

AICTE MODEL CURRICULUM  
FOR  
POST GRADUATE DEGREE COURSE  
**M.TECH**  
IN  
**INFORMATION TECHNOLOGY**  
[W.E.F. 2024-25]



DEPARTMENT OF  
INFORMATION TECHNOLOGY AND COMPUTER  
APPLICATIONS  
AU COLLEGE OF ENGINEERING  
**ANDHRA UNIVERSITY**  
**VISAKHAPATNAM-**  
**530003**



**M.TECH INFORMATION TECHNOLOGY**  
**COURSE STRUCTURE AND SCHEME OF VALUATION W.E.F. 2024-25**

**I SEMESTER**

Code	Name of the subject	Periods/week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
<b>MTCST11</b>	Mathematical Foundations of Computer Science	3	-	70	30	100	3
<b>MTCST12</b>	Advanced Data Structures	3	-	70	30	100	3
<b>MTCST13</b>	Elective-I	3	-	70	30	100	3
<b>MTCST14</b>	Elective-II	3	-	70	30	100	3
<b>MTCST15</b>	Research Methodology &IPR	3	-	70	30	100	2
<b>MTCST16</b>	Organizational Behavior (Audit Course)	3	-	70	30	100	0
<b>MTCST17</b>	Advanced Data Structures Lab		3	50	50	100	2
<b>MTCST18</b>	Elective – II Lab		3	50	50	100	2
<b>Total</b>		<b>18</b>	<b>6</b>	<b>520</b>	<b>280</b>	<b>800</b>	<b>18</b>

**Elective-I:** Distributed Operating Systems/Artificial Intelligence / Cloud Computing

**Elective II:** Advanced Database Management Systems/Computer Networks//Embedded systems



**M.TECH INFORMATION TECHNOLOGY**  
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**II SEMESTER**

Code	Name of the subject	Periods/week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
<b>MTIT21</b>	Web Systems & Technologies	3	-	70	30	100	3
<b>MTCST22</b>	Software Project Management	3	-	70	30	100	3
<b>MTIT23</b>	Elective-III	3	-	70	30	100	3
<b>MTIT24</b>	Elective-IV	3	-	70	30	100	3
<b>MTCST25</b>	Entrepreneurship (Audit Course)	3	-	70	30	100	0
<b>MTCST26</b>	OOSE Lab	-	3	50	50	100	2
<b>MTIT27</b>	Web Programming Lab	-	3	50	50	100	2
<b>MTIT28</b>	Integrating Design Thinking Into Innovation Engineering	-	3	-	100	100	2
<b>Total</b>		<b>15</b>	<b>9</b>	<b>450</b>	<b>350</b>	<b>800</b>	<b>18</b>

**Elective III:** Cryptography & Network Security/Block Chain Technologies/ Machine Learning

**Elective IV:** Big Data Analytics/Full Stack Development/Soft Computing



**M.TECH INFORMATION TECHNOLOGY**  
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**III SEMESTER**

Code	Name of the subject	Periods/week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MTIT31	Elective-V	3	-	70	30	100	3
MTIT32	Open Elective	3	-	70	30	100	3
MTIT33	Dissertation-I / Industrial project		-	100	-	100	10
<b>Total</b>		<b>6</b>	<b>-</b>	<b>240</b>	<b>60</b>	<b>300</b>	<b>16</b>

**Elective V:** Business Intelligence/Internet of Things/ Natural Language Processing

**Open Elective:** Information Retrieval / Cyber Security & Digital Forensics / Deep Learning



**M.TECH INFORMATION TECHNOLOGY**  
**COURSE STRUCTURE AND SCHEME OF VALUATION W.E.F. 2024-25**  
**IV SEMESTER**

Code	Name of the subject	Periods/week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MTCST41	Dissertation - II	-	-	100	-	100	16
<b>Total</b>		-	-	<b>100</b>	-	<b>100</b>	<b>16</b>

**MTCST11**  
**M.Tech (CST) First Semester**  
**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**  
**Common for M. Tech (CST, IT)**

**Instruction: 3 Periods/week**  
**Internal: 30 Marks**

**Time: 3 Hours**  
**External: 70 Marks**

**Credits: 3**  
**Total: 100 Marks**

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**Course Objectives:**

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
- To introduce the students to number theory and its applications.
- To introduce the concepts of Finite automata and the various languages associated with it.
- To introduce deterministic, non deterministic and theoretical model approaches in Computer science.

**Course Outcomes:** At the end of the course, student will be able to

- Apply mathematical foundations algorithmic principles to design computational systems
- Analyze and solve practical computing problems using basic number theory and finite automata concepts.
- Analyze the Regular expressions and determine the types of languages generated by them.
- Apply the theoretical concepts in present day computer science applications.

**Syllabus:**

1. Mathematical notions of sets, sequences and tuples, functions and relations, Primitive recursive functions, computable functions, examples, graphs, strings and languages,
2. Boolean logic – properties and representation, theorems and types of proofs, deductive, inductive, by construction, contradiction and counter-examples.
3. Introduction to Number theory, Divisibility, modular arithmetic (addition modulo and multiplication modulo); Statements and applications of Euler and Fermat Theorems, Primitive Roots, Discrete Logarithms, Primarily Test, Finding Large primes, Definition of Elliptic Curves and their applications to Cryptography.
4. Introduction To Finite Automata: Alphabets and languages- Deterministic Finite Automata – Non- deterministic Finite Automata – Equivalence of Deterministic and Non-Finite Automata – Languages Accepted by Finite Automata – Finite Automata and Regular Expressions – Properties of Regular sets & Regular Languages and their applications.
5. Context Free Languages: Context –Free Grammar – Regular Languages and Context-Free Grammar – Pushdown Automata – Pushdown Automata and Context-Free Grammar – Properties of Context-Free Languages – pushdown automata and Equivalence with Context Free Grammars.
6. Turing Machines: The Definition of Turing Machine – Computing with Turing Machines – Combining Turing Machines, programming techniques for Turing Machines,
7. Variants of Turing Machines, Restricted Turing Machines Universal Turing Machines. The Halting Problem, Decidable & undecidable problems- Post Correspondence Problems

**Text books:**

1. Introduction to Automata Theory, Languages and Computations – J.E. Hopcroft, & J.D. Ullman , Pearson EducationAsia.
2. Cryptography and Network Security, William Stallings.(Second Edition)Pearson Education Asia.

**Reference books:**

1. Introduction to languages and theory of computation – John C. Martin(MGH)
2. Discrete Mathematical structures with application to Computer Science – J.P. Tremblay and R.Manohar
3. Introduction to Theory of Computation – Michael Sipser (ThomsonNrools/Cole)
4. Cryptanalysis of number theoretic Cyphers, Samuel S. WagstaffJr.Champan& Hall/CRC Press2003.
5. Network Security: The Complete Reference by Roberta Bragg, Mark Phodes –Ousley, Keith StrassbergTataMcGraw-Hill.

**MTCST12**  
**M.Tech (CST) First Semester**  
**ADVANCED DATA STRUCTURES**  
**Common for M. Tech (CST, IT)**

**Instruction: 3 Periods/week**  
**3 Internal: 30 Marks**  
**100 Marks**

**Time: 3 Hours**  
**External: 70 Marks**

**Credits:**  
**Total:**

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**Course Objectives:**

- The fundamental design, analysis, and implementation of basic data structures.
- Basic concepts in the specification and analysis of programs.
- Principles for good program design, especially the uses of data abstraction.
- Significance of algorithms in the computer field 5. Various aspects of algorithm development

**Course Outcomes:**

- Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class.
- Master a variety of advanced abstract data type (ADT) and data structures and their implementations.
- Master different algorithm design techniques (brute-force, divide and conquer, greedy, etc
- Ability to apply and implement learned algorithm design techniques and data structures to solve problems.

**Syllabus**

**UNIT- I:** Heap Structures Introduction, Min-Max Heaps, Leftist trees, Binomial Heaps, Fibonacci heaps.

**UNIT-II:** Hashing and Collisions Introduction, Hash Tables, Hash Functions, different Hash Functions:- Division Method, Multiplication Method, Mid-Square Method, Folding Method, Collisions

**UNIT- III:** Search Structures OBST, AVL trees, Red-Black trees, Splay trees, Multiway Search Trees B-trees., 2-3 trees

**UNIT-IV:** Digital Search Structures Digital Search trees, Binary tries and Patricia, Multiway Tries, Suffix trees, Standard Tries, Compressed Tries

**UNIT- V:** Pattern matching Introduction, Brute force, the Boyer –Moore algorithm, Knuth-Morris-Pratt algorithm, Naïve String ,Harspool, Rabin Karp

**Textbooks:**

1. Fundamentals of data structures in C++ Sahni, Horowitz, Mehatha, Universities Press.
2. Introduction to Algorithms, TH Cormen, PHI

**References:**

1. Design methods and analysis of Algorithms, SK Basu, PHI.
2. Data Structures & Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. 3. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Universities Press.



**MTCST13**  
**Elective-I**  
**M.Tech (CST) First Semester**  
**DISTRIBUTED OPERATING SYSTEMS**  
**Common for M.Tech (CST, IT)**

**Instruction: 3 Periods/week**  
**Internal: 30 Marks**

**Time: 3 Hours**  
**External: 70 Marks**

**Credits:3**  
**Total: 100 Marks**

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**Course Objectives:**

- To provide hardware and software issues in modern distributed systems
- To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.
- To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.

**Course Outcomes:**

- To provide hardware and software issues in modern distributed systems.
- To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.
- To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.
- To know about Shared Memory Techniques.

**Syllabus:**

**Unit-1:** Introduction to Distributed Systems, What is a Distributed System?, Hardware concepts, Software concepts, Design issues.

**Unit-2:** Communication in Distributed Systems, Layered Protocols, ATM networks, The Client – sever model, Remote Procedure call, Group communication.

**Unit-3-** Synchronization in Distributed System, Clock Synchronization, Mutual Exclusion, Election algorithms, Atomic transactions, Deadlocks in Distributed Systems.

**Unit-4-**Process and processors in Distributed System threads, System Models, Processors allocation, Scheduling in Distributed System, Fault tolerance, Real-time Distributed System.

**Unit-5-**Distributed File Systems, Distributed File System Design, Distributed File System implementation, Trends in Distributed File System.

**Unit-6:** Distributed Shared Memory, Introduction, What is Shared memory? Consistency models, Page based Distributed Shared memory, Shared – variable Distributed Shared memory, Object based Distributed Shared Memory.

**TEXT BOOK:**

Distributed Operating Systems, Andrew S. Tanenbanm

**Reference Book:**

Advanced Concepts in Operating Systems, Makes Singhal and Niranjan G.Shivaratna

**MTCST13**  
**Elective-I**  
**M.Tech (CST) First Semester**  
**ARTIFICIAL INTELLIGENCE**  
**Common for M.Tech (CST, IT)**

**Instruction: 3 Periods/week**  
**Internal: 30 Marks**

**Time: 3 Hours**  
**External: 70 Marks**

**Credits: 3**  
**Total: 100 Marks**

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### Course Objectives:

- Gain a historical perspective of Artificial Intelligence (AI) and its foundations.
- Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
- Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
- Experience AI development tools such as an 'AI language', expert system shell, and/or data mining tool. Experiment with a machine learning model for simulation and analysis.
- Explore the current scope, potential, limitations, and implications of intelligent systems.

### Course Outcomes:

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

- Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.
- Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.
- Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing.
- Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.
- Solve problems with uncertain information using Bayesian approaches.

