AICTE MODEL CURRICULUM

FOR

POST GRADUATE DEGREE COURSE

M.TECH

IN

INFORMATION TECHNOLOGY

[W.E.F. 2019-20]

DEPARTMENT OF
COMPUTER SCIENCE AND SYSTEMS ENGINEERING
AU COLLEGE OF ENGINEERING (AUTONOMOUS)
ANDHRA UNIVERSITY
VISAKHAPATNAM-530 003

M.TECH. INFORMATIONTECHNOLOGY

COURSE STRUCTURE AND SCHEME OF VALUATION W.E.F. 2019-20

I SEMESTER

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

Elective-I: Distributed Operating Systems/Computer Organization & Architecture/ Computer Graphics
Elective II: Advanced Database Management Systems/Computer Networks//Embedded systems

IISEMESTER

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

Elective III: Cryptography & Network Security/Geo-Informatics/ Artificial Intelligence
Elective IV: Big Data Analytics/Mobile Computing/Soft Computing

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
	Total	6	-	240	60	300	16

Elective V: Business Intelligence/Internet of Things/ E-Commerce

Open Elective: GPS Applications/Operation Research/Bio-Informatics

IVSEMESTER

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

COMPUTER SCIENCE AND SYSTEMS ENGINEERING DEPARTMENT

COLLEGE OF ENGINEERING, ANDHRA UNIVERSITY

VISAKHAPATNAM, ANDHRA PRADESH, INDIA

MTech (Information Technology)

PROGRAM EDUCATIONAL OBJECTIVE (PEO'S)

S.No	PEO
PEO-1	To Implement computing solutions for real world problems and carry out basic and applied research leading to new innovations in Information Technology (IT) and related interdisciplinary areas.
PEO-2	To Apply knowledge of information technology for societal impact.
PEO-3	To be able to understand multicultural and global perspectives to work effectively and ethically.
PEO-4	To engage in life by learning and be a team player.

PROGRAM OUTCOMES (PO'S)

PO-1	Learning information Technology, emphasizing the knowledge of programming, hardware organization, operating systems, computer networking, computation and principles of programming language.
PO-2	Ability to analyse existing literature in information technology and learn to create new algorithms for solving engineering problems.

PO-3	Ability to design new software systems based on interpreting available data in socio-economicdomains and analyse their performance.
PO-4	Ability to analyse the system problems, using systematic approach with well-defined interface.
PO-5	Ability to designsecure hardware and implement with cost effective methods and integrate with software assuring quality and efficiency.
PO-6	Select and apply latest technology and tools required for computing practice and integrate IT-based solutionseffectively into the user environment and ethical practices.
PO-7	Ability to solve problems quickly and effectively, using a scientific approach by breaking down complex problems into manageable blocks.
PO-8	Develop the capabilities to sustain in the environment of rapid technological changes through dynamic learning.

PROGRAM SPECIFIC OUTCOMES (PSO'S)

PSO-1	Design, develop, test and implement software systems for world-wide network of computers to provide solutions to real world problems.
PSO-2	To design I.T based solutions applying latest technologies and practices ethically.
PSO-3	Implement high quality and sustainable solutions complying with environmental, health and safety standards.
PSO-4	Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

MTCST11	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE Common for M. Tech (CST, IT, AI&R,CN, CS&DA)	
Instruction: 3Periods/week,	**Time: 3 Hours**	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

Course Objectives:
- To introduce the concepts of mathematical logic.
- To introduce the concepts of sets, relations, and functions.
- To perform the operations associated with sets, functions, and relations.
- To relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context.
- To introduce generating functions and recurrence relations.
- To use Graph Theory for solving problems.

Course Outcomes:
By the end of the course, the student will be able to demonstrate:
- Rewrite mathematical arguments using logical connectives and quantifiers and verify the validity of logical flow of arguments using propositional, predicate logic, Identify and give examples of various types of relations and describe various properties of the relations.
- Ability to solve problems using permutations and combinations, determine isomorphism of graphs and spanning tree of a given graph using BFS/DFS algorithms, also determine minimal spanning tree of a given graph.
- Ability to construct mathematical proofs of statements and find counterexamples to false statements in Number Theory.
- understand the logic and methods behind the major proofs in Number Theory.
- Ability to think analytically and intuitively for problem-solving situations in related areas of theory in computer science.
- Ability to describe the language accepted by an automaton or generated by a regular expression or a context-free grammar.
- Ability to understand the functioning of Finite-State Machines, Deterministic Finite State Automata, Nondeterministic Finite-State Automata and Pushdown Automata and Turing Machines.

MTCST12	ADVANCED DATA STRUCTURES Common for M. Tech (CST, IT, AI&R, CN, CS&DA)	
Instruction: 3Periods/week,	**Time: 3 Hours**	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

Course Objectives:
- To be familiar with non-linear data structures such as Graphs
- To emphasize the importance of dictionaries and Hashing for the faster retrieval
- Develop effective digital search using trees.
- To implement M-way trees like B- Trees and B+ trees

Course Outcomes:
- Student will be able to write programs to implement various trees.
- Ability to understand various hashing techniques.
- Ability to write programs to implement sorting techniques.
- Ability to understand concepts related to graph theory.

MTCST1 3	Elective-I DISTRIBUTED OPERATING SYSTEMS Common for M. Tech (CST, IT, AI&R, CN, CS&DA)	
Instruction: 3Periods/week,	**Time: 3 Hours**	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

Course objectives:

- understand how computational power of multiple computing systems distributed remotely can solve complex problems and importance of replication of data in distributed systems.

- understand the core concepts of distributed operating systems including process management, synchronization, memory management and file systems.

- apply various distributed algorithms related to clock synchronization, concurrency control, deadlock detection, load balancing, etc.

Course outcomes:

- By the end of the course, the student will be able to:

- identify the core concepts of distributed systems and understand the design principles and architectures for distributed systems.
- understand client-server organizations in distributed systems and how processes in different machines exchange information through group communication.
- analyze fault tolerance and recovery in distributed systems.
- understand the design and implementation of distributed file systems.

MTCST14	Elective-I COMPUTER ORGANIZATIONAND ARCHITECTURE	
	Common for M. Tech (CST, IT, AI&R, CN, CS&DA)	
Instruction: 3Periods/week,	**Time: 3 Hours**	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

Course Objectives:
- To study about structure and functional components of a computer.
- Understanding the hierarchical organization of a computer system which consists of instruction set of commands.
- Learn about the architecture of a computer from a programming view.
- To design a balance system that minimizes performance and utilization of all elements.

Course Outcomes:

- Knowledge about major components of a computer such as processor, memory, and I/O modules along with their interconnections internally with outside world.
- Detailed idea about architecture of central processing unit, functions of control unit, memory, I/O devices, and their issues.
- simple and multiple processor organization and their issues.

MTCSTAIR13	**ELECTIVE-I** **COMPUTER GRAPHICS** **COMMON FOR M.TECH (CST, IT)**	
Instruction: 3Periods/week,	**Time: 3 Hours**	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

Course Objectives:
This course focuses on giving introduction about computer graphics, its wide range of application areas. Also gives information about the graphics hardware, working of hardware and software which are needed for producing graphics. It gives information about basic scan conversion algorithms, 2D, 3D transformations and viewing mechanisms, clipping algorithms, color models and Animation techniques.

Course Outcomes:

- The students will understand graphics principles and graphics hardware.
- The students can demonstrate geometrical transformations.
- The students can create interactive graphics applications and demonstrate computer graphicsanimation.

MTCSTAIR13	ELECTIVE-II ADVANCED DATABASEMANAGEMENT SYSTEMS COMMON FOR M.TECH (CST, IT, CN)	
Instruction: 3Periods/week,	**Time: 3 Hours**	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

Course Objectives:

- To understand the different types of database system architectures.
- Learn new ways to query and model data.
- Become familiar with the expanding role of **database** technology.

Course Outcomes:

- Explain and evaluate the fundamental theories for advanced database architectures and query operators.
- Design and implement parallel database systems with evaluating different methods of storing, managing of parallel database.
- Assess and apply database functions of distributed database.
- Evaluate different database designs and architecture.
- Understand advanced querying and decision support system.

MTCST14	ELECTIVE-II COMPUTER NETWORKSCOMMON FOR M.TECH (CST, IT, CN)	
Instruction: 3Periods/week,	**Time: 3 Hours**	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

Course Objectives:

- Building a firm foundation for understanding fundamentals of Computer
- Networks.
- Familiarize with the basic terminologies of Computer Networking area.
- Understand the state of art in Network protocols, Architecture and Applications.
- Acquire the knowledge of the basic protocols involved in Wired/Wireless
- communication process.

Course Outcomes:

- The student must be able to understand the design and estimate the requirements forpractical setup of a given network scenario and size.

- Realize the Operation, maintenance, and management of the Internet

by mapping thetheoretical networking concepts to the real-time network scenarios.

- Demonstrate the applications of wireless Networks and overview of advancednetworking concepts.

- Identify different networking devices and their usage and functionality.

