GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)

An Autonomous Institute

'A' GRADE ACCREDITED BY NAAC

Evaluation Scheme and Syllabus For

Master of Technology (Computer Science and Engineering)

Effective from the Session: 2024-25

APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO MDU, ROHTAK

1. DEFINITION OF CREDIT

1	1 Lecture (L) per week	1 Credit
2	2 Practical (P) per week	1 Credit
3	2 Seminar per Week	2 Credit
4	4 Project Per Week	2 Credit

2. RANGE OF CREDIT

A credit of 86 is required for a student to be eligible for a postgraduate degree in Computer Science and Engineering.

3. STRUCTURE OF POSTGRADUATE ENGINEERING PROGRAM (M.TECH)

Sr. No.	Category	Breakup of Credits
1	Professional Core Courses	32*
2	Professional Elective Courses (Relevant to chosen specialization/branch)	8*
3	Mandatory Learning Course	3*
4	Multidisciplinary Open Elective Courses	6*
5	Foundation Elective Courses	3*
6	Seminar	6*
7	Lab Courses	4*
8	Project	2*
9	Dissertation	22*
	Total Credits	**86***

**Minor variation is allowed as per need of the respective disciplines.*

4. COURSE CODE AND DEFINITIONS

Sr. No.	Category	Course Code
1	Professional Core Courses	PCC
2	Professional Elective Courses (Relevant to chosen specialization/branch)	PEC
3	Mandatory Learning Course	MLC
4	Multidisciplinary Open Elective Courses	OEC
5	Foundation Elective Courses	FEC
6	Seminar	SM
7	Lab Courses	LC
8	Project	PROJ
9	Dissertation	DISS

GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

Scheme of Studies and Examination

M. Tech (Computer Science & Engineering) –1st Semester

w.e.f. 2024-25

Sr. No.	Category	Course Code	Course Title	Lectures per week			Total Load Per Week	Credits	Examination Scheme (Marks)				Exam Duration in Hours
				Lecture (L)	Tutorial (T)	Practical (P)			Assessment	End Semester Examination		Total	
										Theory	Practical		
1	Professional Core Courses	PCC-MTCSE-101A	Data Communication and Computer Networks	4	0	0	4	4	40	60		100	3
2	Professional Core Courses	PCC-MTCSE-103A	Advanced Operating Systems	4	0	0	4	4	40	60		100	3
3	Professional Core Courses	PCC-MTCSE-105A	Advanced Database Management System	4	0	0	4	4	40	60		100	3
4	Professional Core Courses	PCC-MTCSE-107A	Data Warehouse and Mining	4	0	0	4	4	40	60		100	3
5	Professional Core Courses	PCC-MTCSE-109A	Mathematical Foundation of Computer Science	4	0	0	4	4	40	60		100	3
6	Lab Course	LC-MTCSE-111A	Advanced Operating Systems Lab	0	0	2	2	1	25		25	50	3
7	Lab Course	LC-MTCSE-113A	Advanced Database Management System Lab	0	0	2	2	1	25		25	50	3
8	Seminar	SM-MT-115A	Seminar-I	0	0	2	2	2	50			50	
Total Credits								**24**				**650**	

GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

Scheme of Studies and Examination

M. Tech (Computer Science & Engineering) –2nd Semester

w.e.f. 2024-25

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Load Per Week	Credits	Examination Scheme (Marks)				Exam Duration in H
				Lecture (L)	Tutorial (T)	Practical (P)			Assessment	End Semester Examination		Total	
										Theory	Practical		
1	Professional Core Courses	PCC-MTCSE-102A	Soft Computing	4	0	0	4	4	40	60		100	3
2	Professional Core Courses	PCC- MTCSE-104A	Algorithm Design	4	0	0	4	4	40	60		100	3
3	Professional Elective Courses	Refer Table-I	.....	4	0	0	4	4	40	60		100	3
4	Multidisciplinary Open Elective Courses	Refer Table-II	.....	3	0	0	3	3	40	60		100	3
5	Foundation Elective Courses	Refer Table-III	.....	3	0	0	3	3	40	60		100	3
6	Lab Course	LC-MTCSE-106A	Soft Computing Lab	0	0	2	2	1	25		25	50	3
7	Lab Course	LC-MTCSE-108A	Algorithm Design Lab	0	0	2	2	1	25		25	50	3
8	Seminar	SM-MT-110A	Seminar-II	0	0	2	2	2	50			50	
Total Credits								**22**				**650**	

Table I: Professional Elective Courses

Sr. No.	Course Code	Course Name
1	PEC- MTCSE-112A	Mobile and Wireless Communication
2	PEC- MTCSE-114A	Optimization Techniques
3	PEC- MTCSE-116A	Discrete Mathematics
4	PEC- MTCSE-118A	Internet and Web Development

Table II: Multidisciplinary Open Elective-I Courses

Students of all M. Tech programmes are required to study one Multidisciplinary open elective course in each of the 2nd and 3rd Semesters and one foundation elective course in 2nd Semester for 2-Years Programmes. They may choose any one of the following courses (excluding the courses offered by the departments of their own subjects, if not stated otherwise).

Sr. No	Course Code	Course Name	Offered by Department
1	OEC-130A	Basic of Economics	Management Department
2	OEC-132A	Fundamentals of Management	Management Department
3	OEC-134A	Disaster Management	Civil Engineering
4	OEC-136A	Industrial Safety	Fire Technology and Safety
5	OEC-138A	Indian Literature in Translation-I	Applied Sc. & Humanities (English)
6	OEC-140A	Environmental Issues	Applied Sc. & Humanities (Chemistry)
7	OEC-142A	Quantitative Techniques	Applied Sc. & Humanities (Mathematics)
8	OEC-144A	Sources of Energy-I	Electrical Engineering
9	OEC-146A	Operation Research	Mechanical Engineering
10	OEC-148A	Multimedia Communication	Electronics and Communication Engineering
11	OEC-150A	Introduction to Information Technology	Computer Sc. & Applications
12	OEC-152A	Cyber Forensics and Security	Computer Sc. & Engineering
13	OEC-154A	Computer Science and Principles	Computer Sc. & Engineering
14	OEC-156A	Software Engineering Practice	Computer Sc. & Engineering

Table III: Foundation Elective Courses

Sr. No	Course Code	Course Name	Offered by Department
1	FEC-158A	Basics of Accounting	Management Department
2	FEC-160A	Basics of E-commerce	Management Department
3	FEC-162A	Element of Banking	Management Department
4	FEC-164A	Computer Fundamentals	Computer Sc. & Applications
5	FEC-166A	Communication and Soft Skills	Applied Sc. & Humanities (English)
6	FEC-168A	Entrepreneurship Development	Management Department
7	FEC-170A	Electronics Engineering	Electronics and Communication Engineering

Course Code	**PCC-MTCSE-101A**				
Category	Professional Core Courses				
Course Title	**Data Communication and Computer Networks**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I**
	4	0	0	**4**	
Course Objectives	The objectives of this course are • To explain data communication principles, transmission modes, and network switching techniques. • To introduce network layer protocols, IP addressing, and routing algorithms for efficient network design. • To familiarize students with transport layer protocols and performance optimization through connection and congestion control. • To educate students in network security, applying encryption, firewalls, and VPNs for secure communications.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Define the fundamentals of data communication and computer networks.	Level 1: Remember
CO2	Understand the basic concepts of data communication and computer networks.	Level 2: Understand
CO3	Apply the concepts of data communication, network management & security and networking protocols to solve real world problems.	Level 3: Apply
CO4	Analyze routing algorithms, networking protocols, network management & security measures to improve network performance and ensure data security.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Data communication: Digital and analog communication, Transmission modes, serial and parallel communication, packet switching, circuit switching and message switching.

Network models: OSI and TCP/IP model, OSI vs TCP/IP

MAC: ALOHA, CSMA, CSMA/CD

Unit-II

Network Layer: ARP, RARP, ICMP, IGMP, IPv4, IPv6, IPv4 addressing, classful addressing, CIDR–Introduction, CIDR addressing, CIDR address blocks and Bit masks, subnets and super netting, IPv6 addressing, address space allocation, global unicast addresses.

Routing Algorithms: Distance vector Routing, Link State Routing, Path Vector Routing, Hierarchical Routing, RIP, OSPF, and BGP.

Unit-III

Transport Layer: Transport Layer Services, UDP, TCP Protocol, TCP services, TCP features, connection management, congestion control SCTP Protocol, SCTP services, SCTP features, and SCTP association.
Application layer:-SMTP, POP, IMAP, and MIME, DHCP, DHCP operation, Configuration FTP, SSH.

Unit-IV

Network Management and Security: Congestion control, Quality of services, SNMP, Ciphers- traditional, modern, asymmetric, public and private key, key management, digital signature, Network Layer Security, Transport Layer Security, Application Layer security, Firewall, VPN.

Suggested Readings:

1. Computer Networks by Tanenbaum Andrew S, International edition.
2. TCP/IP protocol suite by Behrouz A. Forouzan, TMH publication.
3. Data Communications and Networking by Behrouz A. Forouzan, TMH.
4. Computer Networking: A Top-Down Approach by Kurose and Ross, Pearson.
5. Computer Networks – A System Approach by Larry L. Peterson & Bruce S. Davie, Morgan Kaufmann Publishers Inc.

