

COURSE CURRICULUM
for
THIRD YEAR B.TECH. DEGREE
in
INFORMATION TECHNOLOGY

(Applicable from the academic session 2024-2025)



Dr. B. C. Roy Engineering College

An Autonomous Institution

Approved by: All India Council for Technical Education (AICTE)
Affiliated to: Maulana Abul Kalam Azad University of Technology, West Bengal (Formerly Known as -WBUT)

Jemua Road, Durgapur, West Bengal, India,713206



Course Name: Image Processing

Course Code: IT-601

(Semester- VI)

Course Broad Category: Professional Core Course

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1. Course Prerequisite:

Useful prerequisites include linear algebra, calculus, probability & statistics, signals and systems (or basic discrete-time concepts), and programming experience.

2. Course Learning Objectives:

The purpose of image processing is to enhance visual quality, extract useful information, enable automated analysis of images.

3. Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System–

- A. Mid-Term Exam(20Marks)-Summative Assessment (CIA-1)
- B. Internal Assessment (20Marks)- Formative Continuous Assessment [Continuous Assessment 1(CIA-2)]
- C. End-Semester Exam (60 Marks)-Summative Assessment.

4. Course Content:

Course Name: Image Processing

Course Code: IT-601

Hours per Week: 3L: 0T: 0P

Credits: 3

Modules	Topics	Lectures
1	Introduction to Digital Image Processing, Application of Digital Image Processing, Image Digitalization, Sampling Quantization and Display, Signal Reconstruction from Samples, Convolution Concept, Numerical application of convolution concept, Signal Reconstruction from Image	10
2	Quantizer Design, Relationship between Pixels, Relationship of Adjacency and Connected Components Labeling, Application of Distance Measures, Basic Transform, Image formation geometry, Stereo Imaging model, Interpolation Techniques	12

3	Resampling, Image Transformation, Separable Transformation, Basis Images, Fourier Transformation, Properties of FT, FT Result Display, Rotation Invariance Property, DCT and Walsh Transform, Hadamard Transformation, Histogram Equalization and Specifications, KL-transform, Image Enhancement: Point Processing Techniques, Contrast Stretching Operation, Histogram Equalization and Specification, Histogram Implementation.	10
4	Image Enhancement: Mask Processing Techniques, Frequency Domain, Processing Techniques, Image Restoration Techniques	8

5. References:

Textbook:

1. Algorithms for Image Processing and Computer Vision (Paperback) by James R. Parker
2. The Image Processing Handbook (Hardcover) by John C. Russ

Reference Books:

1. Fundamentals of Digital Image Processing (Paperback) by Anil K. Jain

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-601.CO1	Learn the fundamentals of digital image processing.	Understand	L2
IT-601.CO2	Learn the image segmentation and representation techniques.	Understand	L2
IT-601.CO3	Understand simple image enhancement techniques in Spatial and Frequency domain.	Apply	L3
IT-601.CO4	Comprehend the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2Dtransforms.	Analyze	L4
IT-601.CO5	Deploy image compression concepts.	Evaluate	L5
IT-601.CO6	Perform the restoration concepts and filtering techniques.	Apply	L3

7. Mapping of course outcomes to module /course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	2	-	1
2	2	3	-	1	-	1
3	2	3	3	2	-	1
4	3	-	-	2	-	1
5	2	-	-	1	3	1

8. Mapping of the Course outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	2	-	-	-	-	-	-	1
CO2	2	2	3	1	-	-	-	-	-	-	-	1
CO3	1	2	2	1	1	-	-	-	-	-	-	1
CO4	1	2	1	1	2	-	-	-	-	-	-	2
CO5	2	2	2	2	3	-	-	-	-	-	-	1
CO6	1	1	1	1	-	-	-	-	-	-	-	1

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	-
CO2	3	1	2	-
CO3	3	2	1	-
CO4	2	1	3	-
CO5	2	-	2	1
CO6	1	-	2	3

***** End of Syllabus*****



Course Name: Computer Networks

Course Code: IT-602

(Semester- VI)

Course Broad Category: Professional Core Course

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1. Course Prerequisite:

Pre-requisites: Operating System, Computer Organization.

2. Course Learning Objectives:

1. An understanding of the overriding principles of computer networking, including Protocol design, protocol layering, algorithm design, and performance evaluation.
2. An understanding of computer networking theory, including principles embodied in the protocols designed for the application layer, transport layer, network layer, and link layer of a networking stack.
3. An understanding of specific implemented protocols covering the application layer, transport layer, network layer, and link layer of the Internet (TCP/IP) stack
4. An understanding of security issues.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies, Quiz.

Evaluation System –

- A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
- B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1(CIA-2)]
- C. End-Semester Exam (60 Marks)- Summative Assessment.

4. Course Content:

Course Name: Computer Networks

Course Code: IT-602

Hours per Week: 3L:0T:0P

Credits: 3

Module	Topics	45L
1.	Introductory Concepts: Goals and applications of networks, Categories of networks, Organization of the Internet, ISP, Network structure and architecture (layering principles, services, protocols and	9L

Module	Topics	45L
	standards), The OSI reference model, TCP/IP protocol suite, Network devices and components. Physical Layer: Network topology design, Types of connections, Transmission media, Signal transmission and encoding, Network performance and transmission impairments, Switching techniques and multiplexing	
2.	Link layer: Framing, Error Detection and Correction, Flow control (Elementary Data Link Protocols, Sliding Window protocols). HDLC Medium Access Control and Local Area Networks: Channel allocation, Multiple access protocols, LAN standards, Link layer switches & bridges (learning bridge and spanning tree algorithms). Including Gigabit Ethernet and Wi-Fi (802.11). Time permitting, a quick exposure to Token Ring and to Bluetooth, WiMax may also be included.	9L
3.	Network Layer: Point-to-point networks, Logical addressing, Basic internetworking (IP, CIDR, ARP, RARP, DHCP, ICMP), Routing, forwarding and delivery, Static and dynamic routing, Routing algorithms and protocols, Congestion control algorithms, IPv6.	9L
4.	Transport Layer: Process-to-process delivery, Transport layer protocols (UDP and TCP), Multiplexing, Connection management, Flow control and retransmission, Window management, TCP Congestion control, Quality of service.	8L
5.	Application Layer: Domain Name System, World Wide Web and Hyper Text Transfer Protocol, Electronic mail, File Transfer Protocol, Remote login, Network management, Data compression, Cryptography – basic concepts. Firewalls.	10L

