Scheme of Examination for
Master of Technology in Computer Science & Engineering
M. Tech. CSE Regular under Choice Based Credit System
w.e.f. academic session 2020-2021

M.TECH. CSE REGULAR - SEMESTER-I

Course No.	Course Title	Credit	Int.	Ext.	Total
MT-FT-11	Advanced Database Systems	4	30	70	100
MT-FT-12	Advanced Data Structures	4	30	70	100
MT-FT-13	Advanced Operating Systems	4	30	70	100
MT-FT-14	Advanced Computer Architecture	4	30	70	100
MT-FT-15	Lab based on MT-FT-11 (implementation in PL/SQL)	2	-	50	50
MT-FT-16	Lab based on MT-FT-12 (implementation in C/C++)	2	-	50	50
Total		**20**	**120**	**380**	**500**

M.TECH. CSE REGULAR - SEMESTER-II

Course No.	Course Title	Credit	Int.	Ext.	Total
MT-FT-21	Advanced Web Technology	4	30	70	100
MT-FT-22	MATLAB Programming	4	30	70	100
MT-FT-23	Elective – I (Network pool)	4	30	70	100
MT-FT-24	Elective – II (AI pool)	4	30	70	100
MT-FT-25	Lab based on MT-FT-21	2	-	50	50
MT-FT-26	Lab based on MT-FT-22	2	-	50	50
Total		**20**	**120**	**380**	**500**

MT-FT-23 Elective – I (Network pool Courses' List)

(i) Network Security
(ii) Advanced Computer Networks
(iii) Wireless Networks

MT-FT-24 Elective – II (AI pool Courses' List)

(i) Soft Computing
(ii) Machine Learning
(iii) Artificial Intelligence

M.TECH. CSE REGULAR - SEMESTER-III

Course No.	Course Title	Credit	Int.	Ext.	Total
MT-FT-31	Modeling and Simulation	4	30	70	100
MT-FT-32	Research Methodology	4	30	70	100
MT-FT-33	Elective – III (Computing pool)	4	30	70	100
MT-FT-34	Elective – IV (Data Analysis pool)	4	30	70	100
MT-FT-35	Lab on MT-FT-31 (in MATLAB)	2	-	50	50
MT-FT-36	Lab on MT-FT-32 (in MATLAB)	2	-	50	50
Total		**20**	**120**	**380**	**500**

MT-FT-33 Elective –III (Computing pool Courses' List)

(i) Cloud Computing
(ii) Grid Computing
(iii) Quantum Computing

MT-FT-34 Elective – IV (Data Analysis pool Courses' List)

(i) Data Warehousing and Data Mining
(ii) Big Data Analytics
(iii) Data Science

M.TECH. CSE REGULAR - SEMESTER-IV

Course No.	Course Title	Credit	Int.	Ext.	Total
MT-FT-41	Dissertation[1]	14	100	250	350
Total		**14**	**100**	**250**	**350**

Total Programme Credits
M. Tech. CSE REGULAR under CBCS

Semester	Max. Marks	Credits
I	500	20
II	500	20
III	500	20
IV	350	14
Sub-total	1850	74
Open Elective Courses	200	08
Programme Total	**2050**	**82**

[1] Clause 11 of Chapter XXII of University Calendar Volume II (MTech CSE ordinance), i.e., the provision of grading system in the evaluation of M. Tech. CSE (Regular) dissertation shall stand repealed from relevant ordinance w.e.f. the batch admitted in 2020-2021.

MT-FT-11 Advanced Database Systems

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Objectives:

- To present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve information from a database efficiently and effectively.
- To discuss issues arising related to transaction processing in multiuser database systems.
- To impart knowledge about centralized, distributed databases, multimedia databases etc.

Learning Outcomes:

- Know the role of a database management system in an organization.
- Understand basic database concepts, including the structure and operation of the relational data model.
- Construct simple and moderately advanced database queries using Structured Query Language (SQL).
- Successfully apply logical database design principles, including E-R diagrams and database normalization.