MTCST14	Elective-II EMBEDDEDSYSTEMS	
Instruction: 3Periods/week,	Time: 3 Hours	Credits: 4
Internal: 30 Marks	External: 70 Marks	Total: 100 Marks

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 be understanding the basic architecture of 8051 micro controller.
- ability to write ALP programs using 8051 instructions set.
- Ability to understand the concepts related to RTOS and its Inter Task Communicationmethods.
- Ability to understand various design issues of RTOS.
- Understand about embedded software development tools.

MTCST15	RESEARCH METHODOLOGY AND IPR Common for M.Tech (CST, IT, AI&R, CN, CS&DA)	
Instruction: 3Periods/week,	Time: 3 Hours	Credits: 4
Internal: 30 Marks	External: 70 Marks	Total: 100 Marks

Course Objective:
- To introduce the students to Intellectual Property Rights (IPR) which is a key component in modern knowledge management processes.
- To create consciousness on IPR in students at an early stage of their education

so that they develop an appreciation for ethical and rightful use of existing knowledge
- To make them understand how to take ownership of knowledge they may develop as a result of their creative innovations, take ownership and either drive themselves in becoming entrepreneurs or become responsible knowledge users in society.
- To expose students some of the recent debates on the societal implications of IPR and its role in national/international trade and socioeconomic development.

Course outcomes:
Learners will be able to
- identify the types of intellectual property protection available for their research outcome.
- conduct patent search and analyses patentability of the invention.
- understand the basic structure of Patent document.
- understand the registration and prosecution of different IPs.
- understand the basics of IP commercialization and techno/commercial/ legal issues in IPR commercialization.

MTCST16	Organizational Behavior (Audit Course) Common for M.Tech (CST, IT, AI&R, CN, CS&DA)		
Instruction: 3Periods/week,	Time: 3 Hours		Credits: 4
Internal: 30 Marks	External: 70 Marks		Total: 100 Marks

Course Objectives:
- To understand the basic concepts of organizational behavior, its foundations and importance
- To enable students to have a basic perspective of Motivation and Motivation theories.
- To acquaint the students about group behavior in organizations, including communication, leadership conflicts and organizational change and how these are linked to an impact organizational performance.

Course Outcomes:
- Identifying fundamental aspects of organizational dynamics.
- Evaluate main theories of motivation and formulating suitable motivational strategies.
- Analyze the behaviors of individuals and groups in organizations.
- Understanding of Leadership theories and Leadership behaviors.
- Apply relevant theories, concepts to address important Organizational Behavior questions.

MTCST17	ADVANCED DATA STRUCTURESLAB Common for M.Tech (CST, IT, AI&R, CN, CS&DA)	
Instruction: 3Periods/week,	Time: 3 Hours	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

Course Objectives:

- Describe and implement a variety of advanced data structures (hash tables, priority
- queues, balanced search trees, graphs).
- Analyse the space and time complexity of the algorithms studied in the course.
- Identify different solutions for a given problem; analyse advantages and disadvantages
- to different solutions

Course Outcomes:

1. Student will be able to write programs to implement stacks and queues.
2. Ability to implement various searching and sorting techniques.
3. Ability to implement programs using trees and graphs.

MTCST18	ELECTIVE-II LAB ADVANCED DATABASE MANAGEMENT SYSTEMS LAB COMMON FOR M. TECH (CST, IT)	
Instruction: 3Periods/week,	Time: 3 Hours	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

Course Objectives:
This lab work will enhance database handling, data manipulation and data processing skills through SQL & PL/SQL

Course Outcomes:
- Understand the fundamentals of relational database systems including: data models, database architectures and ER features.
- Analyze and apply the different normalization techniques.
- Assess the basic issues of transaction processing and concurrency control.
- Understand the roles that databases play in organizations and familiarize with basic database storage, file organization, database accessing techniques.
- Understand the basics of query processing, object-oriented, distributed databases.

MTCST18	ELECTIVE-II LAB COMPUTER NETWORKS LAB		
	COMMON FOR M. TECH (CST, IT)		
Instruction: 3Periods/week,	Time: 3 Hours		Credits: 4
Internal: 30 Marks	External: 70 Marks		Total: 100 Marks

Course Objectives:
- Understand network layers, structure/format, and role of each network layer.
- Able to design and implement various network application such as data transmission between client and server, file transfer, real-time multimedia transmission.

Course Outcomes:

- To Understand the functionalities of various layers of OSI model

- To understand how to use TCP and UDP based sockets and their differences.

MTCST18	ELECTIVE-II LAB EMBEDDED SYSTEMS LAB		
	COMMON FOR M. TECH (CST, IT)		
Instruction: 3Periods/week,	Time: 3 Hours		Credits: 4
Internal: 30 Marks	External: 70 Marks		Total: 100 Marks

Course Objectives:
- To introduce basics of electronics and reading electronics diagrams
- To introduce students to basics of Arduino programming language and IDE
- To provide students' knowledge on how to build prototype circuits, connect them to the Arduino and program the Arduino microcontroller.

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 examples, build prototype circuits, connect them to the Arduino, program the Arduino microcontroller to make the circuits work and connect the Arduino microcontroller to a serial terminal to understand communication and stand-alone use.
- Explore online resources for extending knowledge about the capabilities of the Arduino microcontroller.

MTCSTCN21	WEB SYSTEMS & TECHNOLOGIES		
Instruction: 3Periods/week,	Time: 3 Hours		Credits: 4

Internal: 30 Marks	External: 70 Marks	Total: 100 Marks

Course Objectives:

On completing this course student will be able to

- Understand the principles of Web based application development.
- Design dynamic content in Web Pages using JavaScript. 3 2
- Understanding the concepts of java Servlets, java Server Pages and design applications using them.
- Understand the concepts of Component development and design applications by establishing connections to Databases.

Course Outcomes:

- Students will be able to construct web-based applications and identify where data structures are appearing in them.
- Students will be able to connect java programs to different databases.
- Students will be able to develop EJB program.

MTCSTCN22	OBJECT ORIENTED SOFTWARE ENGINEERING COMMON FOR M. TECH (CST, IT)	
Instruction: 3Periods/week,	Time: 3 Hours	Credits: 4
Internal: 30 Marks	External: 70 Marks	Total: 100 Marks

Course objectives:

- To explain the importance of OOSE in Software development.
- To explain the students the importance of Requirements Engineering.
- To explain the role of UML and Testing in Software Development.
- To explain the entire Software Development Process with aid of case studies.

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 Languageand

- test whether all the requirements specified have been achieved or not.

MTCSTCN23	ELECTIVE-III CRYPTOGRAPHY& NETWORK SECURITY	
Instruction: 3Periods/week,	Time: 3 Hours	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

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 for and importance of network and data security on the Internet and in thedistributed environments.
- Identify the different types of network security issues and their remedies.
- Application various cryptographic tools and techniques in different contexts and as perneed of security levels.
- Implementation of some Internet security protocols and standards

MTCST23	ELECTIVE-III GEO - INFORMATICS	
Instruction: 3Periods/week,	Time: 3 Hours	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

Course Objectives:
The Objective of this course is to teach students,
- Basic concepts and terminology of GIS and its evolution
- Various components of GIS, such as maps, digital representation of geographic data, data quality, data standards, and spatial analysis.
- about the integration of remote sensing and GIS, digital terrain modeling, and spatial analysis and modeling

- process of GIS implementation and project management, including software. engineering, project planning, and systems analysis.
- various GIS issues and prospects of the field.

Course Outcomes:

Upon successful completion of the course, the student will be able to,
- Understand the fundamental concepts and terminology of GIS and its evolution.
- Use various GIS components, such as maps, digital representation of geographic data, and data quality, to solve real-world problems.
- Apply the principles of cartographic design in GIS to create maps and information products.
- Integrate remote sensing data into GIS and understand the process of digital terrain modeling and spatial analysis.
- Plan and implement GIS projects, including software engineering, project planning, and systems analysis.
- Critically analyze the various GIS issues and future prospects of the field and understand their impact on the industry and society.

MTCST23	Elective-III ARTIFICIAL INTELLIGENCE	
Instruction: 3Periods/week,	Time: 3 Hours	Credits: 4
Internal: 30 Marks	External: 70 Marks	Total: 100 Marks

Course Objectives:

- To learn about AI problem, Production Systems, and their characteristics.

- To understand the importance of search and the corresponding search strategies for solving AI problem.

- To introduce to Planning, Natural Language Processing and Expert Systems.

Course Outcomes:

- The student understands AI problem characteristics, state space approach for solving AIproblem, Production System framework.
- The student learns several optimal search strategies and the use of heuristics.
- The student learns relational, inferential, inheritable, and procedural knowledge and thecorresponding knowledge representation approaches.
- The student is introduced to applying AI problem solving approaches to natural languageprocessing, planning and expert systems.

MTCST2 4	Elective-IV BIG DATA ANALYTICS	
Instruction: 3Periods/week,	Time: 3 Hours	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

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 analyses 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:

- Reframe a business challenge as an analytics challenge.
- Apply appropriate analytic techniques and tools to analyze big data.
- Create models and identify insights that can lead to actionable results.
- Effectively participate in big data and other analytics projects.
- Use tools such as MapReduce / Hadoop.