5. References:

Textbooks

1. Behrouz Forouzan, “Data Communication and Networking”, McGraw Hill
2. Andrew Tanenbaum “Computer Networks”, Prentice Hall.
3. William Stallings, “Data and Computer Communication”, Pearson.
4. Kurose and Ross, “Computer Networking- A Top-Down Approach”, Pearson.
5. Peterson and Davie, “Computer Networks: A Systems Approach”, Morgan Kaufmann

CO4													
CO5													
CO6													

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

***** End of Syllabus*****



Course Name: Data Mining and Data Warehousing

Course Code: IT-603

(Semester-VI)

Course Broad Category: Professional Core Course

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1. Course Prerequisite:

- i. Data Structure and Algorithms
- ii. Database Management Systems

2. Course Learning Objectives:

- i. Be able to understand the principles and architectures of data warehousing and data mining.
- ii. Be able to analyze and design various pattern extraction techniques on the association, classification, and clustering of data.
- iii. Be able to understand the mining of text data, time series data and stream data.
- iv. Be able to understand graph mining and web mining.
- v. Be able to apply data mining techniques for solving real-life problems in various domains.

3. Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

- A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
- B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
- C. End-Semester Exam (60 Marks)- Summative Assessment.

4. Course Content:

Course Name: Data Mining and Data Warehousing

Course Code: IT-603

Hours per Week: 3L: 0T: 0P

Credits: 3

Module	Topics	Lectures
1	Data Mining: Mining frequent patterns, association and correlations; Sequential Pattern Mining concepts, primitives, scalable methods; Data Preprocessing: Data types, Quality, Descriptive data summarization – central tendency and dispersion measure, Data cleaning, Data integration & transform, Data reduction, Min-Max Scaling and Z-Score Normalization.	5

2	Association Rule Mining: Market-basket analysis basics, Apriori algorithm, Frequent Pattern Tree, Direct Hashing and Pruning (DHP). Distance Metrics: Examples and four axioms.	6
3	Classification: k-Nearest Neighbors, Naïve Bayes, Decision Tree, Random Forests, Support Vector Machines, Rule-based classification. Prediction: Linear Regression, Logistic Regression.	5
4	Cluster Analysis: Types of data in cluster analysis, Partitioning methods- k-Means, k-Medoids, PAM, CLARA, CLARANS; Hierarchical methods. Agglomerative clustering; Density-based methods DBSCAN; Grid-based methods- STING.	6
5	Introduction to: Text Mining: Hidden pattern mining in text; Mining Time Series Data: Periodicity and trend analysis for time series data; Mining Data Streams: Pattern mining in stream data; and Graph Mining: Social Network Analysis. Web Data Mining: Web content mining, Web usage mining, Web structure mining, Hubs and Authorities, HITS, Page Rank, Data Mining Applications & Information Privacy Security and Social Impacts.	10
6	Introduction to Data Warehousing, ETL (Extract, Transform, Load) and OLAP (Online Analytical Processing) technologies, Explore partitioning strategies and schema differentiation	6

5. References:

Text & References Books:

1. Jiawei Han and M Kamber, Data Mining Concepts and Techniques,, Second Edition, Elsevier Publication, 2011.
2. Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Addison Wesley, 2006.
3. Data Warehousing Fundamentals for IT Professionals, Second Edition by Paulraj Ponniah, Wiley India.
4. Data Warehousing, Data Mining, & OLAP – Second Edition by Alex Berson and Stephen J. Smith, Tata McGraw Hill Education

6. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-603.CO1	Study Predictive Analytics with Data Mining	Understand	L2
IT-603.CO2	Analyze and design various pattern extraction techniques on the association, classification, and clustering of data.	Analyze	L4

IT-603.CO3	Understand the mining of text data, time series data and stream data.	Understand	L2
IT-603.CO4	Understand graph mining and web mining.	Understand	L2
IT-603.CO5	Apply data mining techniques for solving real-life problems in various domains.	Apply	L3
IT-603.CO6	Understanding Data Warehousing Fundamentals.	Understand	L2

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1						
2						
3						
4						
5						
6						

8. Mapping of the Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

9. Mapping to PSO

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

*** End of Syllabus***



Course Name: Distributed Systems

Course Code: IT-604

(Semester – VI)

Course Broad Category: Professional Elective Course

1. Course Prerequisite

- Operating Systems fundamentals
- Computer Networks concepts
- Basic understanding of algorithms and process synchronization

2. Course Learning Objectives

- Understand fundamental concepts, models, and architectures of distributed systems
- Analyze communication, synchronization, and coordination among distributed processes
- Study distributed file systems, fault tolerance, and replication mechanisms
- Explore distributed algorithms for consistency, consensus, and resource sharing

3. Teaching Methodology and Evaluation System

Teaching Methodology:

Lectures with real-world examples, ICT-enabled learning (NPTEL/SWAYAM), problem-solving sessions, mini-projects based on distributed applications.