### Syllabus

1. **Introduction:** Artificial Intelligence, AI Problems, AI Techniques, the Level of the Model, Criteria for Success. Defining the Problem as a State Space Search, Problem Characteristics, Production Systems, Search: Issues in The Design of Search Programs, Un-Informed Search, BFS, DFS; Heuristic Search Techniques: Generate- And- Test, Hill Climbing, Best-First Search, A\* Algorithm, Problem Reduction, AO\* Algorithm, Constraint Satisfaction, Means- Ends Analysis.
2. **Knowledge Representation:** Procedural Vs Declarative Knowledge, Representations & Approaches to Knowledge Representation, Forward Vs Backward Reasoning, Matching Techniques, Partial Matching, Fuzzy Matching Algorithms and RETE Matching Algorithms; Logic Based Programming- AI Programming languages: Overview of LISP, Search Strategies in LISP, Pattern matching in LISP, An Expert system Shell in LISP, Overview of Prolog, Production System using Prolog
3. **Symbolic Logic:** Propositional Logic, First Order Predicate Logic: Representing Instance and is-a Relationships, Computable Functions and Predicates, Syntax & Semantics of FOPL, Normal Forms, Unification & Resolution, Representation Using Rules, Natural Deduction; Structured Representations of Knowledge: Semantic Nets, Partitioned Semantic Nets, Frames, Conceptual Dependency, Conceptual Graphs, Scripts, CYC;.
4. **Reasoning under Uncertainty:** Introduction to Non-Monotonic Reasoning, Truth Maintenance Systems, Logics for Non-Monotonic Reasoning, Modal and Temporal Logics; Statistical Reasoning: Bayes Theorem, Certainty Factors and Rule-Based Systems, Bayesian Probabilistic Inference, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic: Crisp Sets, Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences & Fuzzy Systems.
5. **Experts Systems:** Overview of an Expert System, Structure of an Expert Systems, Different Types of Expert Systems- Rule Based, Model Based, Case Based and Hybrid Expert Systems, Knowledge Acquisition and Validation Techniques, Black Board Architecture, Knowledge Building System Tools, Expert System Shells, Fuzzy Expert systems.
6. **Machine Learning:** Knowledge and Learning, Learning by Advise, Examples, Learning in problem Solving, Symbol Based Learning, Explanation Based Learning, Version Space, ID3 Decision Based Induction Algorithm, Unsupervised Learning, Reinforcement Learning, Supervised Learning: Perceptron Learning, Back propagation Learning, Competitive Learning, Hebbian Learning.

**7. Natural Language Processing:** Role of Knowledge in Language Understanding, Approaches Natural Language Understanding, Steps in The Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis, NLP Understanding Systems; Planning: Components of a Planning System, Goal Stack Planning, Hierarchical Planning, Reactive Systems

**Text Book:**

1. Artificial Intelligence, George F Luger, Pearson Education Publications
2. Artificial Intelligence, Elaine Rich and Knight, Mcgraw-Hill Publications

**References:**

1. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI
2. Multi Agent systems- a modern approach to Distributed Artificial intelligence, Weiss.G, MIT Press.
3. Artificial Intelligence : A modern Approach, Russell and Norvig, Printice Hall

**MTCST13**  
**Elective-I**  
**M.Tech (CST) First Semester**  
**CLOUD COMPUTING**  
**Common for M.Tech (CST, IT, AI&ML)**

**Instruction: 3Periods/week**  
**Internal: 30Marks**

**Time:3Hours**  
**External:70Marks**

**Credits:3**  
**Total: 100Marks**

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**Course Objectives:**

- To implement Virtualization
- To implement Task Scheduling algorithms.
- Apply Map-Reduce concept to applications.
- To build Private Cloud.
- Broadly educate to know the impact of engineering on legal and societal issues involved.

**Course Outcomes:** At the end of the course, student will be able to

- Interpret the key dimensions of the challenge of Cloud Computing.
- Examine the economics, financial, and technological implications for selecting cloud computing for own organization.
- Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
- Evaluate own organizations' needs for capacity building and training in cloud computing- related IT areas.
- Illustrate Virtualization for Data-Center Automation.

**UNIT I:**

**Introduction:** Network centric computing, Network centric content, peer-to-peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing. **Parallel and Distributed Systems:** Introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, model concurrency with Petri Nets.

**UNIT II:**

**Cloud Infrastructure:** At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing,

**UNIT-III**

**Cloud Computing :Applications and Paradigms:** Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, The Map Reduce Program model, HPC on cloud, biological research.

**UNIT IV:**

**Cloud Resource virtualization:** Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades,

## **UNIT-V**

**Cloud Resource Management and Scheduling:** Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feedback control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling.

## **UNIT VI:**

**Storage Systems:** Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Apache Hadoop, Big Table, Megastore (text book 1), Amazon Simple Storage Service(S3) (Text book 2), **Cloud Security:** Cloud security risks, security – a top concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks.

## **UNIT VII:**

**Cloud Application Development:** Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Installing Simple Notification Service on Ubuntu 10.04, Installing Hadoop on Eclipse, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming ( Text Book 1), **Google:** Google App Engine, Google Web Toolkit (Text Book 2), **Microsoft:** Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book2).

## **Text Books:**

- 1.Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier
- 2.Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, RobertElsenpeter,TMH

## **Reference book:**

1. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi,TMH

**MTCST14**  
**Elective-II**  
**Advanced Database Management Systems**  
**Common for M.Tech (CST, IT)**

**Instruction:3 Periods/week**  
**Internal:30 Marks**  
**Marks**

**Time:3 Hours**  
**External:70Marks**

**Credits:3**  
**Total: 100**

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**Course Objectives:**

The students should have an

- Understanding of database design and knowledge of object based databases
- Understanding of Query processing and query optimization
- Understanding of different database system architectures
- Knowledge of different types of databases and their applications.

**Course Outcomes:**

At the end of the course the students will have the ability to:

- Apply functionality and Normalization in databases.
- Recognize and fetch data from object oriented, parallel and distributed databases.
- Use XML and understand the concepts of parallel systems.
- Implement advanced concepts of database in different applications

**UNIT-1: Advanced SQL :** SQL Data Types and Schemas, Integrity Constraints, Authorization, Embedded SQL, Dynamic SQL, Functions and Procedural Constructs, Recursive Queries, Advanced SQL Features.

**Object-Based Databases and XML:** Complex Data Types, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multi set Types in SQL, Object-Identity and Reference Types in SQL, Implementing O-R Features, Persistent Programming Languages, Object-Oriented versus Object-Relational, Structure of XML Data, XML Document Schema, Querying and Transformation, Application Program Interfaces to XML, Storage of XML Data, XML Applications.

**UNIT-2: Query Processing and Query Optimization:** Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions, Transformation of Relational Expressions, Estimating Statistics of Expression Results, Choice of Evaluation Plans, Materialized Views.

**UNIT-3: Recovery System:** Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Nonvolatile Storage, Advanced Recovery Techniques, Remote Backup Systems.

**UNIT-4: Database-System Architectures :** Centralized and Client –Server Architectures, Server System Architectures, Parallel Systems, Distributed Systems, Network Types, Parallel Databases, I/O Parallelism, Inter query Parallelism, Intra query Parallelism, Intra operation Parallelism, Interoperation Parallelism, Design of Parallel Systems.

**UNIT-5: Distributed Databases :** Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Availability, Distributed Query Processing, Heterogeneous Distributed Databases.

**UNIT-6: Advanced Data Types and New Applications :** Time in Databases, Spatial and Geographic Data, Multimedia Databases, Mobility and Personal Databases. Advanced Transaction Processing: Transaction-Processing Monitors, Transactional Workflows, E-Commerce, Main-Memory Databases, Real-Time Transaction Systems, Long-Duration Transactions, Transaction Management in Multi databases.

### **Text Books**

1. Silberchatz, Korth, Sudershan,-Database System Concepts||, Tata MC Graw Hills Publishing, , 5th Edition, 2005

### **Reference Books**

1. RamezElmasri&ShamkantNavathe, -Database Management Systems||, Pearson Education Asia, 6th Edition, 2010
2. Raghu Ramakrishnan, Johannes Gehrke, -Database Management Systems||, McGraw Hill, 3rdEdition 2004
3. N.TamerOzsu, Patrick Valduriez, -Principles of Distributed Database Systems||, Prentice Hal International Inc., 1999
4. Carlo Zaniolo, Stefano Ceri, Christos Faloustsos, R.T.Snodgrass, V.S.Subrahmanian,“ Advanced Database Systems”, Morgan Kaufman Series, 1997

**MTCST14**  
**ELECTIVE-II**  
**COMPUTER NETWORKS**  
**Common for M.Tech (CST, IT)**

**Instruction:3Periods/week**  
**Internal:30Marks**

**Time:3Hours**  
**External:70Marks**

**Credits:3**  
**Total: 100Marks**

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**Course Objectives:**

The students will

1. Learn the basics of computer networks.
2. Understand the design principles and various layers in computer networks
3. Understand the different protocols and architectures of network protocols in networks
4. Understand the various security issues in network protocols

**Course Outcomes:**

**At the end of the course, the student will have**

1. Knowledge on the concepts of Computer Networks and different Transmission Media.
2. Ability to differentiate and know various protocols which play a major role in providing Computer Networks.
3. Knowledge on various protocol layers and architectures of network protocols.
4. Knowledge on various security issues in network protocols.

**Syllabus:**

- 1.**Introduction to Computer Networks:** Introduction, Network Hardware, Network Software, OSI and TCP/IP Reference Models
- 2.**Data Communications:** Transmission Media, Wireless Transmission, Transmission in ISDN, Broad Band ISDN , ATM Networks,
- 3.**Design Issues in Data Link Layer:** Data Link Control, Error Detection & Correction, Sliding Window Protocols, IEEE Standards 802.2, 802.3, 802.4,802.5, 802.6, Over view of High Speed LANs.
- 4.**Design Issues in Network layer:** Routing Algorithms-Shortest Path routing, Link State routing, Hierarchical routing, Broadcast and Multicast routing algorithms; Congestion Control Algorithms, Network Layer in the Internet: IP Protocol, IP Address.
- 5.**Internet Transport Protocols:** Transport Service, Elements of Transport Protocols, TCP and UDP Protocols
6. **Over View of:** DNS, SNMP, Electronic Mail, FTP, TFTP, BOOTP, HTTP Protocols
- 7.**Over View of Network Devices:** Repeaters, Bridges, Routers, Gateways, Multiprotocol Routers, Brouters, Switches, Modems, Channel Service Unit CSU, Data Service Units DSU, NIC, Wireless Access Points, Transceivers, Firewalls, Proxies.
- 8.**Over View of Advanced Concepts in Networks:** Cellular Networks, AdhocNetworks, Mobile Adhoc Networks, Sensor Networks, Virtual Private Networks. Delay Tolerant Networks, IPv6



**Text Book:**

Computer Networks, Andrews S Tanenbaum,, Edition 5, PHI, ISBN:-81-203-1165-5

**References:**

1. Data Communications and Networking ,Behrouz A Forouzan , Tata McGraw-Hill Co Ltd, Second Edition,
2. Computer networks, Mayank Dave, CENGAGE.
3. Computer networks, A System Approach, 5th ed, Larry L Peterson and Bruce S Davie, Elsevier.
4. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
5. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

**MTCST14**  
**Elective-II**  
**EMBEDDED SYSTEMS**  
**Common for M.Tech (CST, IT)**

**Instruction: 3 Periods/week**  
**Internal: 30 Marks**

**Time: 3 Hours**  
**External: 70 Marks**

**Credits: 3**  
**Total: 100 Marks**

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**Course Objectives:**

- To study the basics of embedded systems and its examples.
- To study the 8051 Microcontroller architecture and its instruction set.
- To discuss various software architectures in embedded systems.
- To discuss Inter Task Communication procedures in RTOS and design issues of RTOS.
- To study various embedded software development tools and debugging techniques.