UNIT – I

Database System Concepts and Architecture: Three - Schema Architecture and Data Independence, ER Diagrams, Naming conventions and Design Issues. Relational Model Constraints and Relational Database Schemas, EER model: Subclasses, Super classes, Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and Generalization. Relational Model: Relational Model Concepts, Relational model Constraints and Relational Database Schemas

UNIT – II

Informal design guidelines for Relational schemas: Functional Dependencies, Normal forms based on Primary keys: 1NF, 2NF, 3NF and BCNF, Properties of Relational Decomposition, Multivalued dependencies and 4NF, JOIN dependencies and 5NF. SQL Data Definition and Data types, Specifying Basic Constraints and Queries in SQL, Views in SQL

UNIT – III

Introduction to Transaction processing: Concepts, Concurrency control techniques, Database recovery techniques: Deferred update and Immediate update, ARIES Recovery algorithm, Shadow paging, Database security issues

UNIT –IV

Data Warehousing: Components, Building a data warehouse, Data extraction, cleanup and transformation, OLAP **Future Trends in data models:** Semantic data models, Active and Spatial databases, Temporal databases, Multimedia databases, Distributed Database concepts and Client Server Architecture

Text Books:

1. Elmasri and Navathe, “Fundamentals of Database Systems”, Pearson Education.

Reference Books:

1. Date C.J., “An Introduction to Database Systems”, Pearson Education.
2. Hector G.M., Ullman J.D., Widom J., “Database Systems: The Complete Book”, Pearson Education.
3. Silberschatz A., Korth H., Sudarshan S., “Database System Concepts”, Tata McGraw Hill.

MT-FT-12 Advanced Data Structures

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**

External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Objectives:

- To evaluate how the selection of data structures and algorithm design techniques impacts the execution of programs.
- To select the proper data structure and algorithm strategy for a predetermined application.
- To consider the deliberate method of taking care of issues, different strategies for sorting out a lot of data.
- To utilize the various data structures to discover the solutions for explicit problems.

Learning Outcomes:

- Describe usage of various data structures.
- Analyze the complexity of linear and nonlinear data structures.
- Analyze various algorithms and determine algorithm correctness and time efficiency.
- Choose the appropriate data structure to solve a programming problem and apply theoretical and practical aspects in different application domains.
- Provide deep knowledge of algorithmic and developing code to implement different data structures.

Unit - I

Basic Concepts of Data Types – Abstract Data Types, data and storage structures – Algorithms: performance analysis: time complexity and space complexity, The Role of Algorithms in computing – Analyzing Algorithms – Designing Algorithms – Growth of functions – Asymptotic Notations – Recurrences – Substitution method – Recurrence tree method –The Master method – Floors and Ceilings. Arrays-Abstract Data Types (ADTs) —The Stack ADT– The Queue ADT- Various types of queues and operations- Stacks and their application

Unit - II

The List ADT-Operations (Create, Access, Insert and Delete) - Singly– linked List - Doubly–linked List - Circular–linked List -

Implementation of Trees – Tree Traversals with an application – Operations, Application, Representation on Binary Trees – threading and their implementation- Binary Search Trees –AVL trees – Splay Trees–B Trees– Red and Black Trees- SPlay Trees- Multiway search tree

Unit - III

Representations of Graphs – Topological sort – Shortest – Path Algorithms – Network Flow Problems – Minimum Spanning Tree – Applications of Depth – First–Search – NP – Completeness -Graph Traversals - Breadth First Search - Depth First Search - Graph Processing Algorithms - Dijkstra's Algorithm for minimum cost path - Kruskal's Algorithm for minimum spanning trees and related algorithms.

Unit - IV

Sorting and Searching: Insertion Sort–Shell Sort–Heap Sort–Merge Sort–Quick Sort - Internal Sorting – Bubble Sort – Bin Sort – Radix Sort – External Sorting – Sorting Implementation in C or C++- Searching Techniques- Comparative study of sorting and searching techniques with their complexities.

