit I:

International Business: An Overview – Evolution of International Business, Drivers of Globalization, Influences of International Business, Stages of Internationalization, Differences between Domestic and International Business, International Business Approaches, Advantages of International Business.

Unit II:

Theories of International Trade: Mercantilism, Theory of absolute cost advantage, Comparative cost advantage theory, Relative factor endowment theory, Country similarity theory, Product life cycle theory.

Unit III:

International Business Environment: Social and Cultural Environment, Technological Environment, Economic Environment, Political Environment .Modes of Entering International Business – Modes of Entry, Exporting, licensing, franchising, contract manufacturing, management contracts, turnkey projects.

Unit IV:

Foreign Direct Investment: Factors Influencing FDI, Reasons for FDI, Costs and Benefits of FDI, Trends in FDI, Foreign Direct Investment in India.

Unit V:

International Financial Institutions and Liquidity: IMF, World Bank, International Development Association, International Liquidity and SDR International Finance Cooperation.

Text Books:

1. Cherunilam Francis, International Business, Text and Cases,6/e ,Prentice-Hall of India Private Limited, 2020.
2. K. Aswathappa, International Business, 7 Edition , Tata McGraw Hill, New Delhi, 2020, 7/e

References :

1. John Daniels, Lee Radebaugh, et al, International Business, Pearson Education, 2018, 16/e
2. James H. Taggart and Michael C. Mcdormitt, The Essentials of International Business, Prentice Hall of India, 2000

SALES AND DISTRIBUTION MANAGEMENT

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25003/C	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course objective:

Course Objectives of Sales and Distribution Management are to:

- TO introduce to the concepts of sales and distribution management
- To various concepts of sales planning and budgeting
- To identify sales force management concepts
- To give a knowledge on distribution channels
- To give channel designing strategies

Course Outcomes:

At the end of the Sales and Distribution Management Course students will be able to

- Explain the concepts of sales and distribution management.
- Know the concepts of sales planning and budgeting
- Describe the process and managing of the sales force
- Evaluate different techniques of sales analytics
- Apply sales force compensation methods effectively in an organization.

Unit I :

Introduction: Evolution of Sales Management, Nature and Importance , Roles, Types and Skills of Sales Managers, Sales Objectives, Strategies and Tactics, Emerging Trends, Linking, Sale and Distribution Management, Buying Decision, Sales Knowledge and Sales Related, Marketing Policies, Sales Process, Transactional and Relationship Selling

Unit II:

Sales Planning and Budgeting: Strategic Planning, Role of Marketing & Sales, Marketing & Personal Selling Strategies, Sales Strategy, Developing Sales Forecast,

Forecasting Approaches, Sales Budget, Defining Sales Territories, Procedures, Assigning Territories, Managing Territories, Sales Quotas.

Unit-III:

Sales Force Management: Concepts of Sales Organization, Types of Sales Organization, Structures, , Sizing and Staffing the Sales Force, Training and Motivating Sales Force, Compensating and Leading Sales Force, Evaluating and Controlling the performance of Sales Force.

Unit-IV:

Distribution Management: Definition, Need for Distribution Management, Need for Distribution Channels, , Relationship of Flows to Service Levels, Channel Levels, Service Channels, Retailer as a Salesman, Trading /Retail Formats, E-Tailing, Wholesale – Functions & Classification, Major Wholesaling decisions.

Unit-V:

Designing Channel Systems: Channel Design Factor, Channel Planning Process, , Training, Motivating & Evaluating Channel members, Channel Design Comparison, Implementation, Vertical Integration, Channel Management, Power & Conflict, Principles of Channel Management.

Textbooks:

1. Krishna K. Havaldar, Vasant M. Cavale) Sales and Distribution Management, McGrawHill, 3/e, 2017
2. Tapan K. Panda and Sunil Sahadev, Sales and Distribution Management, Oxford University Press, 2019

References:

1. Still, Cundiff, Govoni, Sales Management, Pearson, 2017, 6/e,
2. Pingali Venugopal, Sales and Distribution Management- An Integrative Approach, Sage, 2020,2/e

INSURTECH

BBA III Year I Semester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A25004/FT	Core	L	T	P	C	CIE	SEE	Total
		3	0	1	4	40	60	100

Course Objectives

Course Objectives of InsurTech are to:

1. To identify the key emerging technologies are being leveraged by the insurance industry.
2. To provide an overview on the role of technology in insurance.
3. To introduce to InsurTech value chain
4. To know the role of collaborative innovation in InsurTech
5. To provide an understaning of challenges and issures in InsurTech

Course Outcomes

At the end of this InsurTech course, students will be able to:

1. Understand the digital transformations in insurance idustry
2. Appreciate the role of technology as an enabler.
3. Know the value drivers in insurTech
4. Analyze collaborative innovation and its role.
5. Gain awareness of challenges and ethical issues insurTech

UNIT I

Introduction: Introduction to Insurance Technology, Digital transformation in insurance, Changing insurance customer, Problems and challenges of insurance industry.

UNIT II

Insurance and Technology: Technology as an enabler, Integrated insurance products , Evolving insurance options, Trends in insurance.

UNIT III

InsurTech Value Chain: Key value drivers in InsurTech, role of insurance in digital customer experience, Innovation among insurance value chain – Sales and distribution, Underwriting and risk management, claims management, customer service and retention.

UNIT IV

Collaborative innovation – Competition and coopetition , Incumbent and Insurtech collaboration, Business model innovation, Big Data technologies enabling data-driven business models.

UNIT V

Challenges and ethical issues in InsurTech- Challenges and ethical issues in Insurtech- Regulation, Scalability, Security, Systems Integration and Standardization, Ethical Issues. Future of insurance

Text Book

1. Sabine L.B.Vanderlinden, ShanM.Millie, Nicole Anderson, Susanne Chishti, The InsurTech Book, Wiley, 2018.

Reference Books

1. The Internet of Things in insurance: Shaping the right strategy, managing the biggest risks, EY 2016.
2. Insurers need to plug into the Internet of Things – or risk falling behind, McKinsey & Company, 2016.
3. *Maroun Maroud, The Insurance Management Playbook – A Leader's Guide*

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MODERN INVESTING

BBA III Year I Semester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A25005/FT	Elective	L	T	P	C	CIE	SEE	Total
		3	0	1	4	40	60	100

Course Objectives

Course Objectives of Modern Investing are to:

1. To familiarize students on portfolio management and modern investing
2. To create awareness on concepts of crowdfunding, market place lending.

Course Outcomes: after completion of the course students will be able to

1. Understand the risks and benefits of traditional investment
2. Know the challenges of crowdfunding
3. Understand current credit landscape.
4. Identify digital lending processes
5. Know the applications of Fintech

UNIT I

Introduction : Introduction, Portfolio Theory, Mean Variance Optimization, Exchange Traded Funds (ETF) & Mutual Funds, Target Date Funds, Customization.

UNIT II

Crowd Funding: Introduction to crowdfunding, Raising Capital, Looking Back at the JOBS Act, Cost of Crowdfunding, Learning from the Crowd, Impact Investing.

UNIT III

Market Place Lending: Introduction to Marketplace Lending, The Consumer Credit Landscape, Evolution of Peer-to-Peer Lending, Student Loan Debt, Lending to Small Businesses

UNIT IV

Future of the lending system: Introduction to digitalization and future of lending, Lending vs borrowing, Private vs Hard Money lending, SME lending, consumer lending, Online lending, growth of lending.

UNIT V

Challenges and applications: Fintech in business models. Benefits and challenges of Fintech models, Case studies.

Text Book

1. Jamey Stegmaier, A Crowd funder's strategy guide, 2015

Reference Books

1. Susanne Chishti, Janos Barberis , The FinTech Book, 2016

ANURAG UNIVERSITY

INTERNSHIP

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25201	Intern	L	T	P	C	CIE	SEE	Total
		0	0	6	3	100	-	100

Course Objective:

The Objective of this course is to introduce students by allowing them to discuss and solve real business challenges by associating with any enterprise.

Course Outcomes: At the end of the course the students will be able to

1. Demonstrate their ability to apply learned skills and also students push boundaries
2. Propose and explore much needed solutions across disciplines and cultures.
3. Improve the personality and become confident to face the employment process.

Exercise:

1. Apply Business Concepts and Theories to Real-World Decision-Making.
2. Address the Specific Business Disciplines; such as Human Resources Management, Operations Management, Marketing, Accounting, Statistics, Economics, Finance, and Business Law.
3. Observe and Participate in Business Operations and Decision-Making.

FUNDAMENTALS OF ENTREPRENEURSHIP

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A26001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Fundamental of Entrepreneurship are to:

- To explain the concepts of entrepreneurship and the role in economic development
- To create awareness about the entrepreneur mindset and support system.
- To understand business plan development process.
- To enable understanding of the financial aspects of entrepreneurship.
- To impart the knowledge of growth strategies for new venture.

Course Outcomes:

At the end of the Fundamental of Entrepreneurship course students will be able to

- Describe the role of Entrepreneurship in the Economy and the support system.
- Interpret the Entrepreneurial Mindset and the Challenges.
- Design a business plan for a Startup Venture.
- Relate the startup venture and the financial aspects applicable.
- Analyze growth strategies for a new venture.

Unit I:

Introduction to Entrepreneurship: Meaning and Concept of Entrepreneurship, the History of Entrepreneurship Development, Role of Entrepreneurship in Economic Development, Agencies in Entrepreneurship Management, Emerging issues in Entrepreneurship.

Unit II:

The Entrepreneur: Skills required to be an Entrepreneur, Entrepreneurial Stress Entrepreneurial Motivation, Entrepreneurial Decision Process, and Role models, Mentors and Support System.

Unit III:

Business Opportunity Identification and Business Plan: Business Ideas, Methods of Generating Ideas, and Opportunity Recognition, Meaning and Significance of a Business Plan, Components of a Business Plan, and Feasibility Study.

Unit IV:

Financing the New Venture*:* Importance of New Venture Financing, Types of Ownership, Securities, Venture Capital, Types of Debt Securities, Determining Ideal Debt-Equity Mix, and Financial Institutions and Banks.

Unit V:

Launching the New Venture and Growth: Choosing the Legal form of New Venture, Protection of Intellectual Property, Marketing the New Venture, Characteristics of High Growth New Ventures, Strategies for Growth, and Building the New Venture Capital, Exit Strategies for Entrepreneurs, Bankruptcy, and Succession and Harvesting Strategy.

Text books:

1. D.F. Kuratko and T.V.Rao, Entrepreneurship-A South Asian Perspective, Cengage Learning,2012.
2. Hisrich, Peters ,Sheperd, Entrepreneurship, Mc.Graw Hill, 11/e, 2020.

References:

1. Vasant Desai, Entrepreneurship Development, Himalayan Publishing House, 2019.
2. Nandan H, Fundamentals of Entrepreneurship, PHI, 2013

BLOCKCHAIN APPLICATIONS

School of Management		III BBA II Semester						
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A26002/A	Elective	L	T	P	C	CIE	SEE	Total
		2	1	2	4	40	60	100

Course Objectives

The course objectives of Block Chain Applications course are to

- Introduce students to Blockchain technology
- Latest financial concepts of Bit Coin, Etherium and Hyper ledger.

Course Outcomes:

After the completion of Block Chain Applications course, student will be able to

- Understand and explore the working of Block chain technology.
- Analyze the working of Smart Contracts.
- Understand and analyze the working of Hyper ledger.
- Apply the learning of solidity and de-centralized apps on Ethereum .

UNIT I

Introduction of Cryptography and Blockchain: Meaning of Block chain, Block chain Technology Mechanisms & Networks, Block chain Origins, Objective of Block chain, Block chain Challenges, Transactions And Blocks, P2P Systems, Keys As Identity, Digital Signatures, Hashing, and public key cryptosystems, private vs. public Block chain.

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UNIT II

What is Bitcoin, The Bitcoin Network, The Bitcoin Mining Process, Mining Developments, Bitcoin Wallets, Decentralization and Hard Forks, Ethereum Virtual Machine (EVM), Merkle Tree, Double-Spend Problem, Blockchain And Digital Currency, Transactional Blocks, Impact Of Blockchain Technology On Cryptocurrency.

UNIT III

Introduction to Ethereum:

What is Ethereum, Introduction to Ethereum, Consensus Mechanisms, Smart Contracts Metamask Setup, Ethereum Accounts, Receiving Ether's, Transaction.

UNIT IV

Introduction to Hyperledger: Hyperledger, Distributed Ledger Technology & its Challenges, Hyperledger & Distributed Ledger Technology, Hyperledger Fabric, Hyperledger Composer.

UNIT V

Unit V:Block chain Applications:

Internet of Things, Medical Record Management System, Domain Name Service and Future of Blockchain, Alt Coins.

Text Book

1. Joseph J Bambara ,Block chain technology : A practical guide to developing Business Law and technology solutions, Mc Graw Hill
2. Herbert Jones ,Cryptocurrencies: An Essential Beginner's Guide to Blockchain Technology, Cryptocurrency Investing, Mastering Bitcoin Basics Including Mining, .

Reference Books

1. Drescher, Blockchain Basics. Apress, 2017.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University

CYBER LAWS

School of Management					III BBA II Semester			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A26002/B	Elective	L	T	P	C	CIE	SEE	Total
		3	0	1	4	40	60	100

Course Objectives

Course Objectives of Cybler Laws are to:

- To give introduction and fundamentals of Cyber law, cyber crimes and legal issues
- To provide knowledge on concepts of IPR
- To provide insights on e-commerce and cyber laws
- To give a conceptual idea on e-governance

Course Outcomes:

After completion of Cyber Laws course students will be able to

- Understand fundamentals of Cyber law
- Have knowledge on issues of cyber crimes and legal issues
- Identify the IPR issues in Cyber law.
- Aware of Cyber laws in e-commerce
- Have an awareness of concepts of e-governance

UNIT I

Introduction to Cyber Laws: Introduction to Cyber Laws, Need, Development, Web Technology, National and International Perspective of Cyber Laws, Issues and challenges, Cyber Security.

UNIT II

Cyber Crime: Jurisdiction issues in Transactional Crimes, Budapest Convention on Cybercrime. Hacking and Legal Issues, Privacy..

UNIT III

Cyber Law and IPR: Understanding Copyright in Information Technology, Software Copyrights Copyright in Internet & Multimedia, Software Piracy, Trademarks in Internet Net Neutrality, Databases in IT, Protection of databases.

UNIT IV

E-Commerce: Legal Aspects of E-Commerce, E-Taxation, E-Banking, Online Publishing and online credit card payment, Non-Disclosure Agreements.

UNIT V

Electronic Governance: Information Technology Act 2000, Electronic Governance, Electronic Evidence, Digital Signatures, Regulations Appellate Tribunal, Internet Service Providers and their liabilities, Social Networking Sites.

Text Book

1. Kamath Nandan, Law Relating to Computer, Internet and E-Commerce, 5th edition, Universal Law Publishing, 2016
2. Gerald R. Ferrera, Reder et.al, CyberLaw Text & Cases, 3rd Edition, Cengage Learning,2012

Reference Books

1. Faroug Ahmed, Cyber Law in India, Allahabad Law Agency, 2017

INTERNATIONAL FINANCE

School of Management					III BBA II Semester			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A26002/C	Elective	L	T	P	C	CIE	SEE	Total
		3	0	1	4	40	60	100

Course Objectives

Course Objectives of International Finance are to:

- To provide insights on scope of International finance
- Give awareness on International foreign exchange systems and portfolio management.
- Familiarize with concepts of financial instruments and project appraisal.

Course Outcomes:

After completion of Cyber Laws course students will be able to

- Identify the Operational aspects of international markets.
- Describe characteristics of foreign exchange system.
- Understand international portfolio management.
- Identify derivative instruments and strategies used by multinational corporations to hedge financial risks.
- Apply capital budgeting techniques.

UNIT I

International Finance Relationships: Importance and scope of International Finance, Globalization of the World Economy, Challenges. Balance of Payments: Accounting Principles, Components, Balance of Payment Evolution of International Monetary Systems

UNIT II

International Foreign Exchange Systems: Exchange Rates and Markets, Foreign Bank Note Market, Spot Foreign Exchange Market, Exchange Rate Quotations, spread, Factors Affecting Exchange Rates, Structure of Foreign Exchange Markets, Arbitrage,

Forward Quotations (Annualized Forward Margin). International Foreign Exchange Markets,

UNIT III

International Portfolio Management: Introduction to Euro Currency Market, Euro Bond Market, Competitive Advantages of Euro Banks, Control & Regulation of Euro Bond Market, Currency Hedging Foreign Bonds. International Equity Markets & Investments International Equity Market Benchmarks, Risk & Return from Foreign Equity Investments, Equity Financing in the International Markets.

UNIT IV

International Financial Instruments: Introduction to Currency Futures, Futures Contracts, Markets & the Trading Process, Hedging & Speculation with Interest Rate Futures. Currency Options, (Option on Spot, Futures & Futures Style Options), Other Currency derivatives: Currency swaps and their use.

UNIT V

International Project Appraisal: International Capital Budgeting Decisions, Incremental Cash Flows, Cash Flows at Subsidiary and Parent Company, Capital Budgeting Techniques, NPV, International Tax Environment. International Project Appraisal: Review of Net Present Value Approach (NPV), Option Approach to Project Appraisal.

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Text Book

1. Alan C Shapiro, Multinational Financial Management,9/e, Wiley India, 2012
2. Maurice D Levi, International Finance,3/e, Routledge, 2009
3. Sugata Ray, Principles of Quantitative Equity Investing: A Complete Guide to Creating, Evaluating, and Implementing Trading Strategies 1/e, FT Press- June 28, 2015.

Reference Books

1. P G Apte, International Financial Management, 2/e,McGraw Hill Education, July 2017
2. Eun&Resnick, International Finance Management,7/e, Tata McGraw Hill Education, Publication, July 2017.
3. Jeff Madura, International Finance Management, 7/e,Thomson Publication, January 2015.

FINANCIAL MARKETS AND SERVICES

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A26003/FT	Core	L	T	P	C	CIE	SEE	Total
		3	0	1	4	40	60	100

Course Objectives:

Course objectives of Finanical Markets and Services are to

- Familiarize with the structure of financial systems and instruments
- Introduce to the regulatory frame work of financial services
- Create awarenesson Venture Capital, credit rating and mutual funds.

Course Outcomes:

At the end of the Financial Markets and Services course, student will be able to

- Understand the structure of financial systems
- Aware of the financial services and regulatory framework
- Identify the venture capital financing patterns
- Recognize Credit Rating agencies and functions
- Analyze the functions of mutual funds

UNIT I

Structure of Financial System – Role of Financial System in Economic Development, Financial Markets and Financial Instruments – Money Markets, Bond Markets, Mortgage Markets, Stock Markets, Foreign Exchange Markets, Derivative Securities Markets, Role of SEBI.

UNIT II

Financial Services: Introduction, Regulatory Frame Work of Financial Services, Merchant Banking, Types, Regulation of Merchant Banking in India. Wealth Management System

UNIT III

Venture Capital: Growth of Venture Capital in India, Financing Patterns, Legal Aspects, Leasing. Hire Purchase Vs. Leasing

UNIT IV

Credit Rating – Meaning, Functions, Debt Rating System of CRISIL, ICRA and CARE. Factoring, Forfeiting and Bill Discounting, Types of Factoring Arrangements

UNIT V

Mutual Funds –Functions, Portfolio Classification, Organization and Management, Debt Securitization, Demat Services, Role of NSDL and CSDL. NAV calculation.

Text Book

1. Bhole&Mahakud, Financial Institutions and Market, TMH, New Delhi
2. V.A.Avadhani, Marketing of Financial Services, Himalayas Publishers, Mumbai

Reference Books

1. DK Murthy, ad Venugopal, Indian Financial System, IK Int Pub House
2. Anthony Saunders and MM Cornett, Fin Markets &Institutions,TMH, New Delhi

PROJECT

School of Management					III BBA II Semester			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A26201	Project	L	T	P	C	CIE	SEE	Total
		0	0	20	10	50	50	100

Course Objectives

2. Aim: The aim of multi stage evaluation is to enable students to do original work on their own so that they can get the benefit in terms of gaining practical knowledge and possible employment

The following is the suggested checklist for the project.

Brief Introduction, Review of Literature, Research Gaps, Research Questions, Objectives of the Study, Hypothesis, Scope of the Study, Period of the Study, Data collectionLiterature Review and Data Analysis and Interpretations, Findings, Suggestions and Conclusion, Appendices.

An internal evaluation will be conducted through progress review seminar by the students.

A Viva Voce will be conducted by the external examiner after completion of the Project and submission of Project report.

COMPREHENSIVE VIVA-VOCE

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A26202	Viva	L	T	P	C	CIE	SEE	Total
		0	0	0	2	100	-	100

A comprehensive viva voce will be conducted at the end of the semester covering all courses.

Program Structure & Syllabus of

BBA II & III Year

(SUPPLY CHAIN MANAGEMENT)

School of Management

R21 Regulations

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.), Hyderabad, Telangana, INDIA

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II BBA I Semester (5L+5T+1 Mini Project)

Sl. No	Code	Category	Course Name	Hours per week			Credits
				L	T	P	
1	A23001	Core	Business Research	3	1	0	4
2	A23002	Core	Business Analytics	3	1	0	4
3	A23003	Core	Organizational Behavior	3	1	0	4
4	A23004	General Elective	D. Business Statistics-II E. Tax Management F. Innovation & Technology Management	3	1	0	4
5	A23005/SCM	Elective	Warehouse Management	3	1	0	4
6	A23201	SEC	Mini Project and Report Writing	0	0	4	2
Total				15	5	4	22

II BBA II Semester (4L+4T+1P+Seminar)

Sl. No	Code	Category	Course Name	Hours per week			Credits
				L	T	P	
1	A24001	Core	Business Law & Environment	3	1	0	4
2	A24002	Core	Production & Operations Management	3	1	0	4
3	A24003	Core	Project Management	3	1	0	4
4	A24004/SCM	Elective	Supply Chain Management	3	1	0	4
5	A24201	SEC	Data Analysis and Visualization	0	0	4	2
6	A24202	SEC	Business Plan Preparation Seminar	0	0	6	3
Total				9	4	10	21

III BBA I Semester (5L+5T+1 Internship)

Sl. No	Code	Category	Course Name	Hours per week			Credits
				L	T	P	
1	A25001	Core	E-Commerce	3	1	0	4
2	A25002	Core	Management Information System	3	1	0	4
3	A25003	General Elective	D. Business Forecasting E. International Business F. Sales & Distribution Management	3	1	0	4
4	A25004/SCM	DSE	Supply Chain Logistics	3	1	0	4
5	A25005/SCM	DSE	Supply Chain Operations	3	1	0	4
6	A25201	Intern	Internship	0	0	4	3
			Total	15	4	4	23

III BBA II Semester (3L+3T+1 Project +1Viva)

Sl. No	Code	Category	Course Name	Hours per week			Credits
				L	T	P	
1	A26001	Core	Fundamentals of Entrepreneurship	3	1	0	4
2	A26002/SCM	DSE	A. Supply Chain Analytics B. SCM Strategy C. Supply Chain Principles	3	1	0	4
3	A26003/SCM	DSE	Customer Analytics	3	1	0	4
4	A26201	Project	Project	0	0	20	10
5	A26202	Viva	Comprehensive Viva-Voce	0	0	0	2
			Total	9	3	20	24

ANURAG UNIVERSITY

Summary of Courses with Credits for BBA

S.No.	Course Type	No of Courses	Credits Per Course	Credits
1	**Ability Enhancement Courses (AECC)** **(**Human Values of Professional Ethics, Gender sensitization)	2	0	0
2	**Skill Enhancement Courses (SEC)** (Productive Tools-lab, QALR, Mini Project and Report Writing, Business Plan Preparation Seminar, Data Analysis and Visualization)	5	4*2 1*3	11
3	**Language Courses (LC)** **(**English for Empowerment, English Language Skills lab, The Power of Data Storytelling, Art of Articulation Lab	4	2*3 2*1	8
4	**Core Courses (CC)**	17	4	68
5	**Discipline Specific Electives (DSE)**	6	4	24
6	**Generic Electives (GE)**	2	4	8
7	**Project (PROJ)**	1	10	10
8	**Comprehensive Viva-voce**	1	2	2
9	**Internship**	1	3	3
		39		**134**

BUSINESS RESEARCH

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Research are to:

- Familiarize students with the concepts of research, types and design
- Familiarize students with various data analysis tools and techniques
- Enable students conduct research and prepare a basic research report

Course Outcomes:

At the end of this Business Research course, students will be able to:

- Demonstrate an understanding of need for research and research process.
- Develop a understanding of sampling and types of samples
- Apply relevant scaling techniques in preparation of questionnaires.
- Have an understanding of various data analysis techniques of research
- Prepare a basic research report

Unit I:

Nature and Scope of Business Research: Role of business research in decision making. The Research process, Management decision problem Vs. Business Research objective, Exploratory, Descriptive, Causal research.

Unit II:

Sampling and Data Collection Methods : Population, Sampling, Sampling errors, Probability and non-probability sampling types. Types of data, Secondary Data, Primary Data, Methods of Data collection for qualitative and quantitative research.

Unit III:

Measurement & Scaling: Primary scales of Measurement - Nominal, Ordinal, Interval & Ratio. Scaling techniques, Likert Scale. Questionnaire design – Types of questions, Content, Wording and Placement.

Unit IV:

Data Analysis: Data preparation, Descriptive statistics, Inferential statistics, Parametric and Non- Parametric tests. Introduction Factor Analysis and Discriminant Analysis.

Unit V:

Research Report Writing: Introduction, Types of research reports, Elements of research report, Referencing.

Textbooks:

1. Donald R. Cooper & Pamela S. Schindler, Business Research Methods, McGraw-Hill Education, India, 2016.
2. C. R. Kothari & Gaurav Garg, Research Methodology: Methods and Techniques, 4th edn, New age International Publishers, 2019.

References:

1. Deepak Chawla and Neena Sondhi, Research Methodology: Concepts and Cases, Vikas Publishing House, India, 2012
2. Bryman A, Business Research Methods, 3rd Edition, Oxford Press, 2011
3. Das Satya Bhushan & Malhotra Naresh K, Marketing Research: An applied Orientation, 7th edn, revised, Pearson India, 2019.

Journals:

1. Business Research
2. Experimental Business Research
3. Business Research Projects

BUSINESS ANALYTICS

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23002	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objective:

Course Objectives of Business Analytics are to:

- To help students recognize and understand the applications of business analytics
- To familiarize about concepts of descriptive and predictive analytics
- To help student develop an analytical approach to business decision making

Course Outcome: At the end of this course the students will be able to

At the end of this Business Analytics course, students will be able to:

- Recognize the role of Analytics in business
- Identify and apply descriptive statistical measures for analysis
- Apply basic Statistical inferences for data.
- Understand Data Mining scope and applications
- Develop decision making skill under uncertainty

Unit - I:

Introduction to Data Analytics: Introduction to Business Analytics, Components of Business Analytics, Modeling stages, Population, Samples, Data Set, Variables and Observations, Types of Data, Data Visualization tools.

Unit - II:

Descriptive Statistical Measures: Descriptive measures for categorical variables, Numerical variables, Relationships among variables. Probability and Probability distributions.

Unit - III:

Statistical Inference: Sampling and sampling distributions, Hypothesis testing, Karl Pearson Correlation Techniques. Simple and Multiple Regression. Regression by the method of least squares, Regression with categorical independent variables .

Unit - IV:

Data Mining: Scope of Data Mining, Data Exploration and Reduction, Unsupervised learning – cluster analysis, Association rules, Supervised learning- Partition Data, Classification Accuracy, prediction Accuracy, k-nearest neighbors, Classification and Regression trees, Logistics Regression.

Unit - V:

Simulation: Random Number Generation, Monte Carlo Simulation, What if Analysis, Verification and Validation, Advantages and Disadvantages of Simulation, Risk Analysis, Decision Tree Analysis.

Text Books:

1. James Evans, Business Analytics, Pearson, 2017,2/e.
2. Albright, Winston, Business Analytics – Data Analysis and Decision Making, Cengage Learning, 2015, 5/e.
3. Camm, Cochran, Fry, Ohlmann, Anderson, Sweeney, Williams Essential of Business Analytics, Cengage Learning.

References:

1. Thomas Eri, Wajid Khattack & Paul Buhler : Big Data Fundamentals, Concepts, drivers and Techniques by Prentice Hall of India, New Delhi, 2015.
2. Akil Maheswari: Big Data, Upskill ahead by Tata McGraw Hill, New Delhi, 2016.
3. Seema Acharya & Subhashini Chellappan: Big Data and Analytics, Wiley Publications, New Delhi, 2015.

Journals:

1. International Journal of Data science and Analytics.
2. International Journal of Data Science (IJDS).
3. International Journal of Data Analytics (IJDA).

ORGANIZATIONAL BEHAVIOR

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23003	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Organizational Behaviour are to:

- To familiarize to the organizational environment and behaviour.
- To help students understand influence of individual and group behaviours on organizational behaviour.
- To identify role of culture in OB.

Course Outcomes: At the end of the course students will be able to

At the end of this Organizational Behaviour course, students will be able to:

- Identify the relevance of various theories to understand organizational behaviour
- Assess the influence of different persnalities on organizational behaviour.
- Demonstrate an understanding of motivation and attitude
- Display understanding of interdependencies in groups and organization.
- Appreciate need for strong organizational culture and need for change.

Unit-1:

Introduction to OB: Organizational Behavior – Nature and Scope of OB, Significance of OB, Organizational Behavior and its significance in other Disciplines, Contribution of Hawthorne studies to OB, Theories of Organizational Behavior, Challenges and Opportunities.

Unit-II:

Foundations of Individual Behavior: Personality, Personality Determinants, Personality Traits, The Big Five Model, Theories of Personality. Values – Types of Values. Perception- Perceptual Process, Perception and Individual Decision- making.

Unit-III:

Motivation and Learning: Theories of Motivation, Hierarchy Needs Theory, Two-Factor Theory, Expectancy Theory. Attitudes -Types of Attitudes, Attitudes and Consistency, Cognitive Dissonance Theory. Learning- Theories of Learning.

Unit-IV:

Foundations of Group Behavior: Groups – Nature, Types, Stages of Groups, Group decision making. Leadership - Theories of leadership. Conflict Management- Conflict process, Conflict Management, Stress – Causes and Consequences of Stress, Stress Management.

Unit-V:

Organizational Culture and Change Management Nature of Culture, Creating and Sustaining Organizational Culture. Change - Forces for Change, factors affecting resistance to Change, approaches to manage change – Lewin's Model, Kotter's Plan for Implementing Change. Organizational Development.

Text book:

1. Robbins, Stephen, Timothy, A & Vohra, N. "Organizational Behavior",Pearson Education, 14/e, 2012.

References:

1. Mc Shane & Von Glinow, "Organizational Behavior", 7/e. Mc Graw Hill Publications, New Delhi, 2014.
2. Fred Luthans, Organizational Behaviour, 12/e, Prentice Hall, 2011.
3. Jerald Greenberg & Robert A Baron, Behavior in Organizations, 9/e, Printice Hall India, 2010.
4. Quick, Nelson & Khandelwal, Organizational Behavior – A South-Asian Perspective, 7/e, Cengage Learning, 2013.

Journals:

1. International Journal of Human Resource Management: Cambridge University Press.
2. The International Journal of Management Education.
3. Asian Journal of Management –Quarterly

BUSINESS STATISTICS-II

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23004/A	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Statistics -II are to:

- To enable student to understand in detail about the application of probability, estimation and hypothesis testing.
- To familiarize with the concepts of Statistical Quality Control and Control Charts.

Course Outcomes:

At the end of this Business Statistics -II course, students will be able to:

- Know the applications of Probability in business.
- Understand concept of estimation and Testing of Hypothesis of few unknown statistical parameters.
- Interpret statistical test results of small sample tests and large sample tests.
- Know types of Statistical Quality Control
- Recognize and interpret control charts for attributes.

Unit-I:

Probability: Basic concepts of Probability, Deterministic and random experiments, Basic Terminology of Probability, Mathematical, Statistical and Axiomatic definitions of probability, their merits and demerits. Conditional Probability and independence of events, Addition and Multiplication theorems for two events. Bayes' theorem and it's applications.

Unit-II:

Estimation: Concept of Point Estimation**,** Interval Estimation, Maximum Error and Confidence Interval Examples.
Testing of Hypothesis: Null Hypothesis and Alternative Hypothesis, Critical Region, Critical Value, Type-I and Type-II errors, Level of Significant, One Tailed and Two Tailed Test.

Unit-III:

Small Sample Tests: t-test for Single Mean, Difference between Two Means (unpaired) and Paired t-test, F - test for equality of population variances, Chi-Square test for Independence of Attributes.
Large Sample Tests: Test for Single Mean, Difference between Two Means, Test for Single Proportion, Difference between two Proportions

Unit-IV:

Statistical Quality Control: Importance of SQC in industry. Dimensions of quality, Statistical basis of Shewart control charts. Construction of control charts for variables (mean, range and standard deviation) and attributes (p, np with fixed and varying sample sizes) and their Interpretation.