Useful Video links:

Unit No.	Topics	Links
Unit-I	Introduction to digital communication	https://youtu.be/4NYt34yNWqU?si=IcnxmQMrKc3QRxtz
	Analog Communication	https://youtu.be/s_vmLqT_6NQ?si=RLE67tZx0L6wk584
	Transmission Modes	https://youtu.be/4jT7TG0NNhc?si=z_x4LZt0NnteRv6X
	Switching Techniques	https://youtu.be/yZV3y-usK_g?si=zNdV2piMDqo4zrSe
	Network Models (OSI and TCP/IP models)	https://youtu.be/8BK70Udgyrc?si=-ZbQsVOEhZzGUY6L
Unit-II	ARP/RARP	https://youtu.be/JkqgkN_j6Lo?si=iPes4Vps2xmW1M9h
	ICMP/IGMP	https://youtu.be/2w8upObjYtk?si=469mTv7AylZlnyhx
	IP Addressing (Ipv4,Ipv6)	https://youtu.be/5vbPS-KnhvI?si=edOqaxGhwXFsBC7M https://youtu.be/FkaFr3cpg6U?si=_1Fqj_a5xvvn-eHG
	Routing algorithms	https://youtu.be/yQBuCHG5co0?si=m0yQA0JvkZj_3VbP
Unit-III	Transport layer services UDP, TCP	https://youtu.be/8-3CSAkscYU?si=A1LkOiW6DNvJ9Sd3
	Connection management	https://youtu.be/fBPDLGwfSUM?si=sfdCQd0ucwr-hTh3
	Congestion control	https://youtu.be/b-nCA0tZU-0?si=uyaZb0XBAkd5_Td8
	Application layer	https://youtu.be/JsUzPkOxZfA?si=r1Hg2VfWvdwRpHSc
Unit-IV	Congestion control	https://youtu.be/b-nCA0tZU-0?si=uyaZb0XBAkd5_Td8
	SNMP	https://youtu.be/YkE2ps9IcUQ?si=37mWvODsAxTYgEUm
	Public/private keys	https://youtu.be/6qKCaxodZkI?si=oxohpdz5MCRGDiWR
	Digital signatures	https://youtu.be/JMq2RaFYWXI?si=XZ97mobwwaLnG-J1
	Application layer security	https://youtu.be/kM5IX1FhABc?feature=shared
	VPN	https://youtu.be/hlndD4Tmnwo?si=YsbnPnaqvZuvM6wB

Course Code	**PCC-MTCSE-103A**				
Category	Professional Core Courses				
Course Title	**Advanced Operating Systems**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I**
	4	0	0	**4**	
Course Objectives	The objectives of this course are • To explain advanced operating system concepts including process management, synchronization, memory management, deadlock, and distributed systems. • To introduce students with synchronization techniques like semaphores, mutex, and monitors to resolve critical section problems in concurrent programming. • To get students introduced to process scheduling algorithms such as Round Robin, SJF, FCFS, and Priority Scheduling in various operating system scenarios. • To understand and analyze deadlock detection, prevention, and avoidance techniques and memory management policies.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Define key concepts, principles and terminology in operating systems, distributed operating systems, multiprocessor and database operating systems.	Level 1: Remember
CO2	Explain the concepts, techniques and algorithms in operating distributed operating systems, multiprocessor and database operating system environments.	Level 2: Understand
CO3	Apply analytical and algorithmic techniques to solve problems related to process scheduling, and concurrency control in advanced operating systems.	Level 3: Apply
CO4	Analyze synchronization mechanisms, deadlock concepts, distributed system protocols, recovery strategies, fault tolerance, and concurrency control in distributed databases and operating systems.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Introduction: Operating System Concept, Functions of an Operating System, Design Approaches, Types of Advanced Operating System – Synchronization Mechanisms, Concept of a Process, Concurrent Processes, The Critical Section Problem, Other Synchronization Problems, Language Mechanisms for Synchronization, Axiomatic Verification of Parallel Programs – Process Deadlocks – Preliminaries, Models of Deadlocks,

Resources, System State, Necessary and Sufficient conditions for a Deadlock, Systems with Single-Unit Requests, Consumable Resources, Re-usable Resources.

Unit-II

Distributed Operating Systems: Introduction, Issues, Communication Primitives, Inherent Limitations– Lamport's Logical Clock, Vector Clock, Causal Ordering, Global State, Cuts, Termination Detection, Distributed Mutual Exclusion, Non-Token Based Algorithms, Lamport's Algorithm – Token-Based Algorithms, Suzuki-Kasami's Broadcast Algorithm, Distributed Deadlock Detection, Issues, Centralized Deadlock-Detection Algorithms –Distributed Deadlock-Detection Algorithms, Agreement Protocols, Classification – Solutions, Applications.

Distributed Resource Management: Distributed File systems, Architecture, Mechanisms, Design Issues, Distributed Shared Memory, Architecture, Algorithm, Protocols – Design Issues. Distributed Scheduling, Issues, Components, Algorithms.

Unit-III

Failure Recovery and Fault Tolerance: Basic Concepts-Classification of Failures, Basic Approaches to Recovery; Recovery in Concurrent System; Synchronous and Asynchronous Check-pointing and Recovery; Check pointing in Distributed Database Systems; Fault Tolerance; Issues – Two-phase and Non-blocking Commit Protocols; Voting Protocols; Dynamic Voting Protocols.

Unit-IV

Multiprocessor and Database Operating Systems: Structures, Design Issues, Threads, Process Synchronization, Processor Scheduling, Memory Management, Reliability / Fault Tolerance; Database Operating Systems, Introduction, Concurrency Control, Distributed Database Systems, Concurrency Control Algorithms.

Suggested Readings:

1. Advanced Concepts in Operating Systems by Mukesh Singhal and N. G. Shivaratri, McGraw Hill, 2000
2. Operating System Concepts by Abraham Silberschatz, Peter B. Galvin, G. Gagne, Sixth Addison n Wesley Publishing Co., 2003.
3. Modern Operating Systems by Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.

Useful Video links:

Unit No.	Topics	Links
Unit-I	Operating System Fundamentals	https://www.youtube.com/playlist?list=PLrpK1inhO61UQRHHuB8xSYulwJrAuVGPw
	Introduction to Processes	https://youtu.be/g_kLI2pkNC4?si=tsSKxqa5cYG4iTkd
	Synchronization	https://youtu.be/qKPCfuZAAEc?si=9rQj9xRt4DARt652
	Deadlocks	https://youtu.be/8ZS7xzWPo5A?si=9i6tbqKdxyk91uR1
Unit-II	Distributed Operating Systems	https://youtu.be/AWryELkUwow?si=x65Zl-2TzFgG8eFj
	Distributed Resource Management	https://youtu.be/dlBVWMdGhqw?si=B-zyFFQMq3Slgo2e
Unit-III	Recovery in Concurrent System	https://www.youtube.com/watch?v=BqujBzSlEZc
Unit-IV	Foundation for Concurrency Control	https://youtu.be/EeVDvQLKU0E?si=1Vk1lA63uDaEsUPD
	Memory Management	https://youtu.be/_pKbqFyG03s?list=PLEAYkSg4uSQ2Pach478muxnoeTNz_QeUJ

Course Code	**PCC-MTCSE-105A**				
Category	Professional Core Courses				
Course Title	**Advanced Database Management System**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I**
	4	-	-	**4**	
Course Objectives	The objectives of this course are • To educate students in database architecture, relational models, SQL, and normalization for efficient database design. • To introduce students to query evaluation, optimization strategies, and techniques for improving query execution. • To provide the knowledge of transaction management, recovery techniques, and concurrency control for data integrity and system reliability. • To explain object-oriented database concepts and distributed DBMS for scalable data management.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Define the fundamental concepts of DBMS & data warehousing.	Level 1: Remember
CO2	Explain the basic concepts DBMS & data warehousing.	Level 2: Understand
CO3	Apply the concepts of DBMS, data warehousing and object relational databases to solve real world problems.	Level 3: Apply
CO4	Analyze architectures, models, and advanced features of DBMS and data warehousing to design efficient and scalable database solutions.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Introduction: Architecture, Advantages, Disadvantages, Data models, relational algebra, SQL, Normal forms. Query Processing: General strategies for query processing, transformations, expected size, statistics in estimation, query improvement. Query evaluation, view processing, query processor.

Unit-II

Recovery: Reliability, Transactions, recovery in centralized DBMS, reflecting updates, Buffer management logging schemes, disaster recovery. Concurrency: Introduction, Serializability, Concurrency control, Locking schemes, Timestamp based ordering, Optimistic, Scheduling, Multisession techniques, Deadlocks.

Unit-III

Object Oriented Database Development: Introduction, object definition language, creating object instances, Object query language.
Distributed Database: Basis concepts, options for distributing a database, distributed DBMS.

Unit-IV

Data Warehousing: Introduction, basic concepts, data warehouse architecture, data characteristics, reconciled data layer, data transformation, derived data layer, user interface. Object Relational Databases: Basic Concepts, Enhanced SQL, and Advantages of object relational approach.

Suggested Readings:

1. An introduction to database systems by Bipin C. Desai, Galgotia Publications.
2. Modern Database Management by Feffery A Liofer, Mary B. Prescotl, Fred R Mcfadden, 6th edition, Pearson Education.
3. Principles of distributed database systems, by M. Tamer & Valduriez, 2nd editon, LPE Pearson education.
4. Database system concepts by Avi Silberschatz, Henry F. Korth, S. Sudarshan, 7th edition, McGraw-Hill.