Hashing: Hash Function – Separate Chaining – Open Addressing – Rehashing – Extendible hashing. Operations on a Hash Table – Create, Insert, Find and Retrieve

References:

1. Mark A.Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education, Fourth Edition.
2. Alfred V.AHO, John E.Hopcroft, Jeffrey D.Ullman, Data Structures and Algorithms, Pearson Education,
3. Ellis Horowitz,Sartaj Sahni,Sanguthevar Rajasekaran, Fundamental of Computer Algorithms, 2nd Edition,Universities Press.
4. Michael T.Goodrich, Roberto Tamassia, David Mount, Data structures and Algorithms in C++, Second Edition, Wiley Publications.
5. Yedidyah Langsam, Moshe J.Augenstein, AAron M.Tenebaum, Data Structures using C and C++, Second Edition, Pearson Education.
6. Seymour lipschutz, Data structures with C, MacGraw Hill.

MT-FT-13 Advanced Operating Systems

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**

External – 70 Marks

Note:-Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Objectives:

Some advanced concepts of operating systems will be covered in this course. The objective of this course is to study, learn, and understand the major concepts of advanced operating systems, namely, multimedia operating systems, distributed and real time operating systems, threads, security and design issues in operating systems.

Learning Outcomes:

From view points of knowledge and understanding, a learner shall be able to appreciate the potential benefits of distributed systems and to summarize the major security issues associated with modern operating systems as also the array of techniques that might be used to enhance the system security. Cognitively, the learners shall be able to apply standard design principles in the construction of these systems and select appropriate approaches for building a range of advanced operating systems.

Unit – I

Multimedia operating systems: Introduction to multimedia; multimedia files and video compression standards; process scheduling, file system, file placement, caching and disk scheduling for multimedia.

Unit – II

Distributed operating systems: Mulltiprocessor hardware and scheduling; multicomputer hardware and scheduling; distributed computing architecture; distributed system models; distributed shared memory and distributed file system; mutual exclusion and deadlocks in distributed systems; network operating system vs. distributed operating system.

Unit – III

Real-time operating systems: Characteristics and classification of real-time systems; scheduling in real-time operating systems; trends in kernel design, exo-kernel and micro-kernel; virtualization; threads – concept, advantages, implementation.

Unit – IV

Design issues in operating systems: Goals and nature of design problem; guiding principles and paradigms of interface design; issues in implementation of operating system; performance of operating system; security – cryptography, user authentication, inside and outside attacks, protection mechanism.

References:

1. Andrew S. Tanenbaum, Modern operating systems, 2e, Pearson – Prentice Hall.
2. Pramod Chandra P. Bhatt, An introduction to operating systems – concepts and practice, 3e, Prentice Hall, India.
3. Charles Crowley, Operating systems – A design oriented approach, Tata McGraw Hill.

MT –FT-14 Advanced Computer Architecture

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note: -Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition, 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Objectives:

- Understand the Concept of Parallel Processing and its applications.
- Analyze the performance of different scalar Computers.
- Develop the Pipelining Concept for a given set of Instructions.
- Distinguish the performance of pipelining and non pipelining environment

Learning Outcomes:

At the end of this course students should:

- know the classes of computers, and new trends and developments in computer architecture
- Understand pipelining, instruction set architectures, memory addressing.
- Understand the various techniques to enhance a processors ability to exploit Instruction-level parallelism (ILP), and its challenges.
- Understand exploiting ILP using dynamic scheduling, multiple issue, and speculation.
- Know symmetric shared-memory architectures and their performance and multiprocessor cache coherence using the directory based and snooping class of protocols.
- Describe the various models to achieve memory consistency.

UNIT-I

Concurrent and Parallel Execution: Von-Neumann computational model, Basic concepts of parallel processing, Types and levels of parallelism, Classifications of parallel architectures.

Instruction-Level-Parallel Processors: Dependencies between instructions, Principles of Pipelining. Pipelined instruction processing, Synchronous & Asynchronous pipeline, Linear Pipeline-clocking & timing control, speedup, efficiency & throughput, Non linear pipeline- reservation table, latency analysis, collision free scheduling, internal data forwarding.

UNIT-II

Introduction to ILP processors – Evolution of ILP, Dependencies between instructions, Principles of pipelining, Performance measures,VLIW architecture, Branch handling- delayed branching, branch processing, multiway branching, guarded execution, Code scheduling- basic block scheduling, loop scheduling, global scheduling.

UNIT-III

Memory Hierarchy Technology : inclusion, coherence and locality, virtual memory models, TLB, paging and segmentation, memory replacement policies, cache addressing models, cache performance issues, interleaved memory organization.