MTCST2 4	Elective-IV MOBILE COMPUTING	
Instruction: 3Periods/week,	Time: 3 Hours	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

Course objectives:
- To introduce the basic concepts and principles in mobile computing. This includes major techniques involved, and networks & systems issues for the design and implementation of mobile computing systems and applications.
- To explore both theoretical and practical issues of mobile computing.
- To provide an opportunity for students to understand the key components and technologies involved and to gain hands-on experiences in building mobile applications.

Course outcomes:
After completion of the course the student should be able to:

- develop algorithms for fundamental concepts in Image processing.

- perform image enhancement, image compression and image segmentation using various methods.

- implement image transformation techniques.

MTCST2 4	Elective-IV SOFT COMPUTING	
Instruction: 3Periods/week,	Time: 3 Hours	Credits: 4
Internal: 30 Marks	External: 70 Marks	Total: 100 Marks

Course objectives:
- To make the student to understand the role of imprecision and uncertainty in real world scenarios.
- To explain the role of Soft Computing in addressing the imprecision and uncertainty.
- To explain the principal components of soft computing that include Fuzzy Sets and Fuzzy Logic, Artificial Neural Networks, Genetic Algorithms and Rough Sets.
- To learn the Design and Implementation of Soft Computing methodologies.
- To explain the design of hybrid systems which is combination of one or more soft computing methodologies mentioned.

Course outcomes:

- Ability to represent Uncertainty / imprecision data.

- Ability to select a suitable method of Soft Computing to solve a particular problem.

- Ability to build hybrid systems using Soft Computing techniques.

MTCST2 5	ENTREPRENEURSHIP (AUDIT COURSE) (common for M.Tech-CST, IT, AI, CN, CSDA)	
Instruction: 3Periods/week,	Time: 3 Hours	Credits: 4
Internal: 30 Marks	External: 70 Marks	Total: 100 Marks

Course Objectives:
- To familiarize the students with the concepts of Management.
- To relate the concepts of Management with industrial organizations.
- To explain the factors affecting productivity and how productivity can be increased in an Industrial undertaking.
- To set forth a basic framework for understanding Entrepreneurship.

Course Outcomes:
On completion of the course, the students will be able to
- Understand the roles, skills and functions of management.
- Distinguish the different types of business organizations.
- Identify the factors involved in Production Operations Management.
- Diagnose organizational problems and take suitable decisions.
- Establish good Human Resource Management practices.
- Acquire necessary knowledge and skills required for organizing and carrying out.

MTCST26	WEB PROGRAMMINGLAB	
Instruction: 3Periods/week,	Time: 3 Hours	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

Course Objectives:
To study the concepts of web applications which includes XHTML, XML, PHP, Java, Ruby with data base access.

Course outcomes:
- Create dynamic documents using XHTML and java script.
- Develop programs by XML which includes user defined tags.
- Create applications using Java Servlets and JSP.

MTCST27	**OBJECT ORIENTED SOFTWARE ENGINEERINGLAB** **Common for M. Tech (CST, IT)**	
Instruction: 3Periods/week,	Time: 3 Hours	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

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 project-like assignment that can, in 1 0 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 and
- test whether all the requirements specified have been achieved or not.

MTCST31	ELECTIVE-V BUSINESS INTELLIGENCE	
Instruction: 3Periods/week,	Time: 3 Hours	Credits: 4
Internal: 30 Marks	External: 70 Marks	Total: 100 Marks

Course Objectives:

- To understand the BI framework and the role of Data Warehousing for Business Intelligence
- To understand the importance of data integration and data quality for Business intelligence
- To understand the schemas for multi-dimensional data modelling
- To understand the basic models suitable for classification and clustering data

Course Outcomes:

- Able to understand the components of BI framework and the role of Data warehousing for Business Intelligence

- Able to understand the need for data integration and learns different approaches to improve data quality for Business intelligence.
- Able to design the schemas for multi-dimensional data modelling of an enterprise.
- Apply appropriate tools to build Decision tree for classification of labelled data
- Can apply tools for hierarchical clustering of unlabeled data

MTCST31	ELECTIVE-V INTERNET OF THINGS	
Instruction: 3Periods/week,	Time: 3 Hours	Credits: 4
Internal: 30 Marks	External: 70 Marks	Total: 100 Marks

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 network of devices.
- Develop prototype models for various applications using IoT technology.

MTCST31	Elective-V E-COMMERCE	
Instruction: 3Periods/week,	Time: 3 Hours	Credits: 4
Internal: 30 Marks	External: 70 Marks	Total: 100 Marks

Course objectives:
Introduce students to electronic commerce and its various applications.
- Provide knowledge of electronic payment systems and risks involved, electronic data interchange, inter-organizational and intra-organizational commerce.
- Introduce students to concepts of information-based marketing including online marketing, advertising on internet, consumer search.
- Provide knowledge of multimedia concepts including digital video and electronic commerce, video conferencing and video processing.

Course outcomes:
By the end of the course, the student should be able to:
- Understand the framework of electronic commerce and its various applications.
- Explain the types of electronic payment systems and risks involved in such systems.
- Understand online marketing and information-based marketing concepts including consumer search, information retrieval, advertising on internet.

MTCST32	OPEN ELECTIVE: GPS APPLICATIONS	
Instruction: 3Periods/week,	Time: 3 Hours	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

Course Objectives:
- Understand the evolution and the development of GPS.
- Analysis the GPS constellation and ground control station.
- Understand the GPS working principle and satellite signal generation.
- Determine the 3D navigation solution for precise position.
- Calculate the errors effecting the GPS pseudo range measurement.
- Ability to understand the different coordinate system and positioning system.

Course Outcomes:
- Summarize the evolution and development of GPS.
- Demonstrate the operational segment of GPS.
- Explain the GPS satellite constellation and laws governing the planetary motion.
- Algorithms development to obtain precise GPS receiving position by mitigating errors.
- Explain importance of GPS system time and coordinate system.
- Brief on the Indian satellite-based navigation system

MTCST32	OPEN ELECTIVE OPERATIONS RESEARCH	
Instruction: 3Periods/week,	Time: 3 Hours	**Credits: 4**
Internal: 30 Marks	**External: 70 Marks**	**Total: 100 Marks**

Course Objectives:

Upon completion of this course, you will be able to:

- Formulate a real-world problem as a mathematical programming model stand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand * Understand the relationship between a linear program and its dual, including strong duality and complementary slackness.
- Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change
- Solve specialized linear programming problems like the transportation and assignment problems.
- Solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
- Understand the applications of basic methods for, and challenges in integer programming.

Course Outcomes:

After learning the course the students should be able to:

- Students will be able to describe characteristics and scope of OR.
- Students will be able to define and formulate mathematical problems.
- Students will be able to select optimal problems solving techniques for a given problem using LP.
- Students will be able to formulate and solve transportation, travelling sales man and transshipment problems.
- Students will be able to formulate and solve optimization problems related to job/ work assignments.
- Students will be able to demonstrate and solve simple models of Game theory.
- Students will be able to evaluate optimum solution using dynamic programming for different applications.
- Students will be able to choose / devise appropriate queuing model for practical application.
- Students will be able to solve different problems related to Network.

MTCST31	OPEN ELECTIVE BIO-INFORMATICS

Instruction: 3Periods/week,	Time: 3 Hours	Credits: 4
Internal: 30 Marks	External: 70 Marks	Total: 100 Marks

Course Objectives:
- To import fundamental concepts in the area of Bioinformatics.
- To understand the concept of DNA Sequence analysis and Protein Information Resources.
- To learn Pairwise alignment techniques and Secondary database searching.
- To gain competence in Analysis packages.

Course Outcomes:
By the end of the course, the student should be:
- Able to understand the application areas of Bioinformatics.
- Able to realize the revolution of Bioinformatics in present areas
- Able to understand building blocks of Bioinformatics and characteristics.

AICTE MODEL CURRICULUM

FOR

POST GRADUATE DEGREE COURSE

M.TECH

IN

INFORMATION TECHNOLOGY

[W.E.F. 2019-20]

DEPARTMENT OF
COMPUTER SCIENCE AND SYSTEMS ENGINEERING
AU COLLEGE OF ENGINEERING (AUTONOMOUS)
ANDHRA UNIVERSITY
VISAKHAPATNAM-530 003

ANDHRA UNIVERSITY: : VISAKHAPATNAM

M.TECH. INFORMATIONTECHNOLOGY

COURSE STRUCTURE AND SCHEME OF VALUATION W.E.F. 2019-20

I SEMESTER

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

Elective-I: Distributed Operating Systems/Computer Organization & Architecture/ Computer Graphics
Elective II: Advanced Database Management Systems/Computer Networks//Embedded systems

IISEMESTER

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

Elective III: Cryptography & Network Security/Geo-Informatics/ Artificial Intelligence
Elective IV: Big Data Analytics/Mobile Computing/Soft Computing

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
	Total	**6**	**-**	**240**	**60**	**300**	**16**

Elective V: Business Intelligence/Internet of Things/ E-Commerce

Open Elective: GPS Applications/Operation Research/Bio-Informatics

IVSEMESTER

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

FIRST SEMESTER
DETAILED SYLLABUS FOR M.TECH (IT)

MTCST11 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
Common for M. Tech (CST, IT, AI&R, CN, CS&DA)

Instruction: 3Periods/week   Time:3HoursCredits: 3
   Internal:30Marks   External:70 Marks   Total: 100Marks

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1. Mathematical notions of sets, sequences and tuples, functions and relations, Primitive recursive functions, computable functions, examples, graphs, strings andlanguages,

2. Boolean logic – properties and representation, theorems and types of proofs, deductive, inductive, by construction, contradiction andcounter-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, Primality Test, Finding Large primes, Definition of Elliptic Curves and their applications toCryptography.

