Program Structure and Syllabus

BTech (Artificial Intelligence) III Year (I & II Semesters)

R20 Regulations

Department of Artificial Intelligence

ANURAG UNIVERSITY

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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	A55031	PCC	Essentials of Machine Learning	3	1	0	4
2	A55032	PCC	Computer Systems II	3	1	0	4
3	A55033	PCC	Web Programming with MEAN	3	0	0	3
4	A55081 A55080 A55079	OEC-I	1. Data Storytelling 2. Entrepreneurship Development 3. Intellectual Property Rights	3 3 2	0 0 1	0 0 0	3
5	A55213	PCC-Lab	Computer Systems Lab	0	0	3	1.5
6	A55214	PCC-Lab	Web Programming with MEAN Lab	0	0	3	1.5
7	A55215	PCC-Lab	Essentials of Machine Learning Lab	0	0	3	1.5
8	A55288	BSC-Lab	Quantitative Aptitude and Reasoning	0	0	3	1.5
9	A55091	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	A56061	PCC	Automata Theory and Applications	3	1	0	4
2	A56062	PCC	Information Retrieval Systems	3	0	0	3
3	A56063	PCC	Computer Vision and Image Processing	3	0	0	3
4	A56036 A56054 A56037 A56064	PEC-I	1. R Programming 2. Mobile Application Development 3. Internet of Things 4. Unified Modeling Language	2	0	0	2
5	A56065 A56066 A56067 A56068	PEC-II	1. Distributed Systems 2. Evolutionary Computing 3. Cryptography 4. Fundamentals of Image Data Mining	3	0	0	3
6	A56288	HSS&MC	Verbal Ability and Critical Reasoning	0	0	3	1.5
7	A56221	PCC Lab	Computer Vision and Information Retrieval Systems Lab	0	0	4	2
8	A56208 A56218 A56209 A56222	PEC-I 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	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		
A55031	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: Introduction, Definition and Applications, Types of Machine Learning Models - Supervised, Unsupervised, Reinforcement learning, Applications, State-of-the-art Languages and Tools, Preparing to Model: Basic Types of Data, Exploring Structure, Data Quality and Remediation. Model Representation: Overfitting and Underfitting, Bias–variance trade-off

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

UNIT-II

Supervised Learning: Applications. Classification and Regression Tasks, Evaluating performance of classification and regression models, Classification Algorithms: k-Nearest

Neighbor, Decision Tree. Regression Algorithms: Simple Linear Regression, Multiple Linear Regression, Logistic Regression

UNIT-III

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

UNIT-IV

Bayesian Learning: Bayes' Theorem and Concept Learning: Brute-force algorithm, Consistent Learners, Bayes Optimal Classifier, Naïve Bayes Classifier, Bayesian Belief Networks

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. Architectures of Neural Network: Single-layer feed forward network, Multi-layer feed forward network, Competitive network, Recurrent Network. Learning Process in ANN. 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		
A55032	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		
A55033	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

DATA STORYTELLING

BTech (AI) III Year I Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
A55081	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

INTERNET OF THINGS LAB

BTech (AI) III Year II Semester					Dept. of Artificial Intelligence			
Code	Category	Hours / Week			Credits	Marks		
A56209	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		
A56222	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.