Unit-V:

Control Charts: Control charts for attributes (C and U charts with fixed and varying sample sizes) and their Interpretation. Construction of control charts for Natural tolerance limits and specification limits, process capability index and modified control charts.

Text Books:

1. J.K Sharma (2013), Business statistics, New Delhi: Pearson Education.
2. Gupta SC: “Fundamental of Statistics” 6th Ed, Himalaya Publishers House, 2004.
3. D.C. Montgomary: Introduction to Statistical Quality Control. Wiley

Reference Books:

1. S.C. Gupta & Indra Gupta (2012), Business Statistics, Hyderabad:Himalaya Publishing House.
2. S.P. Gupta :” Statistical methods” , Sultan Chand & Sons, New Delhi.
3. Parimal Mukhopadhyay : Applied Statistics . New Central Book agency
4. R.C.Gupta: Statistical Quality Control.

TAX MANAGEMENT

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23004/B	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Tax Management are to:

- To familiarize with the basic concepts of income tax for individual and managers..
- To create an awareness on Tax planning with reference to New Industrial Establishment and Investment.
- To give an overview of tax incentives and GST.

Course Outcomes: At the end of the course students will be able to

At the end of this Tax Management course, students will be able to:

- Know on Income tax basics and direct taxes.
  Understand individual tax planning features.

- Identify role of tax planning will help in managerial decisions.
- Have basic knowledge of tax planning in New Industrial Establishment and investments.
- Have Aware of tax planning concepts in exports and the GST.

Unit-I:

Introduction to Direct Taxes: Features of Direct Taxes - Types of Direct Taxes. Overview of Income Tax Act 1961, Basic Concepts: Person – Assessee - Previous Year and Exceptions, Assessment Year Income, Gross Total Income, Taxable Total Income, Residential Status, Incidence of Tax, Permanent Account Number (PAN), Tax Account Number (TAN) . Income Tax Authorities - Functions.

Unit-II:

Tax Planning Individuals: Planning with reference to all five heads of Income for individuals: Salaries, House property, Profits from Business & Profession, Capital gains and Other Sources. Tax Planning with reference to Relief, Concessions, Rebates, Deductions and Incentives.

Unit-III:

Tax Planning for Managerial Decisions: Tax considerations arising with regard to specific management decisions: Make/buy, Own/lease, Installment/hire purchase, Retain/replace, Export/local sale, Shut down/continue, Expand or Contract, Merger and Amalgamations. Advance Tax, Payment of Advance Tax , Filing of Returns, Refunds, Penalties for non-compliance.

Unit-IV:

Tax Planning-New Industrial Establishments & Investments: Tax planning with reference to New Industrial Establishment, Location, Form, Nature and Capital Structure, Short term loans, Term loans, Public Deposits, Bonus Issues, Dividend Policies.

Unit-V:

Tax Planning – Incentives: Schemes for encouraging exports - Salient features of Software Technology Park (STP), Electronic Hardware Technology Park (EHTP) - Other export promotion schemes under EXIM policy. Overview of Goods and Service Tax (GST).

Text Books:

1. Vinod K. Singhania: - Indirect Tax Laws, Taxmann Publications.
2. Madhukar N Hiregange: Goods and Services Tax, Wolters Kluwer.

References:

1. Mahesh Chandra &Shukla, D.C. Income Tax Law & Practice Pragati Publications.
2. Singhania, V.K .Student Guide to Income Tax. (University ed.). Taxmann Publications Pvt. Ltd.
3. Bhagawati Prasad: Direct Tax Laws and Practice.

Journals:

1. International Journal of Accounting and Taxation.
2. Journal of International Accounting, Auditing and Taxation.

INNOVATION AND TECHNOLOGY MANAGEMENT

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23004/C	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Innovation and Technology Management are to:

- To provide an exposure to the needs of technology innovation and creativity.
- To give an overview of various issues connected with Management of Technology in Organizations.
- To appreciate the role of technology in gaining competitive advantage
- To be aware of concepts of technology identification, technology forecasting.
- To enable the role technology diffusion and technology absorption in development.

Course Outcomes:

At the end of Innovation and Technology Management course students will be able to

- Interpret the relationships between technology and Innovation in organization.
- Analyze the impact of technology on business
- Know the process of product Development and linkage between technology Development and Competition.
- Analyze the necessity of technology Forecasting and common mistakes of forecasting.
- Understand the various challenges faced by Technology Diffusion and absorption.
-

Unit I:

Innovation Technology: Introduction, Innovation Technology Relationship, Types of Innovation, Innovation and Changes in Organization, Technology based innovation and Management, Innovation performance, factors, principles, measures, characteristics of Innovative Work Environment**.**

Unit II:

Introduction to Technology Management: Concept and Meaning of Technology, Evolution and Growth of Technology, Role and significance of management of technology, Impact of technology on society and business, Forms of Technology- Process Technology and Product Technology.

Unit III:

Competitive Advantage through New Technologies: Product development stages, linkage between technology development and competition. Managing research and development (R&D), Managing intellectual property.

Unit IV:

Technological Forecasting: Technology Forecasting, Need and role, technology forecasting approaches, technological forecasting methods, and common mistakes in forecasting.

Unit V:

Technology Diffusion and Absorption: Technology Adoption, Technology Diffusion, role and perspectives of innovation diffusion process, technology diffusion curve, technology absorption, benefits of technology absorption, constraints. Issues involved in the management of technology absorption. Government initiatives for technology absorption. Technology life cycle.

Text Books:

1. Rohtagi P K, Rohtagi K and Bowonder B: Technological Forecasting, Tata McGraw Hill,
2. Tarek Khalil:, Management of Technology, McGraw Hill International, 2009.
3. John Ziman, Technological Innovation as an Evolutionary Process, Cambridge University Press, Cambridge, 2000.
4. Dr.Urvashi Makkar, Soni Sharma, Prachi Agarwal Innovation, Technology and Development: A Road Map for Achieving Global Competitiveness, January 2017

References

1. Dasgupta. S: Technology and Creativity & Creativity, Oxford University Press, New York,1996.
2. Proctor. T: The Essence of Management Creativity, Prentice - Hall, New Delhi, 1997.
3. Richards. T: Creativity and Problem Solving Network, Gower, Hampshire, 1997.
4. Ceserani. J & Greatwood. P: Innovation & Creativity, Kogan Page, London, 1995.

Journals:

1. International Journal of Innovation and Management.(Quarterly)
2. International Journal of Technology Management. (Quarterly)

WAREHOUSE MANAGEMENT

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A23005/SCM	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Warehouse Management are to:

- Familiarize students with the concepts of warehouse management
- To create a foundation on retail warehousing concepts, operations strategy.
- To give inputs on strategic aspects of warehousing and inventory controls.

Course Outcomes:

At the end of the Warehouse Management Course students will be able to

- Have knowledge of the concepts of the need, functions of warehousing.
- Have an awareness of types of warehouses
- Be aware of strategic aspects of warehousing in retail
- Understand inventory and control concepts
- Apply the ICT applications in warehousing operations.

Unit I:

Supply Chain and Warehousing: Introduction, Evolution of warehousing, Role and types of warehouse, Supply chain impact on warehousing, Role of a warehouse manager, Functions of Warehouses, Types of Warehouses. Warehousing Cost, Warehousing Strategies, Warehousing Management Systems (WMS).

Unit II:

Warehouse Processes - Receiving and Put-away, Pick preparation, Picking strategies, Order picking methods.

Unit III:

Replenishment to dispatch - Replensihment, Value adding services, stock management, dispatch. Warehouse management systems – Choice, process, selection and implementation, software as a service.

Unit IV:

Warehouse layout and Storage: Data collection and analysis, Space calculations, Aisle width, Other space. Storage equipment, options, warehouse handling equipment. Resourcing a warehouse.

Unit V:

Warehouse Costs: Types of warehouse costs, logistics charging methods. Performance management. Outsourcing. Warehouse of the future.

Text Books:

1. Gwynne Richards, Warehouse Management: A Complete Guide to Improving Efficiency and Minimizing Costs in the Modern Warehouse, Kogan, 2017, 3/e,
2. Stuart Emmett, Excellence in Warehouse Management: How to Minimise Costs and Maximise Value, Wiley, 2005.

References:

1. Edward Frazelle, World-Class Warehousing and Material Handling, Second Edition, 2016, McGraw-Hill Education
2. Philip M. Price, N. J. Harrison, Warehouse Management and Inventory Control, Access Education, 2015,2/e.
3. Edward Frazelle World-Class Warehousing and Material Handling, McGraw-Hill Education, 2016,2/e.

MINI PROJECT & REPORT WRITING

Aim: The aim of Mini projects is to enable students to generate ideas or identify the

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A23201	SEC	L	T	P	C	CIE	SEE	Total
		0	0	4	2	100	-	100

problem/issues by understanding the remote, non-remote areas or surrounding of their society and apply their practical knowledge and provide the solutions.

The Contents of the Community Project Report are:

● Topic of the Project

● Chapter I

Brief Introduction Review of Literature Research Gaps Research Questions

Objectives of the Study

Scope of the Study

Period of the Study

Sample Data Collection Primary Data Secondary Data ●

Chapter II

Data Interpretation, Suggestions Conclusion References to be enclosed

ANURAG UNIVERSITY

BUSINESS LAW AND ENVIRONMENT

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Law and Environment are to:

- To provide awareness on fundamental concepts of business law and Indian Contract.
- To familiarize with Acts and Laws essential for business managers role.

Course Outcomes:

At the end of the Business Law and Environment Course students will be able to

- Identify essential elements of a contract.
- Describe key point of Sale of Goods Act and Negotiable instruments Acts
- Interpret concepts of Law of Agency
- Have awareness of formation of company and MoA.
- Gain insights about laws related to consumer protection.

Unit I:

Indian Contract Act: Meaning and kinds of Contract – Essentials of a Contract, Offer and Acceptance, Free Consent, Capacity of the Parties, Lawful Consideration, Legality of Object, Performance of Contract, Discharge of Contract, Quasi Contract

Unit II:

Sale of Goods Act: Sale and Agreement to Sell, Conditions and Warranties, Transfer of Property, Rights of Unpaid Seller.

Negotiable Instruments Act: Meaning of Negotiable Instruments, Type of Negotiable Instruments, Promissory Note, Bill of Exchange, Cheque.

Unit III:

Law of Agency: Definition, Kinds of Agents, Creation of Agency, Rights and Duties of Agent and Principal, Termination of Agency.

Unit IV:

Company Law: Definition and Kinds of Companies, Formation and Advantages of Incorporation of a Company, Memorandum of Association, Articles of Association, Promoter, Prospectus, Winding up of a Company.

Unit V:

Consumer Protection and Cyber law: Rights of Consumers, Consumer Protection Councils, Redressal Machinery, Cyber Law, Intellectual Property Law-Copyright, Patent, Trademark, Trade Secret

Text Books:

1. Gulshan S.S, Business Law, New Delhi, Excel Books, 2012
2. Balachandran V., Legal Aspects of Business, Tata McGraw Hill, 2012
3. N.D.Kapoor, Mercantile Law, Sultan Chand & Sons, 2006

References :

1. Avatar Singh, Principles of Mercantile Law, Lucknow: Eastern Book Company, 2011
2. Pathak, Legal Aspects of Business, Tata Mcgraw- Hill Publishing Company Limited, New Delhi, 2010.
3. P. P. S. Gogna, Mercantile Law, S. Chand & Co. Ltd., India, 4/e, 2008
4. Ravinder Kumar, Legal Aspect of Business, Cengage Learning, 2/e,2011.
5. Maheswari & Maheswari, Mercantile Law, Himalaya Publishing House, Mumbai
6. Rudder dutt & Sundaram, Indian Economy, Vikas Publishing House, New Delhi.

ANURAG UNIVERSITY

PRODUCTION AND OPERATIONS MANAGEMENT

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24002	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Production and Operations Management are to:

- Provide awareness on fundamentals of operations management
- Familiarize with concepts of capacity planning and inventory management.
- To develop an awareness of the supply chain management and quality management concepts.

Course Outcomes:

At the end of the Production and Operations Management course students will be able to

- Describe the process and factors influencing the operations management.
- Understand capacity planning and facility layout in the organization
- Understand applications of inventory management techniques
- Identify techniques of supply chain planning
- Explain quality control techniques and standards to reduce quality errors

Unit I:

Operations Management: Operations as a source of competitive advantage; Trade-offs and combinations, Process Analysis, Difference between Manufacturing and Service Operations, Product Process Matrix.

Unit -II

Capacity planning: Process Selection and Facility layout, designing product and process layouts and line balancing, Forecasting and types of forecasting.

Unit -III

Inventory Management: Deterministic demand model, EOQ, ABC, Continuous and Periodic review Inventory models.

Unit -IV

Supply chain management; Lean vs Agile supply chains; Aggregate Production Planning; Master Production Schedule and MRP, Project Management.

Unit -V

Quality Management: Quality Assurance, Inspection and Quality Control, Acceptance Sampling, Total Quality Management and ISO 9000 Series Standards, Six Sigma.

Text Books:

1. Nigel Slack, Alistair Brandon-Jones.Operations management, Pearson Education, 9/e, 2019.
2. Panneerselvam ,Production and Operations Managementǁ PHI, 2012
3. S.N.Chary, Production and Operations Mangement, 2019, 6/e.

References:

1. Danny Samson, Operations Management: Integrated Approach, Cambridge, 2012.
2. Kenneth K. Boyer, Rohit Verma, Operations Management, Cengage Learning, 2011.
3. Dipak Kumar Bhattacharyya, Production and Operations Management, Universities Press, 2012.
4. Prof. L.C. Jhamb, Production Operations Management, x, Everest Publishing House,18/e 2013.

PROJECT MANAGEMENT

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24003	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Project Management are to:

- To familiarize with the concepts of project mangement and planning
- To provide insights on project execution parameters and teams.
- To enable application of project performance measurement techniques.

Course Outcomes:

At the end of the Project Management course students will be able to

- Describe the life cycle and concepts of Project Management.
- Apply different approaches to project screening and planning
- Analyze different risk factors in project execution
- Demonstrate team skills
- Understand project performance evaluation techniques.

Unit I:

Introduction: Meaning, Need, Principles Project Lifecycle and its Phases, Project Management Research in brief, Project Management today, Organization strategy and structure and culture, Format of organization structure, Stake holder Management, Organization Culture, creating a culture for Project Management.

Unit-II

Project Identification and Planning: Defining the project, Project Identification Process, Approaches to Project Screening and Selection, Project Planning, Work Breakdown Structure, Financial Module, Getting Approval and Compiling a Project Charter, setting up a Monitoring and Controlling Process.

Unit-III

Project Execution: Initiating the Project, Controlling and Reporting Project Objectives, conducting project evaluation, Risk, Risk Management Factors, Project Management,

Four Stage Process, Risk Management an Integrated Approach, Cost Management, Creating a Project Budget

Unit IV:

Leading Project Teams: Building a Project Team, Characteristics of an effective Project Team, achieving Cross- Functional Co-operation, Virtual Project Teams, Conflicts Management, Negotiations.

Unit V:

Performance Measurement and Evaluation: Monitoring Project Performances, Project Control Cycles, Earned Value Management, Human factors in Project Evaluation and Control, Project Termination, Types of Project Terminations, Project Follow-up. Current and Future Trends in Project Management.

Text books:

1. Larson, Gray, Project Management- The Managerial Process, McGraw Hill, 2017,6/e
2. Jeffery K. Pinto, Project Management, Pearson Education, 2015

References:

1. Enzo Frigenti, Project Management, Kogan, 2015
2. R. Panneerselvam & P. Senthil Kumar, Project Management, PHI, 2015
3. Thomas M. Cappels, Financially Focused Project Management, SPD, 2008.

ANURAG UNIVERSITY

SUPPLY CHAIN MANAGEMENT

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24004/SCM	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Supply Chain Management are to:

- To understand the basic concepts and drivers of SCM.
- To examine the process of material procurement from suppliers
- To know the inventory management techniques
- To evaluate the transportation models used in logistics management
- To find out the importance of warehousing and its types

Course Outcomes:

At the end of the Supply Chain Management course student will be able to

- Understand Logistic management concepts and role
- Identify material sourcing concepts and challenges.
- Analyze the various techniques used in inventory management
- Assess the various modes of transportation techniques used
- Evaluate the role of IT and warehousing techniques

Unit I:

Introduction: Logistics Management, Inbound, Internal and Outbound Logistics in SCM, Developing the Logistics organization for effective Supply Chain Management, development of Integrated Logistics Strategy, Logistics in Maximizing profitability and cash flow, 3PL, 4PL, International Logistics, Reverse Logistics.

Unit II:

Procurement: Sourcing of material, Global Sourcing – issues and problems. E-Procurement, Group Purchasing, Reserve Auctions, Creating and Managing Supplier Relations, Supplier Partnerships, Multi-tier Supplier partnerships.

Unit III:

Inventory Management: Inventory Management in Supply Chain – Role and importance of inventory in SC, Inventory Policies, Inventory as an element of customer service, JIT, VMI, Outsourcing, Factors influencing the decision-making process of outsourcer.

Unit – IV:

Distribution And Transportation: Various sources of distribution channels, Distribution models, 3PL and 4PL, Distribution network, planning Transportation in SC, Transportation formats, Modes of Transportation, factors affecting transportation performance, Factors influencing the selection of transporter.

Unit – V:

Warehousing: Warehousing, Types of warehouses, warehousing operations, Warehouse automation, Warehouse Management Systems. Third party and value added warehousing, Pricing, Revenue Management.

Text Books:

1. Chopra, Meindl, Kalra, Supply Chain Management, Pearson Education India, 2018, 7/e
2. Bowersox, Supply Chain Logistics Management, McGraw Hill Education, 2018, 4/e

References

1. Ashley McDonough, Operations and Supply Chain Management Essentials, Vibrant Publishers, 2019
2. Mohanty, R.P and Deshmukh, S.G, “Essentials of Supply Chain Management”, 2011, Jaico,
3. Chandrasekaran. N, “Supply Chain Management process, system and practice”,1/e,Oxford, 2010.

ANURAG UNIVERSITY

DATA ANALYSIS AND VISUALISATION

School of Management					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A24201	SEC	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Objectives:

Course Objectives of Data Analysis and Visualisation are to:

- To prepare the data for analysis and develop meaningful Data Visualizations.
- Familiarize students with the basic and advanced techniques of information visualization and scientific visualization,
- A detailed view of visual perception, the visualized data and the actual visualization, interaction and distorting techniques

Course Outcomes:

After completion of the Data Analysis and Visualisation course students will be able to

- Able to extract the data for performing the Analysis.
- Analyze the different techniques for visualizing the data.
- Demonstrate key techniques to interpret the data.
- Analyze the data by using the visualization techniques.
- Use visualization techniques for volumetric data

Unit I:

Data Gathering and Preparation: Data formats, parsing and transformation, Scalability and real-time issues, Data Cleaning: Consistency checking, Heterogeneous and missing data, Data Transformation and segmentation.

Unit II:

Exploratory Analysis: Descriptive and comparative statistics, Clustering and association, Hypothesis generation

Unit III:

Visual perception: Introduction, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

Unit IV:

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents. Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

Unit V:

Visualization of volumetric data: Vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations

Textbooks:

1. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications, A K Peters / CRC Press, 2015, 2/e
2. Cole Nussbaumer Knaflic, Storytelling of Data visualization, Guide for business professionals, Willey, 2015

References:

1. Nathan Yau, Data Points: Visualization That Means Something, Wiley, 2013
2. Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2007.

Business Plan preparation
(Seminar)

School of Management					II BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A24202	SEC	L	T	P	C	CIE	SEE	Total
		0	0	6	3	100	-	100

Course Objective:

- To acquire the knowledge regarding various components in developing a business plan.

Course Outcomes: At the end of the course students will be able to

- Analyze the various components pertaining to Business plan
- Identify the various sources to initiate new venture
- Develop the business plan for the business ideas

Suggested contents of the Business plan:

1. Analyze the market
2. Identify various sources of funds
3. Viability of the product
4. Cost
5. Customer
6. Competition
7. Team
8. Revenue
9. Channels

E- COMMERCE

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of E-Commerce are to:

- To provide students with an overview of E-Commerce.
- To make them understand B2B E-Commerce.
- To make them understand B2C E-Commerce.
- To know the elements of E-Commerce.
- To know and understand E-Business.

Course Outcomes:

At the end of the E-Commerce course students will be able to

- Understand concepts of E-Commerce and E-Business.
- Gain awareness of B2B E-Commerce business processes.
- Have knowledge on B2C E-Commerce business processes.
- Identify the elements of E-Commerce
- Know the application areas of E-Business

Unit I:

Introduction to Electronic Commerce: Introduction, need, significance – scope, unique features of E-Commerce. Difference between E-Commerce and E-Business. Pros and Cons of E-Commerce, electronic commerce vs. traditional commerce, prospects of E-Commerce in India.

Unit II:

Business to Business (B2B) E-Commerce: Inter Organization Transactions: Credit Transactions and Trade Cycle, Variety of Transactions; Electronic Markets: Usage of Electronic Markets, Pros and Cons. Inter Organizational E-Commerce.

Unit III:

Business to Consumer (B2C) Electronic Commerce: Consumer Trade Transactions: Internet E-Commerce, Internet Shopping and Trade Cycle, Pros and Cons.

Unit IV:

The Elements of E-Commerce: Elements, E-Visibility, The E-shop, Online Payments, Delivering the Goods, After-Sales Service, Internet E-Commerce Security.

Unit V:

E-BUSINESS: Introduction, Internet Books Shop, Grocery Supplies, Software Supplies and Support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing E-delivery.

Text Books:

1. David Whiteley, E-Commerce, Strategy, Technologies and Applications, McGraw-Hill Edition, 2017
2. S.J.P.T. Joseph, E-Commerce, An Indian Perspective, PHI Learning Pvt. Ltd. 2019, 6/e

References:

1. C.S.V.Murthy, E-Commerce Concepts, Models, Strategies, Himalaya Publishing House, 2015
2. Ward Hanson and Kirthi Kalyanan, Internet Marketing and e-Commerce, Cengage, 2012, 2/e

MANAGEMENT INFORMATION SYSTEM

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25002	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Management Information System are to:

- Familiarize students with the role of information systems at organizations
- To provide insights on SDLC and system design
- To have knowledge on IS Security and control
- To obtain knowledge on ERP models for various functions
- To introduce to ERP implementation strategies

Course Outcomes:

At the end of the Management Information System course, student will be able to

- Recognize the role of Information systems in organizations
- Describe the stages of SDLC and system design
- To have knowledge on IS Security and control
- Have awareness of ERP
- Understand factors influencing successful ERP implementation strategies

Unit I:

Organization and Information Systems: The Organization Structure, Managers and Activities - Data, Information and its Attributes. Introduction to IS Models and types of Information Systems, Nolan Stage Hypothesis, IS Strategic Grid. Critical Success Factors, Socio-Technical Systems Approach (Mumford).

Unit II:

Building of Information Systems: SDLC - System Development Stages, Approaches, System Analysis and Design – Requirement Determination, Strategies, Structure Analysis Tools. System Design- Design Objectives, Conceptual Design, Design Methods.

Unit-III:

IS Security and Control: System Vulnerability and Abuse Business Value of Security and Control Need for Security, Computer Crime – Hacking, Cyber Theft, and Unauthorized use at work. Piracy – Software and Intellectual Property. Privacy – Issues

and the Internet Privacy, Challenges – Working Condition, Individuals, Health and Social Issues

Unit-IV:

ERP Models : Evolution of ERP, Integrated Management Systems, Integrated Data Model. ERP Modules - Finance, Accounting System, Manufacturing and Production Systems, Sales and Distribution Systems, Human Resource Systems, Materials Management System, ERP System Options and Selection, ERP Proposal Evaluation, ERP benefits.

Unit-V:

ERP Implementation and Maintenance: Implementation Strategy Options, Features of Successful ERP Implementation, Strategies to attain success, User Training, Maintaining ERP & IS.

Text Books:

1. C.S.V.Murthy: Management Information System, Himalaya,2009
2. Alexis Leon: ERP (Demystified), 5/e, Tata McGraw-Hill, 2009.

References

1. Gordon B. Davis & Margrethe H.Olson: Management Information Systems, TMH, 2009.
2. C Laudon and Jane P.Laudon, et al: Management Information Systems, Pearson Education, 2009.
3. D P Goyal, Management Information Systems – Managerial Perspective, Macmillan, 3/E, 2010.
4. James A. Obrein: Management Information Systems, TMH, 2009

BUSINESS FORECASTING

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25003/A	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Business Forecasting are to:

- To know various business forecasting techniques**.**
- Learn about categories of regression analysis
- To know about logistic regression models
- To study about Moving Average models
- To learn about seasonal models

Course Outcomes:

At the end of the Business Forecasting course the student able to

- Describe business forecasting models.
- Understand Dummy variables and Regression Models.
- Interpret logistic regression models..
- Understand Forecasting Using an ARMA Models.
- Describe characteristics of Conditional Heteroscedastic Models

Unit-I:

Introduction: Business forecasting models**,** Linear Regression, Building a Regression Model, Making inferences using the estimated model, Using the Regression model to make predictions, Errors, Residuals and R-square, Hypothesis testing in a Linear Regression, 'Goodness of Fit' measures (R-square, Adjusted R-square).

Unit-II:

Regression Analysis: Dummy variable Regression (using Categorical variables in a Regression), Multicollinearity in Regression Models, Mean centering of variables in a Regression model, Building confidence bounds for predictions using a Regression model, Interaction effects in a Regression, Transformation of variables

Unit-III:

Logistic Regression: Introduction of Logistic regression, building of logistic regression model. Linear Time Series Analysis and Its Applications: Stationarity, Correlation and Autocorrelation Function, White Noise and Linear Time Series, Simple Autoregressive Models, Properties of AR Models, Identifying AR Models in Practice, Goodness of Fit, Forecasting.

Unit-IV:

Moving Average Models: Simple Moving-Average Models, Forecasting Using MA Models, Simple ARMA Models, Properties of ARMA, Three Model Representations for an ARMA Model.

Unit-V:

Conditional Heteroscedastic Models: Characteristics of Volatility, Structure of a Model, Model Building. Seasonal Models, Seasonal Differencing, Multiplicative Seasonal Models, Regression Models with Time Series Errors, Consistent Covariance Matrix Estimation, Long-Memory Models.

Text Books:

1. Gupta, S.C., Kapoor V. K., Fundamentals of Applied Statistics, Sultan Chand & Sons; 4/e, 2014
2. Len Tashman, Udo Sglavo, Business Forecasting: Practical Problems and Solutions, 2016, Wiley

References:

1. Douglas C Montgomery, Statistical Quality Control: A Modern Introduction, 6/e, Wiley, 2010
2. B. L. Agarwal, Basic Statistics

INTERNATIONAL BUSINESS

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A25003/B	Elective	3	1	0	4	40	60	100

Course Objectives:

Course Objectives of International Business are to:

- To facilitate knowledge on concepts related to International Trade and business
- To create awareness on theories of international trade
- To be aware of factors influencing international business environment
- To provide conceptual knowledge on FDI
- To create awareness on International Financial Institutions

Course outcomes:

At the end of the International Business course student will be able to

- Understand concepts of international trade and business.
- Identify contents of various international trade theories
- Know the factors influencing international business environment
- Appreciate the role of FDI.
- Have an understanding of various financial institutions and their roles.

Unit I:

International Business: An Overview – Evolution of International Business, Drivers of Globalization, Influences of International Business, Stages of Internationalization, Differences between Domestic and International Business, International Business Approaches, Advantages of International Business.

Unit II:

Theories of International Trade: Mercantilism, Theory of absolute cost advantage, Comparative cost advantage theory, Relative factor endowment theory, Country similarity theory, Product life cycle theory.

Unit III:

International Business Environment: Social and Cultural Environment, Technological Environment, Economic Environment, Political Environment .Modes of Entering

International Business – Modes of Entry, Exporting, licensing, franchising, contract manufacturing, management contracts, turnkey projects.

Unit IV:

Foreign Direct Investment: Factors Influencing FDI, Reasons for FDI, Costs and Benefits of FDI, Trends in FDI, Foreign Direct Investment in India.

Unit V:

International Financial Institutions and Liquidity: IMF, World Bank, International Development Association, International Liquidity and SDR International Finance Cooperation.

Text Books:

1. Cherunilam Francis, International Business, Text and Cases,6/e ,Prentice-Hall of India Private Limited, 2020.
2. K. Aswathappa, International Business, 7 Edition , Tata McGraw Hill, New Delhi, 2020, 7/e

References :

1. John Daniels, Lee Radebaugh, et al, International Business, Pearson Education, 2018, 16/e
2. James H. Taggart and Michael C. Mcdormitt, The Essentials of International Business, Prentice Hall of India, 2000

SALES AND DISTRIBUTION MANAGEMENT

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25003/C	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course objective:

Course Objectives of Sales and Distribution Management are to:

- To introduce to the concepts of sales and distribution management
- To various concepts of sales planning and budgeting
- To identify sales force management concepts
- To give a knowledge on distribution channels
- To give channel designing strategies

Course Outcomes:

At the end of the Sales and Distribution Management Course students will be able to

- Explain the concepts of sales and distribution management.
- Know the concepts of sales planning and budgeting
- Describe the process and managing of the sales force
- Evaluate different techniques of sales analytics
- Apply sales force compensation methods effectively in an organization.

Unit I :

Introduction: Evolution of Sales Management, Nature and Importance , Roles, Types and Skills of Sales Managers, Sales Objectives, Strategies and Tactics, Emerging Trends, Linking, Sale and Distribution Management, Buying Decision, Sales Knowledge and Sales Related, Marketing Policies, Sales Process, Transactional and Relationship Selling

Unit II:

Sales Planning and Budgeting: Strategic Planning, Role of Marketing & Sales, Marketing & Personal Selling Strategies, Sales Strategy, Developing Sales Forecast, Forecasting Approaches, Sales Budget, Defining Sales Territories, Procedures, Assigning Territories, Managing Territories, Sales Quotas.

Unit-III:

Sales Force Management: Concepts of Sales Organization, Types of Sales Organization, Structures, , Sizing and Staffing the Sales Force, Training and Motivating Sales Force, Compensating and Leading Sales Force, Evaluating and Controlling the performance of Sales Force.

Unit-IV:

Distribution Management: Definition, Need for Distribution Management, Need for Distribution Channels, , Relationship of Flows to Service Levels, Channel Levels, Service Channels, Retailer as a Salesman, Trading /Retail Formats, E-Tailing, Wholesale – Functions & Classification, Major Wholesaling decisions.

Unit-V:

Designing Channel Systems: Channel Design Factor, Channel Planning Process, , Training, Motivating & Evaluating Channel members, Channel Design Comparison, Implementation, Vertical Integration, Channel Management, Power & Conflict, Principles of Channel Management.

Textbooks:

1. Krishna K. Havaldar, Vasant M. Cavale) Sales and Distribution Management, McGrawHill, 3/e, 2017
2. Tapan K. Panda and Sunil Sahadev, Sales and Distribution Management, Oxford University Press, 2019

References:

1. Still, Cundiff, Govoni, Sales Management, Pearson, 2017, 6/e,
2. Pingali Venugopal, Sales and Distribution Management- An Integrative Approach, Sage, 2020,2/e

SUPPLY CHAIN LOGISTICS

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25004/SCM	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Supply Chain Logistics are to:

- To familiarize with the basic concepts of logistics management
- To learn the process of material procurement from suppliers
- To know the inventory management techniques
- To evaluate the transportation models used in logistics management
- To find out the importance of warehousing and its types

Course Outcomes:

At the end of the Supply Chain Logistics course student will be able to

- Evaluate the third party and fourth party logistics management
- Examine the necessity of creating and managing supplier relationships
- Analyze the various techniques used in inventory management
- Assess the various modes of transportation techniques used
- Evaluate the role of IT and warehousing techniques

Unit I:

Introduction: Logistics Management, Inbound, Internal and Outbound Logistics in SCM, Developing the Logistics organization for effective Supply Chain Management, development of Integrated Logistics Strategy, Logistics in Maximizing profitability and cash flow, 3PL, 4PL, International Logistics, Reverse Logistics.

Unit II:

Procurement: Sourcing of material, Global Sourcing – issues and problems. E-Procurement, Group Purchasing, Reserve Auctions, Creating and Managing Supplier Relations, Supplier Partnerships, Multi-tier Supplier partnerships.

Unit III:

Inventory Management: Inventory Management in Supply Chain – Role and importance of inventory in SC, Inventory Policies, Inventory as an element of customer

service, JIT, VMI, Outsourcing, Factors influencing the decision making process of outsourcer.

