Course Structure and Syllabus (R20)

BTech (Artificial Intelligence & Machine Learning)

IV Year (I & II Semesters)

BTech (AIML) IV YEAR I SEMESTER

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A57068	PCC	Big Data	3	0	0	3
2	A57056	PCC	Deep Learning	3	1	0	4
3	A57061	PEC-III	1.Natural Language Processing	3	0	0	3
	A57069		2.Fuzzy Logic				
	A57070		3.Speech Processing				
4	A57071	*PEC-IV	1.Cloud Computing	3	0	0	3
	A57072		2.Embedded Robotics				
	A57073		3.Design Patterns				
	A57074		4.Blockchain Technology				
	A57075		5.Cyber Security				
	A57063		6.Cyber Forensics				
	A57076		7.Applications of AI in e-Governance*				
5		*PEC-V	***Any two of the above courses can be chosen against PEC-IV and PEC-V respectively**	3	0	0	3
6	A57216	PCC Lab	Big Data Lab	0	0	4	2
7	A57210	PCC Lab	Deep Learning Lab	0	0	4	2
8	A57230	PROJ	Industry Oriented Mini Project	0	0	4	2
			TOTAL	**15**	**1**	**12**	**22**

BTech (AIML) IV YEAR II SEMESTER

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A58001	OEC-II	1. Technical and Business Communication Skills	2	1	0	3
	A58019		2. Digital Media Literacy				
	A58022		3. Managerial Economics and Financial Analysis				
2	A58005	OEC-III	1. Negotiation Skills	2	1	0	3
	A58008		2. Project Management				
	A58010		3. Value Engineering				
3	A58201	PROJ	Seminar	0	0	4	2
4	A58202	PROJ	Comprehensive Viva-Voce	0	0	0	2
5	A58203	PROJ	Project Work	0	0	20	10
			TOTAL	**4**	**2**	**24**	**20**

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

BIG DATA

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57068	PEC-III	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To understand the concepts of big data and hadoop
2. To understand mapreduce concepts
3. To perform data analysis with pig tool and to perform high volume ingestion into Hadoop of event-based data
4. To create and load data into HIVE tables
5. To create Resilient distributed datasets

Course Outcomes

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

1. Work with hadoop distributed file system
2. Develop map reduce based applications
3. Perform data analysis using pig tool
4. To use hive tool for data analysis
5. Big Data processing using SPARK

UNIT-I

Big Data: characteristics of big data, Applications of Big Data, comparison with other systems, data analysis with Hadoop, scaling out, data flow, combiner functions, Hadoop streaming. HDFS, Design of HDFS, HDFS concepts-blocks, name node and data node, clock caching, HDFS federation, HDFS high availability, failover and fencing, the command line interface, Basic file system operations, Hadoop filesystems, Data flow, Anatomy of a file write, Parallel Copying with distcp, Keeping an HDFS Cluster Balanced

UNIT-II

YARN: Anatomy of a YARN Application Run, resource requests, application lifespan, YARN Compared to MapReduce 1, Scheduling in YARN, scheduler options, Anatomy of a MapReduce Job Run.

UNIT-III

Pig: Comparison with Databases, Pig Latin-Structure, Statements, Expressions, Types, Schemas, Functions, Macros, User-Defined Functions- A Filter UDF, An Eval UDF, A Load UDF; Data Processing Operators- Loading and Storing Data, Filtering Data, Grouping and Joining Data, Sorting Data, Combining and Splitting Data, Pig in Practice Parallelism, Anonymous Relations, Parameter Substitution

Flume: working with flume, Transactions and Reliability, The HDFS Sink, Fan Out, Distribution

UNIT-IV

Hive: HiveQL- Data Types, Operators and Functions, Tables-Managed Tables and External Tables, Partitions and Buckets, Storage Formats, Importing Data, Altering Tables, Dropping Tables, Querying Data- Sorting and Aggregating, MapReduce Scripts, Joins, Sub queries, Views User-Defined Functions, Partitioning -static and dynamic

Sqoop: Sqoop Connectors, import, generated code, Working with Imported Data, Exports

UNIT-V

Spark: Resilient Distributed Datasets- Creation, Transformations and Actions, Persistence, Serialization, Shared Variables, Anatomy of a Spark Job Run--Job Submission, DAG Construction, Task Scheduling, Task Execution; Executors and Cluster Managers

HBase: HBasics, Concepts, HBase Versus RDBMS, Building an Online Query Application

Text Book

1. Tom White, "Hadoop: The Definitive Guide: Storage and Analysis at Internet Scale", 4/e, O'Reilly

References

1. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley India Pvt. Ltd

DEEP LEARNING

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57056	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

1. To advance in training techniques for neural networks
2. To understand various CNN Architectures
3. To understand various RNN Methodologies
4. To custom train Autoencoder Models and implement them.
5. To apply Transfer Learning to solve problems