Useful Video links:

Unit No.	Topics	Links
Unit-I	Introduction to Database system	https://youtu.be/EUzsy3W4I0g?si=H8b7eQ9s0mJWPvuJ
	Normal Forms	https://www.youtube.com/watch?v=NfHGvgMi6rw
	Query Processing & Optimization	https://youtu.be/GYQZpYEaNvk?si=dspK0Tc2mpUJUREd
Unit-II	Transaction	https://www.youtube.com/watch?v=ldIbItnHX9o
	Recovery system	https://youtu.be/ltHM8ayAVcw?si=pP_cKlMp1Pm2kJJ1
	Concurrency control	https://youtu.be/abLIS6BX964?si=FJpQYN7jwNWkjp2u
Unit-III	Object Oriented Database	https://youtu.be/meWQLWq7QSE?si=cReJI6hLmChXjhAq
	Object Query Language	https://youtu.be/wBSzXEa70Wc?si=CTivuvw4xsAzPuFd
	Distributed database	https://youtu.be/aUyqZxn12sY?si=Vkdlq0ZimDdJ2w3F
Unit-IV	Introduction to Data Warehousing	https://www.youtube.com/watch?v=m-aKj5ovDfg
	Object relational database	https://youtu.be/aUyqZxn12sY?si=Vkdlq0ZimDdJ2w3F

Course Code	**PCC-MTCSE-107A**				
Category	Professional Core Courses				
Course Title	**Data Warehouse and Mining**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I**
	4	0	0	**4**	
Course Objectives	The objectives of this course are • To introduce students to the terminology, concepts and applications of data warehousing. • To teach students the basics of various approaches & techniques such as association rule mining and classification used in the data mining. • To explain OLAP techniques for multidimensional data analysis to facilitate interactive decision support. • To provide knowledge of clustering algorithms and web data mining methods to extract patterns from large datasets and web content.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Define the fundamental concepts, and terminologies related to data warehousing, data mining, classification, and clustering methods.	Level 1: Remember
CO2	Explain the principles and methodologies of data warehousing, data mining.	Level 2: Understand
CO3	Implement data warehousing and data mining algorithms in real-world scenarios.	Level 3: Apply
CO4	Analyze complex data mining problems, compare different algorithms and methods for data warehousing and data mining.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Data warehousing: Introduction, Operational data stores, ETL, Data warehouses – design guidelines for data warehouse implementation, Data warehouse metadata; OLAP – introduction, Characteristics, Multidimensional view and data cube, Data cube operations.

Unit-II

Data mining: Introduction, association rules mining, Naive algorithm, Apriori algorithm, direct hashing and pruning (DHP), Dynamic Item set counting (DIC), Mining frequent pattern without candidate generation (FP, growth), performance evaluation of algorithms.

Unit-III

Classification: Introduction, decision tree, tree induction algorithm – split algorithm based on information theory, split algorithm based on Gini index, naïve Bayes method, estimating predictive accuracy of classification method, classification software, software for association rule mining; case study, KDD Insurance Risk Assessment.

Unit-IV

Cluster analysis: Introduction, partitional methods, hierarchical methods, and density-based methods, dealing with large databases, cluster software.

Web Data Mining: Web Terminology and Characteristics, Locality and Hierarchy in the web, Web Content Mining, Web Usage Mining, Web Structure Mining, Web mining Software.

Suggested Readings:

1. Data mining concepts and techniques by Han J., Kamber M. and Pei J., Morgan Kaufmann Publishers (2011) 3rd ed.
2. Data Mining by Pudi V., Krishana P.R., Oxford University press (2009), 1st ed.
3. Data mining by Adriaans P., Zantinge D., Pearson education press (1996), 1st ed.
4. Data Warehousing Fundamentals by Pooniah P., Wiley-Interscience Publication, (2001), 1st ed.

Useful Video links:

Unit No.	Topics	Links
Unit-I	Data warehousing: Introduction, ETL	https://youtu.be/m-aKj5ovDfg?feature=shared
	OLAP	https://youtu.be/G4NYQox4n2g
Unit-II	Introduction to Data mining	https://youtu.be/ykZ-_UGcYWg?feature=shared
	Association rules mining	https://youtu.be/N_whCVtfL9M?feature=shared
Unit-III	Classification: Introduction	https://youtu.be/VsYKqOokgaE?feature=shared
	Decision Tree	https://youtu.be/4l4_BREP6ZI?feature=shared
	Naïve Bayes Method	https://youtu.be/jMS9OKsz9DE?si=LUj-V0wKWyd-KYGg
Unit-IV	Cluster analysis	https://youtu.be/9OjRP0ZLKkk?feature=shared
	Hierarchical Clustering analysis	https://youtu.be/Ot44DnL7V60?si=4N_CBibs_1czBPY2
	Density-based methods	https://youtu.be/AxARUMZh0sk?si=UFAcoGjCkmurkO-l

Course Code	**PCC-MTCSE-109A**				
Category	Professional Core Courses				
Course Title	**Mathematical Foundation of Computer Science**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I**
	4	0	0	**4**	
Course Objectives	The objectives of this course are • To explain the fundamentals of DFA, NFA, and their equivalence, along with Mealy and Moore machines for language recognition. • To introduce the students to context-free grammars, CFLs, and the role of pushdown automata in language parsing. • To understand Turing machines, decidability, and the limits of computation, including the Halting Problem. • To explore undecidable problems, primitive recursive functions, and the Church-Turing Thesis in computation.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Define the fundamentals of automata, formal languages, turing machines, reducibility and computability used in formal language theory.	Level 1: Remember
CO2	Explain the basic concepts and properties of finite automata, formal languages, and Turing machines.	Level 2: Understand
CO3	Apply the concepts of automata machines and models to solve language recognition problems.	Level 3: Apply
CO4	Analyze formal languages, computational models, and the decidability of computational problems, with an understanding of their theoretical and practical implications in computer science.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Regular Languages: Finite automata, DFA, NFA, Equivalence of DFA & NFA, an application Mealy and Moore Models, Regular expressions and languages.
Context free languages (CFL): CFGs, Applications, Ambiguity removal, CNF, GNF.

Unit-II

Push Down Automata: Basics of push down automata (PDA), Acceptance by PDA, PDA and CFL, Parsing and PDA: Top Down Parsing and Bottom up Parsing.

Unit-III

Turing Machine: Turing machines, variants of TMs, Restricted TMs, TMs and Computers.
Decidability: Decidable languages, decidable problems concerning Context free languages, the halting problem, halting problem is undecidable.

Unit-IV

Reducibility and Computability: Undecidable problems from language theory–Regular expressions, Turing machines, Reduction. A simple undecidable problem (PCP), Primitive recursive functions, tractable decision problems, theory of Optimization, Church- Turing Thesis.

Suggested Readings:

1. Introduction to Theory of Computation by Michael Sipser (Thomson Nrools/Cole).
2. Introduction to Automata Theory, Languages and Computations by J.E. Hopcroft, Rajeev Motwani & J.D. Ullman (Pearson Education Asia), 2nd Edition.
3. Theory of Computation by Peter Linz, Prentice Hall of India.
4. Introduction to languages and theory of computation by John C. Martin, McGraw-Hill Higher Education.

Useful Video links:

Unit No.	Topics	Links
Unit-I	Basics of Automata	https://www.youtube.com/watch?v=dVDUcuWPixU
	Equivalence of NFA and DFA	https://www.youtube.com/watch?v=CEqRyV32yBo
	Equivalence of Regular Expression and DFA Througha GNFA	https://www.youtube.com/watch?v=QTdVvyDUtdk
Unit-II	Context Free Grammars and Push Down Automata	https://www.youtube.com/watch?v=aXkvu1d3Xfk
	Pumping Lemma for Context Free Languages	https://www.youtube.com/watch?v=AbCMVqbd8fo
Unit-III	Turing Recognizable &Decidable Languages and TM Examples	https://www.youtube.com/watch?v=t9eGtSOVjPk
	Church-Turing Thesis	https://www.youtube.com/watch?v=yIim-rT7jKY
Unit-IV	Decidable Problems Concerning Regular Languages	https://www.youtube.com/watch?v=WiAVpj9uumU
	Proving Undecidability Using Reductions	https://www.youtube.com/watch?v=0niOxXMi4ME
	Co-Turing Recognizability	https://www.youtube.com/watch?v=KvImCxmvvAM

Course code	**LC-MTCSE-111A**				
Category	Lab Course				
Course title	**Advanced Operating Systems Lab**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I**
	0	0	2	1	
Course Objectives	The objectives of this course are ● To introduce process management techniques such as process creation, scheduling, and inter-process communication using system calls and synchronization mechanisms to the students. ● To describe synchronization methods like semaphores to resolve concurrency issues and ensure safe resource access. ● To provide knowledge about process scheduling algorithms (Round Robin, SJF, FCFS, Priority) for efficient CPU time management. ● To enable students to simulate deadlock handling techniques (Banker's Algorithm) and implement memory and file allocation policies for efficient system resource management.				
Course Pre-requisite	Knowledge of C language needed				
Assessment	25 Marks				
End Semester Practical Examination	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Understand the advanced concepts of operating systems.	Level 2: Understand
CO2	Apply Scheduling algorithms, file allocation techniques, memory management techniques such as paging and demonstrate process creation.	Level 3: Apply
CO3	Solve classic synchronization problems like Producer-Consumer using semaphores to manage concurrency.	Level 3: Apply
CO4	Analyze banker's algorithm for deadlock avoidance and prevention.	Level 4: Analyze

List of Experiments:

Sr. No.	Content
1	Study advanced concepts of operating systems.
2	Write a C program to implement the Round Robin scheduling algorithm.
3	Write a C program to implement the Shortest Job First (SJF) scheduling algorithm.
4	Write a C program to implement the First Come First Served (FCFS) scheduling algorithm.
5	Write a C program to implement the Priority-based scheduling algorithm.

6	Write a C program to implement the sequential file allocation technique.
7	Write a C program to implement the indexed file allocation technique.
8	Write a C program to implement the linked file allocation technique.
9	Write a C program to implement memory management using paging.
10	Write a C program to demonstrate process creation using the fork() system call.
11	Write a C program to solve the producer-consumer problem using semaphores.
12	Write a program to simulate the Banker's algorithm for deadlock avoidance.