Unit IV:

Distribution And Transportation: Various sources of distribution channels, Distribution models, 3PL and 4PL, Distribution network, planning Transportation in SC, Transportation formats, Modes of Transportation, factors affecting transportation performance, Factors influencing the selection of transporter, modes of transport, Fleet Management, Multi Model Transport, Containerization, Vehicle Scheduling and Routing, Milk run and cross docking.

Unit V:

Warehousing: Warehousing, Types of warehouses, warehousing operations, Warehouse automation, Warehouse Management Systems. Third party and value added warehousing, Role and importance of Handling Systems, Selection of Handling Systems. Pricing, Revenue Management and role of IT in SCM. Role, importance and selection of Handling Systems in SC integration.

Text Books:

1. Bowersox, Supply Chain Logistics Management, McGraw Hill Education 2018, 4/e
2. T.A.S. Vijaya Raghavan, Supply Chain Analytics, 2021

References:

1. Power Mark J & Others, “The Outsourcing Hand Book How to Implement a Successful Outsourcing Process”, Kogan Page, 1/e,2010
2. Mohanty, R.P and Deshmukh, S.G, “Essentials of Supply Chain Management”, 1/e,2011
3. D K Agarwal, Logistics and supply chain management, Strategy ,Cases and Best Practices, Macmillan Publishers India Ltd., Cengage, 2017, 2/e

SUPPLY CHAIN OPERATIONS

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25005/SCM	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Supply Chain Operations are to:

- To understand the importance of operations management in production units
- To evaluate the economies, diseconomies and constraints in capacity expansion and change
- To identify the various production process and services processes in the manufacturing and non-manufacturing units
- To know the aggregate planning for production and forecasting
- To understand the various quality management tools and techniques.

Course Outcomes:

At the end of the Supply Chain Operations course the student will be able to

- Identify the historical development and current issues in operations management
- Know the capacity enhancement and considerations in capacity change
- Understand and implement the concept of lean manufacturing
- Evaluate the aggregate planning system and materials management
- Analyze the various statistical quality control techniques and the international standards

Unit I:

Operations And Supply Chain Management: Introduction to Operations and Supply Chain Management, Strategy, Processes and Analytics, Operations and Supply Chain Processes, Differences between Services and Goods, the Goods–Services Continuum, Product–Service Bundling, Efficiency, Effectiveness, and Value, Historical Development of Operations and Supply Chain Management, Current Issues in Operations and Supply Chain Management

Unit II:

Strategic Capacity Management: Capacity Management in Operations and SCM, Capacity Planning Concepts, Economies and Diseconomies of Scale, Capacity Focus,

Capacity Flexibility, Capacity Planning, Considerations in Changing Capacity, Determining Capacity Requirements, Using Decision Trees to Evaluate Capacity Alternatives, Planning Service Capacity

Unit III:

Manufacturing Processes: Production Processes, Production Process Mapping, Designing a Production System, Assembly-Line and Continuous Process Layouts, Assembly, Lean Production

Service Processes: The Nature of Services, An Operational Classification of Services, Designing Service Organizations, Structuring the Service Encounter: Service–System Design

Unit IV:

Sales And Operations Planning: Overview of Sales and Operations Planning Activities, The Aggregate Operations Plan, Production Planning Environment, Relevant Costs, Aggregate Planning Technique, Yield Management, Material Requirements Planning, Master Production Scheduling, Inventory Management, Forecasting Demand

Unit-V:

Quality Management And Six Sigma: Total Quality Management, Quality Specifications and Quality Costs, ISO 9000 and ISO 14000, External Benchmarking for Quality Improvement, Six Sigma Quality, Six Sigma Methodology, Statistical Quality Control, Understanding and Measuring Process Variation, Process Capability.

Text Books:

1. Richard B. Chase, Ravi Shankar, F. Robert Jacobs ,Operations and Supply Chain Management, 15/e (SIE),McGraw Hill Education,2019
2. David Taylor and David Brunt, Manufacturing Operations and Supply chain Management, Vikas Thomson Learning publishers, 2009.

References:

1. Rohit Verma, Kenneth Duncan Boyer, Operations and Supply Chain Management: World Class Theory and Practice, South-Western, 2010
2. Sunil Chopra and Peter Meindi, Supply chain management Pearson Education publishers, 2016
   D K Agarwal, Logistics and supply chain management, Strategy ,Cases and Best Practices, Macmillan Publishers India Ltd., Cengage, 2017, 2/e

ANURAG UNIVERSITY

INTERNSHIP

School of Management					III BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
A25201	Intern	L	T	P	C	CIE	SEE	Total
		0	0	6	3	100	-	100

Course Objective:

The Objective of this course is to introduce students by allowing them to discuss and solve real business challenges by associating with any enterprise.

Course Outcomes: At the end of the course the students will be able to

1. Demonstrate their ability to apply learned skills and also students push boundaries
2. Propose and explore much needed solutions across disciplines and cultures.
3. Improve the personality and become confident to face the employment process.

Exercise:

1. Apply Business Concepts and Theories to Real-World Decision-Making.
2. Address the Specific Business Disciplines; such as Human Resources Management, Operations Management, Marketing, Accounting, Statistics, Economics, Finance, and Business Law.
3. Observe and Participate in Business Operations and Decision-Making.

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FUNDAMENTALS OF ENTREPRENEURSHIP

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A26001	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Fundamental of Entrepreneurship are to:

- To explain the concepts of entrepreneurship and the role in economic development
- To create awareness about the entrepreneur mindset and support system.
- To understand business plan development process.
- To enable understanding of the financial aspects of entrepreneurship.
- To impart the knowledge of growth strategies for new venture.

Course Outcomes:

At the end of the Fundamental of Entrepreneurship course students will be able to

- Describe the role of Entrepreneurship in the Economy and the support system.
- Interpret the Entrepreneurial Mindset and the Challenges.
- Design a business plan for a Startup Venture.
- Relate the startup venture and the financial aspects applicable.
- Analyze growth strategies for a new venture.

Unit I:

Introduction to Entrepreneurship: Meaning and Concept of Entrepreneurship, the History of Entrepreneurship Development, Role of Entrepreneurship in Economic Development, Agencies in Entrepreneurship Management, Emerging issues in Entrepreneurship.

Unit II:

The Entrepreneur: Skills required to be an Entrepreneur, Entrepreneurial Stress Entrepreneurial Motivation, Entrepreneurial Decision Process, and Role models, Mentors and Support System.

Unit III:

Business Opportunity Identification and Business Plan: Business Ideas, Methods of Generating Ideas, and Opportunity Recognition, Meaning and Significance of a Business Plan, Components of a Business Plan, and Feasibility Study.

Unit IV:

Financing the New Venture*:* Importance of New Venture Financing, Types of Ownership, Securities, Venture Capital, Types of Debt Securities, Determining Ideal Debt-Equity Mix, and Financial Institutions and Banks.

Unit V:

Launching the New Venture and Growth: Choosing the Legal form of New Venture, Protection of Intellectual Property, Marketing the New Venture, Characteristics of High Growth New Ventures, Strategies for Growth, and Building the New Venture Capital, Exit Strategies for Entrepreneurs, Bankruptcy, and Succession and Harvesting Strategy.

Text books:

1. D.F. Kuratko and T.V.Rao, Entrepreneurship-A South Asian Perspective, Cengage Learning,2012.
2. Hisrich, Peters ,Sheperd, Entrepreneurship, Mc.Graw Hill, 11/e, 2020.

References:

1. Vasant Desai, Entrepreneurship Development, Himalayan Publishing House, 2019.
2. Nandan H, Fundamentals of Entrepreneurship, PHI, 2013

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SUPPLY CHAIN ANALYTICS

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A26002/A	Elective	3	1	0	4	40	60	100

Course objectives:

Course Objectives of Supply Chain Analytics are to:

- To explain the role of supply chain analytics
- To describe the metrics and key issues in SCA
- Explain the usage of demand analytics and forecasting in SCA
- To impart the knowledge inventory analytics in SCA
- To study the strategic issues of SCA.

Course outcomes:

At the end of the Supply Chain Analytics course, the students will be able to

- Describe the role of supply chain analytics in organizations
- Analyze the key metrics and issues in SCA
- To implement the demand analytics in SCA
- To apply inventory analytics in SCA
- To analyze the strategic issues of SCA

Unit I:

Supply Chain Management: Introduction to Supply Chain Management, Performance Measures, Core Components of Supply Chain Analytics, Role and Importance of analytics in a Supply Chain, Types of Analytics.

Unit II:

Metrics of Supply Chain Analytics: Understanding the Metrics, Strategic Goals, Maturity Models, Reference models, Benchmarking. The importance of Supply Chain Analytics in the Flows Involving Material, Money, Information and Ownership. Key Issues in Supply Chain Analytics.

Unit III:

Demand Analytics: Demand planning and forecasting, basics of statistical forecasting trends, data collection, pre-processing and visualization, Build and interpret a linear model. Predict the impact of price and other factors – validate and improve forecasting

models, Multiple regression for trend , price and other factors. Predicting seasonality – Modeling and formatting seasonal variables.

Unit IV:

Inventory Analytics: Value, Trend, Breakdown and Economic indications of Inventory, relevance of inventory across industries, Metrics of Inventory over total assets and total days, Inventory and financial performance

Unit V:

Strategic Issues in SCA: Implementation stages - Identifying the Business Problem, Finding data, Choose the Right Team, Select Right Tools, Measure Success, Stages of Achieving SCA maturity, Widely Used Tools in SCA, Future of SCA.

Textbooks:

1. Sunil Chopra, Supply Chain Management – Strategy Planning and Operation, 7/e, Pearson, 2018
2. Mark Morley, Supply Chain Analytics for Dummies,Open Text, Special edition, John Wiley & Sons Ltd, 2017
3. Kumar Singh, Strategic topics in Supply Chain Analytics: Exploring simplicity in complexity.

References:

1. Gerald Feigin, Supply Chain Planning and Analytics: The right product in the right placeat the right time, Business Expert Press, 2011
2. Ramesh Sharda, Dursun Delen, Efraim Turban, Business Intelligence and Analytics, 10/e, Pearson, 2018
3. Jeremy F. Shapiro. Modeling the Supply Chain. Duxbury Thomson Learning

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SUPPLY CHAIN MANAGEMENT STRATEGY

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A26002/B	Elective	3	1	0	4	40	60	100

Course objectives:

Course Objectives of Supply Chain Management Strategy are to:

- To examine the current state of the company's logistics
- To determine the overall direction of improvement efforts in logistics challenges
- To examine the operations challenges that MTC faces.

Course objectives:

At the end of the Supply Chain Management Strategy course, students will be able to

- Analyze the current state of the company's logistics.
- Recognize a company's logistical challenges and make appropriate recommendations to overcome the issues.
- Recognize a company's operational challenges and make appropriate recommendations to overcome the issues
- Recognize a company's forecasting and demand planning challenges and make appropriate recommendations to overcome the issues.
- Present a cohesive and logical argument to support your recommendations

Unit I:

Supply Chain Strategy: Introduction, Objectives, saving of revenue, current scenario, current industries issues, challenges, and case studies.

Unit III

Logistics: Inventory requirement, order the inventory, building logistics network, facilities of logistics network, factors influencing logistics network logistics customer service, logistics challenges, Case Studies

Unit III

Operations: Lean Operations, need of warehouses, design a warehouse, Lean Inventory, Operations at Challenges, Case studies

Unit IV:

Forecasting Methods: Naive Forecast, Cumulative Mean Forecast, Forecast Accuracy, Moving Average, Exponential Smoothing.

Unit V:

Planning: Planning Challenges, Supply, Manufacturing and Distribution Planning, Sales and Operations Planning, the Solution for problems, Case Studies.

Textbooks:

1. Edward Frazelle, Supply Chain Strategy, McGraw Hill, 2017,2/e
2. Tony Hines, supply chain Strategies, Demand Driven and Customer Focused, 2/e, Rutledge, 2013.

References:

1. Bram Desmet, Supply Chain Strategy and Financial Metrics, Kogan page, 2018
2. Sunil Chopra, Peter Meindl, Supply Chain Management: Strategy, Planning, and Operation, Pearson, 2018

SUPPLY CHAIN MANAGEMENT PRINCIPLES

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
A26002/C	Elective	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course objectives:

Course Objectives of Supply Chain Management Principles are to:

- To explain the concepts of supply chain management
- To describe the supply issues in supply chain management
- To explain the operational issues in supply chain management
- To know the process management and recent trends in SCM.
- To communicate the issues in integration of SCM.

Course outcomes:

At the end of the Supply Chain Management Principles course, the student will be able to

- To explain the role and elements of SCM
- To analyze the supply issues in SCM.
- To appraise the operational issues faced in SCM.
- To apply the lean thinking process to supply chain management.
- To evaluate the factors influencing integration of SCM.

Unit I:

Introduction to Supply Chain Management: Definition of SCM, Importance, foundations of SCM – Supply elements, Operations Elements, Logistics Elements, Integration Elements, Current Trends in SCM.

Unit II:

Supply Issues in SCM: Purchasing management, Purchasing process, Sourcing process, Role of the supply base, Supplier Selection, Global Sourcing. Developing Supplier Relationships, Ethical and Sustainable Sourcing

Unit III:

Operational Issues in SCM: Demand forecasting, Forecasting techniques, Aggregate production plan, Master production schedule, Capacity Plan, Distribution Requirement Plan, Inventory Management, Inventory Models.

Unit IV:

Process Management: Lean thinking and Supply chain management, Elements of Lean, Six Sigma, Recent trends in CRM, Location factors, Facility Location Techniques

Unit V:

Integration Issues in SCM: SC Process Integration, Supply Chain Integration Model , Obstacles of Process Integration along SC, Performance Measurement along Supply Chains.

Text books:

1. Wisner, Tan, Leong, Principles of Supply Chain Management – A Balanced Approach, 4/e, Cengage Learning, 2016
2. Richard E Crandall, William R.Crandall, Charlie C. Chen, Principles of Supply Chain Management, CRC Press, Taylor & Francis Group, 2015

References:

1. Hokey Min, The essentials of Supply Chain Management – New Business Concepts and Applications, Paul Bober, 2015.
2. Martin Christopher, Logistics and Supply Chain Management, 5/e, FT Publishing International, 2016
3. Sunil Chopra, Peter Meindl Kalra, Supply chain management, 6/e, Pearson, 2016

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CUSTOMER ANALYTICS

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A26003/SCM	Elective	3	1	0	4	40	60	100

Course Objectives:

Course Objectives of Customer Analytics are to:

- To provide basic insights into the basic concepts of customer analytics
- To create awareness about descriptive analytics
- To know the various concepts about predictive analytics
- To understand key elements of prescriptive analytic
- To explain the scientific approach to marketing

Course Outcomes:

At the end of the Customer Analytics course students will be able to

- Describe the role and types of Customer Analytics.
- Apply the key concepts of descriptive analytics.
- Perform functions of predictive analytics.
- Describe the applications of prescriptive analytics.
- Recognize various opportunities to implement analytics.

Unit I:

Basics of Customer Analytics: Introduction to Customer Analytics, Defining Customer Analytics, Benefits of Customer Analytics, Importance, Using Customer Analytics, Types of Analytics, Tools of Analytics.

Unit II:

Descriptive Analytics: Definition, Applications, Visualizing the data, Exploring the data, Descriptive Statistical Measures, Probability Distributions and Data Modeling, Sampling, Estimation, Statistical Inference.

Unit III:

Predictive Analytics: Definition, Descriptive Vs. Predictive Analytics, Trendlines, Regression Analysis, Forecasting Techniques, Data Mining-Tools & Applications in Predictive Analytics.

Unit IV:

Prescriptive Analytics: Definition, Linear Optimization, Applications of Linear Optimization, Integer Optimization, Decision Analysis

Unit V:

Application & Future of Analytics: Introduction to application to analytics, Tips for implementing Analytics, Implementation of Analytics, Application of Analytics, Current State of Analytics, and The Future of Marketing is Business Analytics, Case Studies.

Text Books:

1. Amar Sahay, Business Analytics: A Data-Driven Decision-Making Approach for Business, Volume II**,** BEP, 2020.
2. Amar Sahay, Business Analytics: A Data-Driven Decision-Making Approach for Business, Volume I**,** BEP, 2020.
3. James R. Evans, Business Analytics-Methods, Model and Decisions, 2/e, Pearson, 2016.

References:

1. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Business Analytics Principles, Concepts, and Applications with SAS: What, Why, and How, Pearson Education, 2014
2. Michael Watson, Derek Nelson, Peter Cacioppi, Managerial Analytics: An Applied Guide to Principles, Methods, Tools, and Best Practices, Pearson Education, 2013.
3. Peter Bull, Carlos Centurion, Shannon Kearns, Eric Kelso, Nari Viswanathan, Prescriptive Analytics, Riverlogic

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PROJECT

BBA III Year II Semester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A26201	Project	L	T	P	C	CIE	SEE	Total
		0	0	20	10	50	50	100

Course Objectives

3. Aim: The aim of multi stage evaluation is to enable students to do original work on their own so that they can get the benefit in terms of gaining practical knowledge and possible employment

The following is the suggested checklist for the project.

Brief Introduction, Review of Literature, Research Gaps, Research Questions, Objectives of the Study, Hypothesis, Scope of the Study, Period of the Study, Data collectionLiterature Review and Data Analysis and Interpretations, Findings, Suggestions and Conclusion, Appendices.

An internal evaluation will be conducted through progress review seminar by the students.

A Viva Voce will be conducted by the external examiner after completion of the Project and submission of Project report.

COMPREHENSIVE VIVA-VOCE

School of Management					III BBA II Semester			
Code	Category	Hours / Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A26202	Viva	0	0	0	2	100	-	100

A comprehensive viva voce will be conducted at the end of the semester covering all courses.

ACADEMIC REGULATIONS (AU-R22)

For the

Master of Business Administration Program

With effect from the Academic Year 2022-23

ANURAG UNIVERSITY

Venkatapur, Ghatkesar (M), Medchal-Malkajgiri (Dist), Telangana 500088

www.anurag.edu.in

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Academic Regulations for MBA (Regular) with effect from the Academic Year 2022-23

1. Title and Duration of the Program

1.1 The program shall be called the Postgraduate Program (PGP) in Master of Business Administration, abbreviated as MBA with duration of 2years.

1.2 The MBA program duration shall be two academic years divided into Six Trimesters/Term and each Term having 12-14 weeks of instruction.

1.3 Students admitted to the MBA program shall have to complete the course of study within a maximum time frame of 4 years from the year of admission. Otherwise, they shall forfeit their admission.

2. Admission Procedure

2.1. A candidate for admission to the MBA program must have completed his/her Bachelor's degree with a minimum of 55% marks in aggregate from a recognized university by the Anurag University as equivalent thereto.

2.2. All the eligible applicants satisfying 2.1 shall be governed by the following admission policy:

Note: *The Anurag Group of Institutions (AGI) is an existing institution which is established as Anurag University under the Telangana State Private Universities Act (Establishment and Regulations) No.11 of 2018.*

2.3 Admissions to the MBA programs will be based on a rank in the Anurag University Common Entrance Test, or on marks or percentile secured in CAT/MAT/XAT/CMAT/GMAT/HBSAT or any other test recognized by Anurag University.

2.4. The rule of reservation in admission to the MBA program will be held as per the Section 33 of the Telangana State Private Universities Act No. 11 of 2018, and Rule 10 of the G.O.Ms. No. 26 [Higher Education (UE.1) Department], Dt.20-08-2019.

2.5 Admission and Other fees will be as specified by AU from time to time as per the Act.

3. Credits

The following is the credit allocation table.

Course	Credits
1 Hour Lecture (L) per week	1
1 Hour Tutorial (T) per week	1
2 Hour Practical (P) per week	1
Internship / Project	4
Social Immersion	1
Specialization Project	1
Specialization Project -2 (For MBA Business Analytics)	2
Company Analysis Report	1

4. Distribution and Weightage of Marks

4.1 The performance of a student in a Term shall be evaluated course-wise for a maximum of 100 marks in each theory and practical course. In addition, Internship / Project, Specialization Project, Company Analysis Report, Social Immersion shall be evaluated for 100 marks each.

4.2 For theory courses the distribution shall be 50 marks for Continuous Internal Evaluation (CIE) and 50 marks for the Term End Examination (TEE).

Components	Maximum Marks	Minimum Requirement
Internal Examination Assessment		
Continuous Internal Assessment	20	-
Mid Term Examination	25	-
Attendance	5	80%
Term End Examinations	50	40%
Total		50%

4.3 The distribution of marks for Continuous Internal Evaluation (CIE) and the Term End Examination (TEE) along with the minimum pass percentage shall be as follows:

Course	Continuous Internal Evaluation (CIE)	End Term Examination (TEE)	Minimum Academic Requirement to Pass a course	
			*Minimum Pass Percentage (TEE)	*Minimum Pass Percentage (CIE+TEE)
Theory	50	50	40	50
Laboratory	50	50	40	50
Company Analysis Report	100	0	-	50
Social Immersion	100	0	-	50
Internship / Project	50	50	40	50
Specialization Project	100	-	-	50

* A relaxation of 10% of maximum marks shall be given to physically challenged students.

4.3.1 Continuous Internal Evaluation (CIE)

The CIE for Theory Courses has the following two components of Assignments, Mid Term examinations comprising of 50marks:

a) Mid-term examination:

For theory subjects, there shall be one midterm examinations in each term for 25 marks as a part of continuous evaluation. Each midterm examination shall be conducted for the duration of 60 minutes and the question paper consists of Part-A shall contain 5 questions, each carrying 2 marks (Short Answers) for 10 marks and Part-B (Long Answers) for 15 marks. Part-B shall contain 5 questions of which student have to answer 3 questions; each question carries 5marks.

Mid term examination shall be conducted for 2.5 units of syllabus at the end of 6-7 weeks of instruction.

There shall be an optional second midterm examination during the preparation cum external practical examinations period or during external examination subject to the following conditions:

i. Interested students have to register for the Second mid examination by paying the prescribed registration fee.
ii. Second midterm examination covers entire Term syllabus carrying 25 marks and best of two mid examinations shall be taken as final mid marks secured by each candidate.

b) **Assignments/ Case Analysis / Class Participation/Quizzes:**

The faculty who will handles a particular course defines the scheme of distribution of assignments etc., in consultation with Course coordinator and evaluates the students for 20 marks by conducting any of the following; Case studies /Assignments / Seminars /quizzes/ Group Activities / periodical tests or any other as relevant. At least one group activity should be a part of the assignment. 5 marks for attendance is also considered a part of internal examination and will be awarded only for satisfy requirement of Minimum 80% attendance in the course.

Term End Examinations (TEE):

4.4.1 The Term End examination will be conducted for 50 marks which consist of two parts viz., i). Part - A for 10 marks, ii). Part - B for 40 marks.

4.4.2 Part-A is compulsory, which consists of five (numbered from 1 to 5) with two questions from each unit carrying 2 marks each.

4.4.3 Part-B consists of five questions (numbered from 6 to 10) shall be set by covering one question (may contain sub-questions) from each unit of the syllabus carrying 8 marks each. For each question there will be an “either” “or” choice (that means there will be two questions from each unit and the student should have to

answer any one of them).

4.4.4 For all laboratory courses, there shall be CIE during a Term for 50 marks and TEE for 50 marks. Out of the 50 marks for CIE the breakup shall be as follows:

i. Preparation for Lab: 10 Marks
ii. Observation: 10 Marks
iii. Completion of Experiment: 5 Marks
iv. Record: 5 Marks
v. Skill Test: 20 Marks

4.4.5 There shall be a social immersion where they can study a social issue/ participate in institution enterprise, to be taken up during the I Year II Term. Social Immersion/ Institution enterprise observations shall be submitted in report form and should be presented before the internal committee, which shall be evaluated for 100 marks. There shall be no external marks for Project.

4.4.6 A summer internship / Project is an important step in process of providing opportunity to industry exposure and work closely with professionals. There shall be an Internship/ Project , to be taken up after completion of third trimester and carried out for 6 to 8 weeks duration The student must identify real time managerial issues of chosen organization. The internship/ Project report work shall be submitted in report form and a two seminars to presented before the Project review committee. The report submission should be completed by the end of 4th trimester. The report shall be evaluated for 50 marks by an internal panel and 50 marks by external of evaluators and obtaining 50% marks for the report is mandatory for the award of the degree.

4.4.7 Specialization Project - 1 Student of MBA general and MBA Business Analytics has to do a project in his/ her specialization stream in the II year II trimester . It will be evaluated by an internal panel for 100 marks.

4.4.8 Specialization Project – 2 Student of MBA Business Analytics has to do Specialization project -2 in their specialization stream in II year III trimester.

The project is awarded 2 credits and will be evaluated by internal panel for 100 marks.

4.5 If there is a complaint in awarding the CIE marks, the University shall nominate a committee to look into the matter.

4.6 Candidates shall be permitted to apply for recounting/revaluation of ETE theory scripts within the stipulated period with payment of prescribed fee.

4.7 Recounting: The totalling of the marks awarded shall be verified in the answer script and corrected if there is any mistake.

4.8 Revaluation:

a) The answer scripts of the candidate who applied for revaluation are evaluated by two subject experts independently other than the original evaluator.

b) If the difference of marks between these two valuations is 15% or more of maximum marks, it will be sent for third valuation to another subject expert.

c) Nearest of two valuations out of three will be considered and the average of these two will be taken as the final marks obtained.

d) If the difference of the final marks after revaluation is 15% or more of maximum marks above the original marks, then the revaluation marks are considered for declaring the result.

e) If the revaluation marks are less than the original marks, the original marks are retained and there is no change in the result.

4.9 Challenge Valuation:

The candidates who have applied for revaluation and are not satisfied with the result are only eligible to apply for challenge valuation by paying the prescribed fee in the form of DD payable to the Registrar, AU.

a) On receipt of the DD, a photocopy of the answer booklet shall be given to the student.
b) The paper will be evaluated in the presence of the student by a senior faculty member appointed by the University.
c) If there is any change in the marks of 15% or more of the maximum marks, the new marks will be awarded to the student. Otherwise, there will be no change in original secured marks.

d) If the change in marks (equal or above 15% of the maximum marks) occurs, the amount paid towards challenge valuation will be refunded. Otherwise, the student will forfeit the total amount which he / she has paid.

5. Attendance Requirements

5.1 A student is eligible to write the Term End Examination of a course only if he/ she acquires a minimum of 75% attendance in that course of the Term.

5.2 Condonation of shortage of attendance up to 10% (65% and above and below 75%) in each course of every Term may be granted on medical grounds as approved by the Academic Council.

5.3 A stipulated fee shall be payable towards condonation of shortage of attendance.

5.4 Shortage of attendance below 65% in each course shall not be condoned.

5.5 However, in respect of women candidates who seek condonation of attendance due to pregnancy, the Vice-Chancellor may condone the deficiency of attendance in each course to the extent of 15% (as against 10% condonation for others) on medical grounds subject to submission of medical certificate to this effect. Such condonation shall not be availed twice during the program of study.

5.6 Students whose shortage of attendance is not condoned are not eligible to write Term End Examination of that course. Such students are detained and their registration for that examination stands cancelled.

5.7 A student detained due to shortage of attendance in a Term may re-register that course, as and when offered, within four weeks from the date of commencement of class work with the academic regulations of the batch into which he/she gets re-admitted.

5.8 A student will be promoted to the next Term if he/she satisfies the attendance requirement of at least three theory courses of current Term and shall not be eligible for readmission into the same Term.

5.9 Attendance of N.S.S/N.C.C Camps or Inter collegiate or Inter University or Inter State or International matches or debates or such other Inter University activities as approved by the authorities, will be taken into

consideration while calculating the attendance.

i. Such leave should be availed with prior permission from the Dean, School of Management and not be availed more than twice during the program of study.
ii. Without any prior permission, such leave shall be treated as absence.
iii. While calculating the attendance, the no. of classes not attended in each course should be deleted in the denominator.

5.10 **Promotion Rules:**

5.10.1 A student shall be promoted from I Year to II Year only if he/she fulfills the

academic requirements of securing 50% of average credits (30 credits out of 59 credits) up to I Year III term, from all the examinations, whether or not the candidate takes the examinations.

5.10.2 A student shall register and put up required attendance in all 112 credits and earn all 112 credits for the award of degree.

5.10.3 Students, who fail to earn 112 credits as indicated in the course structure within four academic years from the year of their admission, shall forfeit their admission.

5.11 When a student is detained due to shortage of attendance in any Term, no grade allotments or TGPA/CGPA calculations will be done for that entire Term in which he/she got detained.

5.12 When a student is detained due to lack of credits in any year, he/she may be readmitted after fulfilment of the academic requirements, with the academic regulations of the batch into which he/she gets readmitted.

5.13 For readmitted candidates, if there are any professional electives / open electives, the same may also be re-registered if offered. However, if those electives are not offered in later Terms, then alternate electives may be chosen from the set of elective courses offered under that category.

6 Supplementary Examinations

6.1 A student eligible to appear for Term End Examinations in a course, but absent/failed in that examination, may write the exam in that

course during supplementary examinations. In such cases, CIE assessed earlier for that course will be carried over and added to the marks to be obtained in the supplementary examinations for evaluating his performance in that course.

6.2 Supplementary examination(s) in the failed courses shall be conducted as per schedule given by the University. If the concerned course is not available in the new regulation the student has to appear for the examinations with the syllabus of equivalent course(s) prevailing for the regular students in that academic year. However, if no such similar subject(s) is offered in the current regulation, the supplementary examination(s) shall be conducted with the same syllabus which is studied during regular course of study with extra fee as specified by the University from time to time.

7. Grade Points

7.1 Marks will be awarded to indicate the performance of each student in each theory courses or lab/practical/seminar/project/mini-project etc., based on the percentage of marks obtained in both CIE and TEE taken together as specified above, and a corresponding letter grade shall be given.

7.2 A 10-point absolute grading system using the following letter grades and corresponding percentage of marks shall be followed as given below.

% of Marks Secured (Class Intervals)	Letter Grade (as per UGC Guidelines)	Grade Points
90% and above (≥ 90%, ≤ 100%)	O (Outstanding)	10
Below 90% but not less than 80% (≥ 80%, < 90%)	**A**$^{+}$(Excellent)	9
Below 80% but not less than 70% (≥ 70%, < 80%)	**A** (Very Good)	8

Below 70% but not less than 60% (≥ 60%, < 70%)	**B+**(Good)	7
Below 60% but not less than 50% (≥ 50%, < 60%)	**B** (Above Average)	6
Below 50% (< 50%)	F (Fail)	0
Absent	Ab	0

7.3 A student obtaining "F" Grade in any subjects shall be considered as 'failed' and will be required to rea-appear as 'supplementary candidate' in the TEE, as and when conducted. In such cases, CIE in those subjects will remain same as those the student obtained earlier.

7.4 A letter grade does not imply any specific % of marks.

7.5 In general, a student shall not be permitted to repeat any course(s) only for the sake of 'grade improvement' or 'TGPA/CGPA Improvement'.

7.6 A student earns grade point (GP) in each course, on the basis of letter grade obtained by him/her in that course (excluding mandatory non-credit courses). Then the corresponding 'credit points'(CP) are computed by multiplying the grade point with credits for that particular course.

Credit Points (CP) = Grade Point (GP) x Credits (for a course)

7.7 The student passes the course only when he/she gets GP ≥ 6 ('B' grade or above).

7.8 The TGPA/CGPA at the end of each Term shall be awarded only if he/she passed all the courses up to end of that Term.

8. Registration / Dropping

8.1 Each student has to register for course work at the beginning of each Term as per the schedule mentioned in the academic calendar.

8.2 A student is allowed to register additional theory course/credits during the

course of study with the consent of the faculty advisor.

8.3 A student would be allowed to register in an additional course only if he / she satisfies the prerequisites.

8.4 Departments will notify at the time of registration about the minimum number of students to

be enrolled for a particular course to be offered.

8.5 Any student may be barred from registering for any course for specific reasons like

disciplinary reasons, non- payment of fees, etc.

8.6 A candidate shall be given one chance to re-register and attend the classes for a maximum of

two courses, if the CIE marks secured by a candidate are less than 50% and failed in those subjects but fulfilled the attendance requirement. A candidate must re-register for failed courses within four weeks of commencement of the class work and secure the required minimum attendance to appear for TEE. In the event of the student taking this chance, his CIE marks and TEE marks obtained in the previous attempt stand cancelled.

8.7 Dropping of courses: Within four weeks after the commencement of the Term, the student

may, in consultation with the faculty advisor, drop one or more courses. The dropped courses shall be registered in the subsequent Terms as and when it is offered.

9 Earning of Credit

A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range ‘O’ to ‘B’. Letter grade 'F' in any course implies failure in that course and no credits earned.

10 Passing Standards

10.1 A student shall be declared successful or ‘passed’ in a Term, only when

he/she gets a TGPA

≥ 6.00 (at the end of that particular Term); and a student shall be declared successful or 'passed' in the entire program, only when he/she gets a CGPA ≥ 6.00; subject to the condition that he/she secures a GP ≥ 6 (B Grade or above) in every registered course in each Term.