Course Outcomes

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

1. Have a good understanding of the fundamental issues and basics of deep learning
2. Understand the concept of CNN to apply it in the Image classification problems
3. Learning and understanding the working of various RNN methods
4. Learning and understanding the working of various Autoencoders methods
5. Use Transfer Learning to solve problems with high dimensional data including image and speech

UNIT-I

Deep Learning: Fundamentals, Introduction, Building Block of Neural Networks, Layers, MLPs, Forward pass, backward pass, class, trainer and optimizer, The Vanishing and Exploding Gradient Problems, Difficulties in Convergence, Local and Spurious Optima, Preprocessing, Momentum, learning rate Decay, Weight Initialization, Regularization, Dropout, SoftMax, Cross Entropy loss function, Activation Functions.

UNIT-II

CNN: Introduction, striding and padding, pooling layers, structure, operations and prediction of CNN with layers, CNN -Case study with MNIST, CNN VS Fully Connected

UNIT-III

RNN: Handling Branches, Layers, Nodes, Essential Elements-Vanilla RNNs, GRUs, LSTM

UNIT-IV

Autoencoders: Denoising Autoencoders, Sparse Autoencoders, Deep Autoencoders, Variational Autoencoders, GANS

UNIT-V

Transfer Learning: Types, Methodologies, Diving into Transfer Learning, Challenges

Textbooks

1. Seth Weidman, "Deep Learning from Scratch", O'Reilly Media, Inc., 2019
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press, 2015
3. Dipanjan Sarkar, Raghav Bali, "Transfer Learning in Action", Manning Publications, 2021

References

1. Giancarlo Zaccone, Md. Rezaul Karim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
2. Antonio Gulli, Sujit Pal, "Deep Learning with Keras", Packt Publishers, 2017.
3. Francois Chollet, "Deep Learning with Python", Manning Publications, 2017.

NATURAL LANGUAGE PROCESSING

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57061	PEC-III	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To learn the fundamentals of Natural Language Processing
2. To understand the semantic aspects and similarity measures
3. To understand the aspects of context-free grammar and perform parsing
4. To understand and identify different word senses and find their relationship
5. To apply the NLP techniques in understanding discourses

Course Outcomes

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

1. Solve problems involving regular expressions and N grams
2. Evaluate Vector models
3. Perform parsing operations
4. Build and analyze applications with semantic roles involving selectional restrictions
5. Utilize NLP learning algorithms in understanding a discourse

UNIT-I

Regular Expressions: Regular Expressions, Corpora, Text Normalization, Minimum Edit Distance

Ngram Models: Ngrams, Evaluating Language models, Generalization, Smoothing

UNIT-II

Lexical Semantics, Vector semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF, PMI

Visualizing Embeddings, Semantic Properties of Embeddings, Bias and Embeddings

UNIT-III

Constituency Grammar: Constituency, Context free grammar, Grammar Rules for English, Treebanks, Grammar Equivalence and Normal Form, Lexicalized Grammar

Parsing: Ambiguity, CKY Parsing

UNIT-IV

Word senses, Relation between senses, WordNet, Word Sense Disambiguation
Semantic Roles, Diathesis alternations, Problems with thematic roles, Proposition Bank, FrameNet, Semantic Role Labelling, Selectional Restrictions

UNIT-V

Coreference Resolution: Coreference Phenomena, coreference Tasks and datasets, Architecture of coreference algorithm, Gender bias in coreference

Discourse Coherence: Coherence Relation, Discourse Structure Parsing, Centering and Entity based Coherence, Representation model for local coherence, Global coherence

Text Books

1. Daniel Jurafsky, James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", First Edition, OReilly Media, 2009

References

1. James Allen, "Natural Language Understanding", 2nd Edition, Benjamin, Cummings publishing company, 1995.
2. Rajesh Arumugam, Rajalingappaa Shanmugamani, "Hands-On Natural Language Processing with Python", Packt Publishing Ltd., 2018
3. Deepti Chopra, Nisheeth Joshi, Iti Mathur "Mastering Natural Language Processing with Python", First Edition, Packt Publishing, 2016

FUZZY LOGIC

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57069	PEC-III	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To develop the fundamental concepts such as fuzzy sets, operations and fuzzy relations.
2. To lean about fuzzification of scalar variables and defuzzification of membership functions.
3. To learn three different inference methods for designing fuzzy rule-based systems.
4. To develop fuzzy decision making by introducing some concepts and also Bayesian decision methods
5. To learn different fuzzy classification methods.

Course Outcomes

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

1. Understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also about fuzzy relations.
2. Understand the basic features of membership functions and perform fuzzification and defuzzification
3. Design a fuzzy rule-based system.
4. Combining fuzzy set theory with probability for handling random and non-random uncertainty and the decision-making process.
5. Solve real world problems using fuzzy C-Means clustering.