**Course Outcomes:**

- Student will understand the basic architecture of 8051 microcontroller.
- ability to write ALP programs using 8051 instruction set.
- Ability to understand the concepts related to RTOS and its Inter Task Communication.
- Ability to understand various design issues of RTOS.
- Understand about embedded software development tools

**Syllabus:**

1. **Examples of Embedded Systems** – Typical Hardware – Memory – Microprocessors – Busses – Direct Memory Access – Introduction to 8051 Microcontroller – Architecture-Instruction set – Programming.
2. **Microprocessor Architecture** – Interrupt Basics – The Shared-Data problem – Interrupt Latency.
3. **Round-Robin Architecture** - Round-Robin with Interrupts Architecture - Function-Queue- Scheduling Architecture – Real-Time Operating Systems Architecture – Selection of Architecture.
4. **Tasks and Task States** – Tasks and Data – Semaphores and Shared Data – Semaphore Problems – Semaphore variants.
5. **Message Queues** – Mailboxes – Pipes – Timer Functions – Events – Memory Management – Interrupt Routines in RTOS Environment.
6. **RTOS design** – Principles – Encapsulation Semaphores and Queues – Hard Real-Time Scheduling Considerations – Saving Memory Space – Saving Power.
7. **Host and Target Machines** – Linker/Locator for Embedded Software- Getting Embedded Software into the Target System.
8. **Testing on your Host Machine** – Instruction Set Simulators – Laboratory Tools used for Debugging.

**Text Book:**

1. The 8051 Microcontroller Architecture, Programming & Applications, Kenneth J. Ayala, Penram International.
2. An Embedded Software Primer, David E. Simon, Pearson Education ,2005.

**Reference Book:**

Embedded Systems: Architecture, Programming and Design –Raj Kamal, TataMcGraw- Hill Education, 2008

**MTCST15**  
**RESEARCH METHODOLOGY AND IPR**  
**Common for M.Tech (CST, IT, CN&IS, AI&ML)**

**Instruction:3Periods/week**

**Time:3Hours**

**Credits:2**

**Internal:30Marks**

**External:70Marks**

**Total: 100Marks**

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**Course Objectives:**

- To give an overview of the research methodology and explain the technique of defining a research Problem.
- To learn the importance of literature survey and understand the theoretical and conceptual frameworks.
- To know the various research designs and different data collection methods.
- To explain various forms of the intellectual property and its rights, its relevance and business impact in the changing global business environment.

**Course Outcomes:**

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

- Discuss research methodology and the technique of defining a research problem.
- Explain the functions of the literature review in research, carrying out a literature search, developing theoretical and conceptual frameworks and writing a review.
- Explain various research designs and their characteristics.
- Analyze and Understand the concepts of Intellectual property rights, patents and Designing.

**Syllabus:**

**Unit 1:** Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

**Unit 2:** Effective literature studies approaches, analysis Plagiarism, Research ethics,

**Unit 3:** Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

**Unit 4:** Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

**Unit 5:** Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

**Unit 6:** New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

**References:**

1. Stuart Melville and Wayne Goddard, -Research methodology: an introduction for science& engineering students‘
2. Wayne Goddard and Stuart Melville, -Research Methodology: An Introduction
3. Ranjit Kumar, 2ndEdition, -Research Methodology: A Step by Step Guide for beginners
4. Halbert, -Resisting Intellectual Property, Taylor & Francis Ltd,2007.
5. Mayall, -Industrial Design, McGraw Hill, 1992.
6. Niebel, -Product Design, McGraw Hill, 1974.
7. Asimov, -Introduction to Design, Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, — Intellectual Property in New Technological Age, 2016.
9. T. Ramappa, -Intellectual Property Rights Under WTO, S. Chand, 2008

## MTCST16

### Organizational Behavior (Audit Course)

(Common for CST, IT, AI & ML, and CN&IS)

**Instruction: 3 Periods/week**

**Time: 3 Hours**

**Credits: 3**

**Internal: 30 Marks**

**External: 70 Marks**

**Total: 100 Marks**

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#### Course Objectives:

This course deals with human behavior in organizations:

1. To learn Conceptual frameworks, case discussions.
2. To learn skill-oriented activities applied to course topics which include: motivation, learning and development, group dynamics, leadership, communication, power and influence,
3. change, diversity, organizational design, and culture.
4. To learn Class sessions and assignments are intended to help participants acquire skills and analytic concepts to improve organizational relationships and effectiveness.

#### Course Outcomes:

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

1. Explain the importance & role of management in the business organizations.
2. Analyze knowledge on the importance of planning and organizing.
3. Identify various leadership styles and their suitability to the situation.
4. Apply organizational behavior theories and concepts to individual work experiences.
5. Know how to work more effectively in a team environment.

#### Syllabus

##### UNIT-I

Organizational Behavior: Concept of Organization - Concept of Organizational Behavior – Nature of Organizational Behavior - Role of Organizational behavior - Disciplines contributing to Organizational Behavior.

##### UNIT-II

Motivation: Definition - Nature of Motivation - Role of Motivation - Theories of Motivation: Maslow's Need Hierarchy Theory, Herzberg's Motivation Hygiene Theory and McGregor's Theory X and Theory Y.

##### UNIT-III

Group Dynamics: Meaning - Concept of Group - Types of groups - Formal and Informal groups - Group development - Group cohesiveness and factors affecting group cohesiveness.

##### UNIT-IV

Leadership: Concept of Leadership - Difference between Leadership and Management – Importance of Leadership - Leadership styles: Autocratic leadership, Participative leadership and Free Rein leadership.

##### UNIT-V

Communication: Meaning - Communication Process - Forms of communication: Oral, Written and Non- Verbal communication - Direction of communication: Downward, Upward and Horizontal communication.

## **UNIT-VI**

Organizational conflicts: Concept of conflict - Reasons for conflict - Types of Conflict: Intrapersonal conflict, Interpersonal conflict, Intragroup conflict, Intergroup conflict, Interorganizational conflict - Conflict management.

## **UNIT-VII**

Organizational Change: Nature - Factors in Organizational change -Planned change: Process of planned change - Resistance to change: Factors in resistance to change - Overcoming resistance to change.

### **Text Books.**

**1.L.M.Prasad: Organizational Behavior, Sultan Chand & Sons, New Delhi -110002**

**2.K. Aswathappa: Organizational Behavior, Himalaya Publishing House, New Delhi**

### **Reference Books.**

**1. Stephen Robbins: Organizational Behavior, Pearsons Education, New Delhi.**

**MTCST17**  
**ADVANCED DATA STRUCTURESLAB**  
**Common for M. Tech (CST, IT)**

**Instruction:3Periods/week**

**Time:3Hours**

**Credits:2**

**Internal:50Marks**

**External:50 Marks**

**Total: 100Marks**

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**Course Objectives:**

- To demonstrate the Graph traversal techniques.
- To make students learn the concepts of iterative and recursive algorithms.
- To impart knowledge on Dictionaries using hashing techniques.
- To demonstrate the basic operations on AVL tree, B-tree and Binary heap.
- To enable the students to learn about B-tree and B+-tree operations.

**Course Outcomes:**

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

- Identify the appropriate data structure for a given problem.
- Implement a Dictionary by using hashing techniques.
- Analyze various basic operations of AVL tree, B-tree to improve the efficiency.
- Build a Binary Heap using Priority queues
- Apply the concepts in various domains such as DBMS, compiler construction etc.

**Syllabus**

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods:

a) Linear search b) Binary search

2. Write Java programs to implement the following using arrays and linked lists

a) List ADT

3. Write Java programs to implement the following using an array.

a) Stack ADT b) Queue ADT

4. Write a Java program that reads an infix expression and converts the expression to postfix form.

(Use stack ADT).

5. Write a Java program to implement circular queue ADT using an array.

6. Write a Java program that uses both a stack and a queue to test whether the given string is a palindrome or not.

7. Write Java programs to implement the following using a singly linked list.

a) Stack ADT b) Queue ADT

8. Write Java programs to implement the deque (double ended queue) ADT using

a) Array b) Singly linked list c) Doubly linked list.

9. Write a Java program to implement priority queue ADT.

10. Write a Java program to perform the following operations:

a) Construct a binary search tree of elements.

b) Search for a key element in the above binary search tree.

c) Delete an element from the above binary search tree.

11. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.



12. Write a Java program to implement Dijkstra's algorithm for Single source shortest path problem.
13. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in
  - a) Preorder b) In order c) Post order.
14. Write Java programs for the implementation of bfs and dfs for a given graph.
15. Write Java programs for implementing the following sorting methods:
  - a) Bubble sort b) Merge sort c) Binary tree sort d) Insertion sort e) Heap sort f) Quick sort g) Radix sort
16. Write a Java program to perform the following operations:
  - a) Insertion into a B-tree b) Searching in a B-tree
17. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.
18. Write a Java program that implements KMP algorithm for pattern matching.

#### REFERENCE BOOKS:

1. Data Structures and Algorithms in java, 3rd edition, A.Drozdek, Cengage Learning.
2. Data Structures with Java, J.R.Hubbard, 2nd edition, Schaum's Outlines, TMH.
3. Data Structures and algorithms in Java, 2nd Edition, R.Lafore, Pearson Education.
4. Data Structures using Java, D.S.Malik and P.S. Nair, Cengage Learning.
5. Data structures, Algorithms and Applications in java, 2nd Edition, S.Sahani, UniversitiesPress.
6. Design and Analysis of Algorithms, P.H.Dave and H.B.Dave, Pearson education.
7. Data Structures and java collections frame work, W.J.Collins, McGraw Hill.
- 8 Java: the complete reference, 7th All editon, Herbert Schildt, TMH
9. Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education / Java: How toProgram P.J.Deitel and H.M.Deitel , 8th edition, PHI.

**MTCST18**  
**Elective-II Lab**  
**ADVANCED DATABASE MANAGEMENT SYSTEMS LAB**  
**Common for M.Tech (CST, IT)**

**Instruction:3Periods/week**

**Time:3Hours**

**Credits:2**

**Internal:50Marks**

**External:50 Marks**

**Total: 100Marks**

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**Course Objectives:**

- Knowledge of database design
- A general understanding of database, design and dependency
- Understanding of different types of databases 4 Knowledge of databases on the internet
- Application on enhanced database

**Course Outcomes:**

At the end of the course the students should be able to:

- Basic knowledge and understanding of ER diagram and UML class diagram.
- Ability to apply functionality and Normalization in relational databases.
- Recognize and fetch data from object oriented, parallel and distributed databases.
- Use XML and understand unstructured data 5 Implement concept and deduction of enhanced database on different applications

**Syllabus**

**Experiments**

- Basic SQL
- Intermediate SQL
- Advanced SQL
- ER Modeling
- Database Design and Normalization
- Accessing Databases from Programs using JDBC
- Building Web Applications using PHP & MySQL
- Indexing and Query Processing
- Query Evaluation Plans
- Concurrency and Transactions
- Big Data Analytics using Hadoop

**References**

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, -Database System Conceptsll, 6<sup>th</sup> edition, Tata McGraw Hill, 2011
2. RamezElmasri, Shamkant B. Navathe, -Fundamentals of Database Systemsll, 4<sup>th</sup> Edition, Pearson/Addisionwesley, 2007

**MTCST18**  
**Elective II Lab**  
**COMPUTER NETWORKS LAB**  
**Common for M.Tech (CST, IT)**

**Instruction:3Periods/week**

**Time:3Hours**

**Credits:2**

**Internal:50Marks**

**External:50 Marks**

**Total: 100Marks**

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**Course Objectives:**

- To understand the working principle of various communication protocols.
- To analyze the various routing algorithms.
- To know the concept of data transfer between nodes

**Course Outcomes:**

- Identify and use various networking components Understand different transmission media and design cables for establishing a network
- Implement any topology using network devices
- Analyze performance of various communication protocols.
- Compare routing algorithms
- Understand the TCP/IP configuration for Windows and Linux

**Syllabus**

**Network Programming**

1. Socket Programming
  - a. TCP Sockets
  - b. UDP Sockets
  - c. Applications using Sockets
2. Simulation of Sliding Window Protocol
3. Simulation of Routing Protocols
4. RPC
5. Development of applications such as DNS/ HTTP/ E – mail/ Multi - user Chat

**Web Programming**

1. Design of the Web pages using various features of HTML and DHTML
2. Client server programming using servlets, ASP and JSP on the server side and java script on the client side
3. Web enabling of databases
4. Multimedia effects on web pages design using Flash.