10.2 After the completion of each Term, a grade card or grade sheet (or transcript) shall be issued to all the registered students of that Term, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, grade earned etc.), credits earned, TGPA and CGPA.

11. Vertical Progression

It shall also be necessary to lay down uniform minimum standards for TGPA and CGPA together with the minimum number of credits to be earned in a Term for the vertical progression of students. This shall be used in facilitating the mobility of students from one institute to another and also in avoiding any confusion among the students. At the end of each Term the minimum standard for TGPA = 6.0 and CGPA=6.0. However, failure to secure a minimum CGPA = 6.0 at the end of any Term for the first time, shall attract a warning before approval of the student to continue in the following Term.

12. Eligibility for Award of MBA Degree

A student shall be eligible for award of the MBA degree if he/she fulfils all the following conditions:

12.1 Registered and successfully completed all the components prescribed in the program of study to which he/she is admitted by securing 112 credits.

12.2 Obtained CGPA greater than or equal to 6.0 (minimum requirements for pass)

12.3 He/she has no dues to the Institute, Hostels, Libraries, NCC/NSS etc.

12.4 No disciplinary action is pending against him/her.

12.5 The students, who fail to fulfil the above academic requirements, shall

forfeit their admission.

13. Award of Class

13.1 After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of MBA Degree, he/she shall be placed in one of the following three classes based on the CGPA.

13.2 Students who qualify for the award of the degree as listed in item 13.1 shall be placed in the following classes.

CGPA	Class	Conditions
≥ 8.00	First Class with Distinction	• Should have passed all the courses in 'first appearance' in a Term examination and should complete the program in 2 years of time. • Should not have been detained or prevented from writing the Term end examinations in any Term due to shortage of attendance or any other reason
≥ 6.75 - < 8.00	First Class	• The Students who secure CGPA, but not fulfilling the conditions for "First Class with Distinction" shall be awarded 'First Class'.
≥ 6.00 - < 6.75	Second class	

13.3 A student with final CGPA (at the end of the program) < 6.00 will not be eligible for the award of the degree.

13.4 The CGPA can be converted to equivalent percentage of marks by using the following formula:

Percentage (%) of Marks = (CGPA - 0.5) X 10

14. Consolidated Grade Card

A consolidated grade card containing credits & grades obtained by the candidates will be issued after completion of the two years MBA Program.

15. Withholding of Results

If the student has not paid the dues, if any, to the University or if any case of indiscipline is pending against him, the result will be withheld, and he / she will not be allowed into the next Term. In such cases the matter will be referred to the academic council. The decision of the academic council is final.

16. Transitory Regulations

16.1 Discontinued, detained, or failed candidates are eligible for readmission as and when offered next as per the university admission procedure.

16.2 Students on transfer shall complete the prescribed courses of the concerned program not covered earlier and however should take the remaining program along with others.

17. Transcripts

After successful completion of the total Program of study, a Transcript containing performance of all academic years/Terms will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee.

18. Convocation

18.1 The University shall conduct convocation ceremony to confer the degree(s).

18.2 The University shall institute Prizes and Awards to meritorious students during convocation.

19. Termination from the program

The admission of a student to the program may be terminated in the following circumstances:

19.1 The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.

19.2 The student fails to satisfy the norms of discipline specified by the university from time to time.

20. Amendments

The regulations hereunder are subject to amendments as may be made by Academic Council from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already undergoing the program).

ANNEXURE – I:

Calculation of Grade Point Average

1 Grade Point Average

1.1 TGPA and CGPA

The *credit index* can be used further for calculating the Term Grade Point Average *(TGPA)* and the Cumulative Grade Point Average *(CGPA),* both of which being important performance indices of the student. While T*GPA* is equal to the *credit index* for a Term divided by the total number of *credits* registered by the student in that Term, *CGPA* gives the sum total of *credit indices* of all the previous Terms divided by the total number of *credits* registered in all these Terms. Thus, the Grade Point Average (GPA) will be calculated according to the formula:

$$GPA = \frac{\sum C_i G_i}{\sum C_i}$$

Where C_i = number of credits for the course i,

G_i = grade points obtained by the student in the course.

Term Grade point average (TGPA) is calculated up to second decimal point and it is calculated only when all subjects in that Term are cleared / passed.

$$TGPA = \frac{\sum[(\text{Course credits}) \times (\text{Grade points})]}{\sum[\text{Course credits}]}$$

To arrive at cumulative grade point average (CGPA), the formula is used considering the student's performance in all the courses taken in all the Terms completed up to the particular point of time. CGPA is rounded off to TWO decimal places.

$$CGPA = \frac{\sum[(\text{Course credits}) \times (\text{Grade points})]}{\sum[\text{Course credits}]}$$

CGPA is thus computed from the I Year First Term onwards, at the end of each Term, as per the above formula. However, the TGPA of I year I Term itself may be taken as the CGPA, as there are no cumulative effects.

1.2 Illustrative Example

An illustrative example given below indicates the use of the above two equations in calculating TGPA and CGPA, both of which facilitate the declaration of academic performance of a student, at the end of a Term and at the end of successive Terms respectively.

Year and Trimester	Course No.	Credits	Grade	Grade points	Credit points
I Year I Term..	XX101	4	A	8	32
I Year I Term.	XX102	4	B	6	24
I Year I Term...	XX103	4	A+	9	36
I Year I Term..	XX104	4	A	8	32
I Year I Term..	XX105	1.5	O	10	15
I Year I Term...	XX106	1.5	A+	9	13.5
Total		**19**			**152.5**
	TGPA = 152.5/19 = 8.03			***CGPA = 8.03***	
I Year II Term.	XX107	4	B+	7	28
I Year II Term..	XX108	3	A	8	24
I Year II Term	XX109	3	B	6	18
I Year II Term..	XX110	4	C	5	20
I Year II Term.	XX111	2	A+	9	18

I Year II Term.	XX112	1.5	O	10	15
I Year II Term	XX113	1.5	O	10	15
Total		**19**			**138**
	TGPA= 138/19 = 7.26			***CGPA = (152.5+138) /(19+19) = 7.64***	
I Year III Term	XX114	3	B+	7	21
I Year III Term	XX115	2	A	8	16
I Year II Term.	XX116	3	B	6	18
I Year III Term	XX117	3	C	5	15
I Year III Term.	XX118	2	A+	9	18
I Year III Term.	XX119	1.5	O	10	15
I Year III Term	XX120	1.5	O	10	15
Total		**16**			**118**
	TGPA= 118/16 = 7.37			***CGPA = (152.5+138+118)/(19+19 +16) =7.56***	

1.3 If two students get the same *CGPA*, the tie should be resolved by considering the number of times a student has obtained higher *TGPA;* But, if it is not resolved even at this stage, the number of times a student has obtained higher grades like O, A, B etc. shall be taken into account in rank ordering of the students in a class.

ANNEXURE – II:

Disciplinary Action against Students – Provisions

1. Student's behaviour and discipline will be assessed and will receive the same attention as the academic work. Discipline includes the observance of good conduct and orderly behaviour by the students of the University.
2. All students pursuing a Program at the University shall observe code of conduct and maintain discipline and must consider it as a duty to behave decently at all places.
3. Every student shall always carry the Identity card issued by the University. Every student shall have to produce or surrender the identity card, as and when required by the proctorial staff, teaching and library staff and the officials of the university. The loss of the identity card, whenever it occurs, shall immediately be reported in writing to the Registrar.
4. Any violation of the code of conduct or breach of any rules and regulations of the University is construed as an act of indiscipline and shall make him / her liable for disciplinary action.
5. The following acts are treated as gross indiscipline.
   a) Disobeying the teacher/officials or misbehaving in the class.
   b) Quarrelling or fighting in the University campus or in the hostels amongst themselves or indulging in any activity which amounts to ragging or harassment of other students.
   c) Quarrelling or fighting with a University employee(s) or any other public utility functionaries in the campus.
   d) Indecent behaviour in the campus or outside causing inconvenience to others.
   e) Visiting socially unacceptable websites, smoking or consuming liquor or banned substances like drugs etc.
   f) Damage to the University property.
   g) Indulging in acts of theft, forgery, stealing and misappropriating.
   h) Any other activity that defames the University;
      i. Use of mobile in the class/academic area.
      ii. Irregularity in attending classes, persistent idleness, negligence or indifference towards the work assigned.
      iii. Any other conduct which is considered to be unbecoming of student.

ANNEXURE – III:

Rules for Students Conduct & Behaviour in Campus and Outside

1. The rules and regulations, academic calendar shall be provided to students.
2. In general, Dean - Student Affairs will deal with the welfare and discipline of all students in the campus including Hostel and also outside the campus and will ensure maintenance of good conduct. He/she will be assisted by other members of faculty/ staff/ wardens as nominated.
3. Conduct and Behaviour:
   a) Students should attend all their classes and strictly observe class timings. They should likewise carry out other out-door and extracurricular duties assigned to them. Their attendance and leave are governed by the regulations pertaining to them.
   b) Students must give their undivided attention to their academic work and must be respectful to their teachers and supervisors.
   c) Students must conduct themselves with due decorum in the classes, laboratories, library etc. and move in an orderly and disciplined manner in the campus.
   d) Students should not indulge in abusive behaviour/ violence of any kind with fellow students, teaching faculty and employees of the University within or outside the University. Violence by any student or group of students will lead to severe disciplinary action against them.
   e) No meeting of the students other than those organized under the aegis of the various recognized students' activities shall be called without the prior permission in writing from the Dean, Student Affairs.
   f) No meetings / functions / outsider address organized by the students are allowed within the University without prior permission

from the registrar.

g) No students shall use unfair means at any of the examinations and tests or attempt or threaten the staff to get undue advantage.

h) Students must pay all fees and other dues on specified dates. If they do not do so, they render themselves liable to penalties as in force from time to time.

i) Students must take good care of all University property. Any damage to University property shall be viewed as indiscipline. Such students, in addition to facing the disciplinary action, shall have to replace the damaged property and make good the losses caused due to their action. Students must use the furniture and fittings with due care and must not deface buildings, roads, furniture and fittings etc. in any manner.

j) Students must handle the laboratory equipment, instruments and machinery with great care. Any damage or breakage of such equipment etc., due to improper use and negligent handling will have to be made good by the students concerned.

k) Ragging in any form is unlawful and strictly prohibited. If a student is found in ragging activity, he/she shall be punished as per the Anti-Ragging Act.

l) The University shall have a zero-tolerance policy towards Ragging and shall lay down strict guidelines on the same as per policies of the UGC in vogue and in compliance to directions of Hon'ble Supreme Court.

m) Mobile/cellular phone shall be kept in silent mode during the classes and violation will lead to confiscation of the mobile phone.

n) All the students are required to observe the decorum in the dress code as prescribed by the University. Students not adhering to the prescribed dress code may be denied entry to the University campus;

o) Smoking, consumption/possession of liquor, intoxicants, drugs, cigarettes, hookah etc., inside or outside the Campus is strictly prohibited. Any violation will invoke severe penalty including rustication from the Hostel/University.

4. Policy to prevent Sexual Harassment:

a. The University shall be committed to treating every employee

and student with dignity and respect. It shall seek to create a work environment that is free from sexual harassment of any kind, whether verbal, physical or visual;

b. A policy shall be prescribed by the University to provide guidelines for prompt redressal of complaints related to sexual harassment which should be in full compliance with “The Sexual Harassment of Women at Workplace (Prevention, Prohibition & Redressal)” Act,2013;

c. All references / complaints and redressal mechanism pertaining to any matter will be handled within the ambit of the said Act and the Rules framed there under. The policy so prescribed shall be communicated to all employees and students.

5. Grievance and Redressal Mechanisms:

The University shall constitute various Grievance and Redressal committees and its guidelines as specified by the statutory authorities of the University.

ANNEXURE – IV:

Malpractices Rules

S.No	Nature of Malpractice Improper conduct during examinations	Punishment
	***If the candidate*:**	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he/she is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he/she will be handed over to the police and a case is registered against him/her.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate disappearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Term/year as decided by the board. The hall ticket of the candidate is to be cancelled.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that Term/year. The candidate is also debarred for one/two consecutive terms from class work and all End Term Examinations as decided by Board. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he/she will

		be handed over to the police and a case is registered against him/her.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination. Takes away answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Term/year. The candidate is also debarred for two consecutive Terms from class work and all ETEs. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks	Cancellation of the performance in that subject.
6	Refuses to obey the orders of the Chief Superintendent / Assistant Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty inside or outside the examination hall or causing any injury to himself / herself or to any others or threatens whether by words, either spoken or written or by signs or by visible representation, assaults the officer in-charge, or any person on duty in or outside the examination hall or any others, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination	They shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that Term/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case will be registered against them.

	hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears the script or any part-thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work & shall not be permitted for the remaining examinations of the subjects of that Term/year. The candidate is also debarred for two/ three consecutive Terms from class work and all Term examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Term/year. The candidate is also debarred and forfeits these at.
9.	Who is not a candidate for the particular examination or any person not connected with the University indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Term/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the University will be handed over to police and, a police case will be registered against them.

10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Term/year.
11.	Found copying, on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that Term/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the malpractice committee for further action on suitable punishment as per rules.	

ANURAG UNIVERSITY

ANNEXURE – V:

EVALUATION OF INTERNSHIP/ PROJECT

Every candidate shall be required to submit an Industry internship / Project on a topic approved by the Project Review Committee.

1 A Project Review Committee (PRC) shall be constituted with Head of the Department as Chairperson, Project Supervisor and one senior faculty member of the Departments offering the MBA programme.

2 ***Registration of Project Work:*** A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects, both theory and practical up to third Trimester. The work on the project shall be initiated during the vacation after I year and duration of the project is 6 to 8 weeks.

3 After satisfying 2, a candidate has to submit, in consultation with his Project Supervisor, the title, objective and plan of action of his project work to the PRC for approval. Only after obtaining the approval of the PRC the student can initiate the Project work.

4 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the PRC. However, the PRC shall examine whether or not the change of supervisor or topic leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

5 A candidate shall submit his project status report in two stages. Each stage will be evaluated for 25 marks.

6 After approval from the PRC, a soft copy of the Project work should be submitted for ANTI-PLAGIARISM check and the plagiarism report should be submitted to the examination branch and be included in the final Project work. The Project work will be accepted for submission, if the similarity index is less than **30%.** If the similarity index is more than the required percentage, the student is advised to modify accordingly and re-submit the soft copy of the Project work after one month. The maximum number of re-submissions of Project work after plagiarism check is limited to TWO. If the similarity index is more than 30% in the second attempt, then the candidate has to re-register for the project work and work for two more Terms. If he / she fails even after two more attempts, the admission

is liable to be cancelled. The college authorities are advised to make plagiarism check of every soft copy of Project work before submissions.

7 Three copies of the Project work certified by the supervisor shall be submitted to the College/School/Institute.

8 If the report of the examiner is not favourable, the candidate shall revise and resubmit the Project work. If the report of the examiner is unfavourable again, the Project work shall be summarily rejected.

9 If the report of the examiner is favourable, Project Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who adjudicated the Project work.

10 For Project Evaluation (Viva Voce) in II Year I Term. there is an external evaluation of 50 marks and the same evaluated by the External examiner appointed by the university and PRC.

11 If he / she fails to fulfil as specified in 10, the candidate will reappear for the Viva-Voce examination only after three months. In the reappeared examination also, fails to fulfil, he / she will not be eligible for the award of the degree.

12 The Project work shall be adjudicated by one examiner selected by the university. For this, Chairperson, BOS of the respective departments shall submit a panel of 3 examiners, who are eminent in that field with the help of the concerned guide and senior faculty of the department.

13 The Head of the Department shall coordinate and make arrangements for the conduct of Project Viva- Voce examination.

ANNEXURE – VI: Definitions

In these Regulations, unless the context otherwise requires:

1. Academic Year: Three consecutive trimesters constitute one academic year.
2. Choice Based Credit System (CBCS): The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).
3. Course: Usually referred to, as a 'subject' is a component of a program. All courses need not carry the same weightage. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/tutorials/laboratory work/field work/outreach activities/ project work/ vocational training/viva/seminars/ term papers/assignments/ presentations/self-study etc., or a combination of some of these.
4. Credit Based Semester System (CBSS): Under the CBSS, the requirement for awarding a degree or diploma or certificate is prescribed in terms of number of credits to be completed by the students.
5. Credit: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work field work per week.
6. Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.
7. Credit Point: It is the product of grade point and number of credits for a course.
8. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters i.e., O, A+, A, B+, B, C and F.
9. Term Grade Point Average (TGPA): It is a measure of academic performance in a Term. It is the ratio of total credit points secured by a student in various courses registered in a Term and the total course credits taken during that Term. It shall be expressed up to

two decimal places.

10. Cumulative Grade Point Average (CGPA): It is a measure of overall cumulative performance of a student. The CGPA is the ratio of total credit points secured by a student in all Trimesters and the sum of the total credits. It shall be expressed up to two decimal places.
11. Program: An academic program of the University.
12. Trimester /Term : Each Trimester /Term shall consist of 12 to 14 weeks of instruction.
13. Transcript or Grade Card or Certificate: Based on the grades earned, a grade certificate shall be issued to all the registered students after every Term. The grade certificate will display the course details (code, title, number of credits, grade secured) along with TGPA of that Term and CGPA earned till that Term.
14. Types of courses: The courses in a program may be of three kinds: Core, Elective and Foundation courses.
15. Core course: This is the course which is to be compulsorily studied by a student as a core requirement of a program in a branch of study.
16. Elective course: This is the course to be chosen from a pool of courses. Elective course may be (a) Supportive to the branch of study (b) Providing an expanded scope (c) Enabling an exposure to some other branch/domain (d) Nurturing student's proficiency/skill.
17. Foundation course: This course may be of two kinds, compulsory foundation and elective foundation.
18. Compulsory Foundation courses: These are the courses based upon the content that leads to knowledge enhancement. They are mandatory for all disciplines.
19. Elective Foundation courses: These are value-based and are aimed at personality development.
20. General:
    - The academic regulations should be read as a whole for the purpose of any interpretation.

- In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chancellor is final.

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PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

1. To provide knowledge on fundamental concepts of business and organizations.

2. To provide a critical perspective on theoretical and practical approaches to functional areas of management.

3. To develop leadership and analytical skills to respond effectively to changing business environments.

4. To establish and realize a creative research culture and team skills.

5. To inculcate learning abilities to update on latest technological and management concepts.

6. To develop inquisitiveness and creativeness aimed at self actualization and realization of ethical practices.

PROGRAM LEARNING OUTCOMES (POs)

The learning outcomes specify the knowledge, skills, values and attitudes students are expected to attain in courses or in a program.

1. *Business Environment and Domain Knowledge*: Graduates are able to improve their awareness and knowledge about the functioning of local and global business environments and society.

2.*Critical thinking, Business Analysis, Problem Solving and Innovative Solutions:* Graduates are expected to develop skills on analyzing the business data, application of relevant analysis, and problem solving in other functional areas such as marketing, business strategy and human resources.

3.*Global Exposure and Cross-Cultural Understanding*: Demonstrate a global outlookwith the ability to identify aspects of the global business and Cross Cultural Understanding.

4.*Social Responsiveness and Ethics:* **Graduates are expected to identify contemporary social problems, explore the opportunities for social entrepreneurship, designing business solutions and demonstrate ethical standards in organizational decision making.**

5. *Effective Communication*: Graduates are expected to develop effective oral and written communication especially in business applications, with the use of appropriate technology.

6. *Leadership and Teamwork*: Graduates are expected to collaborate and lead teams across organizational boundaries and demonstrate leadership qualities, maximize the usage of diverse skills of team members in the related context.

Program Structure and Syllabus of

MBA I Year (I, II & III Trimesters)

School of Management

R22 Regulations

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.),
Hyderabad, Telangana, INDIA

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Background

AUSoM (Anurag University School of Management)'s flagship MBA programme is being offered since 2006. Over the past 15 years, there have been many significant developments – in terms of students' intake, addition of specializations, enhanced research capabilities of faculty, diversity of placement of students among many developments.

As the first batch of students under Anurag University is ready to graduate this year in 2022, AUSoM has embarked on a journey to widen the scope of MBA and tread a new path. As a part of the programme revamp, we have decided to make it more rigorous and also finetune it to suit emerging industry requirements.

We have decided propose to do away from existing Semester system and shift to a Trimester mode. More courses are added and students are given a wider basket of specializations and electives to choose from. Overall credits covered (112) exceed the minimum requirement by the regulatory bodies (102).

AUSoM took a fresh look at the program structure and after multiple iterations we bring the proposed curriculum of our regular MBA and a few new courses to esteemed members of The Board of Studies, for their kind consideration.

MBA – First Year – Trimester 1

Total Credits: 22

The first Trimester lays a strong foundation with combination of seven Theory subjects, two Labs and two activities to build managerial competencies.

While the Theory subjects span different domains, they also provide exposure to the economic and legal environments in which businesses operate, Labs bring in the application-oriented approach to leverage IT skills and improve business communication capabilities.

As a part of developing managerial competencies, 'Approaches to Thinking', self-driven activities such as Company Analysis & active participation in Club enable team-building
and industry orientation among students.

S No	Subject	Credits
1	Organization Behavior-I	2.0
2	Financial Accounting and Analysis	3.0
3	Marketing Management I	3.0
4	Business Communications	3.0
5	Statistics for Business Decision Making	3.0
6	Micro Economics	3.0
7	Legal Aspects of Business	2.0
8	Productive Tools Lab	1.0
	Managerial Competency	
9	Company analysis	1.0
10	Approaches to Thinking	1.0
	Total	22

MBA – First Year – Trimester 2

Total Credits: 22

The Second trimester deep – dives into four courses – Organizational behavior, Marketing Management, Economics & Business Communication

Students are introduced to a new managerial competency – 'Aesthetics'.

S No	Subject	Credits
1	Marketing Management – II	3.0
2	Financial Management	3.0
3	Human Resource Management	3.0
4	Operations Research	3.0
5	Organizational Behavior - II	2.0
6	Cost Analysis for Decision Making	2.0
7	Macro economics	2.0
8	Data Visualization with Tableau	1.0
9	English communication skills Lab	1.0
	Managerial Competency	
10	Aesthetics	1.0
11	Social Immersion	1.0
	Total	22

MBA – First Year – Trimester 3 –

Total Credits: 15

The third trimester introduces students to new courses, namely Aesthetics, Negotiation, Design thinking & Business Ethics and corporate governance.

To sensitize students to social problems, a community project is to be carried out by them wherein they identify a problem and provide solutions.

To sensitize students to social problems, a community project is to be carried out by them wherein they identify a problem and provide solutions

At the end of the third trimester, a comprehensive viva tests the overall understanding of courses taught during the first year.

S No	Subject	Credits
1	Operations Management	3
2	Business Research Methods	3
3	Corporate Finance	2
4	Negotiation and Selling	2
5	Business Analytics	2
6	Business ethics and corporate governance	2
	Managerial Competency	
8	Design Thinking	1
9	Book Review	-
	Total	**15**

As a part of partial fulfillment of the program, a six to eight-week mandatory Internship is to be undertaken by the students followed by report and Viva. It carries four credits in the next trimester.

MBA – Second Year – Trimester 4

Total Credits: 22

In the fourth trimester, students are required to choose their area of major specialization – Finance/Marketing/HR.

In the second year, each trimester will have one course and elective within the chosen specialization track. Within each area of Specialization, few courses are mandatory (Compulsory) Elective and others are electives.

Apart from the above, students are to choose one subject from a pool as an Open Elective.

For the Internship taken up at the end of the third trimester, students are required to submit the Report and attend a Viva.

S No	Subject	Credits
1	Digital Business Models	2
2	Compulsory Elective – I	3
3	Compulsory Elective – II	3
4	Elective – I	3
5	Elective – II	3
6	Elective – III	2
7	Open Elective – I	2
8	Internship /Project and Viva	4
	Total	**22**

MBA – Second Year – Trimester 5

Total Credits: 17

Trimester 5 follows the structure of the previous trimester, with one core subject and electives in chosen specialization track and 1 project in their specialization.

S No	Subject	Credits
1	Strategic Management	2
2	Compulsory Elective – III	3
3	Compulsory Elective – IV	3
4	Elective – IV	3
5	Elective – V	3
6	Open Elective – II	2
7	Specialization Project	1
	Total	17

MBA – Second Year – Trimester 6

Total Credits: 14

The final trimester has 15 credits. One core, one compulsory specialization course, three electives in specialization in the last term

S No	Subject	Credits
1	Strategic Management	2
2	Compulsory Elective – V	3
3	Elective - VI	3
4	Elective – VII	3
5	Elective - VIII	3
	Total	**14**

List of Electives offered:

S No	Electives			
	Marketing	**Finance**	**HR**	**Open Elective**
1	Sales and distribution management	Investment Management	Performance Management & Appraisal	Creativity
2	Consumer behavior	Derivatives and Risk Management	Training & Development	Stress Management
3	Customer relationship management	Business Valuation and Analysis	Compensation and Reward Management	Entrepreneurship Development
4	Services marketing	International Finance	HR Planning	IPR
5	Advertising & IMC*	Micro Finance	HRM in Service sector	Managerial Competencies and Career Development
6	Digital Marketing	Financial Markets	Fundamental Labor Laws	The Art of pricing
7	Marketing Analytics	Financial Modelling using Excel	Leadership Development	Managerial Competencies and Career Development

8	Services Marketing	Digital Finance	HR Audit	
9	Brand Management	Behavioral Finance	Counseling	
10	Rural Marketing	Fixed Income Securities		
11	B2B Marketing	Financial Considerations and GST	Organizational development and change management	
12	International Marketing	Capital Expenditure and Planning		
13	Retail Marketing	Financial Analysis Planning and Control		
14		Corporate Taxation		
15		Wealth management		
16		Investment Management (Core Elective)		
17		Derivatives and Risk Management (Core)		

*Integrated Marketing Communications

Summary of Courses with Credits for MBA

S.No.	Course Type	No of Courses	Credits Per Course	Credits
1	**Core courses (CC)**	22	12*2 10*3	54
2	**Discipline Specific Electives (DSE)**	13	12*3 1*2	38

3	**General Electives (GE)**	2	2*2	4
4	**Skill Enhancement Courses (SEC)** (Productive Tools-lab, Data Analysis and Visualization)	2	2*1	2
5	**Language Courses (LC)** **(**English for Empowerment, English Language Skills lab)	2	1*3 1*1	4
6	**Project (PROJ)/Internship**	1	1*4	4
7	**Social Immersion**	1	1*1	1
8	**Specialization Project**	1	1*1	1
9	**Managerial Competency**	**4**	**4*1**	4
	Total	**48**		**112**

ANURAG UNIVERSITY

MBA I YEAR I TRIMESTER [7L +0T+ 3 P]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		Core	Organization Behavior-I	2	0	0	2.0
2		Core	Financial Accounting and Analysis	3	0	0	3.0
3		Core	Marketing Management I	3	0	0	3.0
4		LC	Business Communications	3	0	0	3.0
5		SEC	Statistics for Business Decision Making	3	0	0	3.0
6		Core	Micro Economics	3	0	0	3.0
7		Core	Legal Aspects of Business	2	0	0	2.0
8		SEC	Productive tools lab	0	0	2	1.0
			Managerial Competency				
9		SEC	Company analysis	0	0	2	1.0
10		SEC	Approaches to Thinking	0	0	2	1.0
			TOTAL	**20**	**0**	**6**	**22**

MBA I YEAR II TRIMESTER [7L +0T+ 3P+1 Project]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
		Core	Marketing Management – II	3	0	0	3.0
1		Core	Financial Management	3	0	0	3.0
2		Core	Operations Research	3	0	0	3.0
3		Core	Human Resource Management	3	0	0	3.0
4		Core	Organizational Behavior - II	2	0	0	2.0
5		Core	Cost Analysis for Decision Making	2	0	0	2.0
6		Core	Macro economics	2	0	0	2.0
7		SEC	Data Visualization with Tableau	0	0	2	1.0
8		LC	English communication skills Lab	0	0	2	1.0
			Managerial Competency				
9		SEC	Aesthetics	0	0	2	1.0
10		Proj	Social Immersion	0	0	2	1
			TOTAL	**18**	**0**	**4**	**22**

MBA I YEAR III TRIMESTER [6L+4T+2P]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		Core	Operations Management	3	0	0	3.0
2		Core	Business Research Methods	3	0	0	3.0
3		Core	Corporate Finance	2	0	0	2.0
4		Core	Negotiation and Selling	2	0	0	2.0
5		Core	Business Analytics	2	0	0	2.0
6		AECC	Business Ethics and Corporate Governance	2	0	0	2.0
			Managerial Competency				
7		SEC	Design Thinking	0	0	2	1.0
8		SEC	Book Review	0	0	1	-
			TOTAL	**18**	**0**	**7**	**15**

Organization Behavior-I

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	0	0	2	50	50	100

Course Objective

The course aims to introduce the student to management and organization behavior concepts, to understand the key factors of individual behavior like perception, attitude & values and personality.

Course Outcomes

At the end of this Organizational Behavior - I course, students will be able to:

- Have an awareness of the basic concepts and other contributing fields of organizational behavior.
- Analyze the fundamental concepts of organizational behavior
- Identify the role of perception of Individuals in the organization
- Aware and acknowledge the need for co-holding various personality styles in an organization
- Know the impact of attitudes and values in organizational perspective

UNIT I

Introduction to Management: Functions and Levels of Management. Evolution of Management Theory, Scientific Management, Principles of management, Approaches to management-Behavioral approach, Contingency approach and Contemporary approach

UNIT II

Introduction to Organizational Behavior: Characteristics of Organizational Behavior, Contributing disciplines to the OB field, Significance of OB, Nature and scope of OB, Challenges and opportunities for OB. Organizational Behavior models - Cognitive framework, Behavioristic framework and Social cognitive framework.

UNIT III

Perception and Attribution: Perception meaning - Factors influencing perception, Perceptual Process, The process of interpreting, Attribution theory, when perception fail, Perception and OB, Managing the perception process-Social perception.

UNIT IV

Personality: Personality determinants, Personality traits, The Big Five model-Major personality attributes influencing OB, Theories of personality. Learning - theories of learning, Principles of learning.

UNIT V

Attitudes and Values: Nature of Attitudes, Components of attitudes, Formation of attitudes, Functions of attitudes, Changing attitudes, Work-related attitudes, Values – Attitudes, Values and OB.

Text Books

1. Robbins, S.P. Sanghi, S.&Judge, T. A. Organizational Behavior, Pearson Education, New Delhi, 2018.
2. Aswathappa.K Organizational Behavior, Himalaya Publishing House, New Delhi, 2016.

Reference Books

1. Newstrom J, Organizational Behavior: Human Behavior at Work, Tata McGraw-Hill, New Delhi, 2015.
2. Steven, Von & Sharma., Organizational Behavior, Tata McGraw Hill, New Delhi, 2014.
3. Pareek.U, Understanding Organizational Behavior: Oxford Publishers, New Delhi, 2011.

Financial Accounting & Analysis

MBA I Year I Trimester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

The course aims to introduce the student to financial accounting concepts, to prepare financial statements, and computing of ratios for financial performance .

Course Outcomes

At the end of this Financial Accounting & Analysis course, students will be able to:

- Demonstrate the application of the basic principles of accounting to aid in the financial decisions.
- Prepare the income statement to help them in understanding the financial performance of an organization.
- Draw the Balance sheet and interpret the financial statements to analyse the financial position of the company.
- Prepare the common size statements & compute ratios to analyse the financial performance
- Prepare & analyze the cash flow statements, identify the components of earnings management & accounting land mines

UNIT I

Overview of financial statements: Accounting equation and its components. Basic Accounting Concepts: Balance sheet: Overview, Assets, Liabilities and Owners equity. Basic concepts in Accounting: Money measurement concept, Entity concept, Going Concern concept, Cost Concept, The dual Aspect concept, The accounting period concept, Conservatism concept, Realization concept, Matching concept, consistency concept, Materiality concept.

UNIT II

Final Accounts: Income Statement, Recognition of expenses and expenditure, the income statement: Revenues, cost of sales, Gross Margins, expenses, gains and net income, Retained earnings. Relationship between balance sheet and income statement, Accrual versus cash-based accounting. IFRS (International Financial Reporting Standards) and GAAP (Generally accepted accounting principles)

UNIT III

Preparation of financial statements: Accounting cycle, Income statement and balance sheet simple problems in the preparation of final accounts**.**

UNIT IV

Financial statement analysis I: common-size statement analysis, comparative statement analysis, trend analysis, Ratio Analysis: Liquidity, Activity, Profitability & Turnover rations (Simple Problems).

UNIT V

Financial statement analysis II: Cash Flow statements - Cash from Operations, financing and investing activities. Preparation of simple cash flow statements, Understanding annual report, Understanding Earnings management: Accounting Landmines, Red flags etc.