Distributed –Memory MIMD architectures: Direct interconnection networks-interconnection topologies , switching techniques, routing

UNIT-IV

Shared-Memory MIMD architectures: Dynamic interconnection networks- shared path, switching networks- crossbar & multistage networks. Cache coherence problem, Hardware based cache coherence protocol- Snoopy cache protocol, Directory scheme, hierarchical cache coherence protocol. UMA, NUMA, CC-NUMA and COMA multiprocessors.

References

1. Hennessy J.D., Patterson D.A., “Computer Architecture A Quantitative Approach”, Elsevier India.
2. Sima D., Fountain T., Kasuk P., “Advanced Computer Architecture-A Design space Approach,” Pearson Education.
3. Kai Hwang, “Advanced computer architecture – Parallelism, Scalability, Programmability”, Tata McGraw Hill.

MT-FT-21 Advanced Web Technology

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note: -Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition, 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course objectives:
The Objective of this course is to make the students get acquainted with skills for creating websites and web app through various technologies like HTML, CSS, JavaScript, PHP, MySQL, XML web services.

Learning Outcomes: The course is designed to provide the student an in-depth understanding of content management systems so as to be able to create and host modern websites. Students will gain the skills needed for entry into web application and development careers.

UNIT I

Overview of HTML – Common tags, XHTML, capabilities of HTML5, Cascading Style sheets, XML Relationship between HTML, SGML, and XML, Basic XML, valid Documents. Ways to use XML, The future of XML.

UNIT II

Java Script: Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, Advanced PHP and MySQL**:** PHP/MySQL Functions, displaying queries in tables, Building Forms from queries, Sessions, Cookies.

UNIT III

Introduction: Search Engines: Searching techniques used by search engines, Keywords, advertisements, Search Engine Optimization (SEO) for individual web pages: SEO Web Design, Effective content writing plan, Achieving high rankings, SEO analysis intervals.

UNIT IV

What is CMS? Types of CMS, CMS Architecture, CMS Technologies, WordPress, Drupal, Joomla, Website Creation and maintenance, Web Hosting and Publishing Concepts.

TEXT BOOKS:

1. Peter Smith, “Professional Website performance”, Wiley India Pvt. Ltd.
2. Kogent Learning, "Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML, AJAX - Black Book”, Wiley India Pvt. Ltd.'
3. Web Design The complete Reference, Thomas Powell, Tata McGraw Hill
4. J. C. Jackson, “Web Technologies”, Pearson Education,
5. CMS Security Handbook: The Comprehensive Guide for WordPress, Joomla, Drupal and Plone**,** Tom Canavan, Publisher(s): Wiley

REFERENCE BOOKS:

1. PHP: The Complete Reference by Steven Holzner, Tata McGraw Hill
2. DT Editorial Services, “HTML 5 Black Book”, 2ndEdition, Wiley India, 2016.
3. S. Potts, “JAVA 2 Unleashed”, 6th Edition, Sams Publishing, 2002

MT-FT-22 MATLAB Programming

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Objectives:

- Introduce the MATLAB software environment.
- Fortify an organized, top-down way to define and solve big problems.
- Introduce common approaches, structures, and conventions for creating and evaluating computer programs, primarily in a procedural paradigm with a introduction to object-oriented concepts and terminology.
- Apply a variety of common numeric techniques to solve and visualize engineering-related computational problems.
- To study various toolboxes to solve real life applications

Learning Outcomes:

- Use MATLAB effectively to analyze and visualize data.
- Apply numeric techniques and simulations to solve engineering-related problems.
- Apply a top-down, modular, and systematic approach to design, write, test, and debug sequential MATLAB programs to achieve computational objectives.
- Have in depth understanding and use of Matlab fundamental data structures (classes).
- Create and control simple plot and user-interface graphics objects in MATLAB.
- Be able to understand and use Matlab Toolboxes for solving real life problems.