Note: At least 10 experiments are to be performed by the students. Faculty member can add 2-3 extra experiment under topic beyond syllabus.

Course code	**LC-MTCSE-113A**				
Category	Lab Course				
Course title	**Advanced Database Management System Lab**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I**
	0	0	2	1	
Course Objectives	The objectives of this course are • To enable students to create, modify, and describe tables, and understand SQL syntax for effective database schema design and management. • To develop skills in inserting, updating, and retrieving data using advanced SQL queries, including logical and comparison operators. • To understand the use of SQL set operations, indexes, views, sequences, synonyms, save points, and PL/SQL triggers to enhance database functionality and performance. • To impart knowledge in implementing parallel databases in SQL to optimize performance in large-scale database environments.				
Course Pre-requisite	**Database Management System Lab**				
Assessment	25 Marks				
End Semester Practical Examination	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	**Skill Demonstrated**	**RBT Level**
CO1	Explain fundamental SQL commands to create, describe, and manage database tables.	Level 2: Understand
CO2	Apply SQL queries to create and manipulate tables and implement its advanced features.	Level 3: Apply
CO3	Demonstrate transaction control commands and apply DELETE and DROP operations to manage data and maintain database integrity.	Level 3: Apply
CO4	Analyze triggers in PL/SQL to automate database operations and enforce business rules, ensuring data consistency and process efficiency.	Level 4: Analyze

List of Experiments:

Sr. No.	**Content**
1	To Study SQL and their Commands.
2	Write a program to Create a table using SQL and Describe Table.
3	Write a program to Insert values in a table using SQL and retrieve their values.
4	Write a program to Create a Table in SQL and Apply Logical Operators Using Where Clause.
5	Write a program to Create an SQL query that uses a comparison operator.
6	Write a program to Create an SQL query that performs a SET operation.
7	Write a program to modify the structure of a table.

8	Write a program to Create an SQL query to update specific values in a table.
9	Write a program to Create an SQL query for managing indexes, views, sequences and synonyms.
10	Write a program to Create an SQL query that applies the DELETE and DROP commands.
11	Write a program in SQL to implement transaction control commands.
12	Analyse the use of Triggers in PL/SQL.

Note: At least 10 experiments are to be performed by the students. Faculty member can add 2-3 extra experiment under topic beyond syllabus.

Course Code	**SM-MT-115A**				
Category	Seminar				
Course Title	**Seminar-I**				
Scheme and Credits	L	T	P	**Credits**	**Semester-I**
	0	0	2	**2**	
Course Objectives	The objectives of this course are • To develop students' ability to effectively present research topics and findings by effective communication. • To improve problem-solving and critical thinking skills of the students. • To expose students to the latest trends and advancements by reviewing and discussing contemporary research.				
Assessment	50 Marks				
End Semester Examination	-				
Total	50 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated
CO1	Identify the trends and advancements in the related field.
CO2	Analyze and synthesize research literature with in-depth reviews of key studies and methodologies.
CO3	Undertake problem identification, formulation, proposing solution and analyze the impact on society, economy and environment.
CO4	Prepare a well-organized report employing elements of effective communication and critical thinking.
CO5	Demonstrate a sound technical knowledge of their research field.

Overview:

This is a course designed to help M.Tech students develop research presentation skills. The focus is on selecting a topic or research paper relevant to their specialization, conducting an in-depth review, and effectively presenting the research findings.

General Guidelines:

Topic Selection	Each student is required to choose the research topic based on published review paper(s) or literature related to their relevant field. The same topic cannot be selected by multiple students.
Approval Process	The selected paper or topic must be approved by the faculty members/committee appointed by the Head of Department.
Presentation Guidelines	Each student will have 30-40 minutes for their presentation, followed by 5 minutes for Q&A.
Evaluation	The presentation will be evaluated by a committee constituted by the Head of Department. The evaluation will be based on:

Parameters for the Evaluation of Seminar

Sr. No.	Parameters	Marks Allotted	Relevant COs
1	Clarity of the topic	10	CO1
2	Literature Survey	10	CO2
3	Content Relevancy	10	CO3
4	Presentation Skills	10	CO4
5	Q&A Response	10	CO5

GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

Scheme of Studies and Examination

M.Tech (Computer Science & Engineering) – 2nd Semester

w.e.f. 2024-25

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Load Per Week	Credits	Examination Scheme (Marks)				Exam Duration in H
				Lecture (L)	Tutorial (T)	Practical (P)			Assessment	End Semester Examination		Total	
										Theory	Practical		
1	Professional Core Courses	PCC-MTCSE-102A	Soft Computing	4	0	0	4	4	40	60		100	3
2	Professional Core Courses	PCC- MTCSE-104A	Algorithm Design	4	0	0	4	4	40	60		100	3
3	Professional Elective Courses	Refer Table-I	.....	4	0	0	4	4	40	60		100	3
4	Multidisciplinary Open Elective Courses	Refer Table-II	.....	3	0	0	3	3	40	60		100	3
5	Foundation Elective Courses	Refer Table-III	.....	3	0	0	3	3	40	60		100	3
6	Lab Course	LC-MTCSE-106A	Soft Computing Lab	0	0	2	2	1	25		25	50	3
7	Lab Course	LC-MTCSE-108A	Algorithm Design Lab	0	0	2	2	1	25		25	50	3
8	Seminar	SM-MT-110A	Seminar-II	0	0	2	2	2	50			50	
Total Credits								**22**				**650**	

Course Code	**PCC-MTCSE-102A**				
Category	Professional Core Courses				
Course Title	**Soft Computing**				
Scheme and Credits	L	T	P	**Credits**	**Semester-II**
	4	0	0	**4**	
Course Objectives	The objectives of this course are • To explain the fundamentals of neural networks, their biological foundations, and mathematical models to the students. • To develop students' skills to design and implement neural network models, including supervised, unsupervised, and reinforcement learning. • To provide insights about fuzzy logic, including fuzzy sets, membership functions, and rule generation for uncertain data to the students. • To enhance students' ability to use fuzzy arithmetic operations to solve real-world problems involving uncertainty and imprecision. • To enable students to apply fuzzy logic to manage uncertainty and process imprecise data for decision-making and problem-solving.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Define the fundamental concepts of Artificial Neural Networks and Fuzzy Logic.	Level 1: Remember
CO2	Understand the basic concepts of Artificial Neural Networks and Fuzzy Logic.	Level 2: Understand
CO3	Apply Artificial Neural Networks algorithms, fuzzy logic concepts and techniques in control systems and decision making.	Level 3: Apply
CO4	Analyze complex systems using ANN and fuzzy logic to handle uncertainty and improve decision-making in dynamic environments.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Neural Networks: History, Overview of Biological Neuro-System, Mathematical Models of Neurons, ANN architecture, Learning rules, Gradient Descent Algorithm, Learning Paradigms-Supervised, Unsupervised and Reinforcement Learning, ANN Training Algorithms-Perceptron's, Training Rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

Unit-II

Fuzzy Logic: Introduction to fuzzy Logic, Classical and Fuzzy Sets, Overview of Classical Sets, Mem**be**rship Function, Fuzzy Rule generation. Operations on Fuzzy Sets: Compliment, Intersection, Union, Combination of Operations, Aggregation Operation.

Unit-III

Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations, Classical Logic, Multi-Valued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges.

Unit-IV

Uncertainty Based Information: Information & Uncertainty, Non specificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets.

Suggested Readings:

1. Principles of Soft Computing by Dr. S. N. Sivanandam and Dr. S. N. Deepa, Wiley.
2. Fuzzy Logic & Fuzzy Sets by Klir & Yuan, Pearson.
3. Neural Networks by Simon Haykin, Pearson College Div.
4. Neural Networks: A Classroom Approach by Satish Kumar, McGraw Hill.

Useful Video links:

Unit No.	Topics	Links
Unit-I	Introduction to Artificial Neural Networks	https://youtu.be/xbYgKoG4x2g?si=EhUFZFGB9eTJ0iYV
	Associative memory	https://youtu.be/Ccrw9L1DK4g?si=Y4IJMVdAVJDPqHwy
	Interval, fuzzy numbers	https://youtu.be/6daiRieEQlU?si=3_UhZC0YUuZcQHaw
Unit-II	Fuzzy Sets, Logic and Systems & Applications	https://youtu.be/JrRWdPvG7yk?si=eZRj_P4YjfO-MWka
	Membership Functions	https://youtu.be/EnQcgob2NUM?si=nC7XkleChQdEBHHW
	Set Theoretic Operation On Fuzzy	https://youtu.be/1m4KSMsjdaM?si=5pi7tKXgvBodPYRG
Unit-III	Arithmetic Operations on Fuzzy Numbers	https://youtu.be/PIvxnE2S_tE?si=fN_W9-6858Dg_oH5
	Complement of Fuzzy Sets	https://youtu.be/wUPJon6oXEo?si=PN0-D37aqqsHtXO7
	Fuzzy Relation	https://youtu.be/8Y_QreQ7VC4?si=uo7FZBM1lhZiSXTg
Unit-IV	Operations on Crisp and Fuzzy Relations	https://youtu.be/dKSVecDUUI8?si=hQzRV5pIhHX4nCYs
	Reasoning under Uncertainty	https://www.youtube.com/watch?v=1lKsSiEsJ18

Course Code	**PCC-MTCSE-104A**				
Category	Professional Core Courses				
Course Title	**Algorithm Design**				
Scheme and Credits	L	T	P	**Credits**	**Semester-II**
	4	0	0	**4**	
Course Objectives	The objectives of this course are • To familiarize students to the database architecture, relational models, SQL, and normalization for efficient database design. • To introduce query evaluation, optimization strategies, and techniques for improving query execution to the students. • To provide knowledge about transaction management, recovery techniques, and concurrency control for data integrity and system reliability to the students. • To explain object-oriented database concepts and distributed DBMS for scalable data management.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Define the key concepts of data structures, algorithm design, NP-Hard problems, parallel algorithms and approximation techniques.	Level 1: Remember
CO2	Understand the principles and applications of data structures, algorithm design techniques, optimization methods, NP-Hard problems and parallel algorithms.	Level 2: Understand
CO3	Apply data structures, algorithmic strategies, and optimization techniques to solve real-world problems.	Level 3: Apply
CO4	Analyze and evaluate the performance of algorithms and data structures, and make informed decisions on their suitability for solving complex problems.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Foundation & Data Structure: Foundation & Elementary Data Structure: Algorithms, Performance analysis: Space & time complexity, Growth of functions, Divide & Conquer, Recurrence Equations, Basic elements of data structure like Stacks & Queues, Trees, Graphs, Linked List, Sorting & Order statistics. Data Structure: Dynamic sets & searching: Introduction, Array doubling, Amortized time analysis, R-B trees, Hashing, Dynamic equivalence relations & Union-Find programs, Priority queues with a decrease key operation. Graph & graph traversals: DFS, strongly connected components, Bi-connected components.