UNIT-I

Classical sets: Operations and properties of classical sets, Mapping of classical sets to the functions. Fuzzy sets - Membership functions, Fuzzy set operations, Properties of fuzzy sets.

Classical and Fuzzy relations: Cartesian product, crisp relations-cardinality, operations and properties of crisp relations. Fuzzy relations-cardinality, operations, properties of fuzzy relations, fuzzy Cartesian product and composition, Fuzzy tolerance and equivalence relations, value assignments and other formats of the composition operation.

UNIT-II

Fuzzification and Defuzzification: Features of the membership functions, various forms, fuzzification, defuzzification to crisp sets, l- cuts for fuzzy relations, Defuzzification to scalars. Fuzzy logic and approximate reasoning, other forms of the implication operation

UNIT-III

Fuzzy Systems: Natural language, Linguistic hedges, Fuzzy (Rule based) System, Aggregation of fuzzy rules, Graphical techniques of inference, Membership value assignments: Intuition, Inference, rank ordering, Fuzzy Associative memories

UNIT-IV

Fuzzy decision making: Fuzzy synthetic evaluation, Fuzzy ordering, Preference and consensus, Multi objective decision making, Fuzzy Bayesian, Decision method, Decision making under Fuzzy states and fuzzy actions, Intuitionistic Fuzzy sets, Interval Valued and Applications

UNIT-V

Fuzzy Classification: Classification by equivalence relations-crisp relations, Fuzzy relations, Cluster analysis, Cluster validity, C-Means clustering, Hard C-Means clustering, Fuzzy C-Means algorithm, Classification metric, Hardening the Fuzzy C-Partition

Text Book

1. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", 3rd edition, Wiley,2010.
2. Krassimir T. Atanassov, "Intuitionistic Fuzzy Sets - Theory and Applications", Physica Verlag - Springer, 1999
3. George J.KlirBo Yuan, "Fuzzy sets and Fuzzy logic theory and Applications", PHI, New Delhi,1995.

References

1. D.K. Prathihar, "Soft Computing Fundamentals and Applications", 2007
2. S.N. Sivanandam, S.N. Deepa, "Principles of Soft Computing", 3rd Edition, Wiley Publications, 2013.
3. S. Rajasekaran, G. A. Vijayalakshmi – "Neural Networks and Fuzzy logic and Genetic Algorithms, Synthesis and Applications", PHI, New Delhi,2003.

SPEECH PROCESSING

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57070	PEC-III	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

The students will be able to

1. To learn about the source of sound and its Production process
2. To understand the Signal Processing and Analysis
3. To have an insight on the steps involved in Speech Recognition System Design
4. To learn about models and its implementation
5. To learn about Connected Word Models

Course Outcomes

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

1. Understand the basic concepts of speech and fundamental signal processing
2. approaches.
3. Analyze various methods of Speech Recognition
4. Understand the coding techniques and Performance Analysis in speech Recognition
5. Apply statistical modeling techniques.
6. Understand the various models of continuous speech recognition system.

UNIT-I

Fundamentals of Speech:

Introduction, Speech Production Process, Representing speech in the Time and Frequency domains, Speech sounds and features, Approaches to Automatic Speech Recognition by Machine.

UNIT-II

Signal Processing and Analysis Methods for Speech Recognition:

Introduction, The Bank of Filters Front End Processor, Linear Predictive Coding Model

for Speech Recognition, Vector Quantization, Auditory-Based Spectral Analysis

Models, Encoder Decoder Model- Encoder Decoder Model with RNN.

UNIT-III

Speech Recognition System Design and Implementation:

Introduction, Applications of Source Coding Techniques, Template Training Methods, Performance Analysis and Recognition Enhancements, Template Adaptation to New Talkers, Discriminative Methods in Speech Recognition.

UNIT-IV

Implementation Hidden Markov Models:

Introduction, Discrete-Time Markov Processes, Extension to HMMs, The Three Basic Problems for HMMs, Types of HMMs, Comparisons of HMMs, Model Clustering and Splitting

UNIT-V

Speech Recognition Based on Connected Word Models:

Introduction, General Notation for the Connected Word Recognition problem, The Two-level Dynamic Programming Algorithm, Level Building Algorithm-Computation of the level Building Algorithm, One-Pass Algorithm, Segmental K-means Training Procedure.

Text Book

1. Lawrence Rabiner, Biing-Hwang Juang, "Fundamentals of Speech Recognition", Pearson Education
2. Daniel Jurafsky, James H Martin, "Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education

References

1. Thomas F Quatieri, "Discrete-Time Speech Signal Processing – Principles and Practice", Pearson Education.
2. Claudio Becchetti, Lucio PrinaRicotti, "Speech Recognition", John Wiley and Sons

CLOUD COMPUTING

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57071	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. This course provides an insight into cloud computing

Course Outcomes

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

1. Understand different Computing Paradigms.

2. Learn the fundamentals of Cloud Computing.
3. Understand various service delivery models of a cloud computing architecture. ·
4. Demonstrate the ways in which the cloud can be programmed and deployed
5. Identify applications that can deploy on a Cloud environment.