Unit - I

MATLAB FUNDAMENTALS: What is MATLAB? , History of MATLAB, Origin, Growth and Development, Features of MATLAB, Why to use MATLAB? , Menus and the toolbar, computing with MATLAB, types of file , Editor Debugger, Some useful MATLAB Commands, MATLAB Help System,creating directory and saving files, Constants Variables and Expressions-Character Set, Data Type in MATLAB, Constants, Variables and Expressions, Operators, Hierarchy of Operations, Built-in-Function, Assignment Statements. Vectors and Matrices- Scalars and Vectors, Entering data in MAtrices, Line continuation, Matrices Subscripts, Muti-dimensional matrices and Arrays, Matrix Manipulation, Special MAtrices, Commands related to matrices, Structure Arrays, Cell Arrays.

Unit - II

Polynomials -Entering, Evaluation, Roots,Operations

Input/Output Statements- Data Input, Interactive Inputs, Reading/SToring DAta files, Output COmmands, Low level Input Output FUnctions.

Introduction to Data Import and Export, Other MATLAB I/O capabilities, Supported File Format, Working with Audio/Video File, Importing Audio/Video Data, Reading Audio/video Data From a file, Exporting Audio/Video Data, Example, Working with Spreadsheets, Writing to an XLS File, Reading from an XLS Files, Working with Graphics File, Importing Graphics data, Exporting Graphics data, MATLAB-GUI with GUIDE, Creating a simple GUI Programmatically, Dissertations of different components in GUIDE, Creating Menus.

Unit - III

Matlab Graphics- 2D/3D Plotting Visualization Using MATLAB

2D plot , Multiple Plot, Style options, legends, subplots, Specialized 2D plot- logarithmic,polar,area, bar,barh,hist,rose, pie, stairs,stem,compass. 3D plot - plot3, bar3, bar3h, pie3, stem 3, meshgrid, mesh, surf, contour, contour3.

Control Structures- loops- for,nested for, while, Branch Control STructure- if, switch, break, continue, error, try-catch, Debugging MatLab Programs.

Unit - IV

Introduction to MATLAB Toolboxes

Simulink Introduction, Image & Video processing Toolbox: Application Level Image Processing Techniques, MRI Image processing, Fuzzy Logic Toolbox, Neural Network Toolbox.

References:

1. Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar,MATLAB and its Application in Engineering, Pearson Education.
2. Ram N.Patel, Ankush Mittal, Programming in MATLAB, A Problrm Solving Approach, Pearson Education.
3. Jim Sizemore, John P.Mueller, MATLAB FOR DUMMIES", Wiley.
4. Stephen J.Chapman, Matlab Programming for Engineers, Thomson-Engineering Publisher, CENGAGE Learning.
5. Duane Hanselman, Bruce L Littlefield, Mastering MATLAB 7, Prentice Hall.
6. Amos Gilat, MATLAB: An Introduction with Application, Wiley Publisher.
7. Jaydeep Chakravorty, Introduction to MATLAB Programming , Toolbox and Simulink, Universities Press.
8. S.N. Sivanandam, S.N.Deepa, MATLAB with Control system, signal processing, Image processing toolboxes, Wiley.

MT-FT-23 (i) Network Security

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:-Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Objectives:

Objective of this course is to make the students familiar with the basic concepts of Networking. It will also make the students familiar with the working of latest network technologies and applications.

Learning Outcomes:

After getting though this course student will gain the knowledge of Networking models, different media for transmission, addressing types and their difference, routing protocols. Students will also gain knowledge of layered structure and working of different network technologies used in today's world.

Unit-I

Computer Security Concepts, Introduction, What is Security, security trends,, Components of Information System, OSI security architecture, Security Attacks, Goals for Security , security mechanisms, Integrity policies and Hybrid policies.

Unit-II

Cryptography: Concepts and Techniques, symmetric and asymmetric key cryptography

Symmetric key Ciphers:Classical encryption techniques, Block cipher design principles, DES, Advanced encryption standard, AES structure, Analysis of AES, Block cipher operations, principles of pseudorandom number generation and stream ciphers.

Asymmetric key Ciphers:Principles of public key cryptosystems, RSA algorithm, Analysis of RSA, Diffie-Hellman Key exchange.

Unit-III

Security services, Message confidentiality, message integrity, message authentication, key management, Message Authentication and Hash Functions:Authentication requirements and functions, MAC and Hash Functions, MAC Algorithms: Secure Hash Algorithm, Digital signatures, Key management and distribution, Intruders, Virus and Firewalls, Intruders, Intrusion detection, password management, Virus and related threats, Virus Countermeasures, Denial of service attacks, Firewall design principles, Types of firewalls.