**Reference Books:**

1. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill
2. Programming the World Wide Web by Robert W. Sebesta, Pearson Education

**MTCST18**  
**Elective II Lab**  
**Embedded Systems LAB**  
**Common for M.Tech (CST, IT)**

**Instruction:3Periods/week**

**Time:3Hours**

**Credits:2**

**Internal:50Marks**

**External:50 Marks**

**Total: 100Marks**

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**Course Objectives:**

- To introduce basics of electronics and reading electronics diagrams
- To introduce students to basics of Arduino programming language and IDE
- Assembly language program using 8051
- Interfacing 8051 Microprocessor
- embedded system design using msp430

**Course Outcomes:**

**At the end of this course, students will:**

- Learn the basics of electronics, including reading schematics (electronics diagrams) and how to prototype circuits with a breadboard.
- Learn the Arduino programming language and IDE
- Acquire knowledge on how to program basic Arduino/ RASPBERRY Pi/8051/MSP430 using assembler language or C language.
- students able to learn how to build prototype models and interfacing various sensor to Arduino/ RASPBERRY Pi/8051/MSP430

**Syllabus**

**PART- I:**

1. Simple Assembly Program for  
Addition | Subtraction | Multiplication | Division  
Operating Modes, System Calls and Interrupts, Loops, Branches
2. Write an Assembly programs to configure and control General Purpose Input/Output (GPIO)port pins.
3. Write an Assembly programs to read digital values from external peripherals and execute themwith the Target board.
4. Program for reading and writing of a file
5. Program to demonstrate Time delay program using built in Timer / Counter feature onIDE environment
6. Program to demonstrates a simple interrupt handler and setting up a timer
7. Program demonstrates setting up interrupt handlers. Press button to generate an interrupt andtrace program flow with debug terminal.
8. Program to Interface 8 Bit LED and Switch Interface
9. Program to implement Buzzer Interface on IDE environment
10. Program to Displaying a message in a 2 line x 16 Characters LCD display and verify the resultin debug terminal.
11. Program to demonstrate I2C Interface on IDE environment
12. Program to demonstrate I2C Interface – Serial EEPROM
13. Demonstration of Serial communication. Transmission from Kit and reception from PC using
14. Serial Port on IDE environment use debug terminal to trace the program.
15. Generation of PWM Signal
16. Program to demonstrate SD-MMC Card Interface.

## **PART- II:**

Write the following programs to understand the use of RTOS with ARM Processor on IDE Environment using ARM Tool chain and Library:

1. Create an application that creates two tasks that wait on a timer whilst the main task loops.
2. Write an application that creates a task which is scheduled when a button is pressed, which illustrates the use of an event set between an ISR and a task
3. Write an application that Demonstrates the interruptible ISRs (Requires timer to have higher priority than external interrupt button)
4. a). Write an application to Test message queues and memory blocks. b). Write an application to Test byte queues
5. Write an application that creates two tasks of the same priority and sets the time slice period to illustrate time slicing. Interfacing Programs:
6. Write an application that creates a two task to Blinking two different LEDs at different timings
7. Write an application that creates a two task displaying two different messages in LCD display in two lines.
8. Sending messages to mailbox by one task and reading the message from mailbox by another task.
9. Sending message to PC through serial port by three different tasks on priority Basis.
10. Basic Audio Processing on IDE environment.



**M.TECH INFORMATION TECHNOLOGY**  
**COURSE STRUCTURE AND SCHEME OF VALUATION W.E.F. 2024-25**

**II SEMESTER**

Code	Name of the subject	Periods/week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
<b>MTIT21</b>	Web Systems & Technologies	3	-	70	30	100	3
<b>MTCST22</b>	Object Oriented Software Engineering	3	-	70	30	100	3
<b>MTIT23</b>	Elective-III	3	-	70	30	100	3
<b>MTIT24</b>	Elective-IV	3	-	70	30	100	3
<b>MTCST25</b>	Entrepreneurship (Audit Course)	3	-	70	30	100	0
<b>MTCST26</b>	OOSE Lab	-	3	50	50	100	2
<b>MTIT27</b>	Web Programming Lab	-	3	50	50	100	2
<b>MTIT28</b>	Integrating Design Thinking Into Innovation Engineering	-	3	-	100	100	2
<b>Total</b>		<b>15</b>	<b>9</b>	<b>450</b>	<b>350</b>	<b>800</b>	<b>18</b>

**Elective III:** Cryptography & Network Security/BlockChain Technologies/ Machine Learning

**Elective IV:** Big Data Analytics/Full Stack Development/Soft Computing

**SECOND SEMESTER**  
**DETAILED SYLLABUS FOR M.TECH (IT)**  
**MTIT21 WEB SYSTEMS & TECHNOLOGIES**

**Instruction: 3 Periods/week**  
**Internal: 30 Marks**

**Time: 3 Hours**  
**External: 70 Marks**

**Credits: 3**  
**Total: 100 Marks**

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**1. Introduction:**

History of the Internet and world wide web and HTML, Basic Internet Protocols-HTTP, SMTP, POP3, MIME, IMAP, Introduction to scripting Languages -Java Scripts, Object based Scripting for the web structures, functions, arrays and Objects, Dynamic HTML with JavaScript

**2. Dynamic HTML:**

Introduction to Object references, Dynamic Style, Dynamic Position, Frames, Navigators, Event Models, On Check, On load, Mouse operations, Adding Shadows, Creating Images, Creating Gradients, Creating Motion with Blur, Data binding, Sorting Table data, Binding of Images And Table.

**3. Introduction to PHP Programming:** Introduction , Database Access with PHP, PHP Interpreters, Security Issues, File Handling with PHP, Working with HTML and DHTML, PHP User Authentication

**4. Java Beans:**

Introduction to JavaBeans, Advantages of Java Beans, JDK; Introspection, Using Bound properties, Bean Info Interface, Constrained properties; Persistence, Customizes, Java Beans API, Introduction to EJB's.

**5. Multimedia:**

Audio and Video Speech, Synthesis and Recognition, E-Business Models, Online Payments and Security, Web Servers, Client and Server side Scripting, Accessing Webservers, Apache WebServer.

**6. Database, ASP and XML:**

RDBMS Models, Overview of SQL, ASP-Working of ASP, objects, Session Tracking and Cookies, ADO, Accessing DataBase with ASP, Server side ActiveX Components, Web resources, XML-Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX, Syntax of AJAX, Application Development using XML and AJAX

**7. Servlets and JSP:**

Introduction to Servlets: Servlet Overview Architecture, HTTP package, Handling Http Request & Responses, Using Cookies -Session Tracking, Security Issues, Multi tier architecture, JSP Overview, JSP Processing, JSP Application Design with MVC Setting Up and JSP Environment:

#### 8. **JSP Application Development :**

Generating Dynamic Content Using Scripting Elements Implicit JSP Objects, Conditional Processing, Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users Passing Control and Data between Pages, Sharing Session and Application Data– Memory Usage Considerations

#### **TEXT BOOKS :**

1. Web Programming, building internet applications, 2/e, Chris Bates, Wiley Dream tech
2. The complete Reference Java 2, 5/e, Patrick Naughton, Herbert Schildt. TMH
3. Programming world wide web- Sebesta, PEA

#### **REFERENCE BOOKS :**

1. Internet, WorldWideWeb, How to program, Dietel, Nieto, PHI/PEA
2. Jakarta Struts Cook book, Bill Siggelkow, SPDO'Reilly
3. Web Technologies, 2/e, Godbole, Kahate, TMH, 202,
4. An Introduction to web Design, Programming, Wang, Thomson
5. Web Applications Technologies Concepts- Knuckles, John Wiley



**MTCST22**  
**OBJECT ORIENTED SOFTWARE ENGINEERING**  
**Common for M.Tech (CST, IT)**

**Instruction: 3 Periods/week**  
**Internal: 30 Marks**

**Time: 3 Hours**  
**External: 70 Marks**

**Credits: 3**  
**Total: 100 Marks**

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**Course Objectives: The students would be able to**

- Learn the concepts of Object Oriented software engineering and software process models.
- Understand requirements engineering processes, Unified Modeling Language and its notations and diagrams.
- Understand various architectural styles, the software process and project management activities.
- Understand various types of testing and quality assurance issues.

**Course Outcomes: At the end of the course the students will have the:**

- Knowledge of best practices of Object Oriented software engineering and will be able to apply various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.
- Ability to analyze, elicit and specify software requirements through a productive working relationship with various stakeholders of the project.
- Ability to create various design models for a software system to meet the user needs.
- Knowledge on various types of testing and software process in the development of a software product.

**Syllabus**

**1. Introduction to Object Oriented Software Engineering**

Nature Of The Software, Types Of Software , Software Engineering Projects, Software Engineering Activities, Software Quality, Introduction To Object Orientation, Concepts Of Data Abstraction, Inheritance & Polymorphism, Software Process Models-Waterfall Model, The Opportunistic Model , The Phased Released Model, The Spiral Model, Evolutionary Model, The Concurrent Engineering Model

**2. Requirements Engineering:** Domain Analysis, Problem Definition And Scope, Requirements Definition, Types Of Requirements, Techniques For Gathering And Analyzing Requirements, Requirement Documents, Reviewing, Managing Change In Requirements.

**3. Unified Modeling Language & Use Case Modeling:** Introduction To UML, Modeling Concepts, Types Of UML Diagrams With Examples; User-Centered Design, Characteristics Of Users, Developing Use Case Models Of Systems, Use Case Diagram, Use Case Descriptions, The Basics Of User Interface Design, Usability Principles, User Interfaces.

**4. Class Design and Class Diagrams:** Essentials Of UML Class Diagrams, Associations And Multiplicity, Other Relationships, Generalization, Instance Diagrams, Advanced Features Of Class Diagrams, Interaction And Behavioral Diagrams: Interaction Diagrams, State Diagrams, Activity Diagrams, Component And Deployment Diagrams.

**5. Software Design And Architecture:** The Process Of Design, Principles Leading To Good Design, Techniques For Making Good Design Decisions, Writing A Good Design Document., Pattern Introduction, Design Patterns: The Abstraction- Occurrence Pattern, General

Hierarchical Pattern, The Play-Role Pattern, The Singleton Pattern, The Observer Pattern, The Delegation Pattern, The Adaptor Pattern, The Façade Pattern, The Immutable Pattern, The Read-Only Interface Pattern And The Proxy Pattern; Software Architecture Contents Of An Architecture Model, Architectural Patterns: The Multilayer, Client-Server, Broker, Transaction Processing, Pipe & Filter And MVC Architectural Patterns

6. **Software Testing:** Overview Of Testing, Testing Concepts, Testing Activities, Testing Strategies, Unit Testing, Integration Testing, Function Testing, Structural Testing, Class Based Testing Strategies, Use Case/Scenario Based Testing, Regression Testing, Performance Testing, System Testing, Acceptance Testing, Installation Testing, OO Test Design Issues, Test Case Design, Quality Assurance, Root Cause Analysis, Post- Mortem Analysis.
7. **Software Project Management:** Introduction To Software Project Management, Activities Of Software Project Management, Structure Of Project Plan, Software Engineering Teams, Software Cost Estimation, Project Scheduling, Tracking And Monitoring.
8. **CASESTUDY:** Simple Chat Instant Messaging System, GPS Based Automobile Navigation System, Waste Management Inspection Tracking System(WMITS), Geographical Information System

**Text Book:**

Object-Oriented Software Engineering Practical software development using UML and Java by Timothy C. Lethbridge& Robert, Langanieri Mcgraw-Hill

**References:**

1. 1.Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education Asia.
2. Software Engineering: A Practitioner's Approach, Roger SPressman.
3. A Practical Guide to Testing Object-Oriented Software, John D. McGregor; David A.Sykes, Addison-Wesley Professional.