Unit-II

Advanced Design & Analysis Techniques: Greedy & Dynamic Method: General methods, Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Optimal merge patters, Single-source shortest path, 0/1 Knapsack, Multistage graphs, All-pair shortest path, Optimal binary search trees, Travelling salesperson problem, Flow shop scheduling. Backtracking & Branch and Bound: General methods, 8 Queens problem, Sum of subsets, Graph coloring, Hamiltonian cycles, Knapsack problem, Travelling salesperson problem, Efficiency consideration.

Unit-III

NP-Hard & NP-Complete Problems: Basic concepts, Cook's Theorem, NP-hard graph problem, NP-Hard scheduling problems. String Matching: Introduction, A straight forward solution, The Knuth-Morris-Pratt algorithm, The Boyer-Moore algorithm, approximate string matching.

Unit-IV

Parallel Algorithms: Introduction, Parallelism, The PRAM, and other models, some simple PRAM algorithms, Handling write conflicts, Merge and Sorting, Finding connected components. Approximation algorithms: Introduction, Absolute approximations, ϵ- approximations, Polynomial time approximation schemes, Fully Polynomial time approximations schemes.

Suggested Readings:

1. Computer Algorithms: Introduction to design and analysis (3rdedition) by Sara Baase and Allen Van Gelder, Pearson, 2000.
2. Fundamentals of Algorithms by Gilles Brassard and Paul Bratley, Prentice Hall (1996).
3. Design and Analysis of Algorithms (Computer science Series) by Jeffrey D. Smith Publications.
4. Fundamentals of Computer algorithms, Ellis Horowitz and SratajSahnim 1978, Galgotia Publications.
5. Algorithms Design (PIE) by Eva Tardos and Jon Klienberg, person, Pearson Publications.
6. Introduction to Algorithms, Thomas h Cormen, Harles E leiserson and Ronald Lrivest: 1990, TMH.

Useful Video links:

Unit No.	Topics	Links
Unit-I	Performance analysis: Space complexity	https://youtu.be/FSfsl7xiQBg?si=CuapTVdXhUCO29Xe
	R-B trees	https://www.youtube.com/watch?v=8Y5kheRDAhw
	DFS	https://www.youtube.com/watch?v=CIm6RzdoPCI
Unit-II	Sum of Subset, Knapsack Problem	https://www.youtube.com/watch?v=yDjadhjQ3eE
	Travelling salesperson problem	https://www.youtube.com/watch?v=-cLsEHP0qt0&t=16s
	8 Queens problem	https://youtu.be/FQWTa3XjyWg?si=giNKRtJp0rU8Z3Jj
Unit-III	NP Complete Problem	https://youtu.be/qpCvPS-WwGA?feature=shared
	The Knuth-Morris-Pratt algorithm	https://www.youtube.com/watch?v=NeVqZ5YFmgs&t=6s
Unit-IV	PRAM Algorithm	https://youtu.be/gaJjpBKeYgo?feature=shared
	Approximation algorithms	https://www.youtube.com/watch?v=Dd0XNsAkkqE

Course code	**LC-MTCSE-106A**				
Category	Lab Course				
Course title	**Soft Computing Lab**				
Scheme and Credits	L	T	P	**Credits**	**Semester-II**
	0	0	2	1	
Course Objectives	The objectives of this course are • To enable students to master fuzzy set operations (union, intersection, complement) and apply De Morgan's laws to solve real-world problems. • To expose students to FIS using MATLAB's FIS Editor for applications like predicting tip values based on quality and service. • To introduce students to McCulloch-Pitts neurons to solve logical functions (AND, ANDNOT, XOR) and explore multi-layer networks for non-linear problems. • To introduce and test Hopfield networks for storing and retrieving patterns, handling noisy or incomplete input data.				
Course Pre-requisite	MATLAB				
Assessment	25 Marks				
End Semester Practical Examination	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Understand the fundamental concepts of fuzzy logic, neural networks, and their applications.	Level 2: Understand
CO2	Apply fuzzy logic principles to implement real-world problem-solving systems.	Level 3: Apply
CO3	Apply neural network models for problem solving.	Level 3: Apply
CO4	Analyze hetero-associative neural net and auto-associative net for problem solving.	Level 4: Analyze

List of Experiments:

Sr. No.	Content
1	Study fuzzy logic, neural networks, and their applications.
2	Write a program to perform Union, Intersection and Complement operations.
3	Write a program to implement De- Morgan's Law.
4	Write a program to plot various membership functions.
5	Write a program to implement FIS Editor. Use Fuzzy toolbox to model tip value that is given after a dinner based on quality and service.
6	Write a program to generate AND, NOT function using McCulloch-Pitts neural net.

7	Write a program to generate XOR function using McCulloch-Pitts neural net.
8	Write a program to apply Hebb network to classify two dimensional input patterns in bipolar with given targets.
9	Write a program to implement Perceptron network for an AND function with bipolar inputs and targets.
10	Write a program to store the vector, find the weight matrix with no self-connection. Test this using a discrete Hopfield net.
11	Write a program to calculate the weights for given patterns using hetero-associative neural net.

Note: At least 10 experiments are to be performed by the students. Faculty member can add 2-3 extra experiment under topic beyond syllabus.

Category	**LC-MTCSE-108A**				
Course title	**Algorithm Design Lab**				
Scheme and Credits	L	T	P	**Credits**	**Semester-II**
	0	0	2	1	
Course Objectives	The objectives of this course are • To implement sorting algorithms using Divide & Conquer techniques, such as Quick Sort and Merge Sort, in C++. • To solve shortest path problems by implementing algorithms like Floyd-Warshall and Dijkstra's Algorithm in C++. • To explore optimization and problem-solving strategies by applying algorithms such as the Greedy approach for the Knapsack Problem, Prim's Algorithm for Minimum Spanning Tree, and Dynamic Programming for the Travelling Sales Problem in C++. • To practice problem-solving with recursive and backtracking techniques by implementing solutions for the Tower of Hanoi, N Queen Problem, Sum of Subsets, and connected graph checks, as well as tree operations in B-Trees in C++.				
Course Pre-requisite	**C++ Lab**				
Assessment	25 Marks				
End Semester Practical Examination	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Understand the fundamental concepts of sorting algorithms and optimization techniques using the Divide and Conquer paradigm.	Level 1: Remember
CO2	Apply advanced algorithmic techniques, such as Dynamic Programming, Greedy Algorithms, and Backtracking to effectively solve complex computational problems.	Level 2: Understand
CO3	Implement advanced data structures concepts and algorithms for solving problems using.	Level 3: Apply
CO4	Analyze algorithms for graph connectivity for solving complex computational problems.	Level 4: Analyze

List of Experiments:

Sr. No.	Content
1	Write a C++ Program to perform Quick Sort using Divide & Conquer Technique.
2	Write a C++ Program to perform Merge Sort using Divide & Conquer Technique
3	Write a C++ Program to solve the Knapsack Problem using Greedy Approach
4	Write a C++ Program to solve Travelling Sales Problem using the Dynamic Programming Approach.

5	Write a C++ Program for Sum of Subsets Problem using Back Tracking.
6	Write a C++ Program to find solution of N Queen Problem using Backtracking
7	Write a C++ Program to find all the Shortest Path using Floyd-Warshall Algorithm
8	Write a C++ Program to find the Minimum Spanning Tree using Prim's Algorithm.
9	Write a Program to implement insertion and deletion operations in B-Tree.
10	Write a Program to implement the tower of Hanoi problem using recursion.
11	Write a C++ Program for Shortest Path using Dijkstra's Algorithm.
12	Write a Program to Check whether a given graph is connected or not using the DFS method.

Note: At least 10 experiments are to be performed by the students. Faculty member can add 2-3 extra experiment under topic beyond syllabus.

Course Code	**SM-MT-110A**				
Category	Seminar				
Course Title	**Seminar-II**				
Scheme and Credits	L	T	P	**Credits**	**Semester-II**
	0	0	2	**2**	
Course Objectives	The objectives of this course are • To develop students' ability to effectively present research topics and findings by effective communication. • To improve problem-solving and critical thinking skills of the students. • To expose students to the latest trends and advancements by reviewing and discussing contemporary research.				
Assessment	50 Marks				
End Semester Examination	-				
Total	50 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated
CO1	Identify the trends and advancements in the related field.
CO2	Analyze and synthesize research literature with in-depth reviews of key studies and methodologies.
CO3	Undertake problem identification, formulation, proposing solution and analyze the impact on society, economy and environment.
CO4	Prepare a well-organized report employing elements of effective communication and critical thinking.
CO5	Demonstrate a sound technical knowledge of their research field.