Text Books

1. S N Maheshwar, Suneel K Maheshwari & Sharad K Maheshwari, Financial Accounting, 6/e, Vikas Publishing House, 2018.
2. R. Narayanaswamy, Financial Accounting: A Managerial Perspective,5/e, PHI, 2014.

Reference Books

1. Shirley Carlon, Rosina McAlpine, Chrisann Palm, Lorena Mitrino, Nagaire Kirk & Lily Wong, Financial Accounting: Reporting, Analysis and Decision Making 5/e, John Wiley & Sons 2015.
2. Shashi K Gupta and R K Sharma, Management Accounting Principles and Practice, 14/e, Kalyani Publishers 2018.
3. Ashish K Bhattacharyya, Financial Accounting for Business Managers, 5/e, PHI Publishers 2017

Marketing Management-I

MBA I Year I Trimester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

This course will enable the students to develop an understanding of the role of marketing in a business organization specifically, and in our society at large

Course Outcomes

At the end of this Marketing Management-I course, students will be able to:

- Differentiate between selling and marketing
- Understand consumer buying process
- Classify customers into various segments and compare various product positionings.
- Assess the role of marketing mix elements in marketing strategy.
- Differentiate between the utility of various marketing research approaches such as qualitative and quantitative.

UNIT I

Introduction to Marketing: Needs, wants, demand, types of demand, value, scope of marketing, production concept, product concept, selling concept, marketing concept, holistic marketing concept**.**

UNIT II

Customer Orientation: Consumer insight, factors influencing consumer behavior, B to B markets, nature of buying unit, institutional markets; government markets; e-procurement.

UNIT III

Product management & Segmentation, Targeting, Positioning (STP): Product classifications and levels, product life cycle; segmentation, bases for segamentation of consumer markets, business markets; market targeting; positioning, brand equity.

UNIT IV

Marketing Mix: Elements of marketing mix, new product development, pricing strategies, marketing channels–levels, channels of distribution, promotion

UNIT V

Marketing Research: Marketing research, importance and process, quantitative marketing research, qualitative marketing research, applications of marketing research.

Text Books

1. Philip Kotler and Gary Armstrong, Principles of Marketing, Pearson, 17/e, 2018.

Reference Books

1. Lamb,Hair& Sharma ,Marketing: A South Asian Perspective, CengageLearning, 2016
2. Paul Baines, Chris Fill, Kelly Page, Sara Rosengren, Marketing, OUP ,5/e, 2019,
3. Srinivasan, Case Studies in Marketing, The Indian Context, PHI,2012

Business Communications

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	LC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

To enable the students to understand the techniques to communicate effectively and prepare business reports, business proposals, e-mails, summaries and effective resumes.

Course Outcomes

At the end of this Business Communications course, students will be able to:

- Interpret the subtle nuances of business communication.
- Explain the characteristics of business reports, kinds of reports and elements of effective business report writing.
- Plan and prepare traditional electronic and video resumes.
- Describe effective individual and team presentations.
- Write Business proposals, reports, e-mails and summaries effectively.

UNIT I

Introduction and Communication Basics: Just-A-Minute Presentation Workshop, Feedback and Overcoming Glossophobia, Process, Basic facts about Communication.

UNIT II

Presentations: Oral Presentation Skills, Introduction, Presentations, Management types of Presentations, Planning and Preparing, Visual Aids, Delivery.

UNIT III

Team Presentations: Team Presentations, Benefits and Purposes, Planning and Preparation, Execution, Towards Effective Team Presentation.

UNIT IV

Business Communication: Effective Business Correspondence, Basic Principles, Introduction to Reports and Proposals, Kinds of Reports, Characteristics of Business Reports, Elements of Effective Business Report Writing, Business Proposals.

UNIT V

Individual Presentations: Bios and Resumes, Resume Formats, and Video Resumes, E-Mail Etiquette.

Text Books

1. Meenakshi Raman, Prakash Singh, Business Communication, 2/e, Oxford University Press, 2013.

Reference Books

1. J.P.Parikh, Business Communication: Basic Concepts and Skills, Orient Black Swan
2. David Irwin, Effective Business Communications, Viva-Thorogood, 2013.
3. Rajendra Pal, J S Korlahahi, Essentials of Business Communication, Sultan Chand & Sons, New Delhi, 2013.
4. Subba Rao, B.Anitha Kumar, C.HimaBindu, Business Communication, Cengage, 2012.
5. Anjali Ghanekar, Business Communication Skills, Everest, 2011.
6. Sailesh Sengupta, Business and Managerial Communications, PHI, 2011.

Statistics for Business Decision Making

MBA I Year I Trimester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	SEC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

To enable students to analyze & apply various statistical techniques like descriptive statistics, regression analysis, time series and multivariate analysis for business decision making.

Course Outcomes

At the end of this Statistics for Business Decision Making course, students will be able to:

- Demonstrate skills of collection & presentation of data
- Apply relevant techniques of dispersion for solving problems
- Application of Correlation & Regression Analysis in business scenarios
- Apply relevant techniques for solving small sample problems
- Apply Multivariate analysis for analyzing patterns of data.

UNIT I

Sampling techniques and data collection: Sampling theory, sampling methods, Primary Data and Secondary Data Collection Techniques, Questionnaire Design. Tabulation of Data and General Rules of Tabulation, Diagrammatic and Graphical Presentation of Data

UNIT II

Descriptive measures: Measures of Central Tendency, Measures of Dispersion, Measures of Skewness and Kurtosis and Interpretation (with business applications).

UNIT III

Regression Analysis: Correlation, Types of Correlation and properties of correlation, Regression Analysis and Properties of Regression Coefficients. Method of Least Squares, (with business applications)

UNIT IV

Statistical Inference: Introduction to Null Hypothesis vs. Alternative Hypothesis, Tests of Hypothesis, Procedure for Testing of Hypothesis, Tests of Significance for Small Samples, Applications of t-test, Chi-square test, Association of attributes (with business applications).

UNIT V

Time Series and Multivariate Analysis: Introduction and Utility of Time series. Introduction to multivariate data analysis, Factor analysis, cluster analysis, conjoint analysis and multiple discriminant analysis (with business applications).

Text Books

1. Donald R. Cooper, Pamela S. Schindler, Business Research Methods, 8/e, Tata McGraw Hill Education, 2017.
2. Gaur & Gaur, Statistical Methods for Practice and Research, Sage Publication, 2/e, 2009
3. Joseph. F. Hair, Babin, Anderson, Black, Multivariate Data Analysis, Cengage Learning India Pvt Ltd, 8/e, 2018.

Reference Books

1. Bajpai, Business Statistics, Pearson, 2009.
2. Richard I Levin & David S.Rubin, Statistics for Management, Pearson, 7/e,2008.
3. Montgomery, Design and Analysis of Experiments, Wiley

Micro Economics

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

The course aims to introduce the student to micro economic concepts and apply to the business organization in the real world.

Course Outcomes

At the end of this Micro Economics course, students will be able to:

- Understand the scope of microeconomics in an organization
- Know the concepts of demand and supply elasticity and its influence on managerial decision making
- Describe production function and economies of scale
- Know the applications of cost concepts
- Identify different market structures and pricing strategies.

UNIT I

Introduction to Microeconomics: Definition, nature and scope of microeconomics. Difference between micro and macroeconomics, microeconomics relation with other subjects, Microeconomics and decision making in business

UNIT II

Demand and Supply Analysis: Introduction, determinants of demand, law of demand, exceptions, Elasticity of demand, importance and types of elasticity of demand. Demand forecasting, methods and techniques of demand forecasting..

UNIT III

Production Analysis: Production function, Law of variable proportion theory, Isoquant, Isocost. Law of returns to scale, Economies of scale

UNIT IV

Cost Analysis: Cost concepts, types of cost, cost output relationship in short run and long run. Break even analysis and importance.

UNIT V

Market Structure and Pricing Strategies: Introduction to market, classification of market, features and price determination under perfect competition, monopoly, monopolistic market, features of oligopoly market. Introduction to Pricing, objectives of pricing, pricing methods.

Text Books

1. P.L Mehta, Microeconomics, Sultan Chand & Sons, 2021.
2. Paul A.Samuelson, Microeconomics, Pearson. M.C.Graw Hill, 2021

Reference Books

1. P.L Mehta, Managerial Economics Sultan Chand & Sons, 2017.
2. H. L. Ahuja, Managerial Economics, S. Chand, 2017.

Legal Aspects of Business

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	0	0	2	50	50	100

Course Objective

The objective of this course is to provide the student with adequate knowledge regarding the basic legal aspects of various provisions which will facilitate decision making skills to address the problems.

Course Outcomes

At the end of this Legal Aspects of Business course, students will be able to:

- Understand the elements of a valid contract
- Describe basics of partnerships and differentiate sale and agreement to sell.
- Interpret various concepts related to special contracts like contract of agency, Indemnity & Guarantee and Bailment and pledge
- Have awareness of the procedure of formation of company and appointment of directors.
- Have awareness of the consumer protection mechanism, cyber law.

UNIT I

The Indian Contract Act 1872: Introduction, Essential elements of Contract, Agreement, Offer, Acceptance, Consideration, Capacity to Contract, Contingent Contract, Quasi Contract, Performance of Contract, Discharge of Contract, Remedies to Breach of Contract.

UNIT II

Partnership Act: Essentials of Partnership: Introduction to partnership, rights and duties of partner, types of partners, dissolution of partnership.

Sale of goods act: Sale and agreement to sell, conditions and warranties, transfer of property, finder of Goods, Performance of Contract of Sale. rights of an Unpaid Seller

UNIT III

Special Contract: Contract of Agency, Essentials of Contract of Agency, Kinds of Agents, Relationship of Principal and Agent, Duties and Rights of an Agent, Duties and Rights of the Principal, Termination of Agency, Indemnity and Guarantee: Rights and Duties of Indemnity, Rights of Surety against Principal Debtor, Creditor & Co-Surety.

UNIT IV

Companies Act: Formation, Memorandum, Articles, Prospective Shares, Debentures, Directors Appointment, Powers and Duties, Meetings, Proceedings, Management, Accounts, Audit, Oppression & Mismanagement, Winding Up**.**

UNIT V

The Consumer Protection and Cyber Law: Rights of Consumers, Consumer Protection Councils, Redressal Machinery, District Forum, State Commission, National Commission Recent Amendments. Cyber law in India, Information Technology Act 2000,.

Text Books

1. N.D. Kapoor, Business Laws,7th edition, Sultan Chand& Sons,2018
2. MC.Kuchhal & Vivek, Business Law ,5th edition, Vikas Publishing House Pvt.Ltd 2017

Reference Books

1. Tejpal sheth, Business Law ,3/e, Pearson Publications, 2017
2. Michael Flynn, Kirk W.Buffington, Pennington ,Legal Aspects of Public Procurement 2020

Productive Tools Lab

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	SEC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Course Objective

The objective of the course is to introduce the students to basic tools of MS- office and its applications.

Course Outcomes

At the end of this Productive Tools Lab course, students will be able to:

- Use their digital gadgets in a safe and secure way and use some basic troubleshooting
- Format word documents, work with tables and able to use shortcuts
- Prepare business presentations using powerpoint
- Work with Pivot tables and cross tabulation, descriptive statistics, analysis and visualization.
- Use R and R Studio, its packages for data analysis and visualization.

UNIT I

Managing your devices: Laptop/Computer/Mobiles, Managing virus free environment and basic maintenance.

UNIT II

Productivity Tools: Introduction to MS -PPT, Excel, Word, Shortcuts, Power user shortcuts, Formatting word documents, Making tables and inserting various other files within.

UNIT III

MS PowerPoint: How to prepare a presentation, telling a story with slides - structure of a narrative, Types of presentation, Subject presentation, selling an idea etc.

UNIT IV

MS Excel: Basic functionality, advanced functionality, working with statistical functions, Tabulation, Building charts - pie charts, line diagrams etc. Pivot tables and cross tabulation.

UNIT V

Data Analysis and Visualization Using R: Introduction to R and R Studio, Installing R and R Studio, Importing data from other packages, Data analysis and Data Management with R, Descriptive Statistics, Data Visualization using R packages, Loading and working with R-Packages.

Text Books

1. Bittu Kumar, 2017 Mastering MS Office: Concise Handbook with Screenshots, V&S Publishers.
2. Cox et all- 2007 Microsoft Office System Step-by- Step, 1/e, PHI.
3. David Whigam-Business Data Analysis Using Excel, 1/e, Oxford University Press.
4. R Programming: A Beginner's Guide to Data Visualization, Statistical Analysis and Programming in R, R Publishing, 2019

Reference Books

1. Anita Goel,Computer Fundamentals, Pearson, 2010.
2. Layfe de Micheaux, Pierre, Drouihet, Remy, Liquet, Benoit, The R Software Fundamentals of Programming & Statistical Analysis, 2013
3. Vishwas R Pawgi, Statistical Computing Using R software, Nirali Prakashan, 2016
4. John M Quick, Statistical Analysis with R Beginners guide, 1/e, ShroffpublDirect, 2014

COMPANY ANALYSIS REPORT

MBA I Year I Trimester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	SEC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	0	50

Course Objective

The objective of the course is to introduce students to the various functions of an organization and study the major strategies implemented by any company of their choice.

Students will asked to present a report on company of their choice at the end of the semester

Internal assessment will be done for 50 Marks

Suggested content of the report

1. Financial Analysis
2. Market Analysis
3. Customer Analysis
4. Competition Analysis
5. HR Policies and practices

APPROACHES TO THINKING

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	SEC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	0	50

Course Objective

The objective of this course is to introduce students to basics of thinking and various approaches to thinking. The students will understand the importance of thinking in their lives and profession. They will learn to appreciate the various approaches to thinking such as Systems Thinking, understanding and working with non-linear phenomena among others.

They will learn to understand various models of thinking – for example, Kahneman's System I and System II thinking. They will explore various human biases in thinking and how they impact one's perception, and hence the quality of decision making.

Thinking is a metacognitive competence, and any bias, or lack of rationality or can lead to suboptimal decision making. They will learn about the common biases – confirmation bias, sunken cost syndrome to name a few.

The course will introduce new discoveries about thinking, and will help the student become aware of their own thinking and the thinking patterns they use to aid them in improving their thinking processes.

The course will deploy readings, guest lectures and assignments (both individual and group assignments) to familiarize the students with the current research in thinking, and apply some of the research findings to improve their thinking abilities.

Course Outcomes

At the end of the approaches to thinking course the students will be able to:

- Why thinking is important in one's life and business
- Understand the the biases that influence one's thinking.

- Be aware of their own biases.
- Differentiate between linear and non-linear phenomena, and understand how
- human thinking cannot easily comprehend non-linearity
- Understand various mental models services
- Apply various tools of thinking, such as Brain Storming, Associative Thinking,
- Mind mapping,
- Understand the importance of meta-cognitive abilities
- Explore and build skill in some key meta-cognitive abilities – learning to learn,
- abstraction etc.
- Distinguish underlying frameworks in their thinking.

- Develop familiarity with MECE, and build an inductive and deductive methods of mapping phenomena.

Learning Resources

- Guest Speakers – (An illustrative list of names, non-binding)
- Books, reviews & videos
- Thinking Fast and Thinking Slow – Daniel Kahneman
- Mental Models – Charlie Munger's quotes, writings,
- The upside of irrationality – Dan Ariely
- Black Swan - Nassim Nicholas Taleb
- Fooled by Randomness - Nassim Nicholas Taleb
- Antifragile - Nassim Nicholas Taleb
- Influence – Robert Cialdini
- Pre-suasion – Robert Cialdini
- The art of thinking clearly – Rolf Dobelli
- Design of Everyday Things – Don Norman

Marketing Management – II

MBA I Year II Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	1	0	3	50	50	100

Course Objective

This course will enhance the students' knowledge on marketing strategies and how various concepts can be applied in realistic marketing scenario .

Course Outcomes

At the end of this Marketing Management – II course, students will be able to:

- Customize marketing approaches in different contexts
- Describe and analyze competitive marketing strategies applied by organizations
- Appreciate importance of branding and develop branding strategies.
- Have awareness of factors influencing global marketing strategies
- Get sensitized to online and sustainable marketing strategies

UNIT I

Marketing Planning and Marketing Strategies: Strategies for different stages of PLC, BCG Matrix, Ansoff's Grid, Marketing Planning, Implementation, Marketing department organization, Marketing Control, Marketing Investments.

UNIT II

Competition strategies: Marketing strategies for market leaders, market challengers, market followers; Niche marketing; Guerilla marketing; Ambush marketing.

UNIT III

Brand Management: Role of brands, Brand equity, Brand associations, Brand extension, Brand portfolio, Brand revitalization

UNIT IV

Global Marketplace: International trade system, Choosing markets to enter, Market entry options, Global marketing programs.

UNIT V

Digital Marketing and Sustainable Marketing: Online marketing, Online branding, Consumerism, Environmentalism, Green Marketing, Sustainable Marketing Principles.

Text Books

1. Philip Kotler and Gary Armstrong, Principles of Marketing, Pearson, 17/e, 2018.

Reference Books

1. Lamb,Hair& Sharma ,Marketing: A South Asian Perspective, CengageLearning, 2016
2. Paul Baines, Chris Fill, Kelly Page, Sara Rosengren, Marketing, OUP ,5/e, 2019.
3. Srinivasan, Case Studies in Marketing, The Indian Context, PHI,2012

Financial Management

MBA I Year II Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

The course aims at the student to apply techniques for investment, optimum capital structure, dividend decisions & estimate the working capital management for efficient management of current assets. .

Course Outcomes

At the end of this Financial Management course, students will be able to:

- Appreciate the finance function and the time value of money in their decisions
- Apply various capital budgeting techniques for selecting the feasible projects under risk & uncertainty
- Apply the capital structure theories for an optimal capital structure
- Appraise the dividend decisions and the practices to study the impact on their decisions.
- Estimate working capital requirements and apply the tools to forecast and manage the current assets

UNIT I

Introduction: Nature, scope and objectives of financial management - Time value of money and mathematics of finance - concept of risk and return**.**

UNIT II

Investment decision: Capital budgeting process - Estimation of relevant cash flows - Payback period method - Accounting rate of return - Net present value - Net terminal value - Internal rate of return - Profitability index - Capital budgeting under risk - Certainty equivalent approach and risk adjusted discount rate.

UNIT III

Financing decision: Cost of capital and financing decision - Estimation of components of cost of capital: Equity capital - Retained earnings - Debt and preference capital - Weighted average cost of capital and Marginal cost of capital - Sources of long-term financing - Capital structure - Operating and financial leverage - Determinants of capital structure .

UNIT IV

Dividend decision: Relevance and irrelevance of dividend decision - Cash and stock dividends - Dividend policy in practice.

UNIT V

Working capital management: Meaning and nature of working capital, Determination of working capital requirement, A brief overview of cash management, Inventory management and receivables management.

Text Books

1. Prasanna Chandra; Financial Management Theory and Practice, TMH, 10/e, 2019
2. M.Y. Khan & P.K. Jain,Financial Management, TMH, 7/e, 2017.

Reference Books

1. Ashwath Damodaran ,Corporate Finance-Theory and Practice ,John Wiley & Sons
2. I.M. Pandey,Financial Management (Vikas), 12/e, 2012
3. Brigham & Earnhardt, Financial Management –Theory & Practice, Thomson Learning, 10/e ,2015

Operations Research

MBA I Year II Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

To enable students to utilize various techniques in the area of operations research using linear programming, transportation, assignment and game theory models for business decision making.

Course Outcomes

At the end of this Operations Research course, students will be able to:

- Explain the concepts of operation research & solve Linear Programming Problem
- Solve simplex & Big -M Problems for business decisions
- Solving Transportation & Assignment Problem Models to Decision Making
- Apply various game theory problems.
- Apply decision analysis techniques for business decisions

UNIT I

Introduction: Nature and Scope of Operation Research, Origin of OR, Applications of Operations Research in different Managerial areas, Linear Programming: Application Areas of LPP, Guidelines for formulation of LPP, Formulation of LPP for Different Areas, Solving LPP by Graphical Method**.**

UNIT II

Simplex Method: Solution Methodology of Simplex Algorithm, Artificial Variable techniques Big-M method and Two Phase simplex method, Degeneracy and how to resolve degeneracy(for business decisions).

UNIT III

Transportation and Assignment Models: Definition and Application of the Transportation Model, Solution of the Transportation Problem, the Assignment Model, Travelling Salesman Problem for Business Decisions.

UNIT IV

Game Theory: Introduction, Two Person Zero-Sum Games, Pure Strategies, Games with Saddle Point, Mixed Strategies, Rules of Dominance, Solution Methods of Games without Saddle point – Algebraic, Arithmetic Methods.

UNIT V

Decision Analysis: Introduction, Ingredients of Decision Problems, Decision Making under Risk and Uncertainty for Business Decisions.

Text Books

1. K. Sharma, Operations Research: Theory and Applications, Macmillan.
2. Hillier/Lieberman, Introduction to Operations Research, Tata McGraw Hill Education, 2008

Reference Books

1. ShridharaBhat, Quantitative Analysis for Business Decisions, Himalayan Publishing House, 2009.
2. R.Panneerselvam, Operations Research, PHI, 2008.
3. Gupta and Khanna, Quantitative Techniques for Decision Making, PHI, 2009.

Human Resource Management

MBA I Year II Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

The course aims to introduce the basic understanding of key HRM functions that includes basic functions pertaining to organizations.

Course Outcomes

At the end of this Human Resource Management course, students will be able to:

- Assess the changing role of HRM
- Describe the process of human resource planning and recruitment.
- Aware of training and development processes.
- Know the employee performance training methods.
- Analyze the various contemporary issues in HRM. mines

UNIT I

Introduction to HRM: Definition, Nature and Scope of HRM, Evolution of HRM, challenges of HRM, HR Profession and HR Department, Functions of HRM, Trends shaping human resource management.

UNIT II

Human Resource planning: HRP, Need for Human resource planning ,factors affecting HRP, Job analysis and Job Design, Demand and Supply forecasting ,Recruitment and Selection – Recruitment Process, Sources and Methods of Recruitment, Types of tests and interviews ,Steps in selection, Placement and induction process.

UNIT III

Training and Development: Need and Importance of Training and Development, Training Need Analysis, Training methods, Orienting and onboarding new employees ,Design Training Program, Evaluating the training effort , Management Development, Succession Planning.

UNIT IV

Performance Appraisal: Meaning and importance of Performance Appraisal, Performance Appraisal Process, techniques of Performance Appraisal, dealing with cognitive bias, performance Management, Managing the appraisal discussion.

UNIT V

Compensation: Meaning and of Compensation, Methods of compensation, Basic factors in determining the pay rates, Job Evaluation, Pricing professional and managerial jobs.

Text Books

1. Gary Dessler, BijuVarkey ,Human Resource Management,Pearson Publication, 15/e,2019
2. Subbarao,David Lepak, Mary Gower, Human Resource Management, Pearson,2018.

Reference Books

1. Paul Banfield, Rebecca Kay, Human Resource Management, Oxford, 2019.
2. Wayne &Caseia, Ranjeet Nambudri, “Managing Human Resource, TMH. 2019,
3. Gomez Mejia et.al, Managing Human Resource, PHI,2017.

Organizational Behaviour - II

MBA I Year II Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	0	0	2	50	50	100

Course Objective

The objective of this course is to introduce some basic organizational and individual processes that impact work, become aware of some of the organizational processes, understand group dynamics and learn to be aware of group dynamics.

Course Outcomes

At the end of this Organizational Behaviour - II course, students will be able to:

- Apply the various applications of motivational theories and their application.
- Know different styles of leadership, become aware of their leadership styles, and learn to lead and also follow
- Be aware of group processes, contribute productively to a team
- Understand the importance of change, be aware of the tools of change, apply the change to their own life
- Assess the role of stress, functions and dysfunctions, develop mechanisms to cope with stress and develop work-life balance, and apply a few coping strategies

UNIT I

Motivation: Theories of motivation: Early and contemporary views, Applications of motivation, Nature of motivation, Importance of motivation, Motivational challenges, Theories on motivation, Review of theories, Motivation across cultures.

UNIT II

Leadership: Nature of leadership, Leadership and management, Importance of leadership, formal and informal leadership, Leadership styles and their implications, Theories of leadership, Contemporary issues on leadership.

UNIT III

Group Dynamics: Nature of groups, Types of groups, Group development, Teams Vs Groups, Benefits from teams, Types of teams, implementing teams in Organizations, team Issues – Effective teamwork – Typical teams in organizations – Can group become teams.

UNIT IV

Organizational Dynamics: Organizational culture: Concept, characteristics, elements of culture, creating and sustaining, organizational culture Organizational change: Concept, nature, forces for change, resistance to change, managing resistance to change, Kurt Lewin's theory of change.

UNIT V

Organizational power and politics: Concept, sources of power, the distinction between power, authority, and influence, and Approaches to power. Stress: Meaning and definition, the stress experience, Work stress model, Burnout, Stress management, Stress and performance, Strategies to manage stress.

Text Books

1. S Robbins, S.P., Sanghi, S. & Judge, T. A. Organizational Behavior. New Delhi: 15/e, Pearson Education, 2018.

Reference Books

1. Luthans, F. Organizational Behavior. 12/e, Tata McGraw-Hill, New Delhi: 2017.
2. Aswathappa, K. Organizational Behavior.12/e, Himalaya Publishing House, New Delhi, 2016.
3. Newstrom J. Organizational Behaviour: Human Behaviour at Work. New Delhi: 12/e, Tata McGraw-Hill, 2017.
4. Steven, Von & Sharma., Organizational Behaviour. 13/e, Tata McGraw- Hill, New Delhi
5. Pareek Uday, Understanding Organizational Behaviour,3/e, Oxford Publishers, New Delhi, 2011.

Cost Analysis for Decision Making

MBA I Year II Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	0	0	2	50	50	100

Course Objective

The course aims to understand and apply the tools and techniques of costing in manufacturing and service sectors for managerial decisions.

Course Outcomes

At the end of this Cost Analysis for Decision Making course, students will be able to:

- Integrate the cost concepts in the managerial decisions
- Prepare the cost sheet to ascertain the cost of different cost objects
- Calculate the reak-even point and apply the Cost-Volume-Profit analysis to the decision
- Use the cost data to compare and contrast the decisions involving alternative choices
- Prepare various budgets with respect to a manufacturing and service industry to aid in the managerial decisions

UNIT I

Evolution of cost and management accounting: Evolution of cost and management accounting, the changing role of managerial accounting in a dynamic environment. Basic Cost concepts. Fixed, variable, semi-fixed, Average costs and total costs, differential costs, incremental costs. Sunk costs, opportunity costs. Relevant costs, irrelevant costs, imputed and notional costs. Inventoriable costs and non- inventoriable costs.

UNIT II

Cost sheet and Preparation of cost sheet: Cost sheet and Preparation of cost sheet. Product costs, Cost Accumulation and Cost ascertainment. Cost Accumulation of a Job, batch service and process costing environment.

UNIT III

Cost-Volume-profit analysis: Calculation of break-even point, Applications of breakeven point, assumptions and limitations of break-even analysis, Target Profit and contribution analysis, full costing versus variable costing, Activity Based costing systems, differences in treating overhead costs in traditional vs Activity Based costing systems.

UNIT IV

Decisions involving alternative choices: Decisions involving alternative choices-adding or dropping a product line, Make or buy, acceptance of special orders, pricing decisions.

UNIT V

Budgetary control: Preparation of various budgets of a manufacturing service company. limiting factor analysis in budgetary control, overview of budgetary control in not-for-profit organizations, including the Government budgets.

Text Books

1. Jain S. P and K.L. Narang- Cost Accounting Principles and practice, Kalyani Publishers, 2019
2. Dr. R. Prabhakar Rao, Dr. Reeta, Dr. Shruti Gupta, Cost Accounting - Principles Practice Sultan Chand publication, 2020

Reference Books

1. Charles T. Horngren, Srikanth M, Datar, Madhav V Rajan, Cost Accounting- a Managerial emphasis, Pearson, 15/e, 2015
2. David F Hawkins, Kenneth A, Merchant Accounting- Text and Cases, Robert N Anthony, TMH, 12/e, 2016
3. Hilton and Platt, Managerial Accounting- creating Value in a global business environment, TMH, 9 /e, 2018

Macro Economics

MBA I Year II Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	0	0	2	50	50	100

Course Objective

The objective is to understand basic concepts of macroeconomics and understand the impact of the macroeconomic policies, trends on the firm - what threats, opportunities emerge to the firm.

Course Outcomes

At the end of this Macro economics course, students will be able to:

- Comprehend the role of macroeconomics and national income.
- Apply different growth and economic models in organizations.
- Know influences on organizational strategies based on monetary and fiscal policy for the economy.
- Grasp the significance of tax systems on economy
- Demonstrate the understanding of business cycles and international trade.

UNIT I

Introduction to Macroeconomics: Meaning, nature of macroeconomics, national income, gross domestic product, gross national product, net national product, per capita income, and disposable income, National income measurement.

UNIT II

Theory of Employment: Keynesian theory of employment, theories of economic growth, Harrod-Domar model, Solow model, Marxian model

UNIT III

Money and Fiscal Policy: Definition and functions of monetary and fiscal policy. Instruments of monetary and fiscal policy, analysis of inflation and unemployment

UNIT IV

Introduction to Public Finance: Introduction to tax, tax system in India, progressive, regressive and degressive tax. Good and service tax, tax avoidance and tax evasion.

UNIT V

Business Cycles: Introduction to trade, types of trade. World Trade Organization, structure and functions of World Trade Organization, Meaning of business cycle, phases of business cycle etc.

Text Books

1. Misra & Puri, Indian Economy, HPH, 39/e, 2021
2. Paul A Samuelson, William D Nordhaus, Sudip Chaudhuri, Macroeconomics, McGraw Hill, 20/e, 2021

Reference Books

1. Shirley Sree JataBanarjee, Nanda Kumar warrier, Macro Economics, 1/e, Sage Publications Pvt Ltd, 2018.
2. H.L. Ahuja, Macroeconomic Theory and Policy, 20/e, 2019.
3. A.N.Agarwal, M.K.Agarwal, Indian Economy: Developmental Problems and Policies, New Age Publishers, 43/e, 2019.

Data Visualization with Tableau

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	SEC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.0	50	50	100

Course objectives:

The course aims in visualization practices of translating information into a visual context to make data representation easier.

Course Outcomes:

At the end of the course, the student will be able:

- Understand and describe the main concepts of data visualization
- Assemble dashboard layout.
- Use tools for data and interactions.
- Create ad-hoc reports, data visualizations, and dashboards using Tableau Desktop
- Publish the created visualizations to Tableau Server and Tableau Public

Unit I:

Introduction to Tableau: Course introduction, Dataviz best practices, Getting started with Tableau Desktop, Connecting to the tutorial dataset, creating the first charts, filtering and sorting data.

Unit II:

Creating common visualizations (bar charts, line charts etc.), Assembling a dashboard layout, using dashboard filter.

Unit III:

Transform the data and Interactions, Dataviz best practices,Creating simple calculations in Tableau

Unit IV:

Using table calculations, Interactivity with text and visual tooltips, Interactivity with actions (filter, highlight, URL), Drilldown between dashboards

Unit V:

Data Storytelling: Introduction to data storytelling, creating a data story in Tableau, overview of the Tableau ecosystem, further learning opportunities in tableau.

Text books:

1. Lindy Ryan ,Visual Data Storytelling With Tableau , Pearson India, 2018
2. Ben Jones, Communicating Data with Tableau - Designing, Developing, and Delivering Data Visualizations (Covers Tableau version 8.1) 1/e.

English Communication Skills Lab

MBA I Year II Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	LC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Course Objective

The course aims to improve the fluency of students in spoken English and neutralize their mother tongue influence and use language appropriately for public speaking and interviews.

Course Outcomes

At the end of this English Communication Skills Lab course, students will be able to:

- Differentiate between Spoken and Written English in formal and informal situations
- Learn Task Based Language Learning (TBLL) through various language activities effectively.
- Apply strategies for Effective Communication in different situations.
- Communicate effectively at work place with a special focus on social and professional etiquette.
- Participate in conversation, Public Speaking and Group Discussion

UNIT I

Exercise-I:

The 4 secrets of successful Communication:

Spoken vs. Written language - Formal and Informal English - Elevator speech - Introducing others

Ice-Breaking activities and JAM sessions.

UNIT II

Final Exercise-II

Features of Good Conversation:

Common Everyday Situations - Conversations and Dialogues

Role-Plays - Thanking and Responding - Agreeing and Disagreeing - Seeking and Giving Advice -Making Suggestions etc.

UNIT III

Exercise-III:

Communication at Workplace, Social and Professional Etiquette:

Descriptions (Person, place, object) – Narrations - Giving Directions and Guidelines

Telephone Etiquette

UNIT IV

Exercise-IV:

Formal Presentations:

Public Speaking - Exposure to structured talks - Non-verbal Communication.

UNIT V

Financial Exercise-V:

Extempore speeches:

Debates.

Minimum Requirement of infra structural facilities for ECS Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System etc.