Evaluation System:

- Internal Assessment (CIE) – 40 Marks
- End-Semester Examination (ESE) – 60 Marks

4. Course Outcomes (CO)

Course Outcome	Details	Bloom's Taxonomy	Level
PCIT604.1	Explain distributed system models, architecture, and design challenges	Understand	L2
PCIT604.2	Demonstrate inter-process communication, remote invocation, and synchronization techniques	Apply	L3
PCIT604.3	Analyze distributed algorithms for mutual exclusion, leader election, and coordination	Analyze	L4
PCIT604.4	Evaluate consistency models, fault-tolerant mechanisms, and replication strategies	Evaluate	L5
PCIT604.5	Apply distributed computing concepts to design scalable real-world systems	Apply	L5
PCIT604.6	Develop solutions using distributed paradigms such as client-server, P2P, and cloud-based systems	Create	L6

5. Mapping of Course Outcomes to Course Content

Module	CO1	CO2	CO3	CO4	CO5	CO6
Module 1						
Module 2						
Module 3						
Module 4						
Module 5						

6. Mapping of Course Outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	0	1	0	0	0	0	0	1	0	0
CO2	2	2	2	1	1	0	0	0	1	2	0	0
CO3	2	2	2	2	1	0	0	1	1	2	0	0
CO4	3	3	2	2	2	1	1	1	1	3	0	1
CO5	3	3	3	2	2	1	1	1	2	3	1	1
CO6	3	3	3	3	2	1	1	1	2	3	1	1
AVG.	2.3	2.3	2.2	1.8	1.7	0.7	0.5	0.5	1.3	2.3	0.5	0.5

7. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3
CO1	2	1	1
CO2	2	1	2
CO3	2	1	2
CO4	2	2	2
CO5	2	2	2
CO6	3	2	2

8. Course Content (Module-wise)

Module 1: Introduction to Distributed Systems (Hours: 8)

- Definition, characteristics, goals
- Architectural models: client-server, P2P, hybrid
- Design issues and challenges

Module 2: Distributed Communication (Hours: 8)

- Inter-process communication
- RPC, RMI, Message-oriented communication
- Multicast, group communication

Module 3: Synchronization & Coordination (Hours: 10)

- Logical clocks, vector clocks
- Mutual exclusion algorithms
- Leader election: Bully, Ring algorithms
- Distributed deadlocks

Module 4: Fault Tolerance, Replication & Consistency (Hours: 8)

- Failure models and recovery
- Replication techniques
- Consistency models
- Fault-tolerant protocols

Module 5: **Distributed File Systems & Applications (Hours: 8)**

- DFS concepts, NFS, GFS, HDFS
- Distributed shared memory
- Cloud, cluster, and edge-based systems

10. Textbooks and References

Textbooks

1. Andrew S. Tanenbaum, Maarten Van Steen, *Distributed Systems: Principles and Paradigms*.
2. George Coulouris, Jean Dollimore, Tim Kindberg, *Distributed Systems: Concepts and Design*.

Reference Books

1. Mukesh Singhal & Niranjana Shivaratri, *Advanced Concepts in Operating Systems*.
2. Kai Hwang, *Distributed and Cloud Computing*.

E-Resources

- NPTEL: Distributed Systems
- MIT OpenCourseWare: Distributed Systems
- IEEE Transactions on Distributed and Parallel Systems



Course Name: Web Technology
Course Code: IT-605
(Semester - VI)
Course Broad Category: Professional Elective Course

- 1. Course Prerequisite:** Programming Fundamentals (e.g., C, Java, Python), Data Structures and Algorithms, Database Management Systems (DBMS), Computer Networks, Object Oriented Programming

- 2. Course Learning Objectives:**
 - Understand the Foundations of Web Development
 - Develop Front-End Applications
 - Implement Back-End Functionality
 - Apply Web Standards and Best Practices
 - Work with Advanced Web Technologies

- 3. Teaching methodology and evaluation system for the course:**

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

 - A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
 - B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
 - C. End-Semester Exam (60 Marks)- Summative Assessment.

- 4. Course Content:**

Course Name: Web Technology
Course Code: IT-605
Hours per Week: 3L: 0T: 0P
Credits: 3

Module	Topics	Lectures
1	<p>Introduction(1L): Overview, Network of Networks, Intranet, Extranet 6 and Internet. World Wide Web (1L): Domain and Subdomain, Address Resolution, DNS, Telnet, FTP, HTTP. Review of TCP/IP(1L): Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6. IP Subnetting and addressing (1L): Class ful and Classless Addressing, Subnetting. NAT, IP masquerading, IP tables. Internet Routing Protocol(1L): Routing-Intra and Inter Domain Routing, Unicast and Multicast Routing, Broadcast. Electronic Mail(1L): POP3,SMTP.</p>	6
2	<p>HTML(3L): Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Colorname, Colorvalue.</p> <p>ImageMaps (1L): map, area, attributes of image area. Extensible Markup Language (XML) (4L): Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief. CGI Scripts(1L): Introduction, Environment Variable, GET and POST Methods.</p>	9
3	<p>PERL(3L): Introduction, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling. JavaScript(4L): Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object-string, array, Boolean, reg-ex. Function, Errors, Validation. Cookies(1L): Definition of cookies, Create and Store a cookie with example.</p> <p>Java Applets (2L): Container Class, Components, Applet Life Cycle, Update method; Parameter passing applet, Applications.</p>	10
4	<p>Client-Server programming In Java (2L): 4. Java Socket, Java RMI.</p> <p>Threats(1L): Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks. Network security techniques (2L): Password and Authentication; VPN, IPSecurity, security in electronic transaction, Secure Socket Layer(SSL), Secure Shell (SSH). Firewall(1L): Introduction, Packetfiltering, Stateful, Application layer, Proxy.</p>	4
5	<p>Internet Telephony(1L): Introduction, VoIP. Multimedia Applications(2L): Multimediaover IP:RSVP, RTP, RTCP and RTSP. Streaming media, Codec and Plugins, IPTV. Search Engine and Web Crawler (2L): Definition, Metadata, Web Crawler, Indexing, Page rank, overview of SEO.</p>	5

5. References:

Text & References Books:

1. Web Technology: A Developer's Perspective, N. P. Gopalanand J. Akilandeswari, PHI Learning, Delhi, 2013. (Chapters1-5,7,8,9).
2. Internetworking Technologies, An Engineering Perspective, Rahul Banerjee, PHI Learning, Delhi,2011. (Chapters5,6,12)

6. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-605.CO1	Explain and apply Internet/WWW architecture, TCP/IP features, addressing and subnetting, DNS, routing (unicast/multicast/broadcast), and email protocols (POP3/SMTP)	Understand	L2
IT-605.CO2	Design accessible, standards-compliant web pages using HTML/CSS (forms, tables, lists, layout, image maps) and demonstrate well-formed XML/XHTML structures and validation.	Apply	L3
IT-605.CO3	Explain CGI environment variables and GET/POST, and implement basic request handling to connect client forms with server processes.	Analyze	L4
IT-605.CO4	Implement JavaScript control flow, objects, regex, validation, and error handling; manage client state using cookies; describe Java Applet lifecycle and parameter passing.	Apply	L3
IT-605.CO5	Develop CGI-based Perl programs using arrays, hashes, strings, regular expressions, and file/I/O handling to process and persist web form data.	Analyze	L4
IT-605.CO6	Build basic Java Socket/RMI applications; evaluate threats and apply security controls (authentication, VPN, IPsec, SSL/TLS, SSH, firewalls); explain VoIP and multimedia over IP (RTP/RTCP/RTSP, codecs, IPTV) and the fundamentals of search engines, crawling, indexing, PageRank, and SEO.	Evaluate	L5

7. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	3	1	-	-	-	-	-	-
CO2	3	3	2	-	3	1	-	-	-	-	-	-
CO3	2	1	3	-	3	-	-	-	-	2	-	-
CO4	2	1	3	-	3	-	-	-	-	2	-	-
CO5	2	3	3	-	2	3	-	-	-	2	-	-
AVG.	2.4	2.0	2.4	0.0	2.8	1.66	0.0	0.0	0.0	2.0	0.0	0.0

8. Mapping to PSO

	PSO1	PSO 2	PSO 3	PSO 4
CO1	2	3	1	1
CO2	2	3	1	1
CO3	3	2	3	3
CO4	3	1	3	3
CO5	2	3	2	2

***** End of Syllabus*****



Course Name: Soft computing and Optimization
Course Code: IT-606
(Semester- VI)
Course Broad Category: Professional Elective Course

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1. Course Prerequisite:

A strong mathematical and analytical foundation, proficiency in algorithms, and programming skills.

2. Course Learning Objectives:

Students will learn to classify optimization problems, choose appropriate methods for different problem. Understand the need and origin of optimization methods.

3. Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System–

- A. Mid-Term Exam(20Marks)-Summative Assessment (CIA-1)
- B. Internal Assessment(20Marks)-Formative Continuous Assessment [Continuous Assessment 1(CIA-2)]
- C. End-Semester Exam (60 Marks)-Summative Assessment.

4. Course Content:

Course Name: Soft computing and Optimization

Course Code: IT-606

Hours per Week: 3L: 0T: 0P

Credits: 3

Module number	Topics	Lecture number
1	<p>Introduction, Soft computing vs.hard computing,</p> <p>various types of soft computing techniques, and applications of soft computing. Basic tools of soft computing–Fuzzy logic, neural network, evolutionary computing. Introduction: introduction to biological and artificial neural network , Neural networks, application scope of neural networks, fuzzy logic, genetic algorithm, and hybrid systems.</p>	5
2	<p>Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Fuzzy set operations, properties of fuzzy sets, cardinality, operations, and properties of fuzzy relations. Membership functions: Features of membership functions, Standard forms and boundaries, different fuzzification methods. Fuzzy Controller Fuzzy rule base and approximate reasoning: truth values and tables in fuzzy logic Fuzzy propositions formation of rules, decomposition of compound rules, aggregation of fuzzy rules Fuzzy reasoning, fuzzy inference system, fuzzy expert systems. Fuzzy Controller Applications of Fuzzy Logic: How Fuzzy Logic is applied in Home Appliances, General Fuzzy Logic controllers, Basic Medical Diagnostic systems and Weather forecasting</p>	10
3	<p>Basic Evolutionary Processes, EV : A Simple Evolutionary System, Evolutionary Systems as Problem Solvers, A Historical Perspective, Canonical Evolutionary Algorithms - Evolutionary Programming, Evolution Strategies, A Unified View of Simple EAs- A Common</p>	5
4	<p>Genetic Algorithms: Simple GA, cross over and mutation, Multi-objective Genetic Algorithm (MOGA).Applications of Genetic Algorithm: genetic algorithms in search and optimization, GA based clustering Algorithm,</p>	5

5	Image processing and pattern Recognition Swarm intelligence Particle Swarm Optimization (PSO) Algorithm- Formulations, Pseudo-code, parameters, premature convergence, topology Biases, Real valued and binary PSO Ant colony optimization (ACO) - Formulations, Pseudo-code. Applications of PSO and ACO. Neural Network Introduction to Neural Networks: Advent of Modern Neuroscience, Classical AI and Neural Networks, Biological Neurons and Artificial neural network; model of artificial neuron.	8
6	Learning Methods Hebbian, competitive, Boltzman model etc., Neural Network models: Perceptron, Adaline and Madaline networks; single layer network; Back- propagation and multi layer networks. Competitive learning networks: Kohonen self organizing networks Applications of Neural Networks: Pattern Recognition and classification	7

5. References:

Text Book:

1. Soft Computing: Neuro-Fuzzy and Genetic Algorithms by [Samir Roy](#)

Reference Books:

2. Neuro-fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence Book by Eiji Mizutani and Jyh-Shing Roger Jang

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT606.1	Learn the fundamentals soft computing techniques and their applications.	Identify	Remember
IT606.2	Analyze various neural network architectures.	Explain	Understand
IT606.3	Understand perceptions and counter propagation networks.	Implement	Apply

IT606.4	Define the fuzzy systems.	Organize	Analyze
IT606.5	Analyze the genetic algorithms and their applications.	Assess	Evaluate
IT606.6	Genetic algorithms, its applications and advances.	Construct	Create

7. Mapping of course outcomes to module /course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	2	-	1
2	2	3	-	1	-	1
3	2	3	3	2	-	1
4	3	-	-	2	-	1
5	2	-	-	1	3	1

8. Mapping of the Course outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	2	-	-	-	-	-	-	1
CO2	2	2	3	1	-	-	-	-	-	-	-	1
CO3	1	2	2	1	1	-	-	-	-	-	-	1
CO4	1	2	1	1	2	-	-	-	-	-	-	2
CO5	2	2	2	2	3	-	-	-	-	-	-	1
CO6	1	1	1	1	-	-	-	-	-	-	-	1

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	-
CO2	3	1	2	-
CO3	3	2	1	-
CO4	2	1	3	-
CO5	2	-	2	1
CO6	1	-	2	3

*** End of Syllabus***



Course Name: Parallel & Distributed Algorithms

Course Code: IT-607

(Semester-VI)

Course Broad Category: Professional Elective Course

1. Course Prerequisite:

Basic Programming Knowledge, Data Structures and Algorithms, Computer Architecture, Fundamental Operating system and Networking Concepts.