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 theirapplications.

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 FreeGrammars.

6. Turing Machines: The Definition of Turing Machine – Computing with Turing Machines – Combining Turing Machines, programming techniques for TuringMachines,

7. Variants of Turing Machines, Restricted Turing Machines Universal Turing Machines. The Halting Problem, Decidable &undecidable problems- Post CorrespondenceProblems

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 EducationAsia.

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   ADVANCED DATA STRUCTURES
COMMON FOR M.TECH (CST, IT, AI&R, CN, CS&DA)

Instruction:3Periods/week   **Time:3Hours**   **Credits: 3**
Internal:30Marks   **External:70 Marks**   **Total: 100Marks**

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1. Heap Structures Introduction, Min-Max Heaps, Leftist trees, Binomial Heaps, Fibonacci heaps.

2. Hashing and Collisions Introduction, Hash Tables, Hash Functions, different Hash Functions:- Division Method, Multiplication Method, Mid-Square Method, Folding Method, Collisions

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

4. Digital Search Structures Digital Search trees, Binary tries and Patricia, Multiway Tries, Suffix trees, Standard Tries, Compressed Tries

5. 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, SartajSahni, SanguthevarRajasekaran, Universities Press.

MTCST13 ELECTIVE-I
DISTRIBUTED OPERATING SYSTEMS
COMMON FOR M.TECH (CST, IT)

Instruction: 3 Periods/week   **Time: 3 Hours**   **Credits:3**
Internal: 30 Marks   **External: 70 M arks**   **Total: 100 Marks**

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

2. Communication in Distributed Systems, Lay red Protocols, ATM networks, TheClient – sever model, Remote Procedure call, Group communication.

3. Synchronization in Distributed System, Clock Synchronization, MutualExclusion, Election algorithms, Atomic transactions, Deadlocks in DistributedSystems.

4. Process and processors in Distributed System threads, System Models,Processors allocation, Scheduling in Distributed System, Fault tolerance, Realtime Distributed System.

5. Distributed File Systems, Distributed File System Design, DistributedFile System implementation, Trends in Distributed File System.

6. Distributed Shared Memory, Introduction, What is Shared memory?,Consistency models, Page based Distributed Shared memory, Shared – variableDistributed Shared memory, Object based Distributed Shared Memory.

TEXT BOOK:
1. Distributed Operating Systems, Andrew S. Tanenbanm

Reference Book:
1. Advanced Concepts in Operating Systems, Makes Singhal and NiranjanG.Shivaratna.

MTCST13   ELECTIVE-I
COMPUTER ORGANIZATIONAND ARCHITECTURE
COMMON FOR M.TECH (CST, IT)

Instruction:3Periods/week   **Time:3Hours**   **Credits:3**
Internal:30Marks   **External:70 Marks**   **Total: 100Marks**

1. **Register Transfer and Microoperations:**
   Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

2. **Basic Computer Organization andDesign:**
   Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

3. **Micro programmedControl**:
   Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

4. **Central ProcessingUnit:**
   Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer(RISC)

5. **Input/outputOrganization:**
   Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

6. **Memory Organization**:
   Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

7. **Overview of Computer Architecture:**
   Evolution of Computer Systems, Parallelism in Uni- processor System, Parallel Computer Structures, Architectural Classification Schemes, Parallel Processing Applications.

Text Book:

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd.,Third Edition, Sept. 2008.
2. Computer Architecture and Parallel Processing, Kai Hwang and Faye A. Briggs,McGraw Hill, InternationalEdition1985.

Reference Book:

1. Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd.,Eastern Economy Edition, Sixth Edition,2003.
2. "Computer System Architecture", John. P.Hayes.
3. ComputerArchitectureAquantitativeapproach3rdeditionJohnL.Hennessy&David A. Patterson Morgan Kufmann (An Imprint of Elsevier).

MTCST13   ELECTIVE-I   COMPUTER GRAPHICS
COMMON FOR M.TECH (CST, IT)

Instruction:3Periods/week   **Time:3Hours**   **Credits:3**
Internal:30Marks   **External:70 Marks**   **Total: 100Marks**

1. **Introduction:**
Computer Graphics and their applications: Computer Aided Design, ComputerArt, Entertainment,EducationandTraining,GraphicalUserInterfaces;OverviewofGraphicssystems:VideoDisplay Devices,RasterScanSystems,RandomScanSystems,GraphicsMonitorsAnd Workstations,InputDevices,HardCopyDevices,InteractiveInputMethods,Windowsand Icons,VirtualRealityEnvironments,GraphicsSoftware.

2. **Output primitives :**
Points and Lines, **,** Line and Curve Attributes, Color and Gray scalelevels, Antialiasing, Loading the Frame buffer,   Line   function,   Line   Drawing   Algorithms, CircleGeneratingAlgorithms,EllipseGeneratingAlgorithms,PixelAddressing,AreaFillAttributes,FilledAreaP rimitives,Filled Area Functions, Cell Array, Character Generation, Character Attributes, Bundled Attributes,CurveFunctions, Parallel CurveAlgorithms.

3. **Two Dimensional Transformations:**
Basic   2DTransformations,   MatrixRepresentations,   Homogeneous   Coordinates,   Composite Transformations,   Other   Transformations,Transformations   between   Coordinate   Systems, AffineTransformations.

4. **Three Dimensional Transformations &Projections:**
Translation, Rotation, Scaling,OtherTransformations, Composite Transformations, 3D Transformation Functions, Modeling and Coordinate Transformations, Need for projections, Parallel & Perspective projections, GeneralProjectionTransformations.

5. **Viewing Pipeline and Clipping operations :**
Viewing Pipeline,Viewing Coordinates &Reference frames, Window-to-Viewport Coordinate Transformation, Two Dimensional Viewing Functions, ,Three Dimensional Viewing, View Volumes, Clipping and its Operations, Types of clipping operations-Point Clipping,LineClipping,PolygonClipping, CurveClipping, TextandExteriorClipping.

6. **Three Dimensional Concepts and Object representations:**
3D   display   methods,   3D   Graphics, PolygonSurfaces,CurvedLinesandSurfaces,QuadraticSurfaces,SuperQuadrics,BlobbyObjects,SplineReprese ntations, Cubic Spline methods, Bézier Curves and Surfaces, B-Spline Curves andSurfaces,

7. **Color Models and Basics of Computer Animation:**
Intuitive   color   concepts,   Basics   of   RGB   Colormodel, YIQColorModel,CMY&HSVColormodels.DesignofanimationSequences,RasterAnimations,Key   Frame systems: Morphing, A Simple program onAnimation.

Text Books:
1. Computer Graphics, Donald Hearn &M.Pauline Baker, Pearson Education,New Delhi.
2. Computer Graphics by Dr. Rajiv Chopra.

Reference Books:

1. ProceduralElementsforComputerGraphics,DavidF.Rogers,TataMcGrawHillBookCompany,New Delhi,2003
2. ComputerGraphics:Principles&PracticeinC,J.D.Foley,S.KFeiner,AVanDamF.HJohnPearsonEducation,2004
3. ComputerGraphicsusingOpenGL,FranscisSHillJr,PearsonEducation,2004.
4. Computer Vision and Image Processing: A Practical Approach using CVIPtools, S. E.Umbaugh,, Prentice Hall,1998

MTCST 14 ELECTIVE-II
ADVANCED DATABASEMANAGEMENT SYSTEMS
COMMON FOR M.TECH (CST, IT, CN)

Instruction:3Periods/week	**Time:3Hours**	**Credits:3**
Internal:30Marks	**External:70Marks**	**Total: 100Marks**

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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.

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.

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.

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.

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.

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, CN)

Instruction:3Periods/week   **Time:3Hours**   **Credits:3**
Internal:30Marks   **External:70Marks**   **Total: 100Marks**
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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, Net work 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, NIC, Wireless Access Points, Transceivers, Firewalls, Proxies.

8. **Over View ofAdvanced Concepts in Networks:**
   Cellular Networks, Adhoc Networks, Mobile Adhoc Networks, Sensor Networks, Virtual Private Networks. Delay Tolerant Networks, IPv6

Text Book:

1. 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   EMBEDDEDSYSTEMS

COMMON FOR M.TECH (CST, IT & CN)

Instruction:3Periods/week	**Time:3Hours**	**Credits:3**
Internal:30Marks	**External:70Marks**	**Total: 100Marks**

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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 – InterruptLatency.

3. **Round–Robin Architecture -** Round–Robin with Interrupts Architecture - Function-Queue- Scheduling Architecture – Real-Time Operating Systems Architecture – Selection ofArchitecture.

4. **Tasks and Task States** – Tasks and Data – Semaphores and Shared Data – Semaphore Problems – Semaphorevariants.