UNIT-I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT-II

Cloud Computing Fundamentals: Motivation for Cloud Computing, Defining Cloud Computing, 5-4-3 Principles of Cloud computing, Cloud Ecosystem, Requirements for Cloud Services.

UNIT-III

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Migrating Application to Cloud.

UNIT-IV

Cloud Deployment Models: Private cloud, Public Cloud, Community Cloud, Hybrid Cloud.

Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service.

UNIT-V

Cloud Service Providers: EMC, Google, Amazon Web Services, Microsoft, Windows Azure, IBM, Cloud Models, IBM, Sales force.

Open-Source Support for Cloud: Open-Source Tools for IaaS, Open-Source Tools for PaaS, Open-Source Tools for SaaS.

Text Book

1. K. Chandrasekhran, "Essentials of cloud Computing", CRC press, 2014

References

1. Sandeep Bhowmik, "Cloud Computing", Cambridge University Press; First edition,2017
2. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley, 2011.
3. Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing", Elsevier, 2012.
4. Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'Reilly, SPD, rp 2011.

EMBEDDED ROBOTICS

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57072	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To understand the different robotic modules.
2. To learn various sensors in robotic engineering.
3. To understand the different actuators and control units of robot.
4. To study and understand the different type of robots.
5. To analyze the localization and navigation of robotic systems.

Course Outcomes

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

1. analyze different robotics, robotic applications and their usage.
2. learn various sensors used in robotic technology.
3. identify and understand the characteristics of different actuators in robotics.
4. identify and understand the characteristics of different robotics.
5. analyze localization and navigation of robotic systems.

UNIT-I

Robots and Controllers: Introduction to robotics, types, applications, Mobile Robots, embedded Controllers, Interfaces, Operating System, central Processing Unit, Logic Gates, Function Units, Registers and Memory.

UNIT-II

Sensors: Definition, Sensor Categories, Binary Sensor, Analog versus Digital Sensors, Shaft Encoder, A/D Converter, Position Sensitive Device, Compass, Digital Camera.

UNIT-III

Actuators and Control: DC Motors, H-Bridge, Pulse Width Modulation, Stepper Motors, Servos, On-Off Control, PID Control, Velocity Control and Position Control.

UNIT-IV

Classification of robots: Single Wheel Drive, Differential Drive, track robot, Omni-Directional Drive, Inverted Pendulum Robot, Double Inverted Pendulum, Walking Robots.

UNIT-V

Localization and Navigation: Localization, Probabilistic Localization, Coordinate Systems, Environment Representation, Visibility Graph, Voronoi Diagram, Potential Field Method.

Text Book

1. Thomas Braunl, "Embedded Robotics: Mobile Robot Design and Applications with Embedded Systems", 3rd edition, Springer publications, 2008

References

1. Saeed Niku, "An Introduction to Robotics Analysis, Control, Applications", 2 edition, John Wiley and Sons, Inc., 2011.
2. "Industrial Robotics -Technology, Programming and Applications (SIE)" | 2nd Edition, McGraw Hill Education,2007.
3. James G. Keramas, "Robot Technology Fundamentals", Cengage Publications, 2009.

DESIGN PATTERNS

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57073	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To Apply the suitable design patterns to refine the basic design for given context.

Course Outcomes

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

1. Identify the appropriate design patterns to solve object-oriented design problems.
2. Develop design solutions using creational patterns.
3. Apply structural patterns to solve design problems.
4. Construct design solutions by using behavioral patterns.

UNIT-I

Introduction: What Is a Design Pattern? Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT-II

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns

Structural Pattern Part-I: Adapter, Bridge and Composite

UNIT-III

Structural Pattern Part-II: Decorator, Facade, Flyweight, Proxy

Behavioral Patterns Part-I: Chain of Responsibility, Command, Interpreter, and Iterator.

UNIT-IV

Behavioral Patterns Part-II: Mediator, Memento, Observer.

Behavioral Patterns Part-III: State, Strategy, Template Method, Visitor, and Discussion of Behavioral Patterns.

UNIT-V

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.

Text Book

1. Gamma, Helm, Johnson, and Vlissides. "Design Patterns: Elements of Reusable Object-Oriented Software", Addison-Wesley,1994

References

1. Eric Freeman, Bert Bates. "Head First Design Patterns (A Brain Friendly Guide)", O'Reilly; 1st edition,2004
2. Mark Grand, "Patterns in JAVA", Vol-I, Wiley DreamTech,2002.
3. Mark Grand, "Patterns in JAVA", Vol-II, Wiley DreamTech,1999.
4. Mark Grand, "JAVA Enterprise Design Patterns", Vol-III, Wiley DreamTech,2001.