2. Course Learning Objectives:

Acquire hands-on experience in programming parallel and distributed systems, using concepts such as message passing, pipelining, shared memory, and load balancing. Demonstrate the ability to evaluate and debug parallel programs, optimizing their performance and ensuring correctness. Apply parallel and distributed computing techniques to solve real-world problems in scientific computing, big data, and high-performance computing. Develop the skills to program with parallel computing frameworks (e.g., OpenMP) and distributed shared memory systems. Understand the theoretical foundations and practical challenges involved in designing scalable and efficient parallel algorithms.

3. Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

- A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
- B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
- C. End-Semester Exam (60 Marks)- Summative Assessment.

4. Course Content:

Course Name: Parallel & Distributed Algorithms

Course Code: IT-607

Hours per Week: 3L: 0T: 0P

Credits: 3

Module	Topics	Lectures
Unit 1:	Basic Techniques, Parallel Computers for increasing Computation speed, Parallel & Cluster Computing	8
Unit 2:	Message Passing Technique- Evaluating Parallel programs and debugging, Portioning and Divide and Conquer strategies examples	8
Unit 3:	Pipelining- Techniques computing platform, pipeline programs examples	8
Unit 4:	Synchronous Computations, load balancing, distributed termination examples, programming with shared memory, shared memory multiprocessor constructs for specifying parallel sharing data parallel programming languages and constructs, open MP	11
Unit 5:	Distributed shared memory systems and programming achieving constant memory distributed shared memory programming primitives, algorithms – sorting and numerical algorithms.	9

5. References:

Text & References Books:

1. Parallel Programming, Barry Wilkinson, Michael Allen, Pearson Education, 2nd Edition.
2. Introduction to Parallel algorithms by Jaja from Pearson, 1992.
3. Distributed and Parallel Computing, Sandhya Avasthi, Suman Lata Tripathi, Wiley-Scrivener (2025)
4. Parallel & Distributed Computing, I. A. Dhotre, Technical Publications (2022)

6. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-607.CO1	Fundamental parallel computing techniques, architectures, and cluster computing models to analyze how computation speed can be increased.	Understand	L2
IT-607.CO2	Design and debug parallel programs using message passing techniques and apply partitioning and divide-and-conquer strategies to solve computational problems.	Apply	L3
IT-607.CO3	Implement pipelining strategies on computing platforms and develop pipeline programs for practical applications such as numerical and image processing tasks.	Apply	L3
IT-607.CO4	Utilize synchronous computations, load balancing, and shared memory multiprocessor constructs, employing OpenMP and data-parallel programming languages to optimize performance.	Apply and Analyze	L3, L4

IT-607.CO5	Evaluate distributed shared memory models, apply programming primitives, and implement algorithms such as sorting and numerical methods in distributed environments.	Apply and Analyze	L3, L4
IT-607.CO6	Integrate parallel and distributed computing techniques to design efficient solutions for real-world computational problems, demonstrating scalability, efficiency, and correctness.	Evaluate	L5

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1						
2						
3						
4						
5						
6						

8. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

9. Mapping to PSO

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

*** End of Syllabus***



Course Name: Pattern Recognition

Course Code: IT-608

(Semester-VI)

Course Broad Category: Professional Elective Course

1. Course Prerequisite:

Machine Learning

2. Course Learning Objectives:

1. To introduce fundamental concepts of pattern recognition and machine learning.
2. To develop mathematical foundations for classification, clustering, and feature extraction.
3. To provide practical exposure to algorithms and applications in image, speech, and data analysis.
4. To prepare students for advanced study and research in AI, computer vision, and data science.

3. Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

- A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
- B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
- C. End-Semester Exam (60 Marks)- Summative Assessment.

4. Course Content:

Course Name: Pattern Recognition

Course Code: IT-608

Hours per Week: 3L: 0T: 0P

Credits: 3

Module	Topics	Lectures
Unit 1	Introduction to Pattern Recognition: Definition and scope, Applications in computer vision, speech, biometrics, medical diagnosis, Basic concepts of supervised and unsupervised learning	4
Unit 2	Statistical Pattern Recognition: Bayes decision theory, Maximum likelihood estimation, Parametric and non-parametric classifiers (k-NN, Parzen windows), Linear discriminant functions	8

Unit 3	Feature Extraction and Selection: Feature generation and representation, Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA), Dimensionality reduction techniques	6
Unit 4	Clustering and Unsupervised Learning: Similarity measures, k-means, hierarchical clustering, Gaussian mixture models, Evaluation of clustering results	6
Unit 5	Neural and Structural Approaches: Perceptron and multilayer neural networks, Support Vector Machines (SVM), Hidden Markov Models (HMM), Structural pattern recognition (grammars, trees, graphs)	6
Unit 6	Applications and Case Studies: Image recognition (faces, objects), Speech and handwriting recognition, Biometrics (fingerprint, iris), Emerging applications in data mining and healthcare	5

5. References:

Text & References Books:

1. R. O. Duda, P. E. Hart and D. G. Stork: Pattern Classification, John Wiley, 2001.
2. S. Theodoridis and K. Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.
3. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.

6. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-608.CO1	Understand the Fundamentals of Pattern Recognition	Understand	L2
IT-608.CO2	Apply statistical, structural, and neural approaches to solve classification problems	Analyze	L4
IT-608.CO3	Analyze feature extraction and dimensionality reduction techniques for real-world datasets.	Analyze	L4
IT-608.CO4	Design and implement clustering algorithms for unsupervised learning tasks	Apply	L3
IT-608.CO5	Evaluate classifier performance using appropriate metrics and validation methods	Evaluate	L5
IT-608.CO6	Integrate pattern recognition methods into applications such as image analysis, speech recognition, and biometrics.	Apply	L3

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1						

2												
3												
4												
5												
6												

8. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

9. Mapping to PSO

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

***** End of Syllabus*****



Course Name: Numerical Methods
Course Code: IT-610
(Semester VI)
Course Broad Category: Open Elective Course

1. Course Prerequisite:

Concept of Mathematics in the previous semesters of B. Tech curriculum.