5. **Message Queues** – Mailboxes – Pipes – Timer Functions – Events – Memory Management – Interrupt Routines in RTOSEnvironment.

6. **RTOS design** – Principles – Encapsulation Semaphores and Queues – Hard Real-Time Scheduling Considerations – Saving Memory Space – SavingPower.

7. **Host and Target Machines** – Linker/Locator for Embedded Software- Getting Embedded Software into the TargetSystem.

8. **Testing on your Host Machine** – Instruction Set Simulators – Laboratory Tools used forDebugging.

Text Book:

1. The 8051 Microcontroller Architecture, Programming & Applications, Kenneth J. Ayala, PenramInternational.

2. An Embedded Software Primer, David E. Simon, Pearson Education ,2005.

Reference Book:

1. EmbeddedSystems:Architecture,ProgrammingandDesign,RajKamal,TataMcGraw- Hill Education, 2008

MTCST15   RESEARCH METHODOLOGY& IPR
COMMON FOR M. TECH (CST, IT, AI&R, CN, CS&DA)

Instruction:3Periods/week	Time:3Hours	Credits:2
Internal:30Marks	External:70Marks	Total: 100Marks

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

2. Effective literature studies approaches, analysis Plagiarism, Research ethics

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

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.

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

6. New Developments in IPR: Administration of Patent System. New developmentsin IPR; IPR of Biological Systems, Computer Software etc.Traditional knowledge CaseStudies, 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, 2 ndEdition, "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 M. TECH (CST, IT, AI&R, CN, CS&DA)

Instruction:3Periods/week	**Time:3Hours**	**Credits:0**
Internal:30Marks	**External:70Marks**	**Total: 100Marks**

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1. **Organizationa lBehavior**:
   Concept of Organization - Concept of Organizational Behavior - Nature of OrganizationalBehavior- Role of Organizationalbehavior - Disciplines contributing to OrganizationalBehavior.

2. **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.

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

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

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

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

7. **Organizational Change:**
   Nature - Factors inOrganizational 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 STRUCTURES LAB
(common for M.Tech-CST, IT, AI&R, CN, CSDA)

Instruction:3 Periods/week   **Time: 3 Hours**   **Credits: 2**
Internal:50 Marks   **External: 50 Marks**   **Total: 100 Marks**
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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 shortestpath problem.

13. Write Java programs that use recursive and non-recursive functions to traverse thegiven binary tree in
a) Preorder b) Inorder c) Postorder.

14. Write Java programs for the implementation of Breadth First Search and Depth First Search for a given graph.

15. Write Java programs for implementing the following sorting methods:
a) Bubble sort (b) Insertion sort (c) Quick sort (d) Merge sort (e) Heap sort f) Radix sort
g) Binary tree 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. 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**

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

Outcome:
- Ability to use databases for building web applications.

- Gaining knowledge about the internals of a database system.

References
1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 6th edition, Tata McGraw Hill, 2011

2. RamezElmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 4th 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**

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 scripton 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 LABEMBEDDED SYSTEMS LAB

COMMON FOR M. TECH (CST, IT)

Instruction:3Periods/week	**Time:3Hours**	**Credits:2**
Internal:50Marks	**External:50 Marks**	**Total: 100Marks**

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

SECOND SEMESTER
DETAILED SYLLABUS FOR M.TECH (IT)

MTIT21 WEB SYSTEMS & TECHNOLOGIES

Instruction:3Periods/week	Time: 3Hours	Credits: 3
Internal:30Marks	External:70 Marks	Total: 100Marks

1. **Introduction:**
   HistoryoftheInternetandworldwidewebandHTML,BasicInternet Protocols-HTTP, SMTP,Pop3, Mime, IMAP, Introduction to scripting Languages -Java Scripts,ObjectbasedScriptingforthewebstructures,functions,arraysandObjects, DynamicHTMLwithJavaScript

2. **DynamicHTML:**
   IntroductiontoObjectreferences,DynamicStyle,DynamicPosition, Frames, Navigators, Event Models, On Check, On load, Mouse operations, Adding Shaddows, Creating Images, Creating Gradients, Creating Motion with Blur, Data binding,SortingTabledata,BindingofImagesAndTable.

3. **IntroductiontoPHPProgramming:**
   Introduction**,**DatabaseAccesswithPHP,PHPInterpreters, Security Issues, File HandlingwithPHP,Working with HTML and DHTML, PHP UserAuthentication

4. **Java Beans:**
   IntroductiontoJavaBeans,Advantages ofJavaBeans,BDK; Introspection,UsingBoundproperties,BeanInfoInterface,Constrainedproperties; Persistence,Customizes,JavaBeansAPI,IntroductiontoEJB's.

5. **Multimedia:**
   AudioandVideoSpeech,SynthesisandRecognition,E-BusinessModels, Online Payments andSecurity, Web Servers, Client and Server side Scripting, AccessingWebservers,ApacheWebServer.

6. **Database,ASPandXML:**
   RDBMSModels,Overviewof SQL,ASP-WorkingofASP, objects,SessionTrackingandCookies,ADO,AccessingDataBasewithASP,ServersideActive,XComponents,Webresources,XML-Documenttypedefinition,XMLSchemas, DocumentObjectmodel,PresentingXML,UsingXMLProcessors:DOMandSAX,Syntax ofAJAX,ApplicationDevelopment usingXMLandAJAX

7. **ServletsandJSP:**
   IntroductiontoServelets:ServletOverviewArchitecture,HTTP package, Handling Http Request & Responses, Using Cookies -Session Tracking, SecurityIssues,Multitierarchitecture,JSPOverview,,JSPProcessing.JSPApplication DesignwithMVCSettingUpandJSPEnvironment:

8. **JSP Application Development** :
Generating Dynamic Content, Using Scripting ElementsImplicitJSPObjects,ConditionalProcessing,DisplayingValuesUsingan ExpressiontoSetanAttribute,DeclaringVariablesandMethodsErrorHandlingand DebuggingSharingDataBetweenJSPpages,Requests,andUsersPassingControland Date betweenPages,Sharing Session andApplicationData– Memory Usage Considerations

TEXT BOOKS :

1. WebProgramming,buildinginternetapplications,2/e,ChrisBates,WileyDreamtech

2. ThecompleteReferenceJava2,5/e,PatrickNaughton,HerbertSchildt.TMH

3. Programmingworldwideweb-Sebesta,PEA

REFERENCE BOOKS :

1. Internet,WorldWideWeb,Howtoprogram,Dietel,Nieto,PHI/PEA

2. JakartaStrutsCookbook,BillSiggelkow,SPDO'Reilly

3. WebTehnologies,2/e,Godbole,kahate,TMH,202,

4. AnIntroductiontowebDesign,Programming,Wang,Thomson

5. WebApplicationsTechnologiesConcepts-Knuckles,JohnWiley

MTCST22 OBJECT ORIENTED SOFTWARE ENGINEERING
COMMON FOR M. TECH (CST, IT)

Instruction:3Periods/week	Time:3Hours	Credits: 3
Internal:30Marks	External:70 Marks	Total: 100Marks

1. **Introduction to Object Oriented SoftwareEngineering**
   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-Centred 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 Behavioural Diagrams: Interaction Diagrams, State Diagrams, Activity Diagrams, Component And DeploymentDiagrams.

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-MortemAnalysis.

7. **Software Project Management:**
   Introduction To Software Project Management, Activities Of Software Project Management, Structure Of Project Plan,SoftwareEngineering Teams, Software Cost Estimation, Project Scheduling, Tracking And Monitoring.

CASESTUDY

1. Simple Chat Instant MessagingSystem
2. GPS Based Automobile NavigationSystem
3. Waste Management Inspection Tracking System(WMITS)
4. Geographical InformationSystem

Text Book:

1. Object-Oriented Software Engineering Practical software developmentusing UML and Java by Timothy C. Lethbridge& Robert, LanganiereMcgraw-Hill

References:

1. Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson EducationAsia.
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-WesleyProfessional.

MTIT23 ELECTIVE-III
CRYPTOGRAPHY& NETWORK SECURITY

Instruction:3Periods/week	**Time:3Hours**	**Credits: 3**
Internal:30Marks	**External:70 Marks**	**Total: 100Marks**

1 **Overview:** Computer Security Concepts, Threats, Attacks, and Assets, Security Functional Requirements, A Security Architecture for Open Systems, ComputerSecurity Trends, Computer Security Strategy. Cryptographic Tools: Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions,Public-Key Encryption, Digital Signatures and Key Management, Random andPseudorandom Numbers, Practical Application: Encryption of Stored Data. User Authentication:Means of Authentication, Password-Based Authentication, Token-BasedAuthentication, Biometric Authentication, Remote User Authentication, Security Issues forUser Authentication, Practical Application: An Iris Biometric System, Case Study:Security Problems for ATMSystems.

2 **Access Control:** Access Control Principles, Subjects, Objects, and AccessRights, Discretionary Access Control, Example: UNIX File Access Control, Role-BasedAccess Control, Case Study: RBAC System for a Bank. Database Security: The Need forDatabase Security, Database Management Systems, Relational Databases, DatabaseAccess Control, Inference, Statistical Databases, Database Encryption, CloudSecurity.