Overview:

This is a course designed to help M. Tech students develop research presentation skills. The focus is on selecting a topic or research paper relevant to their specialization, conducting an in-depth review, and effectively presenting the research findings.

General Guidelines:

Topic Selection	Each student is required to choose the research topic based on published review paper(s) or literature related to their relevant field. The same topic cannot be selected by multiple students.
Approval Process	The selected paper or topic must be approved by the faculty members/committee appointed by the Head of Department.
Presentation Guidelines	Each student will have 30-40 minutes for their presentation, followed by 5 minutes for Q&A.
Evaluation	The presentation will be evaluated by a committee constituted by the Head of Department. The evaluation will be based on:

Parameters for the Evaluation of Seminar:

Sr. No.	Parameters	Marks Allotted	Relevant COs
1	Clarity of the topic	10	CO1
2	Literature Survey	10	CO2
3	Content Relevancy	10	CO3
4	Presentation Skills	10	CO4
5	Q&A Response	10	CO5

Course Code	**PEC-MTCSE-112A**				
Category	Professional Elective Courses				
Course Title	**Mobile and Wireless Communication**				
Scheme and Credits	L	T	P	**Credits**	**Semester-II**
	4	0	0	**4**	
Course Objectives	The objectives of this course are • To introduce the key principles of wireless transmission, modulation techniques, and multiple access methods used in modern telecommunication systems. • To enable students to examine the architecture and protocols of satellite systems, WLANs, and Bluetooth to design efficient, secure, and scalable wireless networks. • To explain explore mobile networking concepts such as Mobile IP, ad-hoc routing, and mobility management to address the challenges of connectivity in dynamic environments. • To impart knowledge to the students about transport layer protocols (TCP variants) and application protocols for mobile systems, ensuring reliable, low-latency communication in wireless networks.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Define the fundamentals of mobile and wireless communication.	Level 1: Remember
CO2	Understand the basic concepts of mobile and wireless communication.	Level 2: Understand
CO3	Apply the concepts of wireless communication systems and mobile communication to solve data communication problems.	Level 3: Apply
CO4	Analyze wireless transmission systems, mobile communication, their architectures, and protocols for better data communication.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Application, history, market, reference model and overview, Wireless Transmission- Frequencies, signals, antennae, signal propagation, multiplexing, modulation, spread spectrum, cellular system.
MAC and Telecommunication System: Specialized MAC, SDMA, FDMA, TDMA – Fixed TDM, classical ALOHA, Slotted, ALOHA, CSMA, DAMA, PKMA, reservation TDMA. Collision avoidance, polling inhibit sense multiple access. CDMA, comparison, GSM-mobile services, architecture radio, interface, protocol, localization, calling handover, security, new data services, Introduction to WLL.

Unit-II

Satellite and Broadcast Systems: History, Applications, GEO, LEO, MEO, routing, localization, handover in satellite system, Digital audio and video broadcasting,
WIRELESS LAN: IEEE 802 11- System and protocol architecture, physical layer, MAC layered management, Bluetooth- User scenarios, physical layer, MAC Layer, networking, security and link management.

Unit-III

Mobile Network Layer: Mobile IP-goals, assumptions, requirement, entities, terminology, IP packet delivery, Agent advertisement and discovery, registration, tunnelling, encapsulation, optimization, reserve tunnelling, IPv6, DHCP, Adhoc Networks, Routing, destination sequence distance vector, dynamic source routing, hierarchical algorithm, algorithm, algorithm metric.

Unit-IV

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping; TCP, Mobile TCP fast retransmission, Transaction oriented TCP. Support for Mobility: File, system, WWW-HIT, HTML, system architecture, WAP-architecture, Wireless datagram, protocol, wireless transport layer security, wireless transaction protocol, application environment, and telephony application.

Suggested Readings:

1. Mobile Communication by Jochen Schiller, Pearson Education, 2002
2. Mobile Cellular Telecommunications by LEE, McGRAW-Hill, 2nd Edition.
3. Wireless Communications by Theodore S Rappaport, Pearsons.
4. Wireless and Mobile Communication by Upena Dalal & Manoj K. Shukla, Oxford University Press.

Useful Video links:

Unit No.	Topics	Links
Unit-I	Slotted ALOHA	https://youtu.be/6zv3vcqDj4s
	GSM and CDMA	https://youtu.be/bur9hq_abog
Unit-II	GEO, LEO, MEO	https://youtu.be/P0AXEXi5Xxs
	IEEE 802.11	https://youtu.be/QhKIaK4ReUA
Unit-III	IPV6	https://youtu.be/FkaFr3cpg6U
	Ad-hoc Networks	https://archive.nptel.ac.in/courses/106/105/106105160/
Unit-IV	Fast Retransmission	https://youtu.be/EU_5aVvmGTU?si=iu16Q27wA3nzzs0D

Course Code	**PEC-MTCSE-114A**				
Category	Professional Elective Courses				
Course Title	**Optimization Techniques**				
Scheme and Credits	L	T	P	**Credits**	**Semester-II**
	4	0	0	**4**	
Course Objectives	The objectives of this course are • To explain the core concepts of Operating Systems, including process management, synchronization, scheduling, and deadlock handling for efficient execution. • To explore memory management techniques like swapping, virtual memory, and page replacement to optimize system resources. • To introduce students to the principles of file system and I/O management, including file structures, device drivers, and disk scheduling. • To familiarize students with Windows OS internals and tools like the registry, process/thread management, and WMI to manage system resources and automate tasks.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Define the concepts of linear/non-linear programming, transportation, assignment, reliability, and queuing models.	Level 1: Remember
CO2	Explain problem-solving methodologies for optimization, reliability, and queuing systems.	Level 2: Understand
CO3	Apply optimization techniques, to solve real-world decision-making and resource allocation problems.	Level 3: Apply
CO4	Analyze and evaluate optimization, reliability, and queuing models for efficient decision-making.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Linear Programming: Simplex Method, Big M-Method, Duality in Linear Programming, Sensitivity Analysis, Revised Simplex Method, Two-Phase Simplex Method, Dual Simplex Method. Integer Linear Programming: Branch and Bound Algorithms, Gomory Cutting Plane Method.

Unit-II

Transportation Problems: Types of Transportation Problems, Mathematical Models, Transportation Algorithms. Assignments: Definition, Differences between Transportation and Assignment Models, Representation

Assignment Problem as Transportation Problem and as Linear Programming, Assignment Algorithm -Hungarian Method.

Unit-III

Non-Linear Programming: Classical optimization Techniques, NLP with constraints: Graphical Solution, Multivariable Optimization with Equality constraints (Lagrange Multipliers Method), with inequality constraints-Kuhn-Tucker conditions, Quadratic Programming and Separable Programming: Standard form, Wolf's Method, Beale's Method, Search Method for Unconstrained Non-Linear Programming Problems.

Unit-IV

Reliability: Basic concepts, conditional failure rate function, Failure time distributions, certain life Models, Reliability of a system in terms of the reliability of its components, series system, parallel system. Queuing Theory: Introduction, elements or Parameters of Queuing system, Steady state Balance Equation, Kendall's Notation for Representing Queuing /N/FCFS) Finite ∞ Models, Model!: Single server Model(M/M/1/∞/∞/FCFS), Model 2:M/M/1/ Capacity Queue System, Model3:Multi-server Model, Model4: Machine Servicing Model.

Suggested Readings:

1. Optimization Techniques by C. Mohan and Kusum Deep, New Age International.
2. Operations Research by K. Rajagopal, PHI, India.
3. Reliability Engineering by K K Aggarwal, Springer.
4. Operations Research: An Introduction by Taha H.A, Pearson.
5. Linear Programming and Network Flows by Mokhtar S. Bazaraa, John J. Jarvis, and Hanif D. Sherali, Wiley.
6. Reliability Engineering by Elsayed A. Elsayed. Wiley.
7. Fundamentals of Queuing Theory by Donald Gross, John F. Shortle, James M. Thompson, and Carl M. Harris, Wiley.

Useful Video links:

Unit No.	Topics	Links
Unit-I	Operation Research	https://onlinecourses.nptel.ac.in/noc24_ma55/preview
	Linear Programming	https://www.nptelvideos.com/lecture.php?id=14985
Unit-II	Dual of the transportation problem and the optimality of the MODI method	https://www.youtube.com/watch?v=-tIfLz3Vsuk
	Hungarian Algorithm	https://www.youtube.com/watch?v=BUGIhEecipE
Unit-III	Non linear Programming	https://archive.nptel.ac.in/courses/111/107/111107104/
	Dynamic Programming	https://www.youtube.com/watch?v=qa9fnsdY0A8&t=1s
Unit-IV	Introduction to Queueing Theory	https://www.youtube.com/watch?v=4H9dMn919cs
	Birth-Death Queues: General Theory, M/M/1 Queues and their Steady State Solution	https://www.youtube.com/watch?v=AOcCMi7SPqM

Course Code	**PEC-MTCSE-116A**				
Category	Professional Elective Courses				
Course Title	**Discrete Mathematics**				
Scheme and Credits	L	T	P	**Credits**	**Semester-II**
	4	0	0	**4**	
Course Objectives	The objectives of this course are • To enable students to evaluate and simplify propositions and predicates, and use inference rules for valid reasoning. • To introduce students to expressions, design circuits, and solve logical problems. • To provide knowledge to the students about graph theory problems including traversal, shortest paths, and spanning trees using relevant algorithms. • To explain formal languages and automata to model and solve computational problems using finite state machines and Turing machines.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Define the concepts in logic, Boolean algebra, graph theory, and formal languages.	Level 1: Remember
CO2	Explain the relationships between logical connectives, Boolean functions, graph algorithms, and formal languages.	Level 2: Understand
CO3	Apply logic, Boolean algebra, graph algorithms, and finite state machines to solve problems.	Level 3: Apply
CO4	Analyze and compare different algorithms, logical connectives, and Boolean functions for efficiency and applicability in various computational and real-world scenarios.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Propositions, Logical Connectives, Conditionals and Biconditionals, Tautologies, Logical Equivalences, Predicates, Quantifiers, Inference theory, Validity Probability, Information and Mutual Information.