Unit-IV

Security at layers(Network, Transport, Application),IPSec, Secure Socket Layer(SSL), Transport Layer Security(TLS), Secure Electronic Transaction(SET), Electronic Mail security: Pretty Good Privacy(PGP),S/MIME, Steganography & its application, watermarking & its application.

References:

1. William Stallings, "Cryptography and Network Security: Principles and Practices", Third Edition, Pearson Education, 2006.
2. Matt Bishop,Computer Security art and science, Second Edition, Pearson Education, 2002.
3. Wade Trappe and Lawrence C. Washington, Introduction to Cryptography with Coding Theory 2e, Pearson Education, 2007.
4. Jonathan Katz, and Yehuda Lindell, Introduction to Modern Cryptography, CRC Press, 2007.
5. Douglas R. Stinson, Cryptography Theory and Practice, Third Edition, Chapman & Hall/CRC, 2006.

MT-FT-23(ii) Advanced Computer Networks

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:-Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Objectives:

Objective of this course is to make the students familiar with the basic concepts of Networking. It will also make the students familiar with the working of latest network technologies and applications.

Learning Outcomes:

After getting though this course student will gain the knowledge of Networking models, different media for transmission, addressing types and their difference, routing protocols. Students will also gain knowledge of layered structure and working of different network technologies used in today's world.

Unit-I

Network Models: OSI reference model, TCP/IP reference model.
Transmission Media: Guided Media, Unguided Media.
Connecting LANs: Connecting Devices, Backbone Networks.
Ethernet: IEEE Standards, Standard Ethernet, Fast Ethernet, Gigabit Ethernet.

Unit-II

Logical Addressing: IPv4 Addresses, IPv6 Addresses.
Unicast Routing Protocols and Multicast Routing Protocols
Intradomain and Interdomain Routing Protocols

Unit-III

Wireless LANs: IEEE 802.11, Bluetooth
Wireless Network and Mobile Network: LAN, PAN, Sensor Networks and Adhoc Networks.
Mobile IP
ATM reference model.

Unit-IV

World Wide Web and HTTP, FTP, E-Mail.
Domain Name System: Name Space, Domain Name Space, Distribution of Name Space, DNS in the Internet, Resolution.
Voice Over IP, IPSec, DDoS Attack

References:

1. Behrouz A. Forouzan, Data Communications and Networking, Fourth Ed., Tata McGraw Hill, 2006.
2. Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, Fourth Ed., Morgan Kaufmann, 2007.
3. Jean Walrand and PravinVaraiya, High Performance Communication Networks, 2nd Ed., Morgan Kauffman, 1999.
4. Markus Hoffmann and Leland R. Beaumont, Content Networking: Architecture, Protocols, and Practice, Morgan Kauffman, 2005.

MT-FT-23(iii) Wireless Networks

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note: -Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition, 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Objectives:

- To provide an overview of Wireless Network area and its applications.
- To explain the various terminology, principles, protocols and mobile communication technologies used in wireless network.
- To enhance the student's knowledge in the perspective field of wireless network.

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

- Explain working of different wireless Network technologies.
- Demonstrate application of different protocols for wireless communication technologies.
- Analyse the performance of different technologies in different scenarios/situations.
- Develop learning and research skills by undertaking a comprehensive study of research topic in wireless network.

UNIT-I: MULTIPLE RADIO ACCESS

Medium Access Alternatives: Fixed-Assignment for voice oriented networks, random access for data oriented networks, Handoff and Roaming Support, Security and Privacy.

UNIT-II: WIRELESS WANS

First Generation Analog, Second Generation TDMA- GSM, Short Messaging Service in GSM, Second Generation CDMA- IS-95,GPRS, Third Generation Systems- WCDMA,CDMA2000, Introduction to LTE.

UNIT-III: WIRELESS LANS

Introduction to Wireless LANs- IEEE 802.11 WLAN-Architecture and Services, Physical Layer-MAC Sublayer-MAC Management Sublayer, Other IEEE 802.11 standards, HIPERLAN, Wi-Max standard.