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—Stealthing—Backdoors, Root kits,Countermeasures.
Denial-of-Service Attacks: Denial-of-Service Attacks, Flooding Attacks,Distributed Denial-of-Service Attacks, Application-Based Bandwidth Attacks, Reflector andAmplifier Attacks, Defenses Against Denial-of-Service Attacks, Responding to aDenial-of-Service Attack.

4 **Intrusion Detection:** Intruders, Intrusion Detection, Host-Based IntrusionDetection, Distributed Host-Based Intrusion Detection, Network-Based IntrusionDetection, Distributed Adaptive Intrusion Detection, Intrusion Detection ExchangeFormat, Honeypots, Example System: Snort. Firewalls and Intrusion Prevention Systems:The NeedforFirewalls,FirewallCharacteristics,TypesofFirewalls,FirewallBasing,Firewall Location and Configurations, Intrusion Prevention Systems, Example: UnifiedThreatManagementProducts.

5 **Buffer Overflow:** Stack Overflows, Defending Against Buffer Overflows, Other Formsof Overflow Attacks, Software Security: Software Security Issues, Handling ProgramInput, Writing Safe Program Code, Interacting with the Operating System and OtherPrograms,Handling Program Output. Operating System Security: Introduction to OperatingSystem Security, System Security Planning, Operating Systems Hardening, ApplicationSecurity, Security Maintenance, Linux/Unix Security, Windows Security, VirtualizationSecurity.

6 **Symmetric Encryption and Message Confidentiality:** Symmetric EncryptionPrinciples, Data Encryption Standard, Advanced Encryption Standard, Stream Ciphers andRC4, Cipher

Block Modes of Operation, Location of Symmetric Encryption Devices,Key Distribution. Public-Key Cryptography and Message Authentication: SecureHash Function, HMAC, TheRSA Public-Key Encryption Algorithm, Diffie-Hellman andOtherAsymmetricAlgorithms.

7   **Internet Security Protocols and Standards:** Secure E-mail and S/MIME, DomainKeys IdentifiedMail,SecureSocketLayer(SSL)andTransportLayerSecurity(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 WirelessLAN Security.

TextBook:
1. Computer Security - Principles and Practices (Except the Chapters 13, 14, 15, 16, 17,18, 19), 2^{nd}Edition by William Stallings, Pearson Education,Inc.

ReferenceBooks:
1. Cryptography and Network Security by William Stallings, Pearson Education Asia,New Delhi.
2. NetworkSecurityEssentialsApplicationsandStandards,byWilliamStallings,Pearson Education Asia, NewDelhi.

MTIT23 ELECTIVE-III
GEO - INFORMATICS

Instruction:3Periods/week	**Time: 3Hours**	**Credits: 3**
Internal:30Marks	**External:70 Marks**	**Total: 100Marks**

1. **Introduction:** Definition of GIS and Related Terminology-Evolution of GIS-Components of GIS- Approaches to study of GIS Maps and GIS: Map Scale- Classes of maps-The mapping Process- Plane coordinate systems and Transformations- Geographic Coordinate System of Earth- Map Projection- Establishing a spatial framework for mapping Locations on Earth- Geo-referencing- Acquisition of Spatial Data for the terrain- Topographic Mapping-Attribute Data for Thematic Mapping

2. **Digital Representation of Geographic** Data**:** Technical Issues Pertaining to Digital Representation of Geographic Data-Database creation and management-Raster Geographic and Vector data representation-Object oriented Geographic Data representation-Relationship between Data representation and Data Analysis in GIS Data Quality and Data Standards: Concepts and Definitions of Data Quality-Components of Geographic Data Quality- Assessment of Data Quality- Managing Spatial Data Errors-Geographic Data Standards- Geographic Data Standards And GISDevelopment

3. **Raster and Vector-Based GIS** Data Processing: Acquiring and Handling Raster Data Processing Cartographic Modeling- Characteristics of Vector- Based GIS Data Processing Vector Data Input Functions Non-topological GIS Analysis Functions Feature-Based Topological Functions Layer-Based Topological Functions Vector-Based Output Functions ApplicationProgramming

4. **Visualization of Geographic Information and Generation:** Cartography in the Context of GIS-Human-Computer Interaction and GIS- Visualization of Geographic Information Principles of Cartographic Design in GIS-Generation of InformationProducts

5. **Remote Sensing and GIS Integration:** Principles of Electromagnetic Remote Sensing System Classifications-Imaging Characteristics of Remote Sensing Systems-Extraction of Metric Information from Remotely Sensed Images-Extraction of Thematic Information from Remotely Sensed Images- Integration of Remote Sensing andGIS

6. **Digital Terrain Modeling:** Definitions and Terminology Approaches to Digital Terrain-Data Sampling- Acquisition of Digital Terrain Data-Data Processing, Analysis, and Visualization- Applications of Digital TerrainModels.

7. **Spatial Analysis and Modeling:** Descriptive Statistics-Spatial Auto Correlation- Quadratic Counts and Nearest- Neighbor Analysis-Trend Surface Analysis-Gravity Models-Network Analysis-GISModeling

8. **GIS Implementation and Project Management:** Software Engineering as Applied to GIS- GIS Project Planning-Systems Analysis and User Requirements-Geographic Database Design Methodology-GIS Application Software Design Methodology-Systems Implementation and Technology Rollout-Systems Maintenance and Technical Support, GIS Issues and Prospects: Issues of Implementing GIS-The Trend of GIS-Development Frontiers ofGIS Research.

Text Book:

 Concepts and Techniques of Geographic Information Systems, by C. P. Lo & Albert K. W. Yeung, Prentice Hall of India Ltd

Reference Books:

1) An Introduction to Geographical Information Systems, by Ian Heywood, Sarah Cornelium& Steve Carver, PearsonEducation

2) Introduction to Geographic Information Systems, by Kang-rsungChang, Tata McGraw Hill Publishing CompanyLimited

MTIT23Elective-III
ARTIFICIAL INTELLIGENCE

Instruction: 3Periods/week	**Time:3 Hours**	**Credits: 3**	
Internal:30 Marks	**External:70 Marks**	**Total: 100Marks**	

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-EndsAnalysis.

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, Over view of Prolog, Production System usingProlog

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, Model 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 &FuzzySystems.

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 Expertsystems.

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, HebbianLearning.

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, ReactiveSystems

Text Book:

1. Artificial Intelligence, George F Luger, Pearson EducationPublications

2. Artificial Intelligence, Elaine Rich and Knight, Mcgraw-HillPublications

References:

1. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI

2. Multi Agent systems- a modern approach to Distributed Artificial intelligence, Weiss.G, MITPress.
3. Artificial Intelligence : A modern Approach, Russell and Norvig, PrinticeHall

MTIT24 Elective-IV
BIG DATA ANALYTICS

Instruction: 3Periods/week	**Time: 3Hours**	**Credits: 3**
Internal:30Marks	**External:70 Marks**	**Total: 100Marks**

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 Map Reduce, Understanding the Hadoop Map Reduce fundamentals, Writing a Hadoop MapReduce example, Learning the different ways to write Hadoop Map Reduce in R.

3. IntegratingRandHadoopIntroducingRHIPE,InstallingRHIPE,UnderstandingthearchitectureofHIPE,UnderstandingRHIPEsamples,UnderstandingtheRHIPEfunction,IntroducingRHadoop,UnderstandingthearchitectureofRHadoop,UnderstandingRHadoopexamples,UnderstandingtheRHadoopfunctionreference

4. UsingHadoopStreamingwithRUnderstandingthebasicsofHadoopstreaming, 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. UnderstandingBigDataAnalysiswithMachineLearningIntroductiontomachinelearning, 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.BigDataAnalyticswithRandHadoopByVigneshPrajapati,PacktPublishingLtd.(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
MOBILE COMPUTING

Instruction:3Periods/week	**Time: 3Hours**	**Credits: 3**
Internal:30Marks	**External:70 Marks**	**Total: 100Marks**

1. **Introduction to Mobile Computing,** Overview of Mobile Technologies, Limitations, The Ubiquitous Network, Architecture for Mobile Computing, Three-Tier Architecture, Design Considerations for Mobile Computing, Mobile Computing Through Internet, Mobile Devises and Mobile-EnabledApplications.

2. **Introduction To Wireless Networking**, Various Generations of Wireless Networks, Wireless LANs, Advantages and Disadvantages of WLANs, Fixed Network Transmission Hierarchy, Differences in Wireless and Fixed Telephone Networks, Traffic Routing in Wireless Networks, WAN Link Connection Technologies, CellularNetworks.

3. **WLAN Topologies,** WLAN Standard IEEE 802.11, Comparison Of IEEE 802.11a, B, G and N Standards, Wireless PANs, Hiper LAN, Wireless Local Loop, ATM, Virtual Private Networks, Wireless Data Services, Common Channel Signaling, Various Networks for Connecting to The Internet.

4. **Emerging Technologies:** Introduction - Bluetooth - Radio Frequency Identification (RFID), WIMAX -Mobile IP - Ipv6 - Java Card, TCP/IP in the Mobile Setting, GSM andGPS

5. **Data Management Issues**, Data Replication For Mobile Computers, Adaptive Clustering for Mobile Wireless Networks, File System, Disconnected Operations, Data Services in GPRS - Applications for GPRS - Limitations - Billing andCharging.