BLOCKCHAIN TECHNOLOGY

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57074	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To provide conceptual understanding of the function of Blockchain as a method of securing distributed ledgers.
2. To understand the structure of a Blockchain and why/when it is better than a simple distributed database.

Course Outcomes

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

1. Explain the fundamentals of Blockchain.
2. Understand Public Blockchain System.
3. Interpret Private Blockchain System.
4. Learn Smart Contracts.
5. Understand Application and Limitation of Blockchain.

UNIT-I

Fundamentals of Blockchain: Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future.

Blockchain Types and Consensus Mechanism: Decentralization and Distribution, Types of Blockchain, Consensus Protocol.

UNIT-II

Cryptocurrency: Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

Public Blockchain System: Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain

UNIT-III

Private Blockchain System: Key Characteristics of Private Blockchain, Why We Need Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E-commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.

UNIT-IV

Smart Contracts: Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

Consortium Blockchain: Key Characteristics of Consortium Blockchain, Why We Need Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda.

UNIT-V

Application of Blockchain: Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain in Supply Chain, The Blockchain and IoT.

Limitations and Challenges of Blockchain: Blockchain Implementation – Limitations, Blockchain Implementation – Challenges

Text Book

1. Chandramouli Subramanian, Asha A George, Abhilash K A and Meena Karthikeyan, "Blockchain Technology", Universities Press,2020.

References

1. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly,2014.
2. Melanie Swan, "Blockchain Blueprint for a New Economy", O'Reilly, 2015.
3. Andreas, "Mastering Bitcoin: Programming the Open Blockchain, Antonopoulos", M. O'Reilly, 2017.

CYBER SECURITY

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57075	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. Analyze Cryptography, DNS and Windows security principles.
2. Analyze different attacking techniques of intruder.
3. Apply different exploitation techniques to gain access.
4. Interpret web exploitation tools and attacks.
5. Summarize defense mechanisms and forensics

Course Outcomes

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

1. Learn the fundamentals of cyber security.
2. Identify different types of attacks and motives of attack
3. Learn different exploitation methods to gain access
4. Understand web exploit tools, statistics and social Engineering attacks
5. Understand different defense and Analysis techniques

UNIT-I

Cyber security Fundamentals: Information Assurance Fundamentals, Basic Cryptography, Symmetric Encryption, Public Key Encryption, The Domain Name System (DNS), Firewalls. AI for cybersecurity and cybersecurity for AI .AI systems' support to cybersecurity .AI malicious uses

UNIT-II

Attacker Techniques and Motivations: How Hackers Cover Their Track, Tunneling Techniques, Fraud Techniques: Phishing, Smishing, Vishing, and Mobile Malicious Code, Rogue Antivirus, Click Fraud. Threat Infrastructure: Botnets, Fast-Flux, Advanced Fast-Flux.

UNIT-III

Exploitation: Techniques to Gain a Foothold: Stack-Based Buffer Overflows, Stacks upon Stacks, Crossing the Line, Protecting against Stack-Based Buffer Overflows.

SQL Injection: Protecting against SQL Injection, Conclusion.

Malicious PDF Files: PDF File Format, Creating Malicious PDF Files, Reducing the Risks of Malicious PDF File

UNIT-IV

Web Exploit Tools: Features for Hiding, Commercial Web Exploit Tools and Services Updates, Statistics, and Administration, Proliferation of Web Exploit Tools Despite Protections, DoS Conditions, Brute Force and Dictionary Attacks, Cross-Site Scripting (XSS)

UNIT-V

Defense and Analysis Techniques: Memory Forensics, Honeypots, Malicious Code Naming, Automated Malicious Code Analysis Systems: Passive Analysis, Active Analysis, Physical or Virtual Machines. Intrusion Detection Systems

Text Books

1. James Graham, Richard Howard, Ryan Olson "Cyber Security Essentials", Taylor and Francis Group, LLC,2011
2. Lorenzo Pupillo Stefano Fantin Afonso Ferreira Carolina Polito, "Artificial Intelligence and Cybersecurity", CEPS,2021

References

1. Thomas A. Johnson, "Cyber Security", Taylor & Francis Group, LLC,2015
2. Marjie T. Britz, "Computer Forensics and Cyber Crime - An Introduction", third edition, Pearson Education,2013

CYBER FORENSICS

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57063	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. Create a document review, retention, and destruction policy.
2. Write an acceptable use policy and employer privacy statement.
3. List and describe the generally accepted computer forensic procedures.
4. Explain and list the various legislation and regulations that impact technology.
5. Analyze forensic analysis reports

Course Outcomes

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

1. Perform a forensic investigation by following guidelines to secure the crime or corporate scene.
2. Learn what legal issues are involved and what rights the person of interest has.
3. Perform digitally and court approved images of evidence to be used in a court of law.
4. Learn how to document and store evidence.
5. Learn how to analyze evidence using commercial forensic software and also how to create a report of the said evidence.