UNIT-IV: ADHOC AND SENSOR NETWORKS

Characteristics and Applications of MANET, Routing Protocols- Table-driven and Source-initiated on Demand routing protocols, Hybrid protocols.

Wireless Sensor Networks- Classification, MAC and Routing protocols. Wireless PANs- Architecture of Bluetooth systems, Physical and MAC layer details.

Reference:

1. Vijay. K. Garg, Wireless Communication and Networking, Morgan Kaufmann Publishers.
2. Kaveth Pahlavan, Prashant Krishnamurthy, Principles of Wireless Networks, Pearson Education.
3. Adrian Farrel, Bruce S. Davie, P.Z & Larry L. Peterson, Wireless Networking Complete, Morgan Kaufmann Publishers.
4. C. Siva Ram Murthy and B. S. Manoj, Ad hoc Wireless Networks, Pearson Education.
5. William Stalling, Wireless Communications and Networks, Pearson/Prentice Hall of India.
6. Dharma Prakash Agrawal & Qing-An Zeng, Introduction to Wireless and Mobile Systems, Thomson India Edition.

MT-FT-24 (i) Soft Computing

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**

External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Objectives:

- Study the needs and applications of soft computing.
- To learn how natural and biological systems influence the computational field.
- Provide knowledge and applications of Neural Network, Fuzzy Logic , Genetic Algorithms, Natural Computing.

Learning Outcomes:

- Have an in-depth understanding of some of the soft computing techniques.
- Identify the situations for which it is beneficial to apply soft computing techniques.
- Describe and Apply suitable soft computing techniques for the problems which could not be otherwise solved efficiently.
- Be able to understand how large numbers of agents can self-organize and adapt.

UNIT I

Basic concepts of neuro-computing: Artificial Neural Network (ANN) and their biological roots and motivations, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Applications of Artificial Neural Networks, Competitive learning networks, Kohonenself organizing networks, Hebbian learning; Hopfield Networks, Associative Memories, The boltzman machine; Applications.

UNIT II

Introduction to Fuzzy Logic: Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function. Operations on Fuzzy Sets: Compliment, Intersections-t-norms, Unions- t-conorms, Combinations of Operations, Aggregation Operations. Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables,Arithmetic Operations on Intervals & Fuzzy Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Fuzzy Logic: Classical Logic, Uncertainty Based Information

UNIT III

Genetic Algorithm (GA): Evolutionary computing, conditions for evolution, Simple Genetic
Algorithm (SGA), different types of operators: Selection, Crossover, mutation and replacement, optimization problems and traditional optimization methods, differences between GA and traditional methods, Holland's Schemata theorem.

UNIT IV

Random Optimization, Swarm Intelligence, Natural Computing, Simulated Annealing, Tabu Search, Ant Colony Optimization, Particle Swarm Optimization, Memetic Algorithms, Applications.

References:

1. David.E. Goldberg, Genetic Algorithms in Search, Optimization and machine learning, Addison Wesley.
2. Zbigniew Michalewicz, Genetic algorithms +Data Structures = Evolution Programs, Springers-Verlag.
3. M. Mitchell, An Introduction to Genetic Algorithms, Prentice-Hall.
4. S. Rajasekaran & G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, PHI.
5. S. N. Sivanandam & S. N. Deepa, Principles of Soft Computing, Wiley - India.
6. J-S. R. Jang, C.-T. Sun, E. Mizutani, Neuro-Fuzzy and Soft Computing, PHI.
7. Simon O. Haykin, Neural Networks, A Comprehensive Foundation, PHI.

MT-FT-24(ii) Machine Learning

L/T - 4 **Total Credits – 4** **Internal Marks 30**

External Marks 70

Notes: - Total 09 questions are to bet set by the examiner. First question will be compulsory consisting of 5 short answer type question (each carry 2 marks) covering the entire syllabus uniformly. In addition, 08 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A Candidate is required to attempt five questions in all selecting one from each unit including the compulsory question.

Course Objectives:

- Be able to understand and apply supervised and unsupervised learning algorithms.
- Understand the fundamental concepts in machine learning and popular machine learning algorithms.
- Understand the basic concept of Deep Learning.
- Be able to solve the problems related to the application of machine learning algorithms with programming.