6. **Communications** Asymmetry, Classification of New Data Delivery Mechanisms, Push-Based Mechanisms, Pull-Based Mechanisms, Hybrid Mechanisms, Selective Tuning (Indexing) Techniques. CDMA, GSM , Wireless Data, 3GNetworks andApplications

7. **Introduction to Mobile IP**, Introduction To Wireless Application Protocol, Application Layer MMS - GPRS Applications, Short Message Service (SMS): Mobile Computing Over SMS - SMS - Value Added Services Through SMS -Accessing the SMSBearer.

Text Books:

1. Mobile Computing - Technology Applications And Service Creation, Asoke K Talukder and RoopaR.Yavagal, TMH2006.
2. Mobile Cellular Communication, GottapuSasibhushanaRao,, Pearson Education, First Edition, 2013.

Reference Books:

1. Principles Of Computing, UweHansmann, LotherMerk, Martin S.Nicklous, Thomas Staber, 2ndEd., Springer International Edition.
2. Mobile Communications, J.Schiller, Addison-Wesley,2003
3. Stojmenovic And Cacute, "Handbook Of Wireless Networks And Mobile Computing", Wiley,

MTIT24   Elective-IV
SOFT COMPUTING

Instruction:3Periods/week   **Time: 3Hours**   **Credits: 3**
Internal:30Marks   **External:70 Marks**   **Total: 100Marks**

1. **Introduction to Intelligent systems and Soft Computing:**
   Intelligent Systems, Knowledge based Systems, Knowledge representation and Processing, Soft Computing
2. **Fundamentals of Fuzzy logicsystems:**
   Evolution of Fuzzy logic, developmental stages and utility in Expert system development, Fuzzy sets, Fuzzy operators, generalized operators, implication, support set and alpha cut, fuzzy resolution, measures of fuzziness fuzzy relations, composition and inference, fuzzy decision making
3. **Fuzzy logicControl**:
   Basics of fuzzy control, Defuzzification, Fuzzification, fuzzy control surface, Fuzzy control architectures, Properties of fuzzy control, robustness and stability

4. **Fundamentals of Artificial Neuralnetworks:**
   Learning and acquisition of knowledge, features of ANN, topologies, learning algorithms, Fundamentals of Connectionist Modeling
5. **Major classes of Neuralnetworks**:
   Multi-layer perceptron, RBF networks, Kohonen's self organising networks, Hopfield networks, Industrial and commercial applications of ANN
6. **Dynamic Neural networks and theirApplications:**
   Basics concepts, dynamica and architecture of Recurrent networks (RNN), training algorithms, Dynamic neural networks for identification and control, Dynamic neural networks for chaos time series prediction, ANN for chaos prediction
7. **Neuro-fuzzySystems:**
   Architectures of neuro-fuzzy systems, cooperative neuro-fuzzy systems, Hybrid neuro-fuzzy systems, construction of neuro-fuzzy systems, structure identification and parameter learning phases
8. **EvolutionaryComputing:**
   Overview of evolutionary computing, Genetic algorithms, and Optimisation, schema theorem, Genetic algorithm operators, Integration of genetic algorithms with neural networks, Integration of GA with fuzzy logic, Population based incremental learning,

Text Book:
1. Soft Computing and Intelligent Systems Design, FakhreddineO.Karray and Clarence De Silva, Pearson Edu

Reference Book:
1.Fuzzy Logic With Engineering Application , Timothy J.Ross, John Wiley & Sons PublishingCompany
2.Introduction to Soft Computing: Neuro-Fuzzy and Genetic Algorithms, Samir Roy, Ist Edition, Pearson Edu

MTCST25   ENTREPRENEURSHIP (Audit Course)

Common for M. Tech (CST, IT, AI&R, CN, CS&DA)

Instruction:3 Periods/week	Time: 3 Hours	Credits: 0
Internal: 30 Marks	External: 70 Marks	Total: 100 Marks

Unit -I

Basic Concepts of Management: Nature and Importance ; Functions of the Management; Levels of Management; F.W Taylor's Scientific Management; Henry Fayol's Principles of Management. (**Eight Periods**)

Unit-II

Forms of Business Organizations: Introduction, Types of Businessorganizations**: Private Sector**- Individual Ownership , Partnership, Joint stock companies and Co-Operative organizations**; Public sector**- Departmental Organizations, Public Corporations and Government Companies; The Joint sector Management.(**Eight periods**)

Unit-III

Production and operations Management: Plant location- Factors to be considered in the selection of Plant location; Break - even analysis- Significance and managerial applications; Importance of Production Planning and Control and its Functions; Human Resource Management and Functions of Human Resource Manager (in brief); Functions of Marketing; Methods of Raising Finance. **(Ten periods)**

Unit-IV

Entrepreneurship: Definition,   Characteristics and Skills , Types of Entrepreneurs, Entrepreneur vs. Professional Managers, , Growth of Entrepreneurs, Nature and Importance of Entrepreneurs, Women Entrepreneurs, Problems of Entrepreneurship.**(Six periods**)

Unit-V

Entrepreneurial Development and Project Management: Institutions in aid of Entrepreneurship Development, Idea generation: Sources and Techniques;, Stages in Project formulation ; Steps for starting a small enterprise - Incentives for Small Scale Industries by Government. **(Eight periods**)

Text Books:
1. Sharma,S.C, and Banga, T.R., **Industrial Organization & Engineering Economics**, KhannaPublishers, Delhi, 2000.
2.VasantDesai ,**The Dynamics of Entrepreneurial Development and Management (Planning for future Sustainable growth),**HImalayan Publishing House, 2018.

Reference Books:
 (1) Aryasri , A.R., **Management Science,** McGraw HIll Education (India Private Limited, New Delhi 2014.
 (2) Sheela, P and JagadeswaraRao, K., **Entrepreneurship**, Shree Publishing House, Guntur,

MTIT27 WEB PROGRAMMINGLAB

Instruction:3Periods/week	Time: 3Hours	Credits:2
Internal:30Marks	External:70 Marks	Total: 100Marks

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

   tothesocket. 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 theclient.

4. MailClient:

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

   SMTP Client:Gives the server name, send e-mail to the recipient using SMTPcommands-

5. Simulation of Telnet: Provide a user interface to contact well-known ports, so that client-serverinteraction can be seen by theuser..

6. Design of the Web pages using various features of HTML andDHTML

7. Client server programming using servlets, ASP and JSP on the server side and java script on the client side

8. Web enabling ofdatabases

9. Multimedia effects on web pages design usingFlash.

References

1. Java Network Programming, Harol, OriellyPublications
2. An Introduction to Computer Networking, Kenneth C. Mansfield JrandJames L. Antonakos, Pearson EducationAsia
3. Internet and Web Technologies by Raj Kamal, TataMcGraw-Hill
4. Programming the World Wide Web by Robert W. Sebesta, PearsonEducation

MTCST26 OBJECT ORIENTED SOFTWARE ENGINEERINGLAB
Common for M. Tech (CST, IT)

Instruction:3Periods/week	**Time: 3Hours**	**Credits: 2**
Internal:30Marks	**External:70 Marks**	**Total: 100Marks**

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 projectteam.
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 designmethodology.
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 completedassignment
4. Term projects are projects that a group student or might take through from initial specification to implementation. The project deliverablesinclude

Projects

- Documentationincluding
  o A problemstatement
  o A requirementsdocument
- A Requirements AnalysisDocument.
- A System RequirementsSpecification.
- A Software RequirementsSpecification.
- A designdocument
  o A Software Design Description and a System DesignDocument.
- A testspecification.
- Manuals/guidesfor
  o Users and associated helpframes
  o Programmers
  o Administrators (installationinstructions)

- A project plan and schedule setting out milestones, resource usage and estimatedcosts.
- A quality plan setting out quality assuranceprocedures
- Animplementation.

Reference Books:

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

Detailed Syllabus for M.Tech (IT) Third Semester

MTIT31   ELECTIVE-V   BUSINESS INTELLIGENCE

Instruction:3Periods/week	Time: 3Hours	Credits: 3
Internal:30Marks	External:70 Marks	Total: 100Marks

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 SeemaAcharya "Fundamentals of Business Analytics", Wiley-India, 2011Jiawei Han and MichelineKamber, "Data Mining: Concepts and Techniques", Morgan
2. Kaufmann Publishers, 2000 (ISBN: 1-55860-489-8).
   David Loshin, "Business Intelligence -The Savvy Manager's Guide", Morgan Kaufmann Publishers.

MTIT31   ELECTIVE-V INTERNET OF THINGS

Instruction:3Periods/week　　　　　　**Time: 3Hours**　　　　**Credits: 3**
Internal:30Marks　　　　　　　　　**External:70 Marks**　　**Total: 100Marks**

1. 1.Introductiontotheinternetofthings.IoTArchitecture:HistoryofIoT,M2M– MachinetoMachine,WebofThings,IoT protocols The Architecture The Layering concepts,IoT Communication Pattern, IoT protocol Architecture, The 6LoWPAN

2. Prototyping connected objects. Open-source prototypingplatforms.

3. Integrating internet services. XML and JSON. HTTP APIs for accessing popular Internet services (Facebook, 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. Ubiquitouscomputing,applications of IOT,Virtualization of network resources and physical devices inIOT.