UNIT-I

Computer Forensics and Investigations: What is computer Forensics? Use of computer forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceeding, Computer Forensics services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists.

Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of law Enforcement-Computer forensic Technology.

UNIT-II

Computer Forensics Evidence and capture: Data Recovery Defined Data Backup and Recovery, The Role of Back-up in Data Recovery, The Data Recovery Solution

Evidence Collection and Data Seizure: Why Collection Evidence? Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps.

UNIT-III

Controlling Communication: The Chain of Custody duplication and Preservation of Digit Evidence, Preserving the Digital Crime Scene, Computer Evidence Processing Steps, Legal Aspects of Collection and Preserving Computer Forensics Evidence.

Computer Image Verification and Authentication: Special Needs of Evidential Authentication

Computer Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

UNIT-IV

Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics using network tools.
Processing Crime and Incident Scenes: Identifying Digital Evidence, Collecting the Evidence in Private-Sector Incident Scenes, Processing law Enforcement Crime Scenes,

Preparing for a Search, securing a Computer Incident or Crime Scene, Storing Digital evidence, obtaining a Digital Hash.

UNIT-V

E-mail Investigations: Exploring the Role of E-mail in Investigations, Exploring the Role of Client and Server in E-mail, Investigating Email Crimes and Violations, Understanding Email Servers, Using Specialized Email Forensics Tools,

Mobile Device Forensics: Understanding Mobile Device Forensics, Understanding Acquisition Procedure for Cell Phones and Mobile Devices

Text Books

1. John R. Vacca, "Computer Forensics, Computer Crime Investigation, firewall Media", New Delhi,2005
2. Nelson, Phillips Enfinger, Steuart, "Computer Forensics and Investigations", Cengage Learning.2009

References

1. Keith J. Jones, Richard Bejthich, Curtis W Rose, "Real Digital Forensics", Addison Wesley Pearson Education.2006
2. Tony Sammes and Bairn Jenkinson, "Forensic Compiling A Practitioner's Guide",
3. Springer International edition.2013
4. Christopher L. T. Brown, "Computer Evidence Collection & Presentation, Firewall Media". 2005

BIG DATA LAB

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57216	PCC Lab	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

List of Programs

1. Installation and HDFS commands
   -to create a directory in HDFS, to list the contents of directory, to send/receive a file to/from local file system to HDFS, to display the contents of a file in HDFS, to Copy and move a file, To remove a file or directory in HDFS.
2. Write a word count map reduce program using the mapper, reducer and configuration functions.
3. Write a map reduce program to perform matrix multiplication
4. Hive
   -create and load data into managed and external tables using insert, as select and from insert command,

   -create and load data into static and dynamic partitions

   -word count program using HIVE
5. Pig
   Create tables and load data

   For each, load, store, filter, distinct, Union, split, dump

   Word count program using pig
6. Spark
   Working with Spark commands like map, reduce, filter, groupBy, sort etc
   Function to find sum of each column of given set

   Running Clustering algorithms in Spark

   Running Classification algorithms in Spark
7. Steam data processing using Kafka
8. Working with Hbase CRUD operations

9. Performing data analysis using Cassandra
10. Handling real time data using Mongodb
11. Developing map reduce application

DEEP LEARNING LAB

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57210	PCC-Lab	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

List of Programs

1. Implementation of Linear Regression
2. Deep learning Packages Basics: TensorFlow, Keras and PyTorch
3. Implementation of Neural network
4. Face recognition using CNN
5. Sentiment Analysis using LSTM
6. Language Modeling using RNN
7. Sentiment Analysis using GRU
8. Image Classification with Transfer Learning

TECHNICAL AND BUSINESS COMMUNICATION SKILLS

BTech (AIML) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58001	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	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

To help the students to develop effective communication skills in all communicative contexts for professional advancement

Course Outcomes

At the end of this course, 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 Book

1. S P Dhanavel, "English and Communication Skills for Students of Science and Engineering", Orient Black Swan. 2009.

References

1. Meenakshi Raman & Prakash Singh, "Business Communication", (Second Edition), Oxford University Press. 2012.
2. Sanjay Kumar & Pushp Lata, "Language and Communication skills for Engineers", Oxford University Press. 2018.
3. Anjali Kalkar, et.al., "Business Communication", Orient Black Swan. 2010.
4. Paul V. Anderson, "Technical Communication", Cengage. 2014.
5. Charles W. Knisely & Karin I. Knisely, "Engineering Communication", Cengage. 2015.