Unit-II

Poset, Lattices, Principle of Duality, Basic Properties of Lattices, Some Special Lattices, Boolean Algebras, Identities of Boolean Algebra, Uniqueness of Finite Boolean Algebras, Boolean Functions and Boolean Expressions, Normal Forms, The Karnaugh Map method, Application of Boolean Algebra to Switching Circuits.

Unit-III

Introduction to Graphs, Types of Graphs, Representation of graphs, Paths and Circuits, Graph Traversals, Shortest Path in Weighted Graphs, Dijkstra Algorithm, Euler Graphs, Fleury's Algorithm, Hamiltonian Graphs, Travelling Salesman Problem, Planar Graphs, Kuratowski's Two Graph, Euler's Theorem, Colouring of Graphs, Transport Networks Trees, Rooted Trees, Representation of Algebraic Expressions by Binary Trees, Binary Search Trees, Spanning Trees and Cut-Sets, Minimum Spanning Tree, Kruskal's Algorithm, Prim's Algorithm.

Unit-IV

Languages, Phrase Structure Grammars, Types of Grammars and Languages, Finite State Machines, Equivalent Machines, Finite State Machines as Language Recognizers, Finite State Languages and Type-3 Languages, Turing Machine.

Suggested Readings:

1. Elements of Discrete Mathematics: A Computer Oriented Approach,by C. L. Liu and D. P.Mohapatra, McGraw Hill Education.
2. Discrete Mathematical Structures with Applications to Computer Science by J. P Tremblay and R. Manohar, Tata McGraw Hill Edition.
3. Mathematical Structures for Computer Science by J. L. Gersting, Computer Science Press, New York.
4. Discrete Mathematical Structures by B. Kolman, R. C. Busby and S Ross, PHI.
5. Discrete Mathematics by Babu Ram, Vinayak Publishers and Distributors, Delhi.
6. Discrete Mathematics by Semyour Lipschutz and Marc Lipson, Schaum's outline.
7. Discrete Mathematics by R.K. Bisht and H. S. Dhami, Oxford University Press.

Useful Video links:

Unit No.	Topics	Links
Unit-I	Propositional Logic	https://youtu.be/0uTE24o3q-o
	Conditionals and Biconditionals	https://youtu.be/bD-CUgfe-dA?feature=shared
Unit-II	Lattice Theory	https://youtu.be/QLIQpF9ENqk
	The Karnaugh Map method	https://youtu.be/EznCqZ1eh5Q
Unit-III	Graphs	https://youtu.be/Tm-VB6FsRvY?feature=shared
	Colouring of Graphs	https://youtu.be/kubJIJMOS8I
Unit-IV	Types of Grammars	https://youtu.be/-aIRqNnUvEg
	Turing Machine	https://youtu.be/IhyEGNn-7Uo

Course Code	**PEC-MTCSE-118A**				
Category	Professional Elective Courses				
Course Title	**Internet and Web Development**				
Scheme and Credits	L	T	P	**Credits**	**Semester-II**
	4	0	0	**4**	
Course Objectives	The objectives of this course are • To introduce students to Internet Protocols and Routing • To enhance students' expertise in Router Technology and Security • To expose students to Web Servers, Browsers, and HTTP/HTTPS • To enable students to develop Dynamic Websites Using Modern Web Technologies				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Define the fundamental concepts of internet protocols, web architecture, and web development.	Level 1: Remember
CO2	Understand the concepts of Internet, web design and the role of client-side and server-side technologies in web development.	Level 2: Understand
CO3	Apply the concepts of web design, internet, routing techniques, and web technologies to configure network environments and develop secure web-based systems.	Level 3: Apply
CO4	Analyze the architecture and functionality of routing protocols, web technologies, and website development tools to evaluate their effectiveness in implementing secure and dynamic web-based solutions.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Introduction: Internet protocols models, Internet addresses, IP Routing concepts, Table Driven and next hop routing, other routing related protocols, Internet Access through PPP, SLIP, and WWW.

Unit-II

Router technology: Hubs, Bridges, Routers, Routing Protocols, Routing security, Switch based routing, Routing in unicast environment, multicasting, mobile routing.

Unit-III

Web server and Browser: Web Servers (IIS/PWS & Apache), HTTP request types, system architecture, client-side scripting, accessing web servers, HTTP, secure HTTP, Secure Sockets Layer, WWW Proxies, Web Browser, Bookmarks, Cookies, Progress Indicators, Customization of Browsers, Browsing Tricks, Next Generation Web Browsing, Search Engines, Architecture of Search Engines, Search Tools, Web Crawlers.

Unit-IV

Website Development: DHTML, XHTML, AJAX, XM: Structuring data, XML namespaces, DTD and schemas, XML variables, DOM methods, simple API for XML, web services, and application of XML. Active Server Pages (ASP): How ASP works, ASP objects, file system, objects, ASP.NET

Suggested Readings:

1. Fundamentals of the Internet and the World Wide Web, Raymond Green Law and Ellen Hepp-2011, TMH.
2. Internet and World Wide Web Programming, Deitel, Deitel and Neito, 2000, Pearson Education.
3. Beginning XHTML by Frank Boumphrey, Ted Wugofski, Cassandra Greer, Dave Raggett, Jenny Raggett, Sebastian Schnitzenbaumer, Ted Wugoiski 2000, WROX Press (Indian Shroff Publication SPD)1st Edition.
4. Complete Reference Guide to Java Script, Aron Weiss, QUIE, 1977.
5. Intranet and Internet Engg., By Minoli.

Useful Video links:

Unit No.	Topics	Links
Unit-I	Internet protocol model	https://youtu.be/8BK70UDgyrc?si=ODJJXAaJF3t7fTbD
	Internet addresses	https://youtu.be/5vbPS-KnhvI?si=JGG1P8iQFJjM5QzQ
Unit-II	Routing Protocols	https://youtu.be/yQBuCHG5co0?si=SAmALWddxuOvDWJm
	Routers	https://youtu.be/9HgkQN7u7-8?si=4iSRIS7Y_7y2LMf2
Unit-III	Web Servers	https://www.youtube.com/watch?v=Adx2gP0RNDU
	Architecture of Search Engines	https://www.youtube.com/watch?v=JjywDlY1OJk&t=212s
	Web Crawlers	https://youtu.be/JjywDlY1OJk?si=D38xn2Q_GRzVueKP
Unit-IV	AJAX	https://www.youtube.com/watch?v=2QrLvmi0yhc
	XML	https://www.youtube.com/watch?v=8RK8FDTdLSc
	Active Server Pages	https://www.youtube.com/watch?v=CPPE6rpzJJc

Course Code	**OEC-152A**				
Category	Multidisciplinary Open Elective Courses				
Course Title	**Cyber Forensic and Security**				
Scheme and Credits	L	T	P	**Credits**	**Semester-II**
	3	0	0	**3**	
Course Objectives	The objectives of this course are • To understand the types of information systems and evaluate security threats to organizational assets. • Apply forensic techniques to protect data and identify vulnerabilities like spyware and adware. • To learn ethical hacking practices, including network, web, and password hacking techniques. • To gain proficiency in digital evidence handling and understand legal protocols and cyber laws, including the Information Technology Act 2000.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Define the fundamental concepts of information systems, cyber security and ethical hacking.	Level 1: Remember
CO2	Explain the principles and technologies of cyber security, ethical hacking and their role in protecting information systems.	Level 2: Understand
CO3	Apply the concepts and techniques of ethical hacking and cyber security to identify and mitigate vulnerabilities in computer systems and networks.	Level 3: Apply
CO4	Analyze cybercrimes, security standards and legal frameworks in the context of information technology and forensics.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Introduction to Information Systems: Types of information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Security Investigations. Security threats - Sources of security threats- Motives - Target Assets and vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats, Security Threats to E-Commerce, Cyber-crimes.

Unit-II

Cyber Forensics: Cyber Security, Cyber Security roles, Cyber Security Principles, Difference between information Security and Cyber Security, Types of Computer Forensics Technology, Types of Military Computer Forensic Technology, Types of Law Enforcement: Computer Forensic Technology, Types of Business Computer

Forensic Technology, Specialized Forensics Techniques, Hidden Data and How to Find It, Spyware and Adware, Encryption Methods and Vulnerabilities, Protecting Data from Being Compromised Internet Tracing Methods, Security and Wireless Technologies, Avoiding Pitfalls with Firewalls Biometric Security Systems.

Unit-III

Ethical Hacking: Essential Terminology, Hacking windows – Network hacking – Web hacking – Password hacking, Malware, Scanning, Cracking. Digital Evidence in Criminal Investigations: The Analog and Digital World, Training and Education in digital evidence, Evidence Collection and Data Seizure: Why Collect Evidence, Collection Options Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody, Reconstructing the Attack, The digital crime scene, Investigating Cybercrime, Duties Support Functions and Competencies.

Unit-IV

Cyber Crimes and Cyber Security Standards: Crime incident Handling Basics: Cyber activism, Tracking hackers, clues to cyber-crime, privacy act, search warrants, common terms, organizational roles, procedure for responding to incidents, reporting procedures, legal considerations, Information Technology Act 2000: Scope, jurisdiction, offense and contraventions, powers of police, adjudication, Intellectual property issues in cyberspace, ISO, Copyright Act, Patent Law, Cyber Laws in India..