# MTIT23

## Elective-III

### Cryptography & Network Security

**Instruction:**3Periods/week  
**Internal:**30Marks

**Time:**3Hours  
**External:**70 Marks

**Credits:** 3  
**Total:** 100Marks

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#### Course Objectives:

- Introduction of the issues in network security- its need and importance, taxonomy and terminology.
- Discussion of various cryptographic techniques.
- Exploration of different types of security threats and remedies.
- Understanding of Internet security protocols and standards.

#### Course Outcomes:

- Realize the need and importance of network and data security in the Internet and in distributed environments.
- Identify the different types of network security issues and their remedies.
- Application of various cryptographic tools and techniques in different contexts and as per need of security levels.
- Implementation of some Internet security protocols and standards

#### Syllabus

- 1 **Overview:** Computer Security Concepts, Threats, Attacks, and Assets, Security Functional Requirements, A Security Architecture for Open Systems, Computer Security Trends, Computer Security Strategy. Cryptographic Tools: Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management, Random and Pseudorandom Numbers, Practical Application: Encryption of Stored Data. User Authentication: Means of Authentication, Password-Based Authentication, Token- Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication, Practical Application: An Iris Biometric System, Case Study: Security Problems for ATM Systems.
- 2 **Access Control:** Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control, Example: UNIX File Access Control, Role-Based Access Control, Case Study: RBAC System for a Bank. Database Security: The Need for Database Security, Database Management Systems, Relational Databases, Database Access Control, Inference, Statistical Databases, Database Encryption, Cloud Security.
- 3 **Malicious Software:** Types of Malicious Software (Malware), Propagation—Infected Content— Viruses, Propagation—Vulnerability Exploit—Worms, Propagation—Social Engineering—SPAM E-mail, Trojans, Payload—System Corruption, Payload—Attack Agent—Zombie, Bots, Payload— Information Theft—Key loggers, Phishing, Spyware, Payload—Steal thing—Backdoors, Root kits, Counter measures.  
Denial-of-Service Attacks: Denial-of-Service Attacks, Flooding Attacks, Distributed Denial-of- Service Attacks, Application-Based Bandwidth Attacks, Reflector and Amplifier Attacks, Defenses Against Denial-of-Service Attacks, Responding to a Denial-of-Service Attack.
- 4 **Intrusion Detection:** Intruders, Intrusion Detection, Host-Based Intrusion Detection,

Distributed Host-Based Intrusion Detection, Network-Based Intrusion Detection, Distributed Adaptive Intrusion Detection, Intrusion Detection Exchange Format, Honey pots, Example System: Snort. Firewalls and Intrusion Prevention Systems: The Need for Firewalls, Firewall Characteristics, Types of Firewalls, Firewall Basing, Firewall Location and Configurations, Intrusion Prevention Systems, Example: Unified Threat Management Products.

- 5 **Buffer Overflow:** Stack Overflows, Defending Against Buffer Overflows, Other Forms of Overflow Attacks, Software Security: Software Security Issues, Handling Program Input, Writing Safe Program Code, Interacting with the Operating System and Other Programs, Handling Program Output. Operating System Security: Introduction to Operating System Security, System Security Planning, Operating Systems Hardening, Application Security, Security Maintenance, Linux/Unix Security, Windows Security, Virtualization Security.
- 6 **Symmetric Encryption and Message Confidentiality:** Symmetric Encryption Principles, Data Encryption Standard, Advanced Encryption Standard, Stream Ciphers and RC4, Cipher Block Modes of Operation, Location of Symmetric Encryption Devices, Key Distribution. Public-Key Cryptography and Message Authentication: Secure Hash Function, HMAC, The RSA Public-Key Encryption Algorithm, Diffie-Hellman and Other Asymmetric Algorithms.
- 7 **Internet Security Protocols and Standards:** Secure E-mail and S/MIME, Domain Keys Identified Mail, Secure Socket Layer (SSL) and Transport Layer Security (TLS), HTTPS, IPv4 and IPv6 Security. Internet Authentication Applications: Kerberos, X.509, Public-Key Infrastructure, Federated Identity Management. Wireless Network Security: Wireless Security Overview, IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security.

**Text Book:**

1. Computer Security - Principles and Practices (Except the Chapters 13, 14, 15, 16, 17, 18, 19), 2<sup>nd</sup> Edition by William Stallings, Pearson Education, Inc.

**Reference Books:**

1. Cryptography and Network Security by William Stallings, Pearson Education Asia, New Delhi.
2. Network Security Essentials Applications and Standards, by William Stallings, Pearson Education Asia, New Delhi.

# MTIT23

## ELECTIVE-III

### BLOCK CHAIN TECHNOLOGIES

**Instruction:3Periods/week**  
**Internal:30Marks**

**Time:3Hours**  
**External:70 Marks**

**Credits: 3**  
**Total: 100Marks**

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**Course Objectives:**

- 1: To understand the basic concepts block chain technology and to explore the driving force behind the crypto currency Bit coin.
- 2: To understand about the different methods of Decentralization using Block Chain and different Bit coins and Alternative Coins.
- 3: To understand about Ethereum and applications using Smart contracts and Block Chain Applications

**Course Outcomes:**

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

1. Understand the types, benefits and limitation of block chain.
2. Explore the block chain decentralization and cryptography concepts.
3. Enumerate the Bit coin features and its alternative options.
4. Describe and deploy the smart contracts

**UNIT 1: Block Chain and its History:**

History of block chain, Types of block chain, Block chain Components – Permissioned Block chain  
Permission less Block chain – Consortium Block chain – basics of Consensus Algorithms, Architecture  
& Properties of Block chain.

**UNIT 2: Decentralization and Consensus Algorithms :**

Decentralization using block chain, Methods of decentralization, Routes to decentralization,  
Decentralized organizations, Distributed systems, Distributed ledger, Merkle tree, structure of a block,  
Consensus

**Algorithms-** Proof of Work, Proof of Stack, Proof of Burn, Proof of Elapsed Time, Proof of Activity,  
Proof of Concept.

**UNIT 3: Bit coin and Alternative Coins :**

Bit coin, Transactions, Bit coin payments , Bit coin properties – Transaction life cycle – creation of  
coin – sending payments – double spending using block chain – bit coin anonymity – Ether: Ether coin  
properties, Alternative Coins, Bit coin limitations, Name coin, Lite coin, Primecoin, Zcash

**UNIT 4: Ethereum and smart contracts:**

Ethereum Architecture, solidity programming basics, Smart Contract, Deploying Smart Contracts,  
Integration with UI.

**UNIT 5: Block chain Applications :**

Block chain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media ,Secure  
Voting and Digital Identity, Real Estate, Education

**Textbooks:**

1. Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Author-Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1- 78712-544-5, 2017
2. Bitcoin and Cryptocurrency Technologies, Author- Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Princeton University, 2016
3. Blockchain Technology, Author- Chandramouli Subramanian, Asha A George, Abhilash K A, Meena Karthikeyan, University Press (India) Private Limited, 2021

**References:**

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Author- Daniel Drescher, Apress, First Edition, 2017

**MTIT23**  
**ELECTIVE-III**  
**Machine Learning**

**Instruction:3Periods/week**  
**Internal:30Marks**

**Time:3Hours**  
**External:70 Marks**

**Credits: 3**  
**Total: 100Marks**

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**Course Objectives:**

- To understand the basic theory underlying machine learning.
- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.
- To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

**Course Outcomes:**

After completing this course, the student will be able to

- Appreciate the importance of visualization in the data analytics solution.
- Apply structured thinking to unstructured problems.
- Understand a very broad collection of machine learning algorithms and problems.
- Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory.
  - Develop an appreciation for what is involved in learning from data.

**Syllabus:**

1. **Introduction:** Introduction to Machine Learning, learning task- illustration, Approaches to Machine Learning, Machine Learning algorithms- Theory, Experiment in biology and Psychology.
2. **Concept Learning:** Introduction, Concept Learning Task- Notation, Concept Learning Search, Version spaces, Candidate Elimination Algorithm, Inductive Bias, Biased hypothesis Space, Unbiased Learner, Bias-free Learning, Active queries, Mistake bound/PAC model – basic results. Overview of issues regarding data sources, success criteria
3. **Decision Tree Learning:** Decision Tree Representation, Basic decision Tree Learning, Inductive bias in Decision tree Learning, Issues in Decision Tree Learning, Minimum

Description Length Principle, Occam's razor, Learning with active queries

4. **Neural Network Learning:** Neural Network Representation, Problems for Neural Network Learning, Perceptions and gradient descent, Multi Layer Network and Back propagation Algorithm, Illustrative Example of Back Propagation Algorithm- Face Recognition, Advanced Topics in ANN.
5. **Bayesian Approaches:** Basics of Bayes Theorem and Concept Learning, Expectation Maximization, Minimum Description Length Principle, Naive Bayes Classifier, Bayesian Belief Networks, EM Algorithm, K-Means Algorithm, Hidden Markov Models Instance-Based Techniques; Lazy vs. eager generalization, k nearest neighbor, Locally Weight Representation, Case-based Reasoning
6. **Analytical Learning:** Inductive and Analytical Learning problems, Learning with perfect Domain Theory, Explanation Based Learning, Inductive Bias in EBL, Search Control Knowledge with EBL, Inductive- Analytical Approaches to Learning, Using prior Knowledge for Initialize the Hypothesis, and Altering Search objective, FOCL Algorithm.
7. **Genetic Algorithms:** Representation of Hypothesis as GA., Genetic Operators, Fitness function and Selection, Hypothesis Space search, Genetic Programming, Models of Evolution and Learning, Parallelizing GA, Different search methods for induction 1995

**Text Books:**

1. Machine Learning, Tom Mitchell, McGraw Hill, 1997
2. The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani & Jerome Friedman, Springer Verlag, 2001

**Reference Books:**

1. Pattern Classification, Richard O. Duda, Peter E. Hart and David G. Stork, John Wiley & Sons Inc., 2001
2. Neural Networks for Pattern Recognition, Chris Bishop, Oxford University Press,



# MTIT24

## ELECTIVE-IV BIG DATA ANALYTICS

**Instruction:**3Periods/week  
**Internal:**30Marks

**Time:**3Hours  
**External:**70 Marks

**Credits:** 3  
**Total:** 100Marks

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### Course Objectives:

This course is aimed at enabling the students to

- Provide an overview of an exciting growing field of big data analytics.
- Introduce the tools required to manage and analyze big data like Hadoop, NoSQL, Map Reduce, HIVE, Cassandra, Spark.
- Teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- Optimize business decisions and create competitive advantage with Big Data analytics.

### Course Outcomes:

**After the completion of the course, student will be able to**

- Illustrate on big data and its use cases from selected business domains.
- Interpret and summarize on NoSQL, Cassandra
- Analyze the HADOOP and Map Reduce technologies associated with big data analytics and explore on Big Data applications Using Hive.
- Make use of Apache Spark, RDDs etc. to work with datasets.
- Assess real time processing with Spark Streaming.

### Syllabus:

1. Getting Ready to Use R and Hadoop, Installing R, Installing R-Studio, Understanding the nature of R Language, Installing Hadoop, Understanding Hadoop features, Learning the HDFS and Map Reduce architecture, Understanding Hadoop subprojects.
2. Writing Hadoop Map Reduce Programs Understanding the basics of Map Reduce, Introducing Hadoop MapReduce, Understanding the Hadoop Map Reduce fundamentals, Writing a Hadoop MapReduce example, Learning the different ways to write Hadoop Map Reduce in R.
3. Integrating R and Hadoop Introducing RHIPE, Installing RHIPE, Understanding the architecture of HIPE, Understanding RHIPE samples, Understanding the RHIPE function, Introducing RHadoop, Understanding the architecture of RHadoop, Understanding RHadoop examples, Understanding the RHadoop function reference
4. Using Hadoop Streaming with R Understanding the basics of Hadoop streaming, Understanding how to run Hadoop streaming with R, Exploring the Hadoop Streaming R package.
5. Learning Data Analytics with R and Hadoop Understanding the data analytics project life cycle, Understanding data analytics problems, Exploring web pages categorization, Computing the frequency of stock market change, Predicting the sale price of blue book for bulldozers—case study.
6. Understanding Big Data Analysis with Machine Learning Introduction to machine learning, Supervised machine-learning algorithms, Unsupervised machine learning algorithm, Recommendation algorithms.