DIGITAL MEDIA LITERACY

BTech (AIML) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58019	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. prepare the students to use media source and its content
2. train the students become media literate
3. provide practical tips for incorporating media literacy into the traditional curriculum

Course Outcomes

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

1. use media as a learning tool
2. share knowledge in digital media
3. apply the use of persuasive language
4. exhibit copy writing skills
5. contribute their ideas through blogs

UNIT-I

Introduction, Diversity and Media:

Bias in the Media, Peer Driven Social Learning Communities, Social Learning Spaces,

Mirrored Learning Words, Online Events, The Nitty, Gritties

UNIT-II

Digital Literacy in Action:

Internet Safety and Filtering, Establish Proficiency of Tagging

UNIT-III

Blogging:

Basics of Blog Writing, Foundations of Blogging, Blogs as Professional Development Tool, Blogs as a Learning Tool, Creating Knowledge Habitats

UNIT-IV

The Classroom:

A Market place for Learning, Build an Electronic Calendar-Paper less News Paper, Marketing through social media, Writing Techniques

UNIT-V

Gaming as a Literacy:

How Video games promote Learning? Participatory Culture and Engagement, Collaboration and Cooperation, Motivation

Text Book

1. Jacobs, Hayes Heidi. "Media Literacy", Solution Tree Press: USA.

References

1. Hobbs Renee R.Create "To Learn: Introduction To Digital Literacy", Wiley-Blackwell Publications.
2. Frank, W. Baker. "Media Literacy in the K-12 Classroom", (2nd Edition.). Paperback Publications.
3. Hertz, Mary. Beth. "Digital and Media Literacy in the Age of the Internet: Practical Classroom Applications", Rowman & Littlefield Publishers.
4. Hobbs Renee R. "Digital and Media Literacy", Sage Publications.
5. Potter, W. James. "Introduction to Media Literacy", Sage Publications.

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

BTech (AIML) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58022	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. To explain the fundamentals of the key elements of a business organization.
2. To learn practical approach to various functional areas of decision making.
3. To Compare different Pricing Strategies.
4. To enhance a knowledge of Capital Budgeting Techniques.
5. To solve the problems using Rations analysis.

Course Outcomes

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

1. Describe the concept of demand and its determinants in Managerial decisions.
2. Analyze the cost concepts and breakeven analysis in production.
3. Evaluate the market structures and different Pricing Strategies.
4. Apply the capital budgeting techniques in financial decisions.
5. Application of Ratios in solving 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 Isocosts, 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& Pricing Policies:

Market structures: Types of Competition, Features of Perfect Competition, Monopoly and Monopolistic Competition, Price - Output determination in Perfect Competition and monopoly.

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

Introduction to Financial Accounting: Accounting, Double-Entry Book Keeping, Journal, Ledger, and Trial Balance, Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

UNIT-V

Financial Analysis through ratios: 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. Varshney & Maheshwari, "Managerial Economics", Sultan Chand& Sons, 2014.
2. S.A. Siddiqui and A.S. Siddiqui, "Managerial Economics and Financial Analysis", New Age International Publishers, Hyderabad, 2013

References

1. R. K. Sharma & Shashi K Gupta, "Financial and Management Accounting", 4th Ed., Sultan Chand.
2. V. Rajasekaran & R. Lalitha, "Financial Accounting", Pearson Education, New Delhi, 2010.
3. Domnick Salvatore, "Managerial Economics in a Global Economy", 4th Edition, Cengage, 2009.
4. Subhash Sharma & M. P. Vittal, "Financial Accounting for Management, Text & Cases", Machmillan, 2012.
5. S. N. Maheshwari & S. K. Maheshwari, "Financial Accounting", Vikas 2012.
6. Truet and Truet, "Managerial Economics; Analysis, Problems and Cases", Wiley, 2012.
7. Dwivedi, "Managerial Economics", Vikas 2012.
8. M. Kasi Reddy and S.Saraswathi, "Managerial Economics and Financial Accounting", PHI, 2012.
9. Erich A. Helfert, "Techniques of Financial Analysis", Jalco, 2007.

NEGOTIATION SKILLS

BTech (AIML) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58005	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. To familiarize the students with various negotiation approaches and styles.
2. Understand & develop effective strategies for each stage of a negotiation
3. Identify Cross – cultural challenges that arise in negotiations
4. Enhance communication skills, emphasizing effective listening, persuasion & relationship building
5. Strengthen creative ability to expand the option for resolving a dispute.

Course Outcomes

At the end of the course students will be able to

1. Describe negotiation theories, concepts and tactics to manage negotiations
2. Explain the importance of various factors impacting negotiations.
3. Apply effective negotiation strategies and tactics for different scenarios
4. Identify negotiation practices towards building relationships
5. Evaluate various conflict resolution strategies.