2. Course Learning Objectives:

The objective of this course to build Fundamental Mathematical skills, apply Mathematical Techniques to Engineering Problems, to equip students with the essential tools and methodologies, to analyze and interpret data, make informed decisions under uncertainty, and develop a strong foundation for applications in various fields and to promote critical thinking, encourage collaborative learning.

3. Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies, Guest Lectures.

Evaluation System –

- A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
- B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
- C. End-Semester Exam (60 Marks)- Summative Assessment.

4. Course Content:

Course Name: Numerical Methods
Course Code: IT-610
Hours per Week: 3L: 1T: 0P
Credits: 3

Module	Topics	45L
1.	Approximation in numerical computation: Motivation and application, Rounding off a number, Different types of error (Significant, inherent, Truncation etc.), Different kinds of difference operators, Fundamental theorem of difference calculus (statement only) with applications.	9L
2.	Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation. Numerical integration: Degree of precision, General quadrature formula, Trapezoidal rule, Simpson's 1/3 rule, Geometrical interpretation, Corresponding error terms.	14L

Module	Topics	45L
3.	Numerical solution of a system of linear equations: Direct and indirect/iterative method, Gauss elimination method, Matrix inversion, Crout's LU Factorization method, diagonally dominant of a matrix, Gauss-Seidel iterative method.	6L
4.	Numerical solution of algebraic and transcendental equation: Algebraic and transcendental equation, Bisection method, Regula-Falsi method, Newton-Raphson method, Geometrical interpretation, Corresponding convergence	8L
5.	Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods (II and IVth order), Milne's Predictor-Corrector methods and Finite Difference method.	8L

5. References:

Text Book:

- S. A. Mollah: Numerical analysis and computational procedures.
- R. S. Salaria, Computer Oriented Numerical Methods, Khanna Publishing House.
- Dutta & Jana: Introductory Numerical Analysis.
- Jain, Iyengar, & Jain: Numerical Methods (Problems and Solution).
- Srimanta Pal: Numerical Methods, OUP.

Reference Books:

- J.B. Scarborough: Numerical Mathematical Analysis.
- Balagurusamy: Numerical Methods, Scitech.
- Baburam: Numerical Methods, Pearson Education.
- N. Dutta: Computer Programming & Numerical Analysis, Universities Press.

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-610.1	Ability to analyze error and to understand numerical computation.	Identify	Remember
IT-610.2	Ability to apply numerical methods in integration and concept of interpolation.	Explain	Understand
IT-610.3	Ability to apply numerical methods to solve system of linear equations.	Implement	Apply
IT-610.4	Ability to apply numerical methods to solve algebraic equations.	Organize	Analyze
IT-610.5	Ability to apply numerical methods to solve ordinary differential equations.	Assess	Evaluate
IT-610.6	Design and implement mathematical investigations and projects, including data collection, analysis, and interpretation, and apply appropriate mathematical communication and presentation skills.	Construct	Create

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	2	-	1
2	2	3	-	1	-	1
3	2	3	3	2	-	1
4	3	-	-	2	-	1
5	2	-	-	1	3	1

8. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2
CO1	2	2	1	1	2	-	-	-	-	-	-	1
CO2	1	2	3	1	-	-	-	-	-	-	-	1
CO3	1	2	2	1	1	-	-	-	-	-	-	1
CO4	1	2	1	1	2	-	-	-	-	-	-	2
CO5	2	2	2	2	3	-	-	-	-	-	-	1
CO6	1	1	1	1	-	-	-	-	-	-	-	1

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				



Course Name: Human Resource Development and Organizational Behaviour

Course Code: IT-609

(Semester-VI)

Course Broad Category: Open Elective Course

.....
1. Course Prerequisite:

NIL

2. Course Learning Objectives:

This course explores the principles and practices of Human Resource Development (HRD) and Organizational Behaviour (OB). It equips students with the knowledge and skills to understand human dynamics in organizations, foster employee growth, and design strategies for organizational effectiveness

3. Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

- A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
- B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
- C. End-Semester Exam (60 Marks)- Summative Assessment.

4. Course Content:

Course Name: Human Resource Development and Organizational Behaviour

Course Code: IT-609

Hours per Week: 3L: 0T: 0P

Credits: 3

Module	Topics	Lectures
1	Introduction to HRD and OB: Concept, scope, and importance of HRD, Evolution and role of HRD in organizations, Fundamentals of Organizational Behaviour, Relationship between HRD and OB	4
2	Individual Behaviour in Organizations: Personality, attitudes, and values, Perception and attribution, Learning and reinforcement theories, Motivation theories and applications	4

3	Group Dynamics and Teamwork: Group formation and development, Team roles and effectiveness, Communication in groups, Conflict management and negotiation	5
4	Leadership and Organizational Culture: Leadership theories and styles, Power, politics, and influence in organizations, Organizational culture and climate, Change management and innovation	4
5	HRD Mechanisms and Practices: Training and development methods, Career planning and development, Performance management systems, Mentoring and coaching	5
6	Contemporary Issues in HRD and OB Work-life balance and employee well-being, Diversity and inclusion in organizations, Technology and HRD (e-learning, AI in HR), Ethical issues and future trends in HRD & OB	6

5. References:

Text & References Books:

1. Human Resource Management – Gary Dessler
2. Essentials of Organizational Behavior – Stephen P. Robbins & Timothy A. Judge
3. Management of Organizational Behavior: Leading Human Resources – Paul Hersey, Kenneth H. Blanchard, Dewey E. Johnson
4. Organizational Behaviour: People, Process, Work and Human Resource Management- Laurie J. Mullins

6. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-609.CO1	Explain the concepts, scope, and significance of HRD and OB in organizational contexts.	Understand	L2
IT-609.CO2	Analyze individual behaviour, motivation, and learning processes to enhance workplace effectiveness.	Analyze	L4
IT-609.CO3	Evaluate group dynamics, communication patterns, and conflict resolution strategies for team success.	Understand	L2
IT-609.CO4	Apply leadership theories and cultural frameworks to manage organizational change and innovation.	Apply	L3
IT-609.CO5	Design HRD interventions such as training, career development, and performance	Analyze	L4

	management systems.		
IT-609.CO6	Critically assess contemporary challenges in HRD and OB, including diversity, technology, and ethics.	Understand	L2

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1						
2						
3						
4						
5						
6						

8. Mapping of the Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

9. Mapping to PSO

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

***** End of Syllabus*****



Course Name: Image Processing Lab

Course Code: IT-691

(Semester- VI)

Course Broad Category: Professional Core Course

1. Course Prerequisite:

Programming experience to solve various problems.

2. Course Learning Objectives:

The purpose of image processing is to enhance visual quality, extract useful information.

3. Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System–

A. Internal Assessment(60Marks)-Formative Continuous Assessment

B. End-Semester Exam(40Marks)-Summative Assessment.

4. Course Content:

Course Name: Image Processing Lab

Course Code: IT-691

Hours per Week: 0L: 0T: 4P

Credits: 2

Experiments
1. Implementation of image arithmetic. 2. Simulation and Display of an Image, Negative of an Image (Binary & Gray Scale) 3. Implementation of Relationships between Pixels 4. Contrast stretching of a low contrast image, Histogram, and Histogram Equalization 5. Display of bit planes of an Image 6. Computation of Mean, Standard Deviation, Correlation coefficient of the given Image 7. Implementation of image sharpening filters and Edge Detection using Gradient Filters 8. Implementation of image restoring techniques 9. Implementation of Image Intensity slicing technique for image enhancement 10. Canny edge detection Algorithm

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	2	1	3	-
CO2	3	1	2	-
CO3	3	2	1	-
CO4	2	1	3	-
CO5	2	-	2	1
CO6	1	-	2	3

**** End of Syllabus*****



Course Name: Computer Networks Lab
Course Code: PCC-IT 692
(Semester –VI)
Course Broad Category: Professional Core Course

1. Course Prerequisite:

- C Programming, Java Programming, Operating System Lab.

2. Course Learning Objectives:

- Choose suitable tools to model a network and understand the protocols at various OSI reference levels.
- Design a suitable network and simulate using a Network simulator tool.
- Simulate the networking concepts and protocols using C/C++ programming.
- Model the networks for different configurations and analyze the results.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

- A. Internal Assessment (60 Marks)- Formative Continuous Assessment
- B. End-Semester Exam (40 Marks)- Summative Assessment.

4. Course Content:

Course Name: Computer Networks Lab

Course Code: PCC-IT692

Hours per Week: 0L: 0T: 4P

Credits: 2

Unit	Content
1	NIC Installation & Configuration (Windows/Linux) Understanding IP address, subnet mask. Different LAN Topologies: Mesh, Bus, Star and Tree etc. and their advantages and disadvantages. Different networking commands: ipconfig, ping, tracert, nslookup and netstat
2	Write a HTTP web client program to download a web page using TCP sockets
3	Applications using TCP sockets like: <ul style="list-style-type: none">• Echo client and echo server• Chat• File Transfer
4	Simulation of DNS using UDP sockets

5	Write a code simulating ARP /RARP protocols
6	Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
7	Study of TCP/UDP performance using Simulation tool.
8	Simulation of Distance Vector/ Link State Routing algorithm.
9	Performance evaluation of Routing protocols using Simulation tool.
10	Simulation of error correction code (like CRC).
11	Server Setup/Configuration: FTP, TELNET, NFS, DNS, Firewall.

5. References:

1. B A Forouzan : Data Communications and Networking, TMH, 2003.
2. W Richard Stevens; UNIX Network Programming (Vol-1), AWP, 2004.
3. H Schildt; Java: The Complete Reference, TMH, 2008.

6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details	Action Verb	Knowledge Level
CO1	<i>Define</i> the fundamentals of underlying principles of computer networking		
CO2	<i>Understand</i> the key topology which support the internet.		
CO3	<i>Create</i> socket and <i>analyze</i> different client server mode		
CO4	<i>Demonstrate</i> the installation and configuration of network simulator.		
CO5	Applying Network routing algorithm and evaluate the process of Implementing simple routed internetwork.		
CO6	Evaluate the error using various error correcting techniques.		

7. Mapping of course outcomes to module / course content

Unit	CO1	CO2	CO3	CO4	CO5	CO6

8. Mapping of the Course outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												
AVG.												

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

***** End of Syllabus*****



Course Name: Technical Aptitude–II
Course Code: PC IT-694 (Semester – VI)
Course Broad Category: Professional Core Course

1. Course Prerequisite

- Basic quantitative aptitude skills.
- Completion of Technical Aptitude–I.
- Familiarity with arithmetic and logical reasoning.

2. Course Learning Objectives

- To enhance advanced quantitative aptitude and reasoning skills.
- To develop logical, analytical, and problem-solving abilities.
- To strengthen data interpretation and decision-making skills.
- To apply aptitude techniques to engineering and technical scenarios.
- To prepare students for competitive exams and industry assessments.
- To build readiness for Technical Aptitude–III and higher assessments.

3. Teaching Methodology and Evaluation System

Teaching Methodology:

Interactive exercises, problem-solving sessions, case studies, quizzes, ICT-enabled learning (NPTEL/SWAYAM), group work, mini-tests, and timed aptitude practice sets.