7. ImportingandExportingDatafromVariousDBsLearningaboutdatafilesasdatabase, Understanding MySQL, Understanding Excel, Understanding Mongo DB, Understanding SQLite, Understanding Postgre SQL, Understanding Hive, Understanding HBase.

**Text Book :**

1. Big Data Analytics with R and Hadoop By Vignesh Prajapati, [Packt PublishingLtd](#) .(OpenSourcee-book available)

**Reference Books:**

1. Big Data Analytics By Venkat Ankam, [Packt PublishingLtd](#).
2. Big Data Analytics Made Easy By Y.Lakshmi Prasad, NotionPress.

**MTIT24**  
**ELECTIVE-IV**  
**SOFT COMPUTING**

**Instruction: 3 Periods/week**  
**Internal: 30 Marks**

**Time: 3 Hours**  
**External: 70 Marks**

**Credits: 3**  
**Total: 100 Marks**

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**Course Objectives:**

- Aims to provide comprehensive understanding of Soft computing approaches for AI problemsolving
- Develops in depth knowledge on concepts related to different types of neural networks
- Provides in depth knowledge on concepts related to Fuzzy logic, membership value assignment and reasoning with fuzzy quantities
- Helps to understand the development of Fuzzy Inference systems and Fuzzy expert systems
- Introduces the concepts related to Genetic algorithms for learning from examples

**Course Outcomes**

After completion of course, students would be able to:

- Build neural networks to extract patterns from data
- Build fuzzy inference systems and develop fuzzy expert systems
- Write genetic algorithms for learning the hyper parameters for data classification

**UNIT-I:**

Introduction to Soft computing, Artificial Neural Network: An Introduction, Evolution of Neural Networks, Basic Models of Artificial Neural Network, Important Terminologies of ANNs, McCulloch–Pitts Neuron, Linear Separability, Hebb Network.

**UNIT-II:**

Supervised Learning Network, Perceptron Networks, Adaptive Linear Neuron (Adaline), Multiple Adaptive Linear Neurons, Back-Propagation Network, Radial Basis Function Network, Time Delay Neural Network, Associative Memory Networks, Hopfield Networks

**UNIT-III :**

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets, Classical Relations and Fuzzy Relations, Tolerance and Equivalence Relations, Noninteractive Fuzzy Sets, Membership Function, Features of the Membership Functions, Fuzzification, Methods of Membership Value Assignments, Methods of Membership Value Assignments, Defuzzification

**UNIT-IV:**

Fuzzy Arithmetic and Fuzzy Measures, Measures of Fuzziness, Fuzzy Rule Base and Approximate Reasoning, Fuzzy Propositions, Formation of Rules, Decomposition of Rules (Compound Rules), Aggregation of Fuzzy Rules, Fuzzy Reasoning (Approximate Reasoning), Fuzzy Inference Systems (FIS), Overview of Fuzzy Expert System

**UNTI-V :**

Genetic Algorithm, Introduction, Biological Background, Genetic Algorithm and Search Space, Basic Terminologies in Genetic Algorithm, General Genetic Algorithm, Operators, Stopping Condition for Genetic Algorithm Flow, Constraints, Problem Solving Using Genetic Algorithm, The Schema Theorem, Classification of Genetic Algorithm, Advantages and Limitations of Genetic Algorithm, Applications of Genetic Algorithm.

**Text Books:**

1. S.N. Sivanandam, S.N. Deepa, Principles of Soft Computing, 3ed, Wiley India.
2. Fakhreddine O. Karray, Clarence W. De Silva, Soft Computing and Intelligent Systems Design: Theory, Tools and Applications, 1e, Pearson.

**References:**

1. Fundamentals of Neural Networks – Laurene Fauseett, Prentice Hall India, New Delhi, 1994.
2. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3 ed, Wiley India
3. E – Neuro Fuzzy and Soft computing – Jang J.S.R., Sun C.T and Mizutami, Prentice hall New Jersey, 1998

# **MTCST25**

## **Entrepreneurship(AUDIT COURSE)**

(Common for CST, IT, AI & ML, and CN&IS)

**Instruction:3 Periods/week**

**Time:3 Hours**

**Credits: 3**

**Internal:30 Marks**

**External:70 Marks**

**Total: 100 Marks**

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### **Course Objectives:**

- To create an awareness about entrepreneurship.
- To demonstrate key entrepreneurial leadership qualities.
- To explain the key strategies for starting a new enterprise.
- To provide knowledge about government plans and programmes and availability of resources.
- To provide knowledge on appropriate training skills required to become first generation entrepreneurs.
- To develop an entrepreneurial mind set.

### **Course Outcomes:**

- Identify the readiness and aptitude for entrepreneurship.
- Ability to prepare business plans.
- Ability to mobilize physical, financial and human resources.
- Apply financial, operational, organizational and marketing knowledge in managing an enterprise.
- Understand how entrepreneurship can impact society.

## **Syllabus**

### **UNIT-I**

#### **Introduction:-**

Meaning and Definition of Entrepreneurship - Characteristics and functions of Entrepreneurs – Classification of Entrepreneurs – Barriers to Entrepreneurship – Motivational Factors for Entrepreneurship.

### **UNIT-II**

#### **Business Planning Process:-**

Business Plan – Marketing Plan – Production / Operational Plan – Organisational Plan – Financial Plan.

### **UNIT-III**

#### **Institutions in aid of Entrepreneurs:-**

Role of Government in Promoting Entrepreneurship – Role of Commercial Banks – Role of Development Financial Institutions, IDBI, SIDBI, ICICI, NABARD and State Financial Corporations – Role of Consultancy Organisations.

#### **UNIT-IV**

##### **Small Scale Industries:**

Definition of S.S.I – Types of SSIs – Strengths and Weaknesses of Small Scale Industries – Sickness in SSIs – Reasons and Remedies – MSME's.

#### **UNIT-V**

##### **Women Entrepreneurship:-**

Importance and Need for Women Entrepreneurship – Problems of Women Entrepreneurs – Government and support for Women Entrepreneurs.

#### **UNIT-VI**

##### **Business Project Management:**

Business idea- Sources - Project Identification – Project Formulation – Project Report Preparation – Project Design – Project Appraisal – Project Planning – Project Financing.

#### **UNIT-VII**

##### **Training for Entrepreneurship Development:-**

Need and Importance of Training Entrepreneurs – Objectives and Methods of Training for New and existing Entrepreneurs – Institutions imparting training to Entrepreneurs – Feed Back and Performance of Trainee.

#### **Text Books:**

1. Madhurima Lall, ShikhaSahi:**Entrepreneurship**, Excel Books, New Delhi.
2. Vasant Desai: **Dynamics of Entrepreneurship Development**, Himalaya Publishing House,New Delhi.

#### **Reference Books:**

1. C.V. Bakshi: **Entrepreneurship Development**, Excel Books, New Delhi.
2. Jain: **Hand Book of Entrepreneurs** OXFORD University Press.

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**MTCST26**  
**OBJECT ORIENTED SOFTWARE ENGINEERING LAB**  
**common for M.Tech (CST, IT)**

**Instruction:3 Periods/week**  
**Internal:50 Marks**

**Time:3 Hours**  
**External:50 Marks**

**Credits: 2**  
**Total: 100 Marks**

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**Course Objectives:**

- The purpose of the Software Engineering Lab course is to familiarize the students with modern software engineering methods and tools, Rational Products. The course is realized as a projectlike assignment that can, in principle, by a team of three/four students working full time. Typically the assignments have been completed during the semester requiring approximately 60-80 hours from each project team.
- The goal of the Software Engineering Project is to have a walk through from the requirements, design to implementing and testing. An emphasis is put on proper documentation. Extensive hardware expertise is not necessary, so proportionate attention can be given to the design methodology.
- Despite its apparent simplicity, the problem allows plenty of alternative solutions and should be a motivating and educating exercise. Demonstration of a properly functioning system and sufficient documentation is proof of a completed assignment.
- Term projects are projects that a group student or might take through from initial specification to implementation. The project deliverables include.

**Course Outcomes:**

- Ability to define a problem and perform Requirements Engineering.
  - Ability to draw UML diagrams for the requirements gathered.
  - Ability to implement the designed problem in Object Oriented Programming Language.
  - Test whether all the requirements specified have been achieved or not.
1. The purpose of the Software Engineering Lab course is to familiarize the students with modern software engineering methods and tools, Rational **Products**. The course is realized as a project-like assignment that can, in principle, by a team of three/four students working full time. Typically the assignments have been completed during the semester requiring approximately 60-80 hours from each project team.
  2. The goal of the Software Engineering Project is to have a walk through from the requirements, design to implementing and testing. An emphasis is put on proper documentation. Extensive hardware expertise is not necessary, so proportionate attention can be given to the design methodology.
  3. Despite its apparent simplicity, the problem allows plenty of alternative solutions and should be a motivating and educating exercise. Demonstration of a properly functioning system and sufficient documentation is proof of a completed assignment

4. Term projects are projects that a group student or might take through from initial specification to implementation. The project deliverables include

## **Syllabus**

### ***Projects***

- Documentation including
  - A problem statement
  - A requirements document
- A Requirements Analysis Document.
- A System Requirements Specification.
- A Software Requirements Specification.
- A design document
  - A Software Design Description and a System Design Document.
- A test specification.
- Manuals/guides for
  - Users and associated help frames
  - Programmers
  - Administrators (installation instructions)
- A project plan and schedule setting out milestones, resource usage and estimated costs.
- A quality plan setting out quality assurance procedures
- An implementation.

### **Reference Books:**

1. Project-based software engineering: An Object-oriented approach, Evelyn Stiller, Cathie LeBlanc, Pearson Education
2. VisualModellingwithRationalRose2002andUML, TerryQuatrini, Pearson Education
3. UML2 Toolkit, Hans -Erik Eriksson, etc; Wiley



# MTIT27 WEB PROGRAMMING LAB

**Instruction: 3 Periods/week**  
**Internal: 30 Marks**

**Time: 3 Hours**  
**External: 70 Marks**

**Credits: 2**  
**Total: 100 Marks**

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## Course Objectives:

- To facilitate the graduates with the ability to visualize, gather information, articulate, analyze, solve complex problems, and make decisions. These are essential to address the challenges of complex and computation intensive problems increasing their productivity.
- To facilitate the graduates with the technical skills that prepare them for immediate employment and pursue certification providing a deeper understanding of the technology in advanced areas of computer science and related fields, thus encouraging to pursue higher education and research based on their interest.
- To facilitate the graduates with the soft skills that include fulfilling the mission, setting goals, showing self-confidence by communicating effectively, having a positive attitude, get involved in team-work, being a leader, managing their career and their life.

**Course Outcomes:** After Successful Completion of this activity the student will be able to

- Understand the working principles of the computer System and its components, Apply the knowledge to build, assess, and analyze the software and hardware aspects of it .
  - Plan, develop, test, analyze, and manage the software and hardware intensive systems in heterogeneous platforms individually or working in teams.
  - use the professional, managerial, interdisciplinary skill set, and domain specific tools in development processes, identify the research gaps, and provide innovative solutions to them.
1. Identifying well known ports on a Remote System :By trying to listen to the various well known ports by opening client connections. If the exception does not occur then the remote port is active else the remote port is inactive.
  2. Writing a Chat application:
    - i). One-One: By opening socket connection and displaying what is written by one party to the other.
    - ii). Many-Many (Broad cast): Each client opens a socket connection to the chat server and writes to the socket. Whatever is written by one party can be seen by all other parties.
  3. Data retrieval from a Remote database: At the remote database a server listens for client connections. This server accepts SQL queries from the client, executes it on the database and sends the response to the client.
  4. Mail Client:

POP Client: Gives the server name, user name and password retrieve the mails and allow manipulation of mail box using POP commands.