Reference Books

1. Kumar, Suresh, E. and Sreehari, P. A Handbook for English Language Laboratories. New Delhi: Foundation, 2009.
2. Lab Manual: A Manual entitled English Language Communication Skills (ELCS) Lab Manual- cum- Work Book. New Delhi: Cengage Learning India Pvt. Ltd., 2013.
3. Mohan, Krishna. and Singh, N. P. Speaking English Effectively. (2nd Edition.) New Delhi: Macmillan Publishers India Ltd., 2011.
4. Rutherford, Andrea J. Basic Communication Skills for Technology. (Second Edition.) New Delhi: Pearson Education, 2007.
5. Sasi Kumar, V. and Dhamija, P.V. How to Prepare for Group Discussion and Interviews. Tata McGraw Hill.

Aesthetics

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	SEC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	0	50

Course Objective

The objective of this course is to introduce students to basics of aesthetics. The students will understand the importance of aesthetics in their lives and profession. They will learn to appreciate the various elements of aesthetics such as the Golden Mean, Harmony, Balance, Contrast and other relevant concepts.

Course Outcomes

At the end of this Aesthetics course, students will be able to:

1. Why aesthetics is important in one's life and business
2. Understand the key concepts in aesthetics such as Harmony, Balance, Golden Mean etc.
3. Appreciate the need to develop aesthetically pleasing products and services
4. Discriminate between well designed and crafted products, advertisements and services
5. Appreciate calligraphy, and text presentations and choice of fonts
6. Able to apply some of the concepts to their presentations, poster creation and organizing the class room and their immediate surroundings

Course Description

Students will learn to study the aesthetics of various products, advertisements, understand the needs of customers from an aesthetically pleasing point of view. The students also will learn to appreciate some of the concepts in design of services and products and Point of Sale displays.

An aesthetic sensibility will help them make better presentations, empathise with customers and their aesthetic needs. They will develop a sensitivity to discriminate between well designed products and poorly designed products and interfaces.

The course will deploy readings, guest lectures and assignments (both individual and group assignments)

Articles on aesthetics:

- https://magazine.wharton.upenn.edu/issues/fall-winter-2019/how-aesthetics-define-your-business/oncept.

Guest Speakers: Artists, sculptors, graphic designers (An illustrative list of names, non-binding) such as

- Materials for poster creation

Basic graphics design tools – for example, pro-create or equivalent, or Google drawing tools

A selection of Advertisements for evaluation

Reference Books

1. Ogilvy, David. Ogilvy on Advertising. United Kingdom, Knopf Doubleday Publishing Group, 2013.
2. Norman, Donald A., The Design of Everyday Things. United Kingdom, MIT Press, 2013.

Operations Management

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

The objective of this course is to provide the student with adequate knowledge regarding the different tools of operations management.

Course Outcomes

At the end of this Operations Management course, students will be able to:

- Understand operations management process and factors influencing the Operation Management
- Describe capacity planning and facility layout in the organization
- Implement different techniques to reduce time and cost by using project management
- Apply different cost reduction method in Material management
- Use different quality control techniques and standards to reduce quality errors

UNIT I

Introduction to Operations Management: Role of Operations Management in total management System- Interface between the operation systems and systems of other functional areas- Process planning and process design Production Planning and Control-Basic functions of Production Planning and Control- Production lifecycle.

UNIT II

Capacity planning: Process Selection and Facility layout: Designing product and process layouts and line balancing, Forecasting and its types. Location and the factors influencing location.

UNIT III

Materials Management: Need and importance of Materials management-Materials Requirement Planning-Materials Budgeting- Techniques for prioritization of materials-

Sources of Supply of Materials –selection-evaluation and Performance of suppliers-make or buy decisions.

UNIT IV

Stores Management: Objectives of Stores Management, requirements for efficient Management of Stores, safety stock -Inventory Control - Different Systems of Inventory Control, Types of Inventory- Costs ,Systems of inventory control, ABC, VED and FNSD analyses. Value Analysis ,Importance in cost reduction – concepts and procedures.

UNIT V

Quality management: Quality Assurance, Inspection and Quality Control, Acceptance Sampling, Total Quality Management and ISO 9000 Series Standards, Six Sigma.

Text Books

1. K. Ashwathappa, Sreedhar Bhat, Production and Operations Management, HPH, 2015.
2. R. Panneerselvam, Production and Operation Management 3/e, PHI,2015.

Reference Books

1. Mahadevan. B, —Operations Management, 3/e, Pearson Education, 2015
2. Bozarth, Cecil C. & Handfield, Robert B; Introduction to Operations and Supply Chain Management; Pearson Education; New Delhi.
3. H. Kaushal, Production / Operations Management, Case Study Solutions, MacMillan
4. Wisner, Joel D., Leong, G. Keong & Tan, Keah-Choon; Principles 2012
5. Bozarth, Cecil C. & Handfield, Robert B.; Introduction to Operations and Supply Chain Management; Pearson Education; New Delhi

Business Research Methods

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

The course aims to understand the working capital financing, analyze the credit policies and capital structure of the organization to evaluate and measure the impact of inflation on capital structure and its policies.

Course Outcomes

At the end of this Business Research Methods course, students will be able to:

- Appreciate the role of research in organizations
- Apply qualitative research techniques in his/her research
- Use appropriate research techniques for a given problem
- Implement appropriate statistical tools for research.
- Write research reports

UNIT I

Introduction to Research: Business research – Definition, Nature, purpose of research, types of research, research process, research methodology and research method., Role of Business Research in Managerial Decisions, Deduction and Induction, Ethics in Business Research.

UNIT II

Credit Research Process: Problem Identification - Preliminary Data Gathering - Literature Survey –Theoretical Framework- Sampling, Hypothesis Development - Types of Research Designs: Exploratory, Descriptive, Experimental Designs and Case Study - Measurement of Variables -Rating Scales- Ranking Scales- Reliability and Validity. An overview of Descriptive Statistics and Inferential statistics

UNIT III

Collection of Data: Sources of Data-Primary Sources of Data-Secondary Sources of Data - Data Collection Methods- Quantitative data collection methods – Observation, Interview, Focus groups.

UNIT IV

Statistical techniques of data analysis: Chi-Square test, T test, ANOVA, Factor Analysis, Reliability and Correlation (Spearman and Karl Pearson), Conjoint analysis, Cluster analysis, multivariate data analysis.

UNIT V

Corporate Research report writing: Research Report: Research Reports- Components-Title Page - Table of Contents - Executive Summary - Introductory Section - Body of the Report - Conclusion of the Report- References- Appendix - Guidelines for Preparing a Good Research Report Oral Presentation- The Presentation and Handling Questions

Text Books

1. Uma Sekaran, Research Methods for Business–A Skill Building Approach, John Wiley& Sons (Asia) Pvt. Ltd., Singapore, 7/e, 2017

Reference Books

1. Donald R Cooper and Pamela S Schindler, Business Research Methods, 12/e,Tata McGraw- Hill Publishing Company Limited, New Delhi,2013

Corporate Finance

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	0	0	2	50	50	100

Course Objective

The course aims to understand the working capital financing, analyze the credit policies and capital structure of the organization to evaluate and measure the impact of inflation on capital structure and its policies.

Course Outcomes

At the end of this Corporate Finance course, students will be able to:

- Estimate the capital requirement of an organization
- Evaluate the credit policies and the cash management
- Design the capital structure
- Measure the evaluation of intangible assets
- Identify the impact of inflation on capital structure

UNIT I

Introduction to Working Capital Policy: Factors influencing working capital requirements. Current asset policy and current asset finance policy. Working capital financing: short term financing of working capital, long term financing of working capital. Working capital leverages. Determination of operating cycle and cash cycle. Estimation of working capital requirements of a firm. Determination of level of current assets. Sources for financing working capital

UNIT II

Credit Management: Receivables, Credit management through credit policy variables, marginal analysis, Credit evaluation: Numerical credit scoring and discriminant analysis. Control of accounts receivables, Factoring. Cash and Liquidity Management- Forecasting cash flows– Cash budgets, long-term cash forecasting, monitoring collections and receivables, optimal cash balances – Baumol model, Miller - Orr model & stone model. Strategies for managing surplus funds

UNIT III

Financial Reports: Understanding the structure of financial reports and financial statements, Asset mix of the business, asset measurement and Valuation, Financing mix of liabilities and equities, Measuring earning and profitability. Accounting measures of risk, analysing real time statements.

UNIT IV

Intangible Asset Companies: Financial management in intangible: intensive companies. Characteristics of intangibles, implications for financial managements, Types and approaches to valuations of intangible assets.

UNIT V

Corporate Financial Modelling: Effect planning, sales forecast method, pro-forma P & L account method, pro-forma balance sheet of inflation on; Asset value, firm value, returns, Financial planning : Basis of financial method, determination of External Financing Requirement (EFR).

Text Books

1. Prasanna Chandra; Financial Management Theory and Practice; Tata McGraw Hill, 12/e, 2015
2. M.Y. Khan & P.K. Jain – Financial Management, TMH, 16/e, 2016

Reference Books

1. Ashwath Damodaran – Corporate Finance-Theory and Practice – John Wiley & Sons, 16/e, 2016.
2. I.M. Pandey – Financial Management (Vikas), 12/e, 2014
3. Brigham & Earnhardt, Financial Management – Theory & Practice, Thomson Learning,10/e, 2016
4. Stephen A Ross, Randolf W Westerfield , Jeffrey Jaffe, Corporate Finance, TMH, 11/e, 2017.

Negotiation And Selling

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	0	0	2	50	50	100

Course Objective

To familiarize the students with the various Negotiation theories, basic negotiation skills required, interpersonal skills, and also the ethics involved in Negotiation, along with the various dispute resolution strategies implemented in Industries to build cordial Industrial.

Course Outcomes

At the end of this Negotiation course, students will be able to:

- Have awareness of importance of negotiation and sales skills for a manager
- Describe factors that affect the negotiation process and ethics involved in the negotiation.
- Apply effective negotiation strategies and tactics for different scenarios
- Identify role of sales in organization
- Understand factors effecting sales force management

UNIT I

Introduction to negotiation: Introduction, Concept of Negotiation, Characteristics of a Negotiating Situation, Basic Negotiation Skills, Interpersonal Skills in Negotiation, Theories of Negotiation**.**

UNIT II

Types and Ethics in Negotiation: Types of Negotiation, Principles of Negotiation, Steps of Negotiation, Win-Win Negotiation, Negotiation Tactics, Factors Affecting Success in Negotiation. Ethics in negotiation.

UNIT III

Strategies and multiple parties and teams in Negotiation: Effective Strategies to develop Negotiation Skills, Anchoring / BATNA, Nature of multiparty negotiation, Inter team negotiations, Improving negotiation skills. Managing Negotiation.

UNIT IV

Selling: Importance of Sales, Sales process,: Prospecting, qualifying the prospect, presentation, closing, servicing, Customer satisfaction, Types of sales, Skills needed by a good sales person,

UNIT V

Sales Environment : Environmental factors impacting success in selling, Sales quota. Sales force recruitment and selection.

Text Books

1. Roy J Lewicki, Bruce Barry, and David M Saunders ,Essentials of Negotiation, 5/e, McGraw Hill, 2011.

Reference Books

1. Beverly DeMarr and Suzanne De Janasz ,Negotiation and Dispute Resolution, Prentice Hall, 2013.
2. Malhotra, Deepak, Negotiating the Impossible: How to Break Deadlocks and Resolve ugly Conflicts (without money or muscle). Oakland, CA: Berrett-Koehler Publishers, 2016

Business Analytics

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	0	0	2	50	50	100

Course Objective

The course familiarizes students with fundamentals of data tools and prescriptive analytics.

Course Outcomes

At the end of this Business Analytics course, students will be able to:

- Gain insights into fundamentals of Business Analytics.
- Differentiate between Descriptive, Predictive and Prescriptive Analytics.
- Apply Business Analytics in different domains.
- Explain about prescriptive analytics.
- Understand the applications of Big data.

UNIT I

Introduction: Basics of Data Science, Business Analytics Success Pillars (BASP) framework, Big Data

UNIT II

Descriptive Analytics: Meta Data, Business Performance Measurement, Visual Analytics, Data Warehouse architecture

UNIT III

Predictive Analytics: Text Mining, Text Analytics, Sentiment Analysis, Web Mining, Web Analytics.

UNIT IV

Prescriptive Analytics: Prescriptive Analytics - Introduction, Prescriptive Models - Simulation, Heuristic, Automated Decision Systems and Expert Systems, Knowledge Management.

UNIT V

Applications of Big Data: Applications of Analytics in different Domains - Marketing Analytics, Finance Analytics, HR - Analytics and Supply Chain Analytics**.**

Text Books

1. U. Dinesh Kumar, “Business Analytics”, Wiley, 2017.
2. Ramesh Sharada, Dursun Delen, Efraim Turban, “Business Intelligence and Analytics”, 10/e, Pearson, 2014.

Reference Books

1. Laursen, Thorlund, “Business Analytics for Managers”, 2/e, Wiley, 2017.
2. Sahil Raj, “Business Analytics”, 3/e, Cengage Learning, 2015.
3. Jac Fitz, Mattox II, “Predictive Analytics for Human Resources”, 3/e, Wiley, 2015.
4. Artun, Levin, “Predictive Marketing”, 2/e,Wiley, 2015

Business Ethics and Corporate Governance

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	AECC	L	T	P	C	CIE	SEE	Total
		2	0	0	2	50	50	100

Course Objective

To understand the significance, characteristics of Business ethics To know the relation between business ethics and moral principles

Course Outcomes

At the end of this Business Ethics and Corporate Governance course, students will be able to:

- Analyze the importance of Business ethics in the present world.
- Recognizing the Principles of Ethical Values and Ethical Dilemmas in functional areas of Organization
- Explain the key elements of leadership Approaches towards Business Ethics.
- Application of corporate governance and taking initiation of corporate social responsibility.
- Analyze reasons for corporate governance failures.

UNIT I

Business Ethics: Meaning, Principles of business ethics, Characteristics of ethical organization, Ethics, Ethics of corporate governance, Globalization and business ethics, Stakeholders' protection

UNIT II

Basic Theories: Basic ethical principles, Moral developments, Deontology, Utilitarianism, Virtue theory, Rights theory, Casuist Theory, Ethical egoism, Feminist consequentialism, Moral issues, Kohlberg" s six stages of moral development (CMD) Moral dilemmas, Ethical dilemmas in different business areas.

UNIT III

Ethical Culture in Organization: Developing codes of ethics and conduct, Ethical and value-based leadership, Role of scriptures in understanding Ethics.

UNIT IV

Conceptual Framework of Corporate Governance: Meaning, Governance vs. Good corporate governance, Corporate Governance vs. Corporate Excellence, , Benefits of Good Corporate Governance, Corporate Governance Reforms, Corporate social responsibility.

UNIT V

Major Corporate Governance Failures: Common governance problems in various corporate failures, Case studies.

Text Books

1. Ethical Decision Making and Cases by O. C. Ferrell, John Fraedrich, Ferrell, Cengage, 2012
2. Peter Stanwick, Sarah Dunn Stanwick, Understanding Business Ethics, SAGE, 2013

Reference Books

1. Vincent Icheku, Understanding Ethics and Ethical Decision Making, Corporation, 2011.
2. Ethical Decision Making and Cases by O. C. Ferrell, John Fraedrich, Ferrell, Cengage, 2012

Design Thinking

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	SEC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	0	50

Course Objective

To enable the students to understand and apply different tools of design thinking and strengthening their inter-personal and professional capabilities through team work principles

Course Outcomes

At the end of this Design Thinking course, students will be able to:

- Understand the concept of design thinking
- Identify and solve problems with human centric approach in a creative way.
- Implement design thinking principles in developing products or services.
- Develop the ability to create and test prototypes.
- Understand moral principles during the exploration of teamwork opportunities, and interpersonal skills.

UNIT I

Basics of Design Thinking: Background of design thinking, definition, uses and mindset. Approach of design thinking: Concepts and resources

UNIT II

Processes and Tools of Design Thinking: Five-stage process, visualization, mind mapping, brainstorming.

UNIT III

Case studies: Challenges best suited for design thinking, introduction and implementation of case studies applying design thinking process and tools.

UNIT IV

Applied Design Thinking: Problem identification, empathy based problem definition, ideation. Group discussion and activities to encourage the understanding, acceptance and appreciation of individual differences

UNIT V

Prototyping and Testing: Building prototype, prototype testing and iterations. Final product/service presentation and evaluation

Text Books

1. Jeanne Liedtka, Tim Ogilvie, and Rachel Brozenske, The Designing for Growth Field Book: A Step-by-Step Project Guide (New York: Columbia University Press, 2014.

Reference Books

1. Thomas Lockwood, Design Thinking: Integrating Innovation, Customer Experience, and Brand Value, 2009
2. The Art of Innovation, Tom Kelley Change by Design, Tim Brown

INTERNSHIP / PROJECT

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	PROJECT	L	T	P	C	CIE	SEE	Total
		0	0	8	4	50	50	100

Course Objective

The objective of Internship / Project is to introduce students to the organizational environment and work culture. Internship /Project is to be done after the first year third semester. Duration of Project is 6 weeks to 8 weeks.

After completion of Internship / Project students have to give weekly progress review to the supervisor and present a final report and Viva

The following is the suggested checklist project report.

Brief Introduction

Review of Literature

Research Gaps

Research Questions

Objectives of the Study

Hypotheses

Scope of the Study Period of the Study

Sample Data Collection

Primary Data

Secondary Data

Data Analysis and Interpretations

Findings

Suggestions

Bibliography

Appendices

The project report should clear Plagiarsm check conducted by the examination branch before submission of the report. The acceptable percentage of plagiarism report is less than 30% for a project report.

Students have to present two internal progressive seminars during the project and after the submission of the report an external viva will be held by the university to give the grade as per the university guidelines.

Program Structure and Syllabus of

MBA Business Analytics

I *Year* (I, II & III Trimesters)

School of Management

R22 Regulations

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.),
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Background

The all-pervasive digital ecosystem makes it a logical corollary for a business manager to rely on and get familiar with analytics as the prime source of managerial decision-making system.

Business environment over the past few years has transformed significantly and digital technology has been a major enabler in this. Inescapable reliance on IT across different spheres of an organization has spawned a new way of looking at enhancing effectiveness through Business Analytics (BA). Artificial Intelligence (AI) and Machine Learning (ML) are an integral part of BA.

In tune with the increased demand for BA professionals, we at Anurag University School of Management (AUSoM) would like to introduce a new program, i.e. MBA – Business Analytics.

The proposed program aims to leverage AU's two well-established domains of education – the flagship CSE (Computer Science Engineering) and Business Management. Taking inputs from experienced IT industry professionals and tapping our internal capabilities, program structure of MBA Business Analytics has been designed to blend important courses to align with market requirements.

Through MoUs with BA companies, we would ensure certifications, projects and exposure to multiple sectors to our students and make them industry-ready.

MBA – First Year – Trimester 1

Total Credits: 23

The first trimester lays a strong foundation with combination of six management subjects and three IT subjects

While the theory subjects span different domains, they also provide exposure to the economic environment in which business operate, Labs bring in the application – oriented approach to develop IT skills.

S No	Subject	Credits
1	Organization Behavior-I	2
2	Financial Accounting and Analysis	3
3	Marketing Management I	3
4	Business Communications	3
5	Statistics for Business Decision Making	3
6	Micro Economics	3
7	Database Management System (DBMS)	3
8	DBMS Lab	1
9	Productive Tools Lab	1
	Managerial Competency	
10	Approaches to thinking	1
	Total	**23**

MBA – First Year – Trimester 2

Total Credits: 20

The second trimester deep-dives into three courses – Marketing Management, Finance and Business Communication.

The ratio of business management and IT courses is 5:4, with one lab course. Students are introduced to a new managerial competency – "Aesthetics"

S No	Subject	Credits
1	Marketing Management – II	3
2	Financial Management	3
3	Operations Research	3
4	Human Resource Management	3
5	Business Analytics	2
6	Python Programming	3
7	Python Lab	1
8	English communication skills Lab	1
	Managerial Competency	
9	Aesthetics	1
10	Experiential Learning	------
	Total	**20**

MBA – First Year – Trimester 3

Total Credits: 19

The ratio of business management to IT subjects is 4:4, with one IT Lab.

At the end of the third Trimester students have to take up a Summer Internship / Project. .

S No	Subject	Credits
1	Operations Management	3
2	Business Research Methods	3
3	Project Management	3
4	Negotiation and Selling	2
5	Big Data Analytics	3
6	Data Warehousing and Data Mining	3
7	Data Warehousing and Data Mining Lab	1
	Managerial Competency	
8	Design Thinking	1
	Total	**19**

As a part of partial fulfillment of the program, a six to eight week mandatory internship is to be undertaken by the students followed by report and viva. It carries four credits in the next trimester

The ratio of business management to IT subjects is 3:5, with 2 Labs.

For the Internship taken up at the end of the third trimester, students are required to submit the Report and attend a Viva.

S No	Subject	Credits
1	Product Management	2
2	Digital Business Models / Consumer Behavior / Supply Chain (a pre-requisite for a course next trimester)	3
3	Fundamentals of Artificial Intelligence (AI) and Machine Learning (ML)	3
4	Exploratory Data Analysis	3
5	R Programming	3
6	Open Elective 1 (Stress Management / Value Engineering)	2
7	R Lab	1
8	Advanced Data Visualization Lab	1
9	Internship/Project*	4
	Total	**22**

The ratio of business management to IT subjects is 2:7, with 2 Labs.

S No	Subject	Credits
1	Strategic Management	2
2	Open Elective 2 (Intellectual Property Rights, Pricing, Innovation)	2
3	Consumer Analytics / Supply Chain Analytics / HR Analytics / Financial Analytics	3
4	Cloud Computing	3
5	IoT Analytics	3
6	Predictive Analytics	3
7	Cyber Security Analytics	2
8	Information Security Lab	1
9	Predictive Analytics Lab	1
10	Specialization Project 1**	**1**
	Total	**21**

The final Trimester has two courses and one project. One Open Elective, one sectoral application of AI and one specialization projects are the contents of the concluding trimester.

S No	Subject	Credits
1	Open Elective 3 (Entrepreneurship / Tech enabled business management / Legal and ethical aspects of analytics)	2
2	Sectoral Applications of AI (Healthcare / FinTech / E-Commerce)	3
3	Specialization Project – 2**	2
	Total	**7**

* Immersive official projects with firms with which AU would sign MoUs

** Self-projects by students

Summary of Courses with Credits for MBA

S.No.	Course Type	No of Courses	Credits Per Course	Credits
1	**Skill Enhancement Courses (SEC)** (Productive Tools-lab, Approaches to thinking, Aesthetics, Design)	4	4*1	4
2	**Language Courses (LC)** **(**English for Empowerment, English Language Skills lab)	2	1*3 1*1	4
3	**Core Courses (CC)**	23	5*2 15*3 3*1	58
4	**Discipline Specific Electives (DSE)**	14	9*3 1*2 4*1	33
5	**Generic Electives (GE)**	3	3*2	6
6	**Specialization Project -1**	1	1*1	1
7	**Specialization Project -2**	1	1*2	2
8	**Internship / Project**	1	1*4	4
	Total	**50**		**112**

ANURAG UNIVERSITY

MBA I YEAR I TRIMESTER [7L + 0T+3P]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		Core	Organization Behavior-I	3	0	0	2.0
2		Core	Financial Accounting and Analysis	3	0	0	3.0
3		Core	Marketing Management I	3	0	0	3.0
4		LC	Business Communications	3	0	0	3.0
5		Core	Statistics for Business Decision Making	3	0	0	3.0
6		Core	Micro Economics	3	0	0	3.0
7		Core	Database Management System (DBMS)	3	0	0	3.0
8		Core	DBMS Lab	0	0	2	1.0
9		SEC	Productive Tools Lab	0	0	2	1.0
			Managerial Competency				
10		SEC	Approaches to thinking	0	0	2	1.0
			TOTAL	**20**	**0**	**6**	**23**

MBA I YEAR II TRIMESTER [6 L +0T+ 3P]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1.		Core	Marketing Management – II	3	0	0	3.0
2.		Core	Financial Management	3	0	0	3.0
3.		Core	Operations Research	3	0	0	3.0
4.		Core	Human Resource Management	3	0	0	3.0
5.		Core	Business Analytics	2	0	0	2.0
6.		Core	Python Programming	3	0	0	3.0
7.		Core	Python Lab	0	0	2	1.0
8.		LC	English Communication skills Lab	0	0	2	1.0
			Managerial Competency				
9		SEC	Aesthetics	0	0	2	1.0
10		SEC	Experiential Learning	0	0	0	---
			TOTAL	**18**	**0**	**4**	**20**

MBA I YEAR III TRIMESTER [6L+0T+2P]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1		Core	Operations Management	3	0	0	3.0
2		Core	Business Research methods	3	0	0	3.0
3		Core	Project Management	3	0	0	3.0
4		Core	Negotiation and Selling	2	0	0	2.0
5		Core	Big Data Analytics	3	0	0	3.0
6		Core	Data Warehousing and Data Mining	3	0	0	3.0
7		Lab	Data Warehousing and Data Mining Lab	0	0	2	1
			Managerial Competency				
8		SEC	Design Thinking	0	0	2	1.0
			TOTAL	**18**	**0**	**7**	**19**

Organization Behavior

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	0	0	2	50	50	100

Course Objective

The course aims to introduce the student to management and organization behavior concepts, to understand the key factors of individual behavior like perception, attitude & values and personality.

Course Outcomes

At the end of this Organizational Behavior - I course, students will be able to:

- Have an awareness of the basic concepts and other contributing fields of organizational behavior.
- Analyze the fundamental concepts of organizational behavior
- Identify the role of perception of Individuals in the organization
- Aware and acknowledge the need for co-holding various personality styles in an organization
- Know the impact of attitudes and values in organizational perspective

UNIT I

Introduction to Management: Functions and Levels of Management. Evolution of Management Theory, Scientific Management, Principles of management, Approaches to management-Behavioral approach, Contingency approach and Contemporary approach

UNIT II

Introduction to Organizational Behavior: Characteristics of Organizational Behavior, Contributing disciplines to the OB field, Significance of OB, Nature and scope of OB, Challenges and opportunities for OB. Organizational Behavior models - Cognitive framework, Behavioristic framework and Social cognitive framework.

UNIT III

Perception and Attribution: Perception meaning - Factors influencing perception, Perceptual Process, The process of interpreting, Attribution theory, when perception fail, Perception and OB, Managing the perception process-Social perception.

UNIT IV

Personality: Personality determinants, Personality traits, The Big Five model-Major personality attributes influencing OB, Theories of personality. Learning - theories of learning, Principles of learning.

UNIT V

Attitudes and Values: Nature of Attitudes, Components of attitudes, Formation of attitudes, Functions of attitudes, Changing attitudes, Work-related attitudes, Values – Attitudes, Values and OB.

Text Books

1. Robbins, S.P. Sanghi, S.&Judge, T. A. Organizational Behavior, Pearson Education, New Delhi, 2018.
2. Aswathappa.K Organizational Behavior, Himalaya Publishing House, New Delhi, 2016.

Reference Books

1. Newstrom J, Organizational Behavior: Human Behavior at Work, Tata McGraw-Hill, New Delhi, 2015.
2. Steven, Von & Sharma., Organizational Behavior, Tata McGraw Hill, New Delhi, 2014.
3. Pareek.U, Understanding Organizational Behavior: Oxford Publishers, New Delhi, 2011.

Financial Accounting & Analysis

MBA I Year I Trimester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

The course aims to introduce the student to financial accounting concepts, to prepare financial statements, and computing of ratios for financial performance .

Course Outcomes

At the end of this Financial Accounting & Analysis course, students will be able to:

- Demonstrate the application of the basic principles of accounting to aid in the financial decisions.
- Prepare the income statement to help them in understanding the financial performance of an organization.
- Draw the Balance sheet and interpret the financial statements to analyse the financial position of the company.
- Prepare the common size statements & compute ratios to analyse the financial performance
- Prepare & analyze the cash flow statements, identify the components of earnings management & accounting land mines

UNIT I

Overview of financial statements: Accounting equation and its components. Basic Accounting Concepts: Balance sheet: Overview, Assets, Liabilities and Owners equity. Basic concepts in Accounting: Money measurement concept, Entity concept, Going Concern concept, Cost Concept, The dual Aspect concept, The accounting period concept, Conservatism concept, Realization concept, Matching concept, consistency concept, Materiality concept.

UNIT II

Final Accounts: Income Statement, Recognition of expenses and expenditure, the income statement: Revenues, cost of sales, Gross Margins, expenses, gains and net income, Retained earnings. Relationship between balance sheet and income statement, Accrual versus cash-based accounting. IFRS (International Financial Reporting Standards) and GAAP (Generally accepted accounting principles)

UNIT III

Preparation of financial statements: Accounting cycle, Income statement and balance sheet simple problems in the preparation of final accounts**.**

UNIT IV

Financial statement analysis I: common-size statement analysis, comparative statement analysis, trend analysis, Ratio Analysis: Liquidity, Activity, Profitability & Turnover rations (Simple Problems).

UNIT V

Financial statement analysis II: Cash Flow statements - Cash from Operations, financing and investing activities. Preparation of simple cash flow statements, Understanding annual report, Understanding Earnings management: Accounting Landmines, Red flags etc.

Text Books

1. S N Maheshwar, Suneel K Maheshwari & Sharad K Maheshwari, Financial Accounting, 6/e, Vikas Publishing House, 2018.
2. R. Narayanaswamy, Financial Accounting: A Managerial Perspective,5/e, PHI, 2014.

Reference Books

1. Shirley Carlon, Rosina McAlpine, Chrisann Palm, Lorena Mitrino, Nagaire Kirk & Lily Wong, Financial Accounting: Reporting, Analysis and Decision Making 5/e, John Wiley & Sons 2015.
2. Shashi K Gupta and R K Sharma, Management Accounting Principles and Practice, 14/e, Kalyani Publishers 2018.
3. Ashish K Bhattacharyya, Financial Accounting for Business Managers, 5/e, PHI Publishers 2017

Marketing Management-I

MBA I Year I Trimester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

This course will enable the students to develop an understanding of the role of marketing in a business organization specifically, and in our society at large

Course Outcomes

At the end of this Marketing Management-I course, students will be able to:

- Differentiate between selling and marketing
- Understand consumer buying process
- Classify customers into various segments and compare various product positionings.
- Assess the role of marketing mix elements in marketing strategy.
- Differentiate between the utility of various marketing research approaches such as qualitative and quantitative.

UNIT I

Introduction to Marketing: Needs, wants, demand, types of demand, value, scope of marketing, production concept, product concept, selling concept, marketing concept, holistic marketing concept**.**

UNIT II

Customer Orientation: Consumer insight, factors influencing consumer behavior, B to B markets, nature of buying unit, institutional markets; government markets; e-procurement.

UNIT III

Product management & Segmentation, Targeting, Positioning (STP): Product classifications and levels, product life cycle; segmentation, bases for segamentation of consumer markets, business markets; market targeting; positioning, brand equity.

UNIT IV

Marketing Mix: Elements of marketing mix, new product development, pricing strategies, marketing channels–levels, channels of distribution, promotion

UNIT V

Marketing Research: Marketing research, importance and process, quantitative marketing research, qualitative marketing research, applications of marketing research.

Text Books

1. Philip Kotler and Gary Armstrong, Principles of Marketing, Pearson, 17/e, 2018.

Reference Books

1. Lamb,Hair& Sharma ,Marketing: A South Asian Perspective, CengageLearning, 2016
2. Paul Baines, Chris Fill, Kelly Page, Sara Rosengren, Marketing, OUP ,5/e, 2019,
3. Srinivasan, Case Studies in Marketing, The Indian Context, PHI,2012

Business Communications

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	LC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

To enable the students to understand the techniques to communicate effectively and prepare business reports, business proposals, e-mails, summaries and effective resumes.

Course Outcomes

At the end of this Business Communications course, students will be able to:

- Interpret the subtle nuances of business communication.
- Explain the characteristics of business reports, kinds of reports and elements of effective business report writing.
- Plan and prepare traditional electronic and video resumes.
- Describe effective individual and team presentations.
- Write Business proposals, reports, e-mails and summaries effectively.

UNIT I

Introduction and Communication Basics: Just-A-Minute Presentation Workshop, Feedback and Overcoming Glossophobia, Process, Basic facts about Communication.

UNIT II

Presentations: Oral Presentation Skills, Introduction, Presentations, Management types of Presentations, Planning and Preparing, Visual Aids, Delivery.

UNIT III

Team Presentations: Team Presentations, Benefits and Purposes, Planning and Preparation, Execution, Towards Effective Team Presentation.

UNIT IV

Business Communication: Effective Business Correspondence, Basic Principles, Introduction to Reports and Proposals, Kinds of Reports, Characteristics of Business Reports, Elements of Effective Business Report Writing, Business Proposals.

UNIT V

Individual Presentations: Bios and Resumes, Resume Formats, and Video Resumes, E-Mail Etiquette.