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 of Negotiation: Types of Negotiation, Principles of Negotiation, Steps of Negotiation, Win-Win Negotiation, Negotiation Tactics, Factors Affecting Success in Negotiation.

UNIT-III

Strategies of Negotiation: Fundamentals of Negotiation, Effective Strategies to develop Negotiation Skills, Anchoring / BATNA, Process of Negotiation and Negotiation Phases.

UNIT-IV

Improving Negotiation skills: Enhancing Communication skills for effective Listening, Persuasion & Relationship Building, establishing Trust-Building Relationships.

UNIT-V

Managing Negotiation: Managing Different Types of Negotiations, Cross –Cultural Challenges in Negotiations, Industrial Negotiation: Collective Bargaining, Arbitration, Origins of Conflict, Dispute Resolution.

Text Book

1. Fredluthans, Organisational Behavior, 9th ed, Prentice Hall.
2. Roger Fischer, Essentials of Negotiations, Harward Business School Press.

References

1. Beverly DeMarr and Suzanne De Janasz, Negotiation and Dispute Resolution, Prentice Hall, 2013.
2. Roy J Lewicki, Bruce Barry, and David M Saunders, Essentials of Negotiation, 5th Edition, McGraw Hill, 2011
3. Malhotra, Deepak, Negotiating the Impossible: How to Break Deadlocks and Resolve ugly Conflicts (without money or muscle). Oakland, CA: Berrett-Koehler Publishers, 2016.
4. Fatima, Shaheed; Kraus, Sarit; Wooldridge, Michael, Principles of Automated Negotiation. Cambridge, UK; New York: Cambridge University Press, 2015.
5. Subramanian, Guhan, Dealmaking: New Dealmaking Strategies for a Competitive Marketplace. New York: W. W. Norton & Company, 2011.

PROJECT MANAGEMENT

BTech (AIML) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58008	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. To understand the concept of Project Management.
2. To know about the different approaches to project screening and planning.
3. To explain about the factors of risk involved in project execution.
4. To understand about team leading and functional cooperation.
5. To know about the project performance and future trends in the project management.

Course Outcomes

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

1. Explain about the life cycle and other concepts of Project Management.
2. Apply different approaches to project screening and planning
3. Analyze different risk factors in project execution
4. Estimate how to lead a team, to get functional cooperation
5. Build performance evaluation reports and future trends in project management.

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 Book

1. Gray, Larson, Project Management, Tata McGraw Hill, 2015
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.

VALUE ENGINEERING

BTech (AIML) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58010	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. To understand the concept of value engineering in productivity
2. To understand the different phases of value engineering projects
3. To learn the various decision alternatives
4. To learn value engineering in non-hardware projects
5. To identify the value engineering team and coordinate in different services

Course Outcomes

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

1. Apply the importance of value engineering concepts in productivity
2. Analyze the different phases of value engineering projects
3. Evaluate the different decision alternatives and choose the best alternative for optimization
4. Determine the value engineering concept in non-hardware projects and programmes
5. Analyze the value engineering teams with the help of case study.

UNIT-I

Introduction: Value engineering concepts, advantages, applications, problem recognition, and role in productivity, criteria for comparison, element of choice. Level of value engineering in the organization, unique and quantitative evaluation of ideas.

UNIT-II

Value Engineering and Job Plan: Introduction, orientation, information phase, speculation phase analysis phase. Selection and Evaluation of value engineering projects, Project selection, methods selection, value standards, application of value engineering methodology

UNIT-III

Value Engineering Techniques: Selecting Products and Operation for Value Engineering action, Value Engineering Programmes, Decision Making for Optimum Alternative, Use of Decision Matrix,

Make or Buy, Measuring Profits, Reporting Results, Follow up, Use of advanced techniques like Function Analysis System.

UNIT-IV

Versatility Of Value Engineering: Value engineering operation in maintenance and repair activities, Value Engineering in non-Hardware Projects. Initiating a Value Engineering Programme

UNIT-V

Value Engineering Level of Effort: Value Engineering Team, Co-coordinator, Designer, different Services, Construction Management Contracts, Value Engineering Case Studies.

Text Books

1. Anil Kumar Mukhopadhyaya, "Value Engineering: Concepts Techniques and applications", SAGE Publications 2010.
2. Del L. Younker, "Value Engineering analysis and methodology", Marcel Dekker Inc, New York, 2004

References

1. Alphonse Dell'Isola, "Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations", R S Means Co., 1997
2. Richard Park, "Value Engineering: A Plan for Invention", St. Lucie Press, 1999.
3. Miles, L.D., "Techniques of Value Analysis and Engineering", Second Edition, McGraw Hill 1989.
4. Khanna, O.P., "Industrial Engineering and Management", Dhanpat Rai & Sons, 1993.
5. Anil Kumar Mukhopadhyaya, "Value Engineering Mastermind: From concept to Value Engineering Certification", SAGE Publications, 2003