Suggested Readings:

1. Cryptography and Information Security by V.K. Pachghare, PHI Learning Private Limited, India.
2. Computer Security: Principles and Practice by William Stallings and Lawrie Brown, Prentice Hall.
3. Ethical Decision making and IT: An Introduction with Cases by Earnest A. Kallman, J.P Grillo, McGraw Hill Publication.
4. Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions by Kenneth J. Knapp, IGI Global.
5. Principles of Information Security by Michael E. Whitman, Herbert J. Mattord, Cengage Learning Pub.
6. Computer Network Security by Joseph M Kizza, Springer Verlag.

Useful Video links:

Unit No.	Topics	Links
Unit-I	IT Revolution	https://www.youtube.com/watch?v=bwq74PuiH9o
	Internet Security Threats	https://www.youtube.com/watch?v=2tiZ89N4izc
	Authentication Based Attacks	https://www.youtube.com/watch?v=ch-7pCZZzUg
Unit-II	Cyber Security and Privacy	https://www.youtube.com/watch?v=ozsxJCM4BGs
	Cyber Security policy	https://youtu.be/snROvNy3wf8?si=tAdRHgxQ6guDOMPn
Unit-III	Introduction to Ethical Hacking	https://youtu.be/qswOrF2WPaw?si=XTqfXGwXglP3fEQz
	Man in The middle Attack	https://youtu.be/8_nP254d9aY?si=mgdMeAF9eoEMYcEx
Unit-IV	Security management Governance, risk and compliance	https://www.youtube.com/watch?v=1okOQCY6Bsk
	Cyber security technologies	https://www.youtube.com/watch?v=3rkIe2ZkkfY

Course Code	**OEC-154A**				
Category	Multidisciplinary Open Elective Courses				
Course Title	**Computer Science and Principles**				
Scheme and Credits	L	T	P	**Credits**	**Semester-II**
	3	0	0	**3**	
Course Objectives	The objectives of this course are • To master fundamental computing concepts including problem-solving, data representation, and abstraction. • To learn web development using HTML, CSS, and JavaScript to create interactive web pages. • To understand data mining techniques for extracting patterns and insights from large datasets. • To grasp networking and OS principles, including protocols, resource management, and system operations.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Define the fundamental concepts of computer science and engineering.	Level 1: Remember
CO2	Explain the principles and concepts of computer science.	Level 2: Understand
CO3	Apply the methods and techniques of computer science to solve engineering problems.	Level 3: Apply
CO4	Analyze network structures, web designing, operating systems and data mining techniques to identify problems and propose optimal solutions.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Fundamental of computer science and computational thinking: Logical reasoning, problem solving, data representation, processing of data, abstraction, managing complexity, operation of computers and networks, effective Web searching, ethical, legal and social aspects of information technology.

Unit-II

HTML and XTML basics: LIST – unordered list – nested and ordered list – Basic HTML Tables – Intermediate HTML table and Formatting – basic HTML Forms and Formatting – More Complex HTML Forms – Frameset Element – Nested Frameset. Style Sheets and Graphics: Introduction to Style sheets – Formatting Text by Using Style Sheets – Formatting Paragraphs by Using Style Sheets, Java Script Basics.

Unit-III

Data Mining: Introduction, Motivation, Importance, Knowledge Discovery Process, KDD and Data Mining, Data Mining vs. Query Tools, Kind of Data mining, kind of data, Functionalities, interesting patterns, Classification of data mining systems, Major issues, from Data warehousing to data Mining.

Unit-IV

Computer Networks: Network fundamentals, Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN), Wireless Networks, Inter Networks. Reference Models: The OSI model, TCP/IP model. Operating Systems: Main functions of operating systems. Multi Programming, multiprocessing, and multitasking. Deadlock and CPU scheduling algorithms.

Suggested Readings:

1. Blown To Bits: Your Life, Liberty and Happiness After the Digital Explosion by Hal Abelson, Ken Leeden and Harry Lewis, 2010.
2. HTML & CSS: The Complete Reference by Thomas A. Powell, Osborne Media; 5th Edition, 2010.
3. Data mining: a knowledge, discovery approach by Krzysztof J. Cios, Witold Pedrycz, Roman W. Swiniarski, Springer, 2007.

Useful Video links:

Unit No.	Topics	Links
Unit-I	Effective Web searching	https://www.youtube.com/watch?v=vUvmCyM2C40
	Technology and Ethics	https://youtu.be/cVA80jjesSc
Unit-II	HTML	https://youtu.be/QEtWL4lWlL4
	Stylesheets	https://youtu.be/h_RftxdJTzs
Unit-III	Knowledge Discovery Process	https://youtu.be/ykZ-_UGcYWg
	Data Mining and Knowledge Discovery	https://youtu.be/m5c27rQtD2E
Unit-IV	LAN, WAN, MAN	https://youtu.be/u2UboyYSc4Q
	TCP/IP	https://youtu.be/zzXs0EnCin0
	Network Models	https://youtu.be/3DZLItfbqtQ

Course Code	**FEC-164A**				
Category	Foundation Elective Courses				
Course Title	**Computer Fundamentals**				
Scheme and Credits	L	T	P	**Credits**	**Semester-II**
	3	0	0	**3**	
Course Objectives	The objectives of this course are to • Understand the development of computing systems, their characteristics, and classifications, learn number systems and codes. • Gain knowledge about memory types, storage devices, memory and their impact on performance and data management. • Learn the functions of operating systems, system utilities, application software, and user interfaces. • Gain skills in word processing, spreadsheets, and presentations, including formatting, data manipulation, formula creation, and document presentation. • Understand network types, topologies and applications, and their role in modern communication and data sharing.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to

CO	Skill Demonstrated	RBT Level
CO1	Recall the fundamental concepts of computer systems and office tools.	Level 1: Remember
CO2	Explain the basic concepts of computers, office productivity suite, Internet and its impact on society.	Level 2: Understand
CO3	Apply principles, tools and techniques of computer engineering to solve real world problems.	Level 3: Apply
CO4	Analyze the applications of computer technology, its societal impact and the importance of network security.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Historical Evolution of Computing Systems: Overview of Data Processing, History of Computing, Computer Generations; Characteristics of Computer, Anatomy of Computer, Classification of Computers.
Number Systems and Codes: Introduction, Number Systems and its types, and inter-conversion of Number Systems; ASCII and EBCDIC codes. **Input and Output Devices:** Concept of Input/Output, Types of Input Devices; Output Devices – Printers, Plotters and Monitors.

Unit-II

Memory and Storage Devices: Characteristics of memory systems, memory hierarchy, Types of Memory – RAM, ROM, etc.; Magnetic Disks, Magnetic Tapes, Optical Disks; Concept of Cache Memory and Virtual Memory.

Software and Operating System Concepts: Introduction, Software Types, Language translators, System Utility Software, Application Software; Operating System – Characteristics, its functions, and its classification; User Interfaces – CUI and GUIs. DOS and Windows operating.

Unit-III

Working with Office Tools: Using Word Processing Tool: Opening and Closing of documents, Text creation and Manipulation, Moving Around in a Document, Formatting of text, Table handling, Spell check, language setting and thesaurus, Handling Multiple Documents, Printing of word document.
Using Spreadsheet tool: Basics of Spreadsheet; Manipulation of cells, Formulas and Functions, Editing of Spread Sheet, Page setups, header and footer, printing of Spread Sheet.
Using Slide Presentation Tool: Basics of power point, Preparation and Presentation of Slides, Slide Show, Formatting and Clip Arts, Taking printouts of presentation / handouts.

Unit-IV

Communication and Networks: Data Communication, Transmission Modes, Basics of Computer networks, types of computer network - LAN, MAN, WAN; Network Topologies and Applications of Computer Networks.
Internet Basics: Concept of Internet, Application of Internet, WWW, Web-sites and URLs, Search Engine, Using Electronic mails, Instant Messaging, Web Browsing software, Surfing the Internet.
Social Concern: Positive and Negative Impacts of Computer Technology, Computer Crimes, Computer Virus: Definition, Types of viruses, Characteristics of viruses, anti- virus software.
Computer Applications: Data Analysis, Sports, Research, Education, Business, Medicines & Health Care, Weather Forecasting, Military.

Suggested Readings:

1. Handbook of Computer Fundamentals by Nasib Singh Gill, Khanna Books Publishing Co.(P) Ltd., New Delhi, 2016.
2. Computer Fundamentals by P.K Sinha, BPB Publications.
3. Computing Fundamentals and Programming in C by Nasib Singh Gill, Khanna Book Publishing Co.(P) Ltd., New Delhi.
4. Fundamentals of Computers by V. Rajaraman, PHI.
5. Introduction to Computers by Leon, Alexis & Leon, Mathews, Leon Tech World.
6. Data Processing and Information Technology by C.S. French, BPB Publications.

Useful Video links:

Unit No.	Topics	Links
Unit-I	Evolution of Computers	https://youtu.be/TS2odp6rQHU
	Number Systems and Codes	https://youtu.be/juJR_JDJRa0
Unit-II	Memory	https://youtu.be/cjNORC_00_A
	Cache Memory	https://youtu.be/OvWZ1uQ767U
Unit-III	Word Processing Tool	https://youtu.be/y-AiPdAYixI
	Spreadsheet Tool	https://youtu.be/8tHzppXayik
	Slide Presentation Tool	https://youtu.be/KqgyvGxISxk
Unit-IV	Internet	https://youtu.be/YOXwcbwSEUo
	WWW	https://youtu.be/q9THx--fAFw