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. INFORMATION TECHNOLOGY

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

I SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
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<th>Periods/week</th>
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<td>Elective-II</td>
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<td>Research Methodology &amp; IPR</td>
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Elective II: Advanced Database Management Systems/Computer Networks/Embedded systems

II SEMESTER

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<td>MTCST22</td>
<td>Object Oriented Software Engineering</td>
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<td>Elective-III</td>
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Elective III: Cryptography & Network Security/Geo-Informatics/ Artificial Intelligence
Elective IV: Big Data Analytics/Mobile Computing/Soft Computing
### III SEMESTER

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

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

### IV SEMESTER

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<th>Code</th>
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MTech (Information Technology)

PROGRAM EDUCATIONAL OBJECTIVE (PEO’S)

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<tr>
<th>S.No</th>
<th>PEO</th>
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<tbody>
<tr>
<td>PEO-1</td>
<td>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.</td>
</tr>
<tr>
<td>PEO-2</td>
<td>To Apply knowledge of information technology for societal impact.</td>
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<tr>
<td>PEO-3</td>
<td>To be able to understand multicultural and global perspectives to work effectively and ethically.</td>
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<tr>
<td>PEO-4</td>
<td>To engage in life by learning and be a team player.</td>
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</tbody>
</table>

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-economic domains and analyse their performance. |
| PO-4 | Ability to analyse the system problems, using systematic approach with well-defined interface. |
| PO-5 | Ability to design secure 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 solutions effectively 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. |
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
Common for M. Tech (CST, IT, AI&R, CN, CS&DA)

Instruction: 3 Periods/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.
- 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.
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.
### MTCST14
**Elective-I COMPUTER ORGANIZATION AND ARCHITECTURE**

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

<table>
<thead>
<tr>
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<th>Time: 3 Hours</th>
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<tbody>
<tr>
<td>Internal: 30 Marks</td>
<td>External: 70 Marks</td>
<td>Total: 100 Marks</td>
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</table>

**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)

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<thead>
<tr>
<th>Instruction: 3 Periods/week,</th>
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**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 graphics animation.
### 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.

### 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 for practical setup of a given network scenario and size.
- Realize the Operation, maintenance, and management of the Internet.
by mapping theoretical networking concepts to the real-time network scenarios.

- Demonstrate the applications of wireless Networks and overview of advanced networking concepts.
- Identify different networking devices and their usage and functionality.

<table>
<thead>
<tr>
<th>MTCST1 4</th>
<th>Elective-II</th>
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<td>EMBEDDINGSYSTEMS</td>
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</table>

**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 microcontroller.
- Ability to write ALP programs using 8051 instructions set.
- Ability to understand the concepts related to RTOS and its Inter Task Communication methods.
- Ability to understand various design issues of RTOS.
- Understand about embedded software development tools.

<table>
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<th>MTCST1 5</th>
<th>RESEARCH METHODOLOGY AND IPR</th>
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**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.

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

Instruction: 3 Periods/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: 3 Periods/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.
### ELECTIVE-II LAB COMPUTER NETWORKS LAB

**COMMON FOR M. TECH (CST, IT)**

**Instruction:** 3 Periods/week, **Time:** 3 Hours **Credits:** 4

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**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.

### ELECTIVE-II LAB EMBEDDED SYSTEMS LAB

**COMMON FOR M. TECH (CST, IT)**

**Instruction:** 3 Periods/week, **Time:** 3 Hours **Credits:** 4

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**Course Objectives:**
- To introduce basics of electronics and reading electronics diagrams
- To introduce students to basics of Arduino programming language and IDE
- 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.

### WEB SYSTEMS & TECHNOLOGIES

**Instruction:** 3 Periods/week, **Time:** 3 Hours **Credits:** 4
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.
- 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.

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MTCSTCN22
OBJECT ORIENTED SOFTWARE ENGINEERING
COMMON FOR M. TECH (CST, IT)

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<th>Instruction: 3Periods/week,</th>
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<td>Internal: 30 Marks</td>
<td>External: 70 Marks</td>
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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: 3 Periods/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 the distributed environments.
- Identify the different types of network security issues and their remedies.
- Application various cryptographic tools and techniques in different contexts and as per need of security levels.
- Implementation of some Internet security protocols and standards.

MTCST23
ELECTIVE-III GEO - INFORMATICS

Instruction: 3 Periods/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.