Text Books

1. Meenakshi Raman, Prakash Singh, Business Communication, 2/e, Oxford University Press, 2013.

Reference Books

1. J.P.Parikh, Business Communication: Basic Concepts and Skills, Orient Black Swan
2. David Irwin, Effective Business Communications, Viva-Thorogood, 2013.
3. Rajendra Pal, J S Korlahahi, Essentials of Business Communication, Sultan Chand & Sons, New Delhi, 2013.
4. Subba Rao, B.Anitha Kumar, C.HimaBindu, Business Communication, Cengage, 2012.
5. Anjali Ghanekar, Business Communication Skills, Everest, 2011.
6. Sailesh Sengupta, Business and Managerial Communications, PHI, 2011.

Statistics for Business Decision Making

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	SEC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

To enable students to analyze & apply various statistical techniques like descriptive statistics, regression analysis, time series and multivariate analysis for business decision making.

Course Outcomes

At the end of this Statistics for Business Decision Making course, students will be able to:

- Demonstrate skills of collection & presentation of data
- Apply relevant techniques of dispersion for solving problems
- Application of Correlation & Regression Analysis in business scenarios
- Apply relevant techniques for solving small sample problems
- Apply Multivariate analysis for analyzing patterns of data.

UNIT I

Sampling techniques and data collection: Sampling theory, sampling methods, Primary Data and Secondary Data Collection Techniques, Questionnaire Design. Tabulation of Data and General Rules of Tabulation, Diagrammatic and Graphical Presentation of Data

UNIT II

Descriptive measures: Measures of Central Tendency, Measures of Dispersion, Measures of Skewness and Kurtosis and Interpretation (with business applications).

UNIT III

Regression Analysis: Correlation, Types of Correlation and properties of correlation, Regression Analysis and Properties of Regression Coefficients. Method of Least Squares, (with business applications)

UNIT IV

Statistical Inference: Introduction to Null Hypothesis vs. Alternative Hypothesis, Tests of Hypothesis, Procedure for Testing of Hypothesis, Tests of Significance for Small Samples, Applications of t-test, Chi-square test, Association of attributes (with business applications).

UNIT V

Time Series and Multivariate Analysis: Introduction and Utility of Time series. Introduction to multivariate data analysis, Factor analysis, cluster analysis, conjoint analysis and multiple discriminant analysis (with business applications).

Text Books

1. Donald R. Cooper, Pamela S. Schindler, Business Research Methods, 8/e, Tata McGraw Hill Education, 2017.
2. Gaur & Gaur, Statistical Methods for Practice and Research, Sage Publication, 2/e, 2009
3. Joseph. F. Hair, Babin, Anderson, Black, Multivariate Data Analysis, Cengage Learning India Pvt Ltd, 8/e, 2018.

Reference Books

1. Bajpai, Business Statistics, Pearson, 2009.
2. Richard I Levin & David S.Rubin, Statistics for Management, Pearson, 7/e,2008.
3. Montgomery, Design and Analysis of Experiments, Wiley

Micro Economics

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

The course aims to introduce the student to micro economic concepts and apply to the business organization in the real world.

Course Outcomes

At the end of this Micro Economics course, students will be able to:

- Understand the scope of microeconomics in an organization
- Know the concepts of demand and supply elasticity and its influence on managerial decision making
- Describe production function and economies of scale
- Know the applications of cost concepts
- Identify different market structures and pricing strategies.

UNIT I

Introduction to Microeconomics: Definition, nature and scope of microeconomics. Difference between micro and macroeconomics, microeconomics relation with other subjects, Microeconomics and decision making in business

UNIT II

Demand and Supply Analysis: Introduction, determinants of demand, law of demand, exceptions, Elasticity of demand, importance and types of elasticity of demand. Demand forecasting, methods and techniques of demand forecasting..

UNIT III

Production Analysis: Production function, Law of variable proportion theory, Isoquant, Isocost. Law of returns to scale, Economies of scale

UNIT IV

Cost Analysis: Cost concepts, types of cost, cost output relationship in short run and long run. Break even analysis and importance.

UNIT V

Market Structure and Pricing Strategies: Introduction to market, classification of market, features and price determination under perfect competition, monopoly, monopolistic market, features of oligopoly market. Introduction to Pricing, objectives of pricing, pricing methods.

Text Books

1. P.L Mehta, Microeconomics, Sultan Chand & Sons, 2021.
2. Paul A.Samuelson, Microeconomics, Pearson. M.C.Graw Hill, 2021

Reference Books

1. P.L Mehta, Managerial Economics Sultan Chand & Sons, 2017.
2. H. L. Ahuja, Managerial Economics, S. Chand, 2017.

Database Management Systems

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective:

Course Objectives: The course enables students to outline systemic database design approaches, techniques related to concurrency and recovery manager, explore the File organizations, indexing and hashing mechanisms

Course Outcomes:

At the end of this Database Management Systems course, students will be able to:

1. Have knowledge on fundamentals of Data base systems
2. Formulate Queries using SQL and Relational Formal Query Languages
3. Apply different normal forms to design the Database
4. Summarize concurrency control protocols and recovery algorithms
5. Identify suitable Indices and Hashing mechanisms for effective storage and retrieval of Data

UNIT I

Introduction to Database System Concepts: Introduction to Database System Concepts: Database-System Applications, Purpose of Database Systems, View of Data, Database Language, Database Design, Database Architecture, Database Users and Administrators.

Introduction to the Relation Models and Database Design using ER Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations Overview of the Design Process, The Entity-Relationship Model, Constraints, Entity-Relationship Diagrams- Unary, Binary, ternary, Aggregation.

UNIT II

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Aggregate Functions, Nested Sub queries.

Formal Relational Query Languages: The Relational Algebra, Tuple Relational Calculus.

UNIT III

Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Functional Dependencies, Closure set of Functional dependencies, Procedure for Computing F+, Boyce Codd Normal form, BCNF Decomposition Algorithm, Third Normal Form, Third Normal Form Decomposition Algorithm

Transactions: Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Serializability.

UNIT IV

Concurrency Control: Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols.

Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, ARIES, Remote Backup Systems.

UNIT V

File Organization: Fixed and variable length records, Sequential file organization, Data Dictionary, Buffer manager.

Indexing and Hashing: Basic Concepts, Ordered Indices, B+-Tree Index Files, B+-Tree Extensions, Multiple-Key Access, Static Hashing, Extendible Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices..

Text Books

1. R Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts,

Reference Books

1. N Raghu Ramakrishna, Johannes Gchrke, Database Management System, 3/e, Tata McGraw-Hill, 2003.
2. C J Date, A Kannan, S Swamynathan, An Introduction to Database Systems, 8/e, Pearson 2006
3. P Raja Sekhar Reddy, A Mallikarjuna Reddy, Foundations of Database Management
4. Systems, Lambert Academic Publishing, 2020 (e-Book)
5. https://www.pdfdrive.com/fundamentals-of-database-systems-pdf-e51477130.html

Database Management Systems Lab

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		0	0		1.0	50	50	100

Course Outcomes:

At the end of the Database Management systems Lab course students will be able to

1. Apply different types of SQL commands to create, manipulate and access data from database
2. Construct database by using various integrity constraints
3. Develop basic PL/SQL programs
4. Implement PL/SQL Programs using procedures, functions and cursors
5. Create trigger for given problem

Week 1

27. R Data Base user creation, Data definition Language commands, Data Manipulation commands, Data Control Language Commands, Transaction Control Language commands..

Week 2

28. Database Schema for scenario 1 and creating a view.

Week 3

29. Database Schema for scenario 2 and creating tables and views

Week 4

30. Database Schema for scenario 3, creating tables and views.

Week 5

31. Database Schema for scenario 4, creating tables and views .

Week 6

32. Database Schema for scenario 5, creating tables and views.

Week 7

33. Writing programs.

Week 8

34. Create cursons, functions, triggers

Week 9

35. Review

Text Book:

1. Ivan Bayross, SQL, PL/SQL: The programming Language of Oracle, 3/e, BPB Publications, 2008.

Productive Tools Lab

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	SEC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Course Objective

The objective of the course is to introduce the students to basic tools of MS- office and its applications.

Course Outcomes

At the end of this Productive Tools Lab course, students will be able to:

- Use their digital gadgets in a safe and secure way and use some basic troubleshooting
- Format word documents, work with tables and able to use shortcuts
- Prepare business presentations using powerpoint
- Work with Pivot tables and cross tabulation, descriptive statistics, analysis and visualization.
- Use R and R Studio, its packages for data analysis and visualization.

UNIT I

Managing your devices: Laptop/Computer/Mobiles, Managing virus free environment and basic maintenance.

UNIT II

Productivity Tools: Introduction to MS -PPT, Excel, Word, Shortcuts, Power user shortcuts, Formatting word documents, Making tables and inserting various other files within.

UNIT III

MS PowerPoint: How to prepare a presentation, telling a story with slides - structure of a narrative, Types of presentation, Subject presentation, selling an idea etc.

UNIT IV

MS Excel: Basic functionality, advanced functionality, working with statistical functions, Tabulation, Building charts - pie charts, line diagrams etc. Pivot tables and cross tabulation.

UNIT V

Data Analysis and Visualization Using R: Introduction to R and R Studio, Installing R and R Studio, Importing data from other packages, Data analysis and Data Management with R, Descriptive Statistics, Data Visualization using R packages, Loading and working with R-Packages.

Text Books

1. Bittu Kumar, 2017 Mastering MS Office: Concise Handbook with Screenshots, V&S Publishers.
2. Cox et all- 2007 Microsoft Office System Step-by- Step, 1/e, PHI.
3. David Whigam-Business Data Analysis Using Excel, 1/e, Oxford University Press.
4. R Programming: A Beginner's Guide to Data Visualization, Statistical Analysis and Programming in R, R Publishing, 2019

Reference Books

1. Anita Goel,Computer Fundamentals, Pearson, 2010.
2. Layfe de Micheaux, Pierre, Drouihet, Remy, Liquet, Benoit, The R Software Fundamentals of Programming & Statistical Analysis, 2013
3. Vishwas R Pawgi, Statistical Computing Using R software, Nirali Prakashan, 2016
4. John M Quick, Statistical Analysis with R Beginners guide, 1/e, ShroffpublDirect, 2014

APPROACHES TO THINKING

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	SEC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	0	50

Course Objective

The objective of this course is to introduce students to basics of thinking and various approaches to thinking. The students will understand the importance of thinking in their lives and profession. They will learn to appreciate the various approaches to thinking such as Systems Thinking, understanding and working with non-linear phenomena among others.

They will learn to understand various models of thinking – for example, Kahneman's System I and System II thinking. They will explore various human biases in thinking and how they impact one's perception, and hence the quality of decision making.

Thinking is a metacognitive competence, and any bias, or lack of rationality or can lead to suboptimal decision making. They will learn about the common biases – confirmation bias, sunken cost syndrome to name a few.

The course will introduce new discoveries about thinking, and will help the student become aware of their own thinking and the thinking patterns they use to aid them in improving their thinking processes.

The course will deploy readings, guest lectures and assignments (both individual and group assignments) to familiarize the students with the current research in thinking, and apply some of the research findings to improve their thinking abilities.

Course Outcomes

At the end of the approaches to thinking course the students will be able to:

- Why thinking is important in one's life and business
- Understand the the biases that influence one's thinking.

- Be aware of their own biases.
- Differentiate between linear and non-linear phenomena, and understand how
- human thinking cannot easily comprehend non-linearity
- Understand various mental models services
- Apply various tools of thinking, such as Brain Storming, Associative Thinking,
- Mind mapping,
- Understand the importance of meta-cognitive abilities
- Explore and build skill in some key meta-cognitive abilities – learning to learn,
- abstraction etc.
- Distinguish underlying frameworks in their thinking.

- Develop familiarity with MECE, and build an inductive and deductive methods of mapping phenomena.

Learning Resources

- Guest Speakers – (An illustrative list of names, non-binding)
- Books, reviews & videos
- Thinking Fast and Thinking Slow – Daniel Kahneman
- Mental Models – Charlie Munger's quotes, writings,
- The upside of irrationality – Dan Ariely
- Black Swan - Nassim Nicholas Taleb
- Fooled by Randomness - Nassim Nicholas Taleb
- Antifragile - Nassim Nicholas Taleb
- Influence – Robert Cialdini
- Pre-suasion – Robert Cialdini
- The art of thinking clearly – Rolf Dobelli
- Design of Everyday Things – Don Norman

Marketing Management – II

MBA I Year II Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	1	0	3	50	50	100

Course Objective

This course will enhance the students' knowledge on marketing strategies and how various concepts can be applied in realistic marketing scenario .

Course Outcomes

At the end of this Marketing Management – II course, students will be able to:

- Customize marketing approaches in different contexts
- Describe and analyze competitive marketing strategies applied by organizations
- Appreciate importance of branding and develop branding strategies.
- Have awareness of factors influencing global marketing strategies
- Get sensitized to online and sustainable marketing strategies

UNIT I

Marketing Planning and Marketing Strategies: Strategies for different stages of PLC, BCG Matrix, Ansoff's Grid, Marketing Planning, Implementation, Marketing department organization, Marketing Control, Marketing Investments.

UNIT II

Competition strategies: Marketing strategies for market leaders, market challengers, market followers; Niche marketing; Guerilla marketing; Ambush marketing.

UNIT III

Brand Management: Role of brands, Brand equity, Brand associations, Brand extension, Brand portfolio, Brand revitalization

UNIT IV

Global Marketplace: International trade system, Choosing markets to enter, Market entry options, Global marketing programs.

UNIT V

Digital Marketing and Sustainable Marketing: Online marketing, Online branding, Consumerism, Environmentalism, Green Marketing, Sustainable Marketing Principles.

Text Books

1. Philip Kotler and Gary Armstrong, Principles of Marketing, Pearson, 17/e, 2018.

Reference Books

1. Lamb,Hair& Sharma ,Marketing: A South Asian Perspective, CengageLearning, 2016
2. Paul Baines, Chris Fill, Kelly Page, Sara Rosengren, Marketing, OUP ,5/e, 2019.
3. Srinivasan, Case Studies in Marketing, The Indian Context, PHI,2012

Financial Management

MBA I Year II Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

The course aims at the student to apply techniques for investment, optimum capital structure, dividend decisions & estimate the working capital management for efficient management of current assets. .

Course Outcomes

At the end of this Financial Management course, students will be able to:

- Appreciate the finance function and the time value of money in their decisions
- Apply various capital budgeting techniques for selecting the feasible projects under risk & uncertainty
- Apply the capital structure theories for an optimal capital structure
- Appraise the dividend decisions and the practices to study the impact on their decisions.
- Estimate working capital requirements and apply the tools to forecast and manage the current assets

UNIT I

Introduction: Nature, scope and objectives of financial management - Time value of money and mathematics of finance - concept of risk and return**.**

UNIT II

Investment decision: Capital budgeting process - Estimation of relevant cash flows - Payback period method - Accounting rate of return - Net present value - Net terminal value - Internal rate of return - Profitability index - Capital budgeting under risk - Certainty equivalent approach and risk adjusted discount rate.

UNIT III

Financing decision: Cost of capital and financing decision - Estimation of components of cost of capital: Equity capital - Retained earnings - Debt and preference capital - Weighted average cost of capital and Marginal cost of capital - Sources of long-term financing - Capital structure - Operating and financial leverage - Determinants of capital structure .

UNIT IV

Dividend decision: Relevance and irrelevance of dividend decision - Cash and stock dividends - Dividend policy in practice.

UNIT V

Working capital management: Meaning and nature of working capital, Determination of working capital requirement, A brief overview of cash management, Inventory management and receivables management.

Text Books

1. Prasanna Chandra; Financial Management Theory and Practice, TMH, 10/e, 2019
2. M.Y. Khan & P.K. Jain,Financial Management, TMH, 7/e, 2017.

Reference Books

1. Ashwath Damodaran ,Corporate Finance-Theory and Practice ,John Wiley & Sons
2. I.M. Pandey,Financial Management (Vikas), 12/e, 2012
3. Brigham & Earnhardt, Financial Management –Theory & Practice, Thomson Learning, 10/e ,2015

Operations Research

MBA I Year II Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

To enable students to utilize various techniques in the area of operations research using linear programming, transportation, assignment and game theory models for business decision making.

Course Outcomes

At the end of this Operations Research course, students will be able to:

- Explain the concepts of operation research & solve Linear Programming Problem
- Solve simplex & Big -M Problems for business decisions
- Solving Transportation & Assignment Problem Models to Decision Making
- Apply various game theory problems.
- Apply decision analysis techniques for business decisions

UNIT I

Introduction: Nature and Scope of Operation Research, Origin of OR, Applications of Operations Research in different Managerial areas, Linear Programming: Application Areas of LPP, Guidelines for formulation of LPP, Formulation of LPP for Different Areas, Solving LPP by Graphical Method**.**

UNIT II

Simplex Method: Solution Methodology of Simplex Algorithm, Artificial Variable techniques Big-M method and Two Phase simplex method, Degeneracy and how to resolve degeneracy(for business decisions).

UNIT III

Transportation and Assignment Models: Definition and Application of the Transportation Model, Solution of the Transportation Problem, the Assignment Model, Travelling Salesman Problem for Business Decisions.

UNIT IV

Game Theory: Introduction, Two Person Zero-Sum Games, Pure Strategies, Games with Saddle Point, Mixed Strategies, Rules of Dominance, Solution Methods of Games without Saddle point – Algebraic, Arithmetic Methods.

UNIT V

Decision Analysis: Introduction, Ingredients of Decision Problems, Decision Making under Risk and Uncertainty for Business Decisions.

Text Books

1. K. Sharma, Operations Research: Theory and Applications, Macmillan.
2. Hillier/Lieberman, Introduction to Operations Research, Tata McGraw Hill Education, 2008

Reference Books

1. ShridharaBhat, Quantitative Analysis for Business Decisions, Himalayan Publishing House, 2009.
2. R.Panneerselvam, Operations Research, PHI, 2008.
3. Gupta and Khanna, Quantitative Techniques for Decision Making, PHI, 2009.

Human Resource Management

MBA I Year II Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

The course aims to introduce the basic understanding of key HRM functions that includes basic functions pertaining to organizations.

Course Outcomes

At the end of this Human Resource Management course, students will be able to:

- Assess the changing role of HRM
- Describe the process of human resource planning and recruitment.
- Aware of training and development processes.
- Know the employee performance training methods.
- Analyze the various contemporary issues in HRM. mines

UNIT I

Introduction to HRM: Definition, Nature and Scope of HRM, Evolution of HRM, challenges of HRM, HR Profession and HR Department, Functions of HRM, Trends shaping human resource management.

UNIT II

Human Resource planning: HRP, Need for Human resource planning ,factors affecting HRP, Job analysis and Job Design, Demand and Supply forecasting ,Recruitment and Selection – Recruitment Process, Sources and Methods of Recruitment, Types of tests and interviews ,Steps in selection, Placement and induction process.

UNIT III

Training and Development: Need and Importance of Training and Development, Training Need Analysis, Training methods, Orienting and onboarding new employees ,Design Training Program, Evaluating the training effort , Management Development, Succession Planning.

UNIT IV

Performance Appraisal: Meaning and importance of Performance Appraisal, Performance Appraisal Process, techniques of Performance Appraisal, dealing with cognitive bias, performance Management, Managing the appraisal discussion.

UNIT V

Compensation: Meaning and of Compensation, Methods of compensation, Basic factors in determining the pay rates, Job Evaluation, Pricing professional and managerial jobs.

Text Books

1. Gary Dessler, BijuVarkey ,Human Resource Management,Pearson Publication, 15/e,2019
2. Subbarao,David Lepak, Mary Gower, Human Resource Management, Pearson,2018.

Reference Books

1. Paul Banfield, Rebecca Kay, Human Resource Management, Oxford, 2019.
2. Wayne &Caseia, Ranjeet Nambudri, “Managing Human Resource, TMH. 2019,
3. Gomez Mejia et.al, Managing Human Resource, PHI,2017.

Business Analytics

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	0	0	2	50	50	100

Course Objective

The course familiarizes students with fundamentals of data tools and prescriptive analytics.

Course Outcomes

At the end of this Business Analytics course, students will be able to:

- Gain insights into fundamentals of Business Analytics.
- Differentiate between Descriptive, Predictive and Prescriptive Analytics.
- Apply Business Analytics in different domains.
- Explain about prescriptive analytics.
- Understand the applications of Big data.

UNIT I

Introduction: Basics of Data Science, Business Analytics Success Pillars (BASP) framework, Big Data

UNIT II

Descriptive Analytics: Meta Data, Business Performance Measurement, Visual Analytics, Data Warehouse architecture

UNIT III

Predictive Analytics: Text Mining, Text Analytics, Sentiment Analysis, Web Mining, Web Analytics.

UNIT IV

Prescriptive Analytics: Prescriptive Analytics - Introduction, Prescriptive Models - Simulation, Heuristic, Automated Decision Systems and Expert Systems, Knowledge Management.

UNIT V

Applications of Big Data: Applications of Analytics in different Domains - Marketing Analytics, Finance Analytics, HR - Analytics and Supply Chain Analytics**.**

Text Books

1. U. Dinesh Kumar, “Business Analytics”, Wiley, 2017.
2. Ramesh Sharada, Dursun Delen, Efraim Turban, “Business Intelligence and Analytics”, 10/e, Pearson, 2014.

Reference Books

1. Laursen, Thorlund, “Business Analytics for Managers”, 2/e, Wiley, 2017.
2. Sahil Raj, “Business Analytics”, 3/e, Cengage Learning, 2015.
3. Jac Fitz, Mattox II, “Predictive Analytics for Human Resources”, 3/e, Wiley, 2015.
4. Artun, Levin, “Predictive Marketing”, 2/e,Wiley, 2015

Python Programming

MBA I Year II Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

The course aims to enable students to master important Python Programming concepts such as string operations, sequences, data structures, classes, objects and reusability.

Course Outcomes

After completion of the Python Programming course student will be able to:

1. Apply control structures, functions and packages in Problem Solving
2. Analyze various String handling functions and data structures
3. Model the object-oriented problems with classes and objects
4. Solve the problems by using Inheritance and polymorphism
5. Illustrate programs on Exception Handling and various packages

.

UNIT I

Introduction to Python: Features of Python Language, Data Types, Operators, Expressions, Control Statement, Standard I/O Operations.

Functions and Modules: Declaration and Definition Function Calling, More on Defining Functions, Recursive Functions, Modules, Packages in Python, Doc Strings..

UNIT II

Strings and Regular Expressions: String Operations, Built-in String Methods and Functions, Comparing Strings, function in Regular Expression.

Sequence: List, Tuples, Dictionaries, Sets.

UNIT III

Introduction to Object Oriented Programming: Features of OOP, Merits and demerits of Object Oriented Programming Languages, Applications of OOP

Implementation of classes and objects in Python: Classes and Objects, Class Method and Self Argument. The __init__Method, Class Variables and Object Variables, The __del__Method, Public and Private Data Members, Private Methods, Built-in Functions to Check, Get, Set and Delete Class Attributes, Garbage Collection (Destroying Objects)..

UNIT IV

Implementation of Inheritance in Python: Inheriting Classes in Python, Types of Inheritance, Abstract Classes and Interfaces, Meta class

Implementation of Operator Overloading in Python: Introduction, Implementing Operator Overloading, Overriding Methods

Exception Handling in Python: Introduction, Exception hierarchy, Handling Exception, Multiple Except Blocks and Multiple Exceptions, Finally Block.

UNIT V

M Python NumPy: NumPy ND array, Data Types, Functions of NumPy Array, NumPy Array Indexing, Mathematical Functions on Arrays in NumPy

Python Pandas: Pandas Features, Dataset in Pandas, Data Frames, Manipulating the Datasets, Describing a Dataset, group by Function, Filtering, Missing Values in Pandas, Concatenating Data Frames. Import data from csv file.

Introduction to Matplotlib: Plot, Scatterplot, Introduction to Tkinter ,Date and Time Packages.eatures of oligopoly market. Introduction to Pricing, objectives of pricing, pricing methods.

Text Books

1. ReemaThareja, Python Programming using Problem Solving Approach, 1/e, Oxford Higher Education, 2017
2. James Payne, Beginning Python using Python 2.6 and Python 3, 1/e, Wiley
.

Reference Books

1. Charles Dierach, Introduction to Computer Science using Python,2013
2. https://www.programiz.com/python-programming
3. https://www.javatpoint.com/python-tutorial
4. https://www.geeksforgeeks.org/python-programming-language/

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Python Programming Lab

MBA I Year II Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		0	0	2	1.0	50	50	100

Course Outcomes

After completion of the course student will be able to:

1. Develop programs on data types, operators and expressions
2. Apply the data structures in real time scenarios
3. Write the programs on strings and functions
4. Implement programs on class and related issues.
5. Use of python exception handling and packages..

Week 1

1. Installation and Environment set up of Python & Programs on Data types
2. Programs on Standard I/O, Operators and Expressions.

Week 2

3. Programs on Functions, lists and Tuples.

Week 3

4. Programs on Dictionaries, Strings and string operations

Week 4

5. Programs on Regular Expressions, Inheritance and Polymorphism.

Week 5

6. Programs on Exception Handling, Demonstration of Numpy Package.

Week 6

7. Demonstration of Pandas Package, matplotlib Package and Tkinter Package.

Week 7

8. Demonstration of Date and Time Packages.

Week 8

9. P Overview.

Week 9

10. C Overview.

English Communication Skills Lab

MBA I Year II Trimester					School of Management			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	LC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Course Objective

The course aims to improve the fluency of students in spoken English and neutralize their mother tongue influence and use language appropriately for public speaking and interviews.

Course Outcomes

At the end of this English Communication Skills Lab course, students will be able to:

- Differentiate between Spoken and Written English in formal and informal situations
- Learn Task Based Language Learning (TBLL) through various language activities effectively.
- Apply strategies for Effective Communication in different situations.
- Communicate effectively at work place with a special focus on social and professional etiquette.
- Participate in conversation, Public Speaking and Group Discussion

UNIT I

Exercise-I:

The 4 secrets of successful Communication:

Spoken vs. Written language - Formal and Informal English - Elevator speech - Introducing others

Ice-Breaking activities and JAM sessions.

UNIT II

Final Exercise-II

Features of Good Conversation:

Common Everyday Situations - Conversations and Dialogues

Role-Plays - Thanking and Responding - Agreeing and Disagreeing - Seeking and Giving Advice -Making Suggestions etc.

UNIT III

Exercise-III:

Communication at Workplace, Social and Professional Etiquette:

Descriptions (Person, place, object) – Narrations - Giving Directions and Guidelines

Telephone Etiquette

UNIT IV

Exercise-IV:

Formal Presentations:

Public Speaking - Exposure to structured talks - Non-verbal Communication.

UNIT V

Financial Exercise-V:

Extempore speeches:

Debates.

Minimum Requirement of infra structural facilities for ECS Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System etc.

Reference Books

1. Kumar, Suresh, E. and Sreehari, P. A Handbook for English Language Laboratories. New Delhi: Foundation, 2009.
2. Lab Manual: A Manual entitled English Language Communication Skills (ELCS) Lab Manual- cum- Work Book. New Delhi: Cengage Learning India Pvt. Ltd., 2013.
3. Mohan, Krishna. and Singh, N. P. Speaking English Effectively. (2nd Edition.) New Delhi: Macmillan Publishers India Ltd., 2011.
4. Rutherford, Andrea J. Basic Communication Skills for Technology. (Second Edition.) New Delhi: Pearson Education, 2007.
5. Sasi Kumar, V. and Dhamija, P.V. How to Prepare for Group Discussion and Interviews. Tata McGraw Hill.

Aesthetics

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	SEC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	0	50

Course Objective

The objective of this course is to introduce students to basics of aesthetics. The students will understand the importance of aesthetics in their lives and profession. They will learn to appreciate the various elements of aesthetics such as the Golden Mean, Harmony, Balance, Contrast and other relevant concepts.

Course Outcomes

At the end of this Aesthetics course, students will be able to:

1. Why aesthetics is important in one's life and business
2. Understand the key concepts in aesthetics such as Harmony, Balance, Golden Mean etc.
3. Appreciate the need to develop aesthetically pleasing products and services
4. Discriminate between well designed and crafted products, advertisements and services
5. Appreciate calligraphy, and text presentations and choice of fonts
6. Able to apply some of the concepts to their presentations, poster creation and organizing the class room and their immediate surroundings

Course Description

Students will learn to study the aesthetics of various products, advertisements, understand the needs of customers from an aesthetically pleasing point of view. The students also will learn to appreciate some of the concepts in design of services and products and Point of Sale displays.

An aesthetic sensibility will help them make better presentations, empathise with customers and their aesthetic needs. They will develop a sensitivity to discriminate between well designed products and poorly designed products and interfaces.

The course will deploy readings, guest lectures and assignments (both individual and group assignments)

Articles on aesthetics:

- https://magazine.wharton.upenn.edu/issues/fall-winter-2019/how-aesthetics-define-your-business/oncept.

Guest Speakers: Artists, sculptors, graphic designers (An illustrative list of names, non-binding) such as

- Materials for poster creation

Basic graphics design tools – for example, pro-create or equivalent, or Google drawing tools

A selection of Advertisements for evaluation

Reference Books

1. Ogilvy, David. Ogilvy on Advertising. United Kingdom, Knopf Doubleday Publishing Group, 2013.
2. Norman, Donald A.The Design of Everyday Things. United Kingdom, MIT Press, 2013.

Operations Management

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

The objective of this course is to provide the student with adequate knowledge regarding the different tools of operations management.

Course Outcomes

At the end of this Operations Management course, students will be able to:

- Understand operations management process and factors influencing the Operation Management
- Describe capacity planning and facility layout in the organization
- Implement different techniques to reduce time and cost by using project management
- Apply different cost reduction method in Material management
- Use different quality control techniques and standards to reduce quality errors

UNIT I

Introduction to Operations Management: Role of Operations Management in total management System- Interface between the operation systems and systems of other functional areas- Process planning and process design Production Planning and Control-Basic functions of Production Planning and Control- Production lifecycle.

UNIT II

Capacity planning: Process Selection and Facility layout: Designing product and process layouts and line balancing, Forecasting and its types. Location and the factors influencing location.

UNIT III

Materials Management: Need and importance of Materials management-Materials Requirement Planning-Materials Budgeting- Techniques for prioritization of materials-Sources of Supply of Materials –selection-evaluation and Performance of suppliers-make or buy decisions.

UNIT IV

Stores Management: Objectives of Stores Management, requirements for efficient Management of Stores, safety stock -Inventory Control - Different Systems of Inventory Control, Types of Inventory- Costs ,Systems of inventory control, ABC, VED and FNSD analyses. Value Analysis ,Importance in cost reduction – concepts and procedures.

UNIT V

Quality management: Quality Assurance, Inspection and Quality Control, Acceptance Sampling, Total Quality Management and ISO 9000 Series Standards, Six Sigma.

Text Books

1. K. Ashwathappa, Sreedhar Bhat, Production and Operations Management, HPH, 2015.
2. R. Panneerselvam, Production and Operation Management 3/e, PHI,2015.

Reference Books

1. Mahadevan. B, —Operations Management, 3/e, Pearson Education, 2015
2. Bozarth, Cecil C. & Handfield, Robert B; Introduction to Operations and Supply Chain Management; Pearson Education; New Delhi.
3. H. Kaushal, Production / Operations Management, Case Study Solutions, MacMillan
4. Wisner, Joel D., Leong, G. Keong & Tan, Keah-Choon; Principles 2012
5. Bozarth, Cecil C. & Handfield, Robert B.; Introduction to Operations and Supply Chain Management; Pearson Education; New Delhi

Business Research Methods

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

The course aims to understand the working capital financing, analyze the credit policies and capital structure of the organization to evaluate and measure the impact of inflation on capital structure and its policies.

Course Outcomes

At the end of this Business Research Methods course, students will be able to:

- Appreciate the role of research in organizations
- Apply qualitative research techniques in his/her research
- Use appropriate research techniques for a given problem
- Implement appropriate statistical tools for research.
- Write research reports

UNIT I

Introduction to Research: Business research – Definition, Nature, purpose of research, types of research, research process, research methodology and research method., Role of Business Research in Managerial Decisions, Deduction and Induction, Ethics in Business Research.

UNIT II

Credit Research Process: Problem Identification - Preliminary Data Gathering - Literature Survey –Theoretical Framework- Sampling, Hypothesis Development - Types of Research Designs: Exploratory, Descriptive, Experimental Designs and Case Study - Measurement of Variables -Rating Scales- Ranking Scales- Reliability and Validity. An overview of Descriptive Statistics and Inferential statistics

UNIT III

Collection of Data: Sources of Data-Primary Sources of Data-Secondary Sources of Data - Data Collection Methods- Quantitative data collection methods – Observation, Interview, Focus groups.