6. Internet of Things Standardisation M2M Service Layer Standardization OGC Sensor Web forIoT

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   E-COMMERCE

Instruction:3Periods/week	**Time: 3Hours**	**Credits: 3**
Internal:30Marks	**External:70 Marks**	**Total: 100Marks**

1. **Introduction:** Electronic Commerce-Frame Work, Anatomy of E-Commerce Applications, E-Commerce Consumer Applications, E-Commerce Organization Applications. Consumer Oriented Electronic Commerce - Mercantile Process Models, Digital Economy and e-businessModels
2. **Electronic Payment Systems** – Types of Electronic Payment Systems, Digital Token- Based, Smart Cards, Credit Cards, Risks in Electronic Payment Systems, Designing Electronic Payment Systems Electronic Data Inter Change, Inter Organizational Commerce - EDI, EDI Implementation, Value AddedNetworks.
3. **Intra Organizational Commerce**, Macro Forces and Internal Commerce, Work Flow Automation and Coordination, Customization and Internal Commerce, Supply Chain Management. Business Cases for Document Library, Digital Document Types, Corporate DataWare-Houses.
4. **Advertising And Marketing:** Information Based Marketing, Advertising On Internet, Online Marketing Process, Market Research. Consumer Search and Resource Discovery, Information Search and Retrieval, Commerce Catalogues, InformationFiltering.
5. **Multimedia-Key Multimedia Concepts,** Digital Video and Electronic Commerce, Desktop Video Processing, Desktop VideoConferencing.
6. **Business to consumer e-commerce:** On line Marketing and Selling, Information Goods, Electronic Markets and Auctions on theInternet
7. **E-Business Intelligence:** Data Mining, Web Merchandising and Recommender Systems, Intelligent Agents in e-commerce, Business-to-Business e-commerce and Supply ChainManagement
8. **Security of Internet** Hosts and Networks, Public Key Infrastructure, Safety of e- commerce Applications

Text Books:

Frontiers of Electronic Commerce, Kalakata and Whinston, Pearson.

References

1. E-Commerce fundamentals and Applications, Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, JohnWiley.
2. E-Commerce, S.Jaiswal,Galgotia.
3. E-Commerce, Efrain Turbon, Jae Lee, David King, H.MichaelChang.
4. E-Commerce - Business, Technology and Society, Kenneth C.Taudon, Carol GuyericoTraver.

MTIT32   OPEN ELECTIVE: GPS APPLICATIONS

Instruction:3Periods/week   **Time: 3Hours**   **Credits: 3**
Internal:30Marks   **External:70 Marks**   **Total: 100Marks**

UNIT-1:
Development of NAVSTAR GPS.GPS Satellite configuration- Space segment, Control segment, User segment.

UNIT-2:
GPS working principle, basic equations for finding user position, user position determination with least squares estimator.

UNIT-3:
Other Global Satellite Constellations, GLONASS, GALILEO, Comparison of 3 GNSS (GPS, GALILEO, GLONASS)interms of constellation and services provided.

UNIT-4:
GPS Signal generation, Pseudorandom noise (PRN) code, C/A code , P code, Navigation data, Signal structure of GPS, signal power.

UNIT-5:
Coordinate Systems: Geoid, Ellipsoid, Coordinate Systems, Geodetic and Geo centric coordinate systems, ECEF coordinates, world geodetic 1984 system, Conversion between Cartesian and geodetic coordinate frame.

UNIT-6:
GPS Error sources, ionospheric effects on GPS signals and its mitigation methods.

UNIT-7:
Satellite based augmentation system-need for GPS augmentation, GPS Aided GEO Augmented System (GAGAN).

Textbook:
1. G S RAO, Global Navigation Satellite Systems, McGraw-Hill Publications, New Delhi, 2010
2. Pratap Mishra, Global positioning system: signals, measurements, and performance, Ganga-Jamuna Press, 2006.

Reference Books:
1. Scott Gleason and DemozGebre-Egziabher, GNSS Applications and Methods, Artech House, 685
   Canton Street, Norwood, MA 02062, 2009.
2. James Ba – Yen Tsui, 'Fundamentals of GPS receivers – A software approach', John Wiley & Sons
   (2001).
3. B.Hoffmann-Wellenhof, GPS theory and practice, 5th Edition, Springer 2001.

MTIT32   OPEN ELECTIVE: OPERATION RESEARCH

Instruction:3Periods/week   **Time: 3Hours**   **Credits: 3**
Internal:30Marks   **External:70 Marks**   **Total: 100Marks**

1. OverviewofOperationsResearch,TypesofORModels,PhasesofOperationsResearch–ORTechniques,IntroductiontoLinearProgramming,FormulationofLinearProgrammingProblem, Graphical Solution; Graphical SensitivityAnalysis,

2. StandardFormofLPP,BasicFeasibleSolutions,UnrestrictedVariables,SimplexAlgorithm,ArtificialVariables, Big M Method, Two Phase Simplex Method, Degeneracy,Alternative Optimal, Unbounded Solutions, Infeasible Solutions, Primal And Dual Problems AndTheirRelations, Dual SimplexMethod

3. Transportation Problem as LPP, Initial Solutions, North West Corner Rule,LowestCost Method, VogelsApproximation Method, Optimum Solutions of TPP, Degeneracyin Transportation, Transportation Algorithms ,

4. Assignment Problem , Assignment Problem as LPP, Hungarian Method, Travelling SalesmanProblem, Solutions Of TSP, Sequencing Problems, N-Jobs Two Machine Problems, N-JobsK-MachinesProblems,Two-JobsM-MachineProblems,CrewSchedulingProblems

5. NetworkRepresentationofAProject,CPMandPERT,CriticalPathCalculations,Time–Cost Optimizations, PERT Analysis and Probability Considerations, Resource Analysis inNetworkScheduling.

6. Replacement Problems-Individual And Group Replacement Policy, Reliability &SystemFailure Problems, Inventory-Factors Effecting Inventory-EOQ, Inventory Problems With andWithout Shortages, Inventory Problems With Price Breakups, Multi Item DeterministicProblems. Probabilistic InventoryProblems

7. Game Theory: Two Person Zero Sum Games, MixedStrategyGamesandTheir Algorithms.

TextBooks:

1. Operations   Research,   KantiSwaroop,   P.K.   Gupta,   Man   Mohan,   Sulthan Chand&SonsEducation

2. PublishersOperationsResearch–AnIntroduction,HandyATahaPearson Education.

MTIT32   OPEN ELECTIVE: BIO-INFORMATICS

Instruction:3Periods/week	**Time: 3Hours**	**Credits: 3**
Internal:30Marks	**External:70 Marks**	**Total: 100Marks**

Unit-1

Basic Biology: What is life? The unity and the diversity of living things. Prokaryotes and Eukaryotes, Yeast and People, Evolutionary time and relatedness, Living parts: Tissues, cells, compartments and organelles, Central dogma of molecular biology, Concept of DNA, RNA, Protein and metabolic pathway. What is Bioinformatics? Recent challenges in Bioinformatics.

Unit2

Biological databases: Their needs and challenges. Example of different biological databases – sequence, structure, function, micro-array, pathway, etc.

Unit-3

Sequence Analysis: Theory and Tools: -Pairwise alignment – Different local and global search alignment, Heuristic searches (like BLAST) applicable to search against database, Multiple alignment algorithms, Whole genome comparison.

Unit4

Walk through the genome: Prediction of regulatory motifs, Operon, Gene, splices site, etc.

Unit-5

 Markov models: Hidden Markov models – The evaluation, decoding and estimation problem and the algorithms. Application in sequence analysis.

Unit-6

Molecular phylogeny: maximum Parsimony, distance Matrix and maximum likelihood methods. Concepts of adaptive evolution.

Unit-7

Application of graph theory in Biology: Biochemical Pathway, Protein-protein interaction network, Regulatory network and their analysis.

Text Books:

1. Bioinformatics: David Mount

2. Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic acids, R. Durbin, S.R. Eddy, A. Krogh and G. Mitchison.

IVSEMESTER

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

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 BINDINGSPECIFICATIONS:

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. PREPARATIONFORMAT:

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

3.2   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.

3.3   Abstract – Abstract should be one page synopsis of the project report typed one and half line spacing, Font Style Times New Roman and Font Size12.

3.4   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 **Appendix3.**

3.5   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 thishead.

3.6   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 thishead.

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

3.8   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 in to several chapters and each chapter may be further divided into several divisionsandsub-divisions.

- Each chapter should be given an appropriatetitle.
- Tables and figures in a chapter should be placed in the immediate vicinity of the reference where they arecited.
- 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 theyannotate.

3.9 Appendices–

- Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the centraltheme.
- 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 pagealso.

3.10 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 quotedabove.

REFERENCES:

1. Barnard, R.W. and Kellogg, C. (1980) Applications of Convolution Operators to Problems in Univalent Function Theory, Michigan Mach, 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.