Evaluation System:

Continuous Internal Evaluation (CIE) – 60 Marks

- Participation & Attendance – 10 Marks
- Assignments / Quizzes – 20 Marks
- Mini-tests – 20 Marks
- Viva-Voce – 10 Marks

End Semester Evaluation (ESE) – 40 Marks

- Final Aptitude Test / Mock Test – 30 Marks
- Viva-Voce – 10 Marks

4. Course Content

Module	Content
1	Advanced Numerical Aptitude (Weeks 1–3): Time–work–efficiency, profit–loss–discount, ratio–proportion–percentages.
2	Logical Reasoning & Analytical Puzzles (Weeks 4–5): Complex sequences, patterns, puzzles, seating arrangements, coding–decoding, syllogisms.
3	Data Interpretation (Weeks 6–7): Bar, line, pie charts; tables; case-based interpretation; multi-source data analysis.
4	Advanced Problem Solving (Weeks 8–10): Permutations and combinations, probability, basic statistics, decision making.
5	Speed–Distance–Time & Misc. (Weeks 11–12): Speed-distance problems, simple compound interest, mixed aptitude sets.
6	Mock Tests & Assessment (Weeks 13–14): Solving timed aptitude papers, group problem-solving, individual mini-assessment.

5. References

Textbooks:

1. R.S. Agarwal, *Quantitative Aptitude*.
2. Arun Sharma, *How to Prepare for Quantitative Aptitude for Competitive Exams*.

Reference Books:

1. Nishit Sinha, *Quantitative Aptitude for Competitive Examinations*.
2. Abhijit Guha, *Logical and Analytical Reasoning*.

E-Resources:

- NPTEL / SWAYAM Aptitude Modules.
- Online aptitude portals such as IndiaBix.

6. Course Outcomes (CO)

Course Outcome	Details	Bloom's Taxonomy	Level
CO1	Solve advanced arithmetic and algebraic problems.	Apply	L3
CO2	Apply logical reasoning for complex sequences, puzzles, arrangements.	Analyze	L4
CO3	Analyze data from charts, graphs, and tables.	Analyze	L4
CO4	Evaluate and select optimal solutions in technical scenarios.	Evaluate	L5
CO5	Demonstrate proficiency in problem-solving under constraints.	Evaluate	L5
CO6	Exhibit readiness for industry-oriented aptitude tests.	Create	L6

7. Mapping of Course Outcomes to Course Content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1						
2						
3						
4						
5						
6						

8. Mapping of Course Outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	1	1	1	2	2	2	1	1
CO2	2	3	2	3	2	1	1	2	2	2	1	1
CO3	2	2	3	2	2	2	1	2	2	2	1	1
CO4	2	2	2	3	3	2	2	2	2	2	2	1
CO5	3	2	2	3	2	2	2	2	2	3	2	1
CO6	3	3	3	3	3	2	2	3	2	3	2	2
AVG.	2.5	2.3	2.3	2.7	2.2	1.8	1.5	2.2	2.0	2.4	1.7	1.3

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1
CO2	2	3	2	1
CO3	2	3	2	1
CO4	3	3	2	2
CO5	3	3	2	2
CO6	3	3	3	2

***** End of Syllabus *****



Course Name: Data Mining and Data Warehousing Laboratory

Course Code: IT-693

(Semester-VI)

Course Broad Category: Professional Core Course

.....
1. Course Prerequisite:

- i. Data Structure and Algorithms
- ii. Database Management Systems

2. Course Learning Objectives:

- i. To provide hands-on experience with data preprocessing, mining algorithms, and warehousing concepts.
- ii. To enable students to apply theoretical knowledge to real-world datasets.
- iii. To develop skills in using tools such as SQL, Python (scikit-learn, pandas), R, Weka, or Hadoop.

3. Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

- A. Internal Assessment(60Marks)-Formative Continuous Assessment
- B. End-Semester Exam(40Marks)-Summative Assessment.

4. Course Content:

Course Name: Data Mining and Data Warehousing Laboratory

Course Code: IT-693

Hours per Week: 0L: 0T: 4P

Credits: 2

Unit	Content
1	Data Preprocessing <ul style="list-style-type: none">• Handling missing values, normalization, discretization, and transformation of datasets.• Tools: Python (pandas, NumPy) or Weka.
2	Association Rule Mining <ul style="list-style-type: none">• Implement Apriori and FP-Growth algorithms.• Generate frequent item sets and rules from transactional datasets.
3	Classification Techniques <ul style="list-style-type: none">• Apply Decision Trees, Naïve Bayes, and k-Nearest Neighbors.• Evaluate performance using confusion matrix and accuracy metrics.
4	Clustering Methods <ul style="list-style-type: none">• Implement k-Means and Hierarchical clustering.• Visualize clusters and analyze intra/inter-cluster distances.
5	Data Warehousing Concepts <ul style="list-style-type: none">• Design a star schema and snowflake schema.

	<ul style="list-style-type: none"> • Create fact and dimension tables using SQL.
6	OLAP Operations <ul style="list-style-type: none"> • Perform roll-up, drill-down, slice, and dice operations on warehouse data. • Use SQL queries or OLAP tools.
7	Advanced Mining <ul style="list-style-type: none"> • Implement text mining or web mining on sample datasets. • Sentiment analysis or keyword extraction.

5. References:

Text & References Books:

1. Data Mining for Business Analytics – Galit Shmueli, Peter C. Bruce, Nitin R. Patel
2. Mining of Massive Datasets – Jure Leskovec, Anand Rajaraman, Jeffrey Ullman
3. Practical Data Mining with Weka – Ian H. Witten, Eibe Frank
4. Hands-on guide using Weka software, perfect for lab experiments and student practice.

6. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-693.CO1	Apply preprocessing techniques to clean and transform raw datasets for mining tasks.	Apply	L3
IT-693.CO2	Implement association rule mining algorithms to discover frequent patterns and relationships in data.	Analyze	L4
IT-693.CO3	Develop and evaluate classification models using decision trees, Bayesian methods, and nearest neighbor approaches	Apply	L3
IT-693.CO4	Perform clustering on multidimensional datasets and interpret the quality of clusters.	Evaluate	L5
IT-693.CO5	Design data warehouse schemas and execute OLAP operations for multidimensional analysis.	Apply	L3
IT-693.CO6	Integrate data mining and warehousing techniques in a mini project to solve real-world problems.	Evaluate	L5

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1						
2						
3						
4						

5						
6						

8. Mapping of the Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

9. Mapping to PSO

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

***** End of Syllabus*****