Learning Outcomes:

- Recognize major programming languages.
- Identify potential applications of machine learning in practice.
- Select the suitable machine learning tasks for given application.
- Implement feature extraction and selection to represent data as features to serve as input to machine learning models.

Unit 1

Introduction to Machine Learning. Artificial Intelligence and Machine Learning. Types of Machine Learning. Key Elements of Machine Learning. Applications. Hypothesis Space and Inductive Bias.

Unit II

Supervised Learning: Introduction, methods. Classification: Decision Tree, Random Forest, Naive Bayes. Regression: Linear Regression, Multivariable Regression, Logistic Regression. Support Vector Machine.

Unit III

Unsupervised Learning: Association Learning. Clustering: K-Means, Adaptive Hierarchical, Gaussian Mixture, Fuzzy C-Means. Dimension Reduction: Principal Component Analysis, Linear Discriminant Analysis, Generalized Discriminant Analysis.

Unit IV

Ensemble Learning. Reinforcement Learning. Introduction to Deep Learning. Neural Network Basics. Deep Neural Network. Convolutional Neural Network, Recurrent Neural Network, Graph Neural Network.

Reference Books:

1. T. Hastie, R. Tibshirani, J. Friedman. The Elements of Statistical Learning, 2e, 2008.
2. Machine Learning. Tom Mitchell. First Edition. McGraw- Hill, 1997
3. Machine Learning for Hackers. Drew Conway, Jobn Myles. O'Reilly. 2012
4. Deep Learning Ian Goodfellow, Yoshua Bengio, Aaron Courville. MIT Press. 2016.
5. Introduction to machine learning, E. Alpaydin. MIT Press, 2e, 2009
6. Machine Learning in Action , P. Harrington. Manning Publication. 2012.
7. Machine Learning and Pattern Recognition. C.M. Bishop. Springer.

MT-FT-24(iii) Artificial Intelligence

L/T - 4 **Total Credits – 4** **Internal Marks 30**

External Marks 70

Note:-Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Objectives:

- To study about intelligent agent and search methods.
- To study the concept of expert systems.
- To study about representing knowledge.
- To construct plan and methods for generating knowledge.

Learning Outcomes: By the end of the course students will be able to:

- Understand what the AI is.
- Apply search and knowledge representation techniques to solve AI problems.
- Have ability to identify the solution of AI problems.

UNIT-I

Introduction: Concept and evolution of artificial intelligence, brief description of various application areas of artificial intelligence.

The predicate calculus: Syntax and semantic for propositional logic and FOPL, Censual form, inference rules, resolution and unification.

Knowledge: representation: Network representation-Associative network & conceptual graphs, structured representation: Frames & Scripts.

UNIT-II

Search Strategies & Production Systems: Strategies for state space search-data driven and goal driven search; search algorithms- uninformed search (depth first, breadth first, depth first with iterative deepening) and informed search (Hill climbing best first, AN algorithm, mini-max etc.), computational complexity, Properties of search algorithms-Admissibility, Monotonicity, Optimality, Dominance, etc.
Types of production system control of search in production system.

UNIT-III

Rule based expert systems: Architecture, development, managing uncertainty in expect systems (Bayesian probability theory, Non-monotonic logic and reasoning with beliefs.

Fuzzy logic: definition, Fuzzy logic systems architecture, difference between Boolean and fuzzy logic.

UNIT-IV

Knowledge acquisition: Types of learning, learning automata, genetic algorithms, intelligent editors, learning by induction.

Understanding: What is understanding? What makes it hard? Understanding as constraint satisfaction.

An overview of programming languages for artificial intelligence.

References:

1. George F. Luger, William A. Stubblefield, Artificial Intelligence, The Benjamin/Cummings Publishing Company, Inc.
2. Dan W. Patterson, Introduction to Artificial Intelligence and Expert system, PHI.
3. Eugene Charniak, Drew McDermott, Introduction to Artificial Intelligence" Addison Wesley.

4. Wils J. Nilsson, Principles of Artificial Intelligence, Narosa Publishing house.
5. Jackson Peter, Introduction to Expert systems, 3rd edition, (Addison Wesley -2000).