UNIT IV

Statistical techniques of data analysis: Chi-Square test, T test, ANOVA, Factor Analysis, Reliability and Correlation (Spearman and Karl Pearson), Conjoint analysis, Cluster analysis, multivariate data analysis.

UNIT V

Corporate Research report writing: Research Report: Research Reports- Components-Title Page - Table of Contents - Executive Summary - Introductory Section - Body of the Report - Conclusion of the Report- References- Appendix - Guidelines for Preparing a Good Research Report Oral Presentation- The Presentation and Handling Questions

Text Books

1. Uma Sekaran, Research Methods for Business–A Skill Building Approach, John Wiley& Sons (Asia) Pvt. Ltd., Singapore, 7/e, 2017

Reference Books

1. Donald R Cooper and Pamela S Schindler, Business Research Methods, 12/e,Tata McGraw- Hill Publishing Company Limited, New Delhi,2013

Project Management

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

Course Objective of Project Management is to help the student understand the concepts of project management, explain how to identify the projects and planning, analyze how to execute the projects, assess how to lead the team and evaluation of projects and to explain the Performance Measurement and Evaluation of the projects.

Course Outcomes

At the end of this Project Management course, students will be able to:

1. Have awareness of components and stages of project life cycle.
2. Know the phases and approaches to project selection
3. Understand the risk and cost implications of project execution.
4. Appreciate the characteristics of effective project teams
5. Describe the project performance and monitoring measures.

UNIT I

Introduction: Introduction to project management, need for project management, project management principles. Project lifecycle, project management phases in lifecycle, organization structure, stake holder management, creating a culture for project management.

UNIT II

Project Identification and Planning: Project identification process, defining the project, approaches to project screening and selection, project planning, work breakdown structure, financial module, getting approval and compiling a project charter, setting up a monitoring and controlling process.

UNIT III

Project Execution: Initiating the project, controlling and reporting project objectives, conducting project evaluation, risk, role of risk management, project management, risk management an integrated approach, cost management, creating a project budget.

UNIT IV

Leading Project Teams: Building a project team, characteristics of an effective project team. Achieving cross-functional co-operation, virtual project teams, conflict management, negotiations

UNIT V

Performance Measurement and Evaluation: Monitoring project performances, Project control cycles, Earned Value management, Human factors in project evaluation and control. Project termination, types of project terminations, project follow-up.

Text Book

1. Jeffery K. Pinto, Project Management, Pearson Education,2015

Reference Books

1. Gray, Larson, Project Management, Tata McGraw Hill,2015
2. Enzo Frigenti, Project Management, Kogan, 2015
3. R. Panneerselvam & P. Senthilkumar, Project Management, PHI, 2015
4. Thomas M.Cappels, Financially Focused Project Management, SPD,2008.
5. Guide to Project Management Body of Knowledge (PMBOK® Guide) of Project Management Institute, USA.

Negotiation And Selling

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	0	0	2	50	50	100

Course Objective

To familiarize the students with the various Negotiation theories, basic negotiation skills required, interpersonal skills, and also the ethics involved in Negotiation, along with the various dispute resolution strategies implemented in Industries to build cordial Industrial.

Course Outcomes

At the end of this Negotiation course, students will be able to:

- Have awareness of importance of negotiation and sales skills for a manager
- Describe factors that affect the negotiation process and ethics involved in the negotiation.
- Apply effective negotiation strategies and tactics for different scenarios
- Identify role of sales in organization
- Understand factors effecting sales force management

UNIT I

Introduction to negotiation: Introduction, Concept of Negotiation, Characteristics of a Negotiating Situation, Basic Negotiation Skills, Interpersonal Skills in Negotiation, Theories of Negotiation**.**

UNIT II

Types and Ethics in Negotiation: Types of Negotiation, Principles of Negotiation, Steps of Negotiation, Win-Win Negotiation, Negotiation Tactics, Factors Affecting Success in Negotiation. Ethics in negotiation.

UNIT III

Strategies and multiple parties and teams in Negotiation: Effective Strategies to develop Negotiation Skills, Anchoring / BATNA, Nature of multiparty negotiation, Inter team negotiations, Improving negotiation skills. Managing Negotiation.

UNIT IV

Selling: Importance of Sales, Sales process,: Prospecting, qualifying the prospect, presentation, closing, servicing, Customer satisfaction, Types of sales, Skills needed by a good sales person,

UNIT V

Sales Environment : Environmental factors impacting success in selling, Sales quota. Sales force recruitment and selection.

Text Books

1. Roy J Lewicki, Bruce Barry, and David M Saunders ,Essentials of Negotiation, 5/e, McGraw Hill, 2011.

Reference Books

1. Beverly DeMarr and Suzanne De Janasz ,Negotiation and Dispute Resolution, Prentice Hall, 2013.
2. Malhotra, Deepak, Negotiating the Impossible: How to Break Deadlocks and Resolve ugly Conflicts (without money or muscle). Oakland, CA: Berrett-Koehler Publishers, 2016

Big Data Analytics

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	1	0	3	50	50	100

Course Objective

Course Objective of Big Data Analytics is to enable students to interpret the meaning of big data in company databases using pre-determined queries and multidimensional analysis, understand Data exploration and decision science

Course Outcomes

At the end of this Big Data Analytics course, students will be able to:

1. Know about sources of Big Data and Analyzing Tools.
2. Map statistical methods to analyze huge data.
3. Know the other frameworks in Distributed File Systems.
4. Know to create cluster in Hadoop distributed file system.
5. Apply Map Reduction in HDFS.

UNIT I

Introduction to Big Data: Introduction to BigData, Characteristics of Big Data, Traits of Big data, Challenges of Conventional Systems, Sources of Big Data, Evolution Of Analytic Scalability, Analytic Processes and Tools, Analysis vs Reporting, Modern Data Analytic Tools, Statistical Concepts: Sampling Distributions -Re-Sampling - Statistical Inference -Prediction Error.

UNIT II

Big Data In Enterprise: Problems with traditional large-scale systems, Big Data in enterprise, Comparison with other systems, Hadoop Frame work.

UNIT III

Introduction to Hadoop: History of Hadoop, Data Storage and Analysis**,** Hadoop - Setup Hadoop -Pseudo mode-Cluster mode-IPv6-Installation of Java, Hadoop-Configurations of Hadoop.

UNIT IV

HDFS: The Hadoop Distributed File System-HDFS Design and Architecture-HDFS Concepts-Interacting HDFS using command line-Interacting HDFS using Java APIs-Dataflow-Blocks-Replica-Hadoop Processes-Name node-Secondary name node-Job tracker-Task tracker-Data node.

UNIT V

MapReduce: How MapReduce Works-Anatomy of a Hadoop Cluster-Hadoop Ecosystem Components-Developing Map Reduce Application-Phases in Map Reduce Framework-Map Reduce Input and Output Formats-Introduction to Writing a MapReduce Program-The MapReduce Flow-Examining a Sample MapReduce Program-Basic MapReduce API Concepts-The Driver Code-The Mapper-The Reducer.

Introduction to Languages and Databases: Hadoop Programming languages: Pig, Hive

NOSQL Databases: Cassandra, Mongo, Cloudera, CouchDB, HBase

Text Books

1. Bill Franks, “Taming the Big data tidal wave”, SAS, Wiley, 2012.
2. Tom White, “ Hadoop: The Definitive Guide”, 3/e, O’Reilly Media, 2012.

Reference Books

1. Michael Minelli, Michele Chambers, Ambiga Dhiraj, Jim Stogdill, “Big Data Big Analytics : Emerging Business Intelligence and Analytic Trends for Today's Businesses”, 1/e, Wiley Publications, 2013
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGraw Hill Publishing, 2012
3. Pete Warden, “Big Data Glossary”, O’Reilly, 2011

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Warehousing and Data Mining

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objective

Course Objective of Data Warehousing and Data Mining is to:

Familiarizes students with the data mart, associations, clustering and recent trends in data mining

Course Outcomes

At the end of this Data Warehousing and Data Mining course, students will be able to:

1. Design a data mart or data warehouse for any organization
2. Apply Association and classification knowledge to different data sets
3. Apply the clustering Techniques for different data sets
4. Explore recent trends in data mining such as web mining, spatial-temporal mining
5. To explore applications of time series and multimedia data mining.

UNIT I

Data Warehouse and OLAP Technology: what is a Data Warehouse, Multidimensional Data Model, OLAP Operations on Multidimensional Data, Data Warehouse Architecture
Cube computation: Multiway Array Aggregation, BUC

UNIT II

Introduction to Data Mining: Fundamentals of data mining, Data Mining Functionalities, Data Mining Task Primitives, Major issues in Data Mining. **Data Preprocessing**: Needs for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction

UNIT III

Mining Frequent Pattern: Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules,

Classification and Prediction: Issues Regarding Classification and Prediction,

Classification by Decision Tree Induction, Bayesian Classification.

UNIT IV

Cluster Analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods-K-means, PAM, Hierarchical Methods-BIRCH, Density-Based Methods-DBSCAN, Outlier Detection.

UNIT V

Pattern Discovery in real world data: Mining Time-Series Data, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web, Data Mining Applications

Text Book

1. Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, 2/e, Elsevier, 2007.

Reference Books

1. Alex Berson and Stephen J. Smith, Data Warehousing, Data Mining & OLAP, Tata McGraw Hill, Tenth Reprint, 2007.

2. Arun K.Pujari , Data Mining Techniques, 2/e, Universities press.

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Data Warehousing and Data Mining Lab

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		0	0	2	1.0	50	50	100

Course Objective

Course Objective of Data Warehousing and Data Mining Lab is to familiarizes students with data mining, data cleaning, data integration, algorithms and techniques

Course Outcomes

At the end of this Data Warehousing and Data Mining Lab course, students will be able to:

1. Understand the data mining process and important issues around data cleaning, pre-processing and integration**.**
2. Explore the algorithms and techniques used in data mining, such as clustering, association mining, classification and prediction.

WEEK 1

Design multi-dimensional data models namely star, snowflake and Fact constellation schemas for an enterprise using open source tools like Pentaho Data Integration and Pentaho Business Analytics.

WEEK 2-3

Apply below preprocessing techniques on given dataset. Handling Missing Values, Remove records having a NULL value, Replace Numeric attributes by mean value, Remove Nominal attributes having null value, Sampling, Discretization (Binning), Normalization.

WEEK 4-5

Demonstrate performing association rule mining on data sets using Aprori and FP growth algorithms with different support and confidence values. Compare association rule mining results of Aprori and FP growth for given dataset, and deduce which algorithms is performing best and poor for each dataset and justify.

WEEK 6-7

Demonstrate performing classification on data sets using Id3, J48 classification algorithm. Compare classification results of ID3, J48 and Naïve-Bayes classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.

WEEK 8-9

Demonstrate performing clustering on given data sets using k-means clustering algorithm with different values of k (number of desired clusters). Compare with other clustering techniques available in Weka. Explore visualization features of Weka to visualize the clusters. Derive interesting insights and explain.

Design Thinking

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	SEC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	0	50

Course Objective

To enable the students to understand and apply different tools of design thinking and strengthening their inter-personal and professional capabilities through team work principles

Course Outcomes

At the end of this Design Thinking course, students will be able to:

- Understand the concept of design thinking
- Identify and solve problems with human centric approach in a creative way.
- Implement design thinking principles in developing products or services.
- Develop the ability to create and test prototypes.
- Understand moral principles during the exploration of teamwork opportunities, and interpersonal skills.

UNIT I

Basics of Design Thinking: Background of design thinking, definition, uses and mindset. Approach of design thinking: Concepts and resources

UNIT II

Processes and Tools of Design Thinking: Five-stage process, visualization, mind mapping, brainstorming.

UNIT III

Case studies: Challenges best suited for design thinking, introduction and implementation of case studies applying design thinking process and tools.

UNIT IV

Applied Design Thinking: Problem identification, empathy based problem definition, ideation. Group discussion and activities to encourage the understanding, acceptance and appreciation of individual differences

UNIT V

Prototyping and Testing: Building prototype, prototype testing and iterations. Final product/service presentation and evaluation

Text Books

1. Jeanne Liedtka, Tim Ogilvie, and Rachel Brozenske, The Designing for Growth Field Book: A Step-by-Step Project Guide (New York: Columbia University Press, 2014.

Reference Books

1. Thomas Lockwood, Design Thinking: Integrating Innovation, Customer Experience, and Brand Value, 2009
2. The Art of Innovation, Tom Kelley Change by Design, Tim Brown

INTERNSHIP / PROJECT

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	PROJECT	L	T	P	C	CIE	SEE	Total
		0	0	8	4	50	50	100

Course Objective

The objective of Internship / Project is to introduce students to the organizational environment and work culture. Internship /Project is to be done after the first year third semester. Duration of Project is 6 weeks to 8 weeks.

After completion of Internship / Project students have to give weekly progress review to the supervisor and present a final report and Viva

The following is the suggested checklist project report.

Brief Introduction

Review of Literature

Research Gaps

Research Questions

Objectives of the Study

Hypotheses

Scope of the Study Period of the Study

Sample Data Collection

Primary Data

Secondary Data

Data Analysis and Interpretations

Findings

Suggestions

Bibliography

Appendices

The project report should clear Plagiarsm check conducted by the examination branch before submission of the report. The acceptable percentage of plagiarism report is less than 30% for a project report.

Students have to present two internal progressive seminars during the project and after the submission of the report an external viva will be held by the university to give the grade as per the university guidelines.

Entrepreneurship Minors

Student can opt for any courses that are not studied in their Engineering stream . Courses opting total of 18 credits are to opted by the student.

Sl. No	Course Name	Hours per week			Credits
		L	T	P	
1	Introduction to Entrepreneurship	2	1	0	3
2	Entrepreneurship Strategies	2	1	0	3
3	Digital Business Models	2	1	0	3
4	The Art of pricing	2	1	0	3
5	Intellectual Property rights & Finance	2	1	0	3
6	Project development and Pitching	0	0	6	3
7	Negotiation & Sales Management	2	0	0	3
8	Marketing Management	3	0	0	3

INTRODUCTION TO ENTREPRENEURSHIP

Entrepreneurship Minors								
Code	Category	Hours / Week			Credits	Marks		
	Minor	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives:

- To make participants self-discover their innate flow, entrepreneurial style, and identify problems worth solving thereby becoming entrepreneurs
- To handhold participants on lean methodology to craft value proposition and get ready with lean canvas
- To create solution demo by conducting customer interviews and finding problem-solution fit for building Minimum Viable Product (MVP)
- To make participants understand cost structure, pricing, revenue types and importance of adopting shared leadership to build good team
- To help participants build a strong brand and identify various sales channels for their products and services

Course Outcomes:

At the end of the Introduction to entrepreneurship course students will be able to

- Create Business Model and MVP.
- Craft value propositions for Business
- Create cost structure and pricing
- Create branding for products and services
- Apply Intellectual property rights.

Unit – I:

Self Discovery and Opportunity Discovery: Finding the Flow; Effectuation; Identifying the Effectuation principles used in activities; Identifying Problem Worth Solving; Design Thinking; Brainstorming; Presenting the Identified problems; Identifying the Entrepreneurial Style.

Unit – II:

Customer, Solution and Lean Methodology: Customers and Markets; Segmentation and Targeting; Identifying Jobs, Pains, and Gains and Early Adopters; Crafting Value Proposition Canvas (VPC); Presenting VPC; Basics of Business Model and Lean Approach; Sketching the Lean Canvas; Risks and Assumptions; Presenting Lean Canvas.

Unit – III:

Problem-Solution Fit and Building MVP: Blue Ocean Strategy - Plotting the Strategy Canvas; Four Action Framework: Eliminate-Reduce-Raise-Create Grid of Blue Ocean Strategy; Building Solution Demo and Conducting Solution Interviews; Problem-Solution Fit; Building MVP; Product-Market Fit; Presenting MVP.

Unit – IV:

Financial Planning & Team Building : Cost Structure - Estimating Costs; Revenues and Pricing: Revenue Streams, Revenue Types, Identifying Secondary Revenue Streams, Estimating Revenue and Price; Profitability Checks; Bootstrapping and Initial Financing; Practising Pitch; Shared Leadership; Hiring and Fitment, Team Role and Responsibilities.

Unit – V:

Marketing, Sales, Regulations and Intellectual Property : Positioning and Branding; Channels; Sales Planning; Project Management; Basics of Business Regulations; How to Get Help to Get Started; Patents, Trademark, Licensing, Contracts; Common Legal mistakes, Types of Permits, Tax Registration Documents, Compliance; Infringement and Remedies, Ownership and Transfer.

Suggested books:

1. Czikszentmihalyi, M., 2008. Flow: The Psychology of Optimal Experience. Harper Perennial Modern Classics
2. Sarasvathy, S. D., 2009. Effectuation: Elements of Entrepreneurial Expertise. Edward Elgar Publishing Ltd.
3. Ries, E., 2011. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. The Crown Publishing Group

References:

1. https://www.forbes.com/sites/chrismyers/2015/12/16/find-your-flow-and-success-will-follow/
2. https://necrophone.com/2014/01/20/effectuation-the-best-theory-of-entrepreneurship-you-actually-follow-whether-youve-heard-of-it-or-not/

ENTREPRENEURSHIP STRATEGIES

Entrepreneurship Minors					II BBA I Semester			
Code	Category	Hours / Week			Credits	Marks		
	Minor	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives:

- To understand the importance of growth and to be able to chart a path towards business growth To build traction by measuring the effectiveness of channels
- To stabilize key revenue streams by exploring new channels and partnerships and understanding customer buying decisions
- To train participants on crafting sales pitch and closing a sale and make participants aware of optimizing costs and operational expenses
- To list and comply with the requirements relating to regulatory compliance and to effectively pitch the venture to potential stakeholders

Course Outcomes: At the end of the course students will be able to

- Understand the difference between growth stage and start up phase.
- Explain the Bulls Eye Framework
- Analyze the reasons for customer buying affinity
- Understand the Optimizing cost and Optimizing expenses
- Asses the legal issues and Financial models

Unit I:

Growth Stage, Expanding Customer Base and Scaling: Comparison of growth stage and startup phase - Growth assessment Assessing readiness for growth - Ansoff Matrix, Adjacency mapping, More new business model types, Identifying additional customer segments with solutions, evaluating business models for the new customer segments, Re looking at the Problem Statement, exploring additional ways to monetize.

Unit II:

Traction Channels, Budgeting and Planning: The Bulls eye framework, Identifying channels using Bulls Eye Framework, Measuring the effectiveness of selected channels, Budgeting and Planning.

Unit III:

Growth Revenues: Stabilizing key revenue streams, Developing additional revenue streams (licensing, franchising); Exploring new channels and partnerships, Reasons for customer buying affinity, Making buying decisions,Listening skills.

Unit IV:

Sales Planning and improving margins: Sales planning, setting targets, Unique Sales Proposition (USP), Art of the sales pitch , Follow-up and closing a sale, Asking for the sale, Strengthening sales using Sales pitch template and using Financial model template, Testing price elasticity, optimizing costs and operational expenses, Advanced concepts of unit costing.

Unit V:

Financial Modeling, Legal and Expert Support: Financial modeling of venture's growth, Analyzing competitor and peer's financial models, Overview of legal issues and their impact on entrepreneurs, Importance of getting professional help , Importance of being compliant and keeping proper documentation, Patents and Intellectual property, Trademarks: The importance of a Mentoring , role of business advisors and experts for specific targets in growth plan.

Text Books:

1. Fortin, F., 2015. Ansoff Matrix Essentials. CreateSpace Independent Publishing Platform
2. McKeown, L., 2014: Predictable Success: Getting your Organization on the Growth Track—And Keeping it There. Greenleaf Book Group Press
3. Weinberg, G. & Mares, J., 2014. Traction: A Startup Guide to getting customers. S-curves Publishing

References/Websites:

1. https://www.mindtools.com/pages/article/newTMC_90.htm Reinventing Your Business Model by Mark W. Johnson, Clayton M. Christensen, and Henning Kagermann, HBR
2. http://www.unstoppablegrowth.com/core/where_to_grow.asp?groupCode=9 ‘Eight Essentials for Scaling Up Without Screwing Up’ Robert I. Sutton HBR February 2014
3. Case: Business Model Innovation at Wildfang Charla Mathwick https://hbr.org/2003/12/growth-outside-the-core"

DIGTAL BUSINESS MODELS

Code	Category	Hours / Week			Credits	Marks		
	Minor	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives:

- To help students to understand digital economy, e-business and business models.
- To make them understand digital business models and its toods
- To help students to work on some case studies using digital business models
- To help them understand how to take decision making working with digital models
- To understand make them work on some models like amazon, walgreens

Course Outcomes:

At the end of this Digital Business Model course, the students will be able to

- Understand the digital economy, e-business and digital business models.
- Use digital business models' tools used to rise of internet mega brands and how companies use in the digital era.
- Understand how companies use digital business models.
- Practice decision making process using digital business models
- Take up some of the case studies who are implementing the digital business models

Unit-I:

Introduction: Digital economy and key concepts, The movement from 'e-business' to digital business models, Key actors and stakeholders in the digital economy.

Unit-II:

Digital Business Models: Introduction to digital business models. Digital business models will be used as a tool to explain the rise of internet mega brands and how companies can innovate in the digital era.

Unit-III:

How Internet companies use digital business models: Concept of the Digital Business Models to analyze how Apple, Google, Facebook, Amazon and several other internet-era incumbents are using digital business models to create, deliver, capture and defend value.

Unit-IV:

Developers as the new Decision Makers: Discussion on how and why developers are emerging as the new decision makers.

Unit-V:

Developers as the Engine of Digital Business Models: Discussion on how developers are the engine of Digital Business Models and how companies from Amazon to Walgreens are working with developers to create, deliver, capture and defend value.

Text Book:

1. Digital Business Models: Driving Transformation and Innovation, Annabeth Aagaard (Editor), Kindle Edition, Palgrave Macmillan; 1st ed. 2019 edition (4 December 2018).
2. Digital Business Models: Concepts, Models, and the Alphabet Case Study, Bernd W. Kindle Edition,1st ed. 2019 Edition, Kindle Edition.

References:

1. Haftor, D.M. (2015). Some Heuristics for Digital Business Model Configuration.
2. DiFenSE 2015 – Digital Business Innovation and the Future Enterprise Information
   Systems Engineering, 27th International Conference on Advanced Information Systems Engineering; 8 – 12 June, 2015, Stockholm, Sweden

THE ART OF PRICING

Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Minor	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		2	**1**	**0**	**3**	**40**	**60**	**100**

Course Objectives:

- To provide an overview of pricing
- To understand the various dimensions of pricing
- To understand the variations in pricing.
- To develop an understanding of various pricing strategies.
- To understand the pricing challenges/opportunities in various industries and markets.

Course outcomes:

At the end of the course the art of pricing the students will be able to

- Give an overview of pricing.
- Have a comprehension of various dimensions of pricing.
- To analyze the variations in pricing
- Able to develop pricing strategies.
- Able to handles various pricing challenges and optimize the markets.

Unit I:

Pricing

Pricing, Significance of pricing, Pricing Objectives, Factors affecting price determination.

Unit II:

Setting price levels

Setting price boundaries, establishing the initial price, Price/Volume trade-off, price elasticity, Customer driven pricing

Unit III:

Managing price variance

Pricing policy development, Price segmentation, Price promotions, Discount management, Product life cycle pricing.

Unit IV:

Pricing strategies and Pricing Innovations

Price-offer configuration, Multipart price structures, Bundling, Subscriptions, Auction pricing models, Psychology of pricing, flash sales, Price optimization technology, pricing strategies for Customer Lifetime value.

Unit V:

Challenges/opportunities in particular industries/market environments

Pricing commodities/utilities, pricing network services, Pricing for products with externalities, Pricing in two sided markets,Pricing for perishable goods, durable goods and services.

Text Books:

1. The Strategy and Tactics of Pricing (STP) – A guide to growing more profitably Thomas T. Nagle, John E. Hogan and Joseph Zale, Prentice Hall, 5. Edition, 2011
2. Meehan/Simonetto /Montan /Goodin - Pricing and Profitability Management – A practical guide for Business Leaders, John Wiley & Sons, 2011
3. Dolan/Simon – Power Pricing – How managing price transforms the bottom line, The Free Press, 1996
4. Tim J. Smith - Setting Price Levels, Managing Price Discounts & Establishing Price Structures, South Western, 2012

References:

1. Marketing Management by Kotler, Keller , Koshy and Jha, Pearson Education, 2018
2. Marketing Strategies by Rajan Saxena Tata- McGraw Hill Publishing Company, 2017

INTELLECTUAL PROPERTY RIGHTS & FINANCE

Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	Minor	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		2	**1**	**0**	**3**	**40**	**60**	**100**

Course Objectives:

Intellectual property refers to the rights which are attached to the creation of the mind and which take the form of a property. Though intangible in nature, intellectual property has become the driving force of many companies today.

Course Outcomes:At the end of the course students will be able to

- Understand the importance of IPR
- Explain the concept of Trademarks
- Analyze the rights to perform the work related to copy rights
- Know about the Law of Patents
- Understand the role of trade secrets.

Unit – I:

Introduction to IPR: Concept of IPR, Importance of intellectual property rights. Types of intellectual property, international agencies and treaties.

Unit – II:

Trade Marks, Copy Rights : Concept of trademarks, Purpose and function of trademarks, Acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

Concept of Copyright Right, Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration

Unit – III:

Law of patents, Trade secrets : Introduction to Patent, Foundation of patent law, patent searching process, ownership rights and transfer.

Trade Secrets & Geographical Indication: Trade secrets law, determination of trade secrets, protection for submission, trade secret litigation. Unfair competitions, False advertising

Unit – IV:

Introduction to Finance : Nature, scope and objectives of financial management - Time value of money , Concept of risk and return**.** Capital Budgeting techniques.

Unit V :

Working capital management: Meaning and nature of working capital, Determination of working capital requirement, A brief overview of cash management, Inventory management and receivables management

Text Books:

1. Intellectual property rights, Deborah. E. Bo choux, Cengage Learning.
2. Intellectual property rights- nleashmy the knowledge economy, Prabuddha Ganguli, Tate Mc Graw Hill Publishing company ltd.
3. Prasanna Chandra; Financial Management Theory and Practice, TMH, 10/e, 2019
4. M.Y. Khan & P.K. Jain,Financial Management, TMH, 7/e, 2017.

Reference Books:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage Learning.
2. https://nptel.ac.in/course

Negotiation And Sales Management

MBA I Year III Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	1	0	3	50	50	100

Course Objective

To familiarize the students with the various Negotiation theories, basic negotiation skills required, interpersonal skills, and also the ethics involved in Negotiation, along with the various dispute resolution strategies implemented in Industries to build cordial Industrial.

Course Outcomes

At the end of this Negotiation course, students will be able to:

- Have awareness of importance of negotiation and sales skills for a manager
- Describe factors that affect the negotiation process and ethics involved in the negotiation.
- Apply effective negotiation strategies and tactics for different scenarios
- Identify role of sales in organization
- Understand factors effecting sales force management

UNIT I

Introduction to negotiation: Introduction, Concept of Negotiation, Characteristics of a Negotiating Situation, Basic Negotiation Skills, Interpersonal Skills in Negotiation, Theories of Negotiation**.**

UNIT II

Types and Ethics in Negotiation: Types of Negotiation, Principles of Negotiation, Steps of Negotiation, Win-Win Negotiation, Negotiation Tactics, Factors Affecting Success in Negotiation. Ethics in negotiation.

UNIT III

Strategies and multiple parties and teams in Negotiation: Effective Strategies to develop Negotiation Skills, Anchoring / BATNA, Nature of multiparty negotiation, Inter team negotiations, Improving negotiation skills. Managing Negotiation.

UNIT IV

Sales Management: Importance of Sales, Sales process,: Prospecting, qualifying the prospect, presentation, closing, servicing, Customer satisfaction, Types of sales, Skills needed by a good sales person.

UNIT V

Sales Strategies : Environmental factors impacting success in selling, Sales quota, Sales force recruitment and selection, territory management. Case studies.

Text Books

1. Roy J Lewicki, Bruce Barry, and David M Saunders ,Essentials of Negotiation, 5/e, McGraw Hill, 2011.

Reference Books

1. Beverly DeMarr and Suzanne De Janasz ,Negotiation and Dispute Resolution, Prentice Hall, 2013.
2. Malhotra, Deepak, Negotiating the Impossible: How to Break Deadlocks and Resolve ugly Conflicts (without money or muscle). Oakland, CA: Berrett-Koehler Publishers, 2016

Marketing Management

MBA I Year I Trimester					School of Management			
Code	Category	Hours / Week			Credits	Marks		
	Core	L	T	P	C	CIE	SEE	Total
		2	1	0	3	50	50	100

Course Objective

This course will enable the students to develop an understanding of the role of marketing in a business organization specifically, and in our society at large

Course Outcomes

At the end of this Marketing Management-I course, students will be able to:

- Differentiate between selling and marketing
- Understand consumer buying process
- Classify customers into various segments and compare various product positionings.
- Assess the role of marketing mix elements in marketing strategy.
- Differentiate between the utility of various marketing research approaches such as qualitative and quantitative.

UNIT I

Introduction to Marketing: Needs, wants, demand, types of demand, value, scope of marketing, production concept, product concept, selling concept, marketing concept, holistic marketing concept**.**

UNIT II

Customer Orientation: Consumer insight, factors influencing consumer behavior, B to B markets, nature of buying unit, institutional markets; government markets; e-procurement.

UNIT III

Product management & Segmentation, Targeting, Positioning (STP): Product classifications and levels, product life cycle; segmentation, bases for segmentation of consumer markets, business markets; market targeting; positioning, brand equity.

UNIT IV

Marketing Mix: Elements of marketing mix, new product development, pricing strategies, marketing channels–levels, channels of distribution, promotion

UNIT V

Marketing Research: Marketing research, importance and process, quantitative marketing research, qualitative marketing research, applications of marketing research.

Text Books

1. Philip Kotler and Gary Armstrong, Principles of Marketing, Pearson, 17/e, 2018.

Reference Books

1. Lamb,Hair& Sharma ,Marketing: A South Asian Perspective, CengageLearning, 2016
2. Paul Baines, Chris Fill, Kelly Page, Sara Rosengren, Marketing, OUP ,5/e, 2019,
3. Srinivasan, Case Studies in Marketing, The Indian Context, PHI,2012

Project development and Pitching

Code	Category	Hours / Week			Credits	Marks		
	Seminar	L	T	P	C	CIE	SEE	Total
		0	0	6	3	100	0	100

Course Objectives:

Project pitching helps in building his idea to prototype and pitch in front of investors.

At the end of the course, student has to develop an idea and pitch his / her idea .

Item 9:

Presentation of the Amendments to the Ph. D. Rules & Regulations for discussion and approval.

Item 1A: Request to amend for the renaming of the existing compulsory pre-registration RPWP course into the "Research Paper Writing and Publication Ethics (RPW&PE)" course with four credits and 100 marks. (As per below UGC Guidelines).

The aim of the RPW&PE course is that the Scholar will learn the essentials of Research Methodology and publication ethics by doing literature surveys/experiments/simulations etc., and technical report on 8 to 10 research papers of his/her broad area of research approval of DRC. The Scholar will learn ethical issues rose when people are involved as participants in research.

1B) Request to amend the pattern of examination of RPW&PE coursework: The research scholar shall secure a minimum of 50% marks to pass this course. The Scholar needs to present two seminars on the approved research papers and research publication ethics before DRC. Each seminar is evaluated for 100 marks (30 marks for technical writing of the seminar content and 40 marks for technical presentation, and 30 marks for Research Publication Ethics). The DRC will evaluate the Scholar based on the average marks of two seminar presentations.

The UGC circular.D.O.No.F.1-1/2018 (Journal /CARE) dated December 2019 to all Vice-Chancellors, the UGC approved a two-credit course, "Research and Publication Ethics," to be made compulsory for all Ph.D. students as pre-registration course work. (Presented in543rd meeting of the University Grants Commission held on 9th August 2019. Item-2.07-page 10**).**

In the meeting held on 10-03-2022, with all Heads and Chairperson DRC of the Departments, it is resolved to approve the same and suggested to place before the academic council for approval**.**

Request for approval from the next batch of scholars admitted into Ph.D. program.

Item 2: Exemption for M.Phil. Degree holders of regular mode in the concerned subject from AU Ph.D. eligibility test and from the Ph.D. course work, however, they need to appear and pass the Research Paper Writing and Publication Ethics (RPW&PE) course.

As per the University Grants Commission (Minimum Standards and Procedure for Award of M.PHIL./PH.D Degrees) Regulations, 2016 section 5, section 7.6 of Draft University Grants Commission (Minimum Standards and Procedures for Award of Ph.D. Degree) Regulations, 2022, and OU Ph.D. rules and regulations

of section 3.3-c and 8.1, the M.Phil. Degree holders in regular mode in the concerned subject are exempted from the eligibility test and Course work.

Request to permit the above.

Item 10:

Proposal for the Five Day Classwork for Students

Item 11:

Any other matter with the permission of the Chair