SMTP Client: Gives the server name, send e-mail to the recipient using SMTP commands-
  5. Simulation of Telnet: Provide a user interface to contact well-known ports, so that client-server interaction can be seen by the user..
  6. Design of the Web pages using various features of HTML and DHTML
  7. Client server programming using servlets, ASP and JSP on the server side and java script on the client side

8. Web enabling of databases
9. Multimedia effects on web pages design using Flash.

## **References**

1. Java Network Programming, Harold, Orielly Publications
2. An Introduction to Computer Networking, Kenneth C. Mansfield and James L. Antonakos, Pearson Education Asia
3. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill
4. Programming the World Wide Web by Robert W. Sebesta, Pearson Education

# MTIT 28

## INTEGRATING DESIGN THINKING INTO INNOVATION ENGINEERING

**Instruction: 3 Periods/week**  
**Internal: 30 Marks**

**Time:3 Hours**  
**External:70 Marks**

**Credits:2**  
**Total: 100Marks**

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### Course Objectives:

- To expose students to the design process as a tool for innovation.
- To develop students' professional skills in client management and communication.
- To study about various ideation tools and generate creative solutions.
- To understand about prototyping

**Course Outcomes:**After Successful Completion of this activity the student will be able to

- Outline a problem, apply methods of Empathy on user groups
- Describe and Define the problem specific to the user group
- Apply Ideation tools to generate Ideas to solve the problem
- Develop prototype
- Test the ideas and demonstrate Storytelling ability to present the Ideas

**Students shall form into groups and Identify a problem (preferably societal problem with engineering orientation to solve) suitable for the design thinking and go through the process week-wise. At the end of each phase, brief documentation shall be submitted and a final report covering all phases has to be submitted at the end of the semester.**

**Introduction to Design Thinking:** A primer on design thinking - Traditional approach, The new design thinking approach. Stages in Design Thinking : Empathize, Define, Ideate, Prototype, Test. Mindset For Design thinking, Design thinking for product and process innovation, Difference between engineering design and design thinking.

**Case Studies:** General, Engineering and Service applications.

**Activities:** Identify an Opportunity and Scope of the Project Explore the possibilities and Prepare design brief

### Methods and Tools for Empathize and Define phases:

Empathize - Methods Empathize Phase: Ask 5 Why / 5W+H questions, Stakeholder map, Empathy Map, Peer Observation, Trend analysis

Define-Methods of Define Phase : Storytelling, Critical Items Diagram, Define Success

**Activities:** Apply the methods of empathize and Define Phases Finalize the problem statement

**Methods and Tools for Ideate phase:**

Ideate-Brainstorming, 2x2 Matrix, 6-3-5 method, NABC method;

**Activities:** Apply the methods of Ideate Phase: Generate lots of Ideas

**Methods and Tools for Prototype Phase:**

**Prototype-**Types Of Prototypes-Methods Of Prototyping-Focused Experiments, Exploration Map, Minimum Viable Product;

**Activities:** Apply the methods of Prototype Phase: Create prototypes for selected ideas

**Methods and Tools for Test Phase:**

**Test- Methods of Testing:** Feedback capture grid, A/B testing

**Activities:** Collect feedback; iterate and improve the ideas

**Solution Overview-**Create a Pitch - Plan for scaling up - Roadmap for implementation

**Activities:** Present your solution using Storytelling method

**Project Submission:** Fine tuning and submission of project report

**Reference Books:**

1. Tim Brown, Change by Design : How Design Thinking Transforms Organizations and Inspires Innovation, Harper Collins-books, 2009.
2. Michael Lewrick, Patrick Link, Larry Leifer, The Design Thinking Toolbox, John Wiley & Sons, 2020.
3. Michael Lewrick, Patrick Link, Larry Leifer, The Design Thinking Playbook, John Wiley & Sons, 2018.
4. Kristin Fontichiaro, Design Thinking, Cherry Lake Publishing, USA, 2015.
5. Walter Brenner, Falk Uebernickel, Design Thinking for Innovation - Research and Practice, Springer Series, 2016.
6. Gavin Ambrose, Paul Harris, DesignThinking, AVA Publishing, 2010.
7. Muhammad Mashhood Alam, Transforming an Idea into Business with Design Thinking, First Edition, Taylor and Francis Group, 2019.
8. S.Balaram, Thinking Design, Sage Publications, 2011.

**Web References:**

1. <https://designthinking.ideo.com/>
2. <https://thinkibility.com/2018/12/01/engineering-vs-design-thinking/>
3. <https://www.coursera.org/learn/design-thinking-innovation>
4. [https://swayam.gov.in/nd1\\_noc20\\_mg38/preview](https://swayam.gov.in/nd1_noc20_mg38/preview)



**M.TECH INFORMATION TECHNOLOGY**  
**COURSE STRUCTURE AND SCHEME OF VALUATION W.E.F. 2024-25**

**III SEMESTER**

Code	Name of the subject	Periods/week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MTIT31	Elective-V	3	-	70	30	100	3
MTIT32	Open Elective	3	-	70	30	100	3
MTIT33	Dissertation-I / Industrial project		-	100	-	100	10
<b>Total</b>		<b>6</b>	<b>-</b>	<b>240</b>	<b>60</b>	<b>300</b>	<b>16</b>

**Elective V:** Business Intelligence/Internet of Things/ Natural Language Processing

**Open Elective:** Information Retrieval/Cyber Security / Digital Forensics/Deep Learning

**MTIT31  
ELECTIVE-V  
BUSINESS INTELLIGENCE**

**Instruction: 3 Periods/week  
Internal: 30 Marks**

**Time: 3 Hours  
External: 70 Marks**

**Credits: 3  
Total: 100 Marks**

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**Course Objectives :**

- To become familiar with the ethics and basics of Business Intelligence and Decision Support Systems
- To define mathematical models, data mining and data preparation
- To study marketing models, Logistic and production models and Data analysis

**Course Outcomes:** Students will be able to:

- Understand and Analyse the role of mathematical models wrt Business intelligence architectures, representation of the decision-making process, evolution of information systems.
- Understand concepts of data mining, data preparation, process and analysis techniques.
- Understand and Evaluate different classification models and clustering techniques

- **Syllabus:**

**UNIT-I**

Introduction to Business Intelligence Types of digital data; Introduction to OLTP, OLAP and Data Mining; BI Definitions & Concepts; Business Applications of BI; BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities

**UNIT-II**

Basics of Data Integration (Extraction Transformation Loading); Concepts of data integration; Need and advantages of using data integration; Introduction to common data integration approaches; Introduction to data quality, data profiling concepts and applications, Introduction to SSIS Architecture, Introduction to ETL using SSIS;

**UNIT-III**

Data Warehouse and OLAP Technology – Definition, A Multidimensional Data Model, Concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema; Data Warehouse Architecture. Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling; Introduction to business metrics and KPIs; Introduction to enterprise reporting; Concepts of dashboards, balanced scorecards; Applications of Data mining and Case studies of BI

**UNIT- IV**

Data Mining—On What Kind of Data? Data Mining Functionalities—What Kinds of Patterns Can Be Mined? Mining Association rules: Basic concepts, frequent item set mining methods. Definitions of classification, prediction and clustering;

**UNIT-V**

Classification and Prediction - Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Prediction, Cluster Analysis - Types of Data in Cluster Analysis, Hierarchical Methods.

**TEXT BOOKS :**

1. R N Prasad and Seema Acharya -Fundamentals of Business Analytics, Wiley-India, 2011  
Jiawei Han and Micheline Kamber, -Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, 2000 (ISBN: 1-55860-489-8).
2. David Loshin, -Business Intelligence -The Savvy Manager's Guide, Morgan Kaufmann Publishers.

# MTIT31

## ELECTIVE-V

### INTERNET OF THINGS

**Instruction: 3 Periods/week**

**Time: 3 Hours**

**Credits: 3**

**Internal: 30 Marks**

**External: 70 Marks**

**Total: 100 Marks**

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#### **Course Objectives:**

- Vision and Introduction to Internet of Things (IoT).
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Understand Real World IoT Design Constraints, Industrial Automation and Commercial.

#### **Course Outcomes:**

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

- Explain in a concise manner how the general Internet as well as Internet of Things work.
- Understand constraints and opportunities of wireless and mobile networks for Internet of Things.
- Use basic sensing and measurement and tools to determine the real-time performance of a network of devices.
- Develop prototype models for various applications using IoT technology.

#### **Syllabus**

1. 1. Introduction to the internet of things: IoT Architecture, History of IoT, M2M– Machine to Machine, Web of Things, IoT protocols                      The Architecture      The Layering concepts, IoT Communication Pattern, IoT protocol Architecture, The 6LoWPAN
2. Prototyping connected objects. Open-source prototyping platforms.
3. Integrating internet services. XML and JSON. HTTP APIs for accessing popular Internet services (Face book, Twitter, and others). Practical activities. IoT Application Development: Application Protocols MQTT, REST/HTTP, CoAP, MySQL
4. Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards.
5. Ubiquitous computing, applications of IOT, Virtualization of network resources and physical devices in IOT.
6. Internet of Things Standardization M2M Service Layer Standardization OGC Sensor Web for IoT

#### **TEXT BOOK**

1. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems author . Marina Ruggieri H, River Publishers Series In Communications



**MTIT31**  
**Elective-V**  
**NATURAL LANGUAGE PROCESSING**

**Instruction: 3 Periods/week**  
**Internal: 30 Marks**

**Time: 3 Hours**  
**External: 70 Marks**

**Credits: 3**  
**Total: 100 Marks**

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**Course Objectives:**

This course introduces the fundamental concepts and techniques of natural language processing (NLP).

- Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
- Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

**Course Outcomes:**

After completion of this course

- Demonstrate a given text with basic Language features
- To design an innovative application using NLP components
- Explain a rule based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To compare and contrast the use of different statistical approaches for different types of NLP applications.

**UNIT I:**

**INTRODUCTION:** Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

**UNIT II:**

**WORD LEVEL ANALYSIS:** Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part- of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

**UNIT III:**

**SYNTACTIC ANALYSIS:** Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures

#### **UNIT IV:**

**SEMANTICS AND PRAGMATICS:** Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

#### **UNIT V:**

**DISCOURSE ANALYSIS AND LEXICAL RESOURCES:** Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

#### **Text Books:**

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

#### **Reference Books:**

1. Language Processing with Java and LingPipe Cookbook, 1<sup>st</sup> Edition, Breck Baldwin, Atlantic Publisher, 2015.
2. Natural Language Processing with Java, 2<sup>nd</sup> Edition, Richard M Reese, O'Reilly Media, 2015.
3. Handbook of Natural Language Processing, Second, Nitin Indurkha and Fred J. Damerau, Chapman and Hall/CRC Press, 2010. Edition
4. Natural Language Processing and Information Retrieval, 3<sup>rd</sup> Edition, Tiwary, Oxford University Press, 2008. Edition, Tanveer Siddiqui, U.S.

# MTIT32

## OPEN ELECTIVE

### INFORMATION RETRIEVAL

**Instruction: 3 Periods/week**  
**Internal: 30 Marks**

**Time: 3 Hours**  
**External: 70 Marks**

**Credits: 3**  
**Total: 100 Marks**

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#### Course objectives

- To provide an overview of Information Retrieval.
- To introduce students about insights of the several topics of Information retrieval such as Boolean retrieval model, Vector space model.
- To provide comprehensive details about various evaluation methods.
- To provide implementation insight about the topics covered in the course.

#### Course outcomes

- Students will understand the need for information retrieval and methods of retrieving.
- Students will get the understanding different information retrieval models.
- Students will get to know about evaluation methods of the information retrieval model.
- Students will get to know the challenges associated with each topic.

#### Syllabus

- **Introduction to Information storage and retrieval systems:** Domain Analysis of IR systems, IR and other types of Information Systems, IR System Evaluation, Introduction to Data structures and algorithms related to Information Retrieval: Basic Concepts, Data structures, Algorithms.

**Inverted Files:** Introduction, Structures used in Inverted Files, Building an Inverted files using a sorted array, Modifications to the Basic Techniques.

**Signature Files:** Introduction, Concepts of Signature files, Compression, Vertical Partitioning, Horizontal Partitioning.

**New Indices for Text:** PAT Trees and PAT Arrays: Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT Trees as PATRICA Trees, PAT representation as Arrays.

**Lexical Analysis and Stop lists:** Introduction, Lexical Analysis, Stop lists.

**Stemming Algorithms:** Introduction, Types of Stemming algorithms, Experimental Evaluations of Stemming, Stemming to Compress Inverted Files.

**Thesaurus Construction:** Introduction, Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri.

**String Searching Algorithms:** Introduction, Preliminaries, The Naive Algorithm, The Knutt-Morris-Pratt Algorithm, The Boyer-Moore Algorithm, The Shift-Or Algorithm, The Karp-Rabin Algorithm

### **Reference Books**

- Modern Information Retrieval, Ricardo Baeza-Yates, Neto, PEA,2007.

Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark Academic Press,2000.

Information Retrieval: Algorithms and Heuristics , Grossman, OphirFrieder,2/e, Springer,2004.

Information Retrieval Data Structures and Algorithms ,Frakes, Ricardo Baeza-Yates, PEA

Information Storage and Retrieval, Robert Korfhage, John Wiley & Sons.

Introduction to Information Retrieval, Manning, Raghavan, Cambridge University Press

**MTIT32**  
**OPEN ELECTIVE**  
**CYBER SECURITY & DIGITAL FORENSICS**

**Instruction: 3 Periods/week**  
**Internal: 30 Marks**

**Time: 3 Hours**  
**External: 70 Marks**

**Credits: 3**  
**Total: 100 Marks**

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**Course Objective**

- Understand the threats in networks and security concepts.
- Apply authentication applications in different networks.
- Understand security services for email.
- Awareness of firewall and its applications.

**Course Outcomes**

By the end of the course, the student should be able to:

- Differentiate among different types of security attacks.
- Define computer forensics.
- Identify the process in taking digital evidence.
- Describe how to conduct an investigation using methods of memory, operating system, and network and email forensics.
- Assess the different forensics tools.

**Introduction to Information Security Fundamentals and Best Practices:** Protecting Your Computer and its Contents, Securing Computer Networks--Basics of Networking, Compromised Computers, Secure Communications and Information Security Best Practices, Privacy Guidelines, Safe Internet Usage.

**Ethics in Cyber Security & Cyber Law:** Privacy, Intellectual Property, Professional Ethics, Freedom of Speech, Fair User and Ethical Hacking, Trademarks, Internet Fraud, Electronic Evidence, Cybercrimes.

**Penetration Testing:** Overview of the web from a penetration testers perspective, Exploring the various servers and clients, Discussion of the various web architectures, Discussion of the different types of vulnerabilities, Defining a web application test scope and process, Defining types of penetration testing.

**Web Application Security:** Common Issues in Web Apps, What is XSS, SQL injection, CSRF, Password Vulnerabilities, SSL, CAPTCHA, Session Hijacking, Local and Remote File Inclusion, Audit Trails, Web Server Issues.

**Forensics & Network Assurance:** Forensic Technologies, Digital Evidence Collection, Evidentiary Reporting, Layered Defense, Surveillance and Reconnaissance, Outsider Threat Protection

**Information Risk Management:** Asset Evaluation and Business Impact Analysis, Risk Identification, Risk Quantification, Risk Response Development and Control, Security Policy, Compliance, and Business Continuity. Forensic investigation using Access Data FTK, En-Case

**Cyber Incident Analysis and Response:** Incident Preparation, Incident Detection and Analysis. Containment, Eradication, and Recovery. Proactive and Post-Incident Cyber Services, CIA triangle

**Text Books:**

1. The Official CHFI Study Guide for Computer Hacking Forensic Investigator by Dave Kleiman
2. CISSP Study Guide, 6th Edition by James M. Stewart

**MTIT32**  
**OPEN ELECTIVE**  
**DEEP LEARNING**

**Instruction: 3 Periods/week**

**Time: 3 Hours**

**Credits: 2**

**Internal: 50 Marks**

**External: 50 Marks**

**Total: 100 Marks**

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**Course Objectives: The students will**

- Gain the importance of Deep learning and differences between ML and DL.
- Understand the fundamentals of feed forward neural networks, regularization methods
- Understand the various optimization in deep learning models
- Gain insight on advanced topics such as convolution neural networks, recurrent neural networks, long short term memory cells.

**Course Outcomes**

After completion of course, students would be able to:

- Explore feed forward networks and Deep Neural networks
- Mathematically understand the deep learning approaches and paradigms
- Complex feature extraction with CNN and RNNs
- Apply the deep learning techniques for various applications

**1. Machine Learning Basics:**

Learning Algorithms, Capacity, Overfitting, and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised and Unsupervised Learning algorithms, Stochastic Gradient Descent, Building a ML algorithm, Challenges and Motivation to Deep learning

**2. Deep forward Networks:**

Learning XOR, Gradient -based Learning, Hidden Units, Architecture Design, Back-propagation and other Differentiation algorithms

**3. Regularization for Deep Learning:**

Parameter Norm Penalties, Norm Penalties as constrained Optimization, Regularization and under-constrained problems, dataset Augmentation, Noise robustness, semi-supervised learning, multitask learning, Early stopping, parameter tying and setting, sparse presentations, bagging and other ensemble methods, dropout

**4. Optimization for Training Deep Models:**

Difference between learning and pure optimization, Challenges in NN optimization, Basic algorithms, parameter Initialization strategies, Algorithms with adaptive learning rates,

**5. Convolutional Networks:**

Convolution operation, Motivation, pooling, convolution and pooling as an infinitely strong prior, variants of basic convolution function, structured outputs, data types, efficient convolution algorithms, random or unsupervised features

**6. Sequence Modeling: Recurrent and recursive nets:**

Unfolding computational graphs, recurrent neural networks, bidirectional RNNs, Encoder-

decoder Sequence-to-sequence Architectures, Deep recurrent networks, recursive neural networks, challenge of long-term dependencies, echo state networks, leaky units and other strategies for multiple time scales, Long Short -term Memory (LSTM) and other gated RNNs

### **7. Practical methodology and applications:**

Performance metrics, default baseline models, determining whether to gather more data, selecting hyperparameters, debugging strategies, multi-digit number recognition, large scale deep learning, applications in computer vision and NLP

### **Text Book:**

1. "Deep Learning", Ian Goodfellow, YoshuaBengio and Aaron Courville, published by MIT Press,UK, 2017 Series
2. Deep Learning with Keras: The Textbook by Antonio Gulli and Sujit Pal, PacktPublishing Ltd, Birmingham, UK, April 2017

### **Reference Book:**

1. Deep Learning with TensorFlow, The Textbook by Giancarlo Zaccone, Md. RezaulKarim, and Ahmed Menshawy, Packt Publishing Ltd, Birmingham, UK, April 2



**M.TECH INFORMATION TECHNOLOGY**  
**COURSE STRUCTURE AND SCHEME OF VALUATION W.E.F. 2024-25**  
**IV SEMESTER**

Code	Name of the subject	Periods/week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
<b>MTCST41</b>	<b>Dissertation - II</b>	-	-	100	-	100	16
<b>Total</b>		-	-	<b>100</b>	-	<b>100</b>	<b>16</b>

1. A publication of a paper on the thesis work in a National/International Conference proceedings with presentation certificate or a paper on the thesis work be communicated to a National/International Journal & accepted for publication for the submission of thesis at the end of 4th semester is mandatory.
2. Final Thesis should be submitted at the end of 4th semester and it will be evaluated by a committee consisting of Chairman Board of Studies, Head of the Department, External Examiner and thesis guide.
3. The candidate has to defend his thesis in a Viva-voce examination to be conducted by the above committee. The committee should submit a report, with signatures of all the members, candidate wise for 100 marks.



# GUIDELINES FOR PREPARING THE REPORT OF PROJECT WORK

## 1. ARRANGEMENT OF CONTENTS:

The sequence in which the project report material should be arranged and bound should be as follows:

1. Cover Page & Title Page
2. Bonafide Certificate
3. Abstract
4. Table of Contents
5. List of Tables
6. List of Figures
7. List of Symbols, Abbreviations and Nomenclature
8. Chapters
9. Appendices
10. References

The tables and figures shall be introduced at appropriate places.

## 2. PAGE DIMENSION AND BINDING SPECIFICATIONS:

The dimension of the project report should be in A4 size. The project report should be bound using flexible cover of the thick white art paper. The cover should be **printed in black letters** and the text for printing should be identical.

## 3. PREPARATION FORMAT:

**3.1. Cover Page & Title Page** – A specimen copy of the Cover page & Title page of the project report are given in **Appendix 1**.

**Bonafide Certificate** – The Bonafide Certificate shall be in double line spacing using Font Style Times New Roman and Font Size 14, as per the format in **Appendix 2**. The certificate shall carry the supervisor's signature and shall be followed by the supervisor's name, academic designation (not any other responsibilities of administrative nature), department and full address of the institution where the supervisor has guided the student. The term '**SUPERVISOR**' **must** be typed in capital letters between the supervisor's name and academic designation.

**Abstract** – Abstract should be one page synopsis of the project report typed one and half linespacing, Font Style Times New Roman and Font Size 12.

**Table of Contents** – The table of contents should list all material following it as well as any material which precedes it. The title page and Bonafide Certificate will not find a place among the items listed in the Table of Contents but the page numbers of which are in lower case Roman letters. One and a half spacing should be adopted for typing the matter under this head. A specimen copy of the Table of Contents of the project report is given in **Appendix 3**.

**List of Tables** – The list should use exactly the same captions as they appear above the tables in the text. One and a half spacing should be adopted for typing the matter under this head.

**List of Figures** – The list should use exactly the same captions as they appear below the figures in the text. One and a half spacing should be adopted for typing the matter under this head.

**List of Symbols, Abbreviations and Nomenclature** – One and a half spacing should be adopted or typing the matter under this head. Standard symbols, abbreviations etc. should be used.

**Chapters** – The chapters may be broadly divided into 3 parts (i) Introductory chapter, (ii) Chapters

developing the main theme of the project work (iii) and Conclusion. The main text will be divided into several chapters and each chapter may be further divided into several divisions and sub-divisions.

- Each chapter should be given an appropriate title.
- Tables and figures in a chapter should be placed in the immediate vicinity of the reference where they are cited.
- Footnotes should be used sparingly. They should be typed single space and placed directly underneath in the very same page, which refers to the material they annotate.

### **Appendices–**

- Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the central theme.
- Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2, etc.
- Appendices, Tables and References appearing in appendices should be numbered and referred to at appropriate places just as in the case of chapters.
- Appendices shall carry the title of the work reported and the same title shall be made in the contents page also.

### **List of References**

The listing of references should be typed 4 spaces below the heading –REFERENCES in alphabetical order in single spacing left – justified. The reference material should be listed in the alphabetical order of the first author. The name of the author/authors should be immediately followed by the year and other details. A typical illustrative list given below relates to the citation example quoted above.

### **REFERENCES:**

1. Barnard, R.W. and Kellogg, C. (1980) Applications of Convolution Operators to Problems in Univalent Function Theory, Michigan Math. J., Vol.27, pp.81–94.
2. Shin, K.G. and McKay, N.D. (1984) Open Loop Minimum Time Control of Mechanical Manipulations and its Applications, Proc. Amer. Contr. Conf., San Diego, CA, pp.1231-1236.

### **4. TYPING INSTRUCTIONS:**

The impression on the typed copies should be black in color. One and a half spacing should be used for typing the general text. The general text shall be typed in the Font style Times New Roman and Font size 12 and chapter headings and subheadings shall be font size 14 and bold.