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<td>ARTIFICIAL INTELLIGENCE</td>
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**Instruction:** 3Periods/week, **Time:** 3 Hours **Credits:** 4

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**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 AI problem, 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 the corresponding knowledge representation approaches.
• The student is introduced to applying AI problem solving approaches to natural language processing, planning and expert systems.
### Elective-IV

#### BIG DATA ANALYTICS

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<thead>
<tr>
<th>Instruction: 3 Periods/week,</th>
<th>Time: 3 Hours</th>
<th>Credits: 4</th>
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<tr>
<th>Internal: 30 Marks</th>
<th>External: 70 Marks</th>
<th>Total: 100 Marks</th>
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**Course Objectives:**
This course is aimed at enabling the students to
- Provide an overview of an exciting growing field of big data analytics.
- Introduce the tools required to manage and 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.

### Elective-IV

#### MOBILE COMPUTING

<table>
<thead>
<tr>
<th>Instruction: 3 Periods/week,</th>
<th>Time: 3 Hours</th>
<th>Credits: 4</th>
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<table>
<thead>
<tr>
<th>Internal: 30 Marks</th>
<th>External: 70 Marks</th>
<th>Total: 100 Marks</th>
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</table>

**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**

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<tr>
<th>Instruction: 3Periods/week,</th>
<th>Time: 3 Hours</th>
<th>Credits: 4</th>
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<tbody>
<tr>
<td>Internal: 30 Marks</td>
<td>External: 70 Marks</td>
<td>Total: 100 Marks</td>
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</table>

**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)

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<tr>
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</thead>
<tbody>
<tr>
<td>Internal: 30 Marks</td>
<td>External: 70 Marks</td>
<td>Total: 100 Marks</td>
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</tbody>
</table>
**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.

<table>
<thead>
<tr>
<th>MTCST26</th>
<th>WEB PROGRAMMINGLAB</th>
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<tr>
<td>Instruction: 3 Periods/week, Time: 3 Hours</td>
<td>Credits: 4</td>
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<tr>
<td>Internal: 30 Marks</td>
<td>External: 70 Marks</td>
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</table>

**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 javascript.
- Develop programs by XML which includes user defined tags.
- Create applications using Java Servlets and JSP.

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<tr>
<th>MTCST27</th>
<th>OBJECT ORIENTED SOFTWARE ENGINEERINGLAB</th>
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<tbody>
<tr>
<td>Instruction: 3 Periods/week, Time: 3 Hours</td>
<td>Credits: 4</td>
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<tr>
<td>Internal: 30 Marks</td>
<td>External: 70 Marks</td>
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</table>
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 10 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.

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<table>
<thead>
<tr>
<th>MTCST31</th>
<th>ELECTIVE-V BUSINESS INTELLIGENCE</th>
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<tbody>
<tr>
<td>Instruction: 3Periods/week, Time: 3 Hours</td>
<td>Credits: 4</td>
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<tr>
<td>Internal: 30 Marks</td>
<td>External: 70 Marks</td>
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</table>

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

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<tr>
<th>Course</th>
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</table>

### 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 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.

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<tbody>
<tr>
<td>Internal: 30 Marks</td>
<td>External: 70 Marks</td>
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</table>
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.

<table>
<thead>
<tr>
<th>MTCST32</th>
<th>OPEN ELECTIVE: GPS APPLICATIONS</th>
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</thead>
<tbody>
<tr>
<td>Instruction: 3 Periods/week,</td>
<td>Time: 3 Hours</td>
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<tr>
<td>Internal: 30 Marks</td>
<td>External: 70 Marks</td>
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</table>

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.
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.
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. INFORMATION TECHNOLOGY**

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

## I SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Name of the subject</th>
<th>Periods/week</th>
<th>Max. Marks</th>
<th>Total</th>
<th>Credits</th>
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</table>

**Total**: 18  6  520  280  800  18


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

## II SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
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<tr>
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<td>Theory</td>
<td>Lab</td>
<td>Ext.</td>
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<tr>
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<td>Web Systems &amp; Technologies</td>
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<td>Object Oriented Software Engineering</td>
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<td>Elective-III</td>
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<td>MTIT28</td>
<td>Mini Project With Seminar</td>
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</table>

**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

<table>
<thead>
<tr>
<th>Code</th>
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<tr>
<td></td>
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<td>Theory</td>
<td>Lab</td>
<td>Ext.</td>
<td>Int.</td>
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<td>Elective-V</td>
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<td>-</td>
<td>70</td>
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<tr>
<td>MTIT32</td>
<td>Open Elective</td>
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<td>-</td>
<td>70</td>
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<tr>
<td>MTIT33</td>
<td>Dissertation-I / Industrial project</td>
<td>-</td>
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<td><strong>Total</strong></td>
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<td>-</td>
<td><strong>240</strong></td>
<td><strong>60</strong></td>
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</table>

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

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

## IV SEMESTER

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<tr>
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<tr>
<td></td>
<td></td>
<td>Theory</td>
<td>Lab</td>
<td>Ext.</td>
<td>Int.</td>
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<tr>
<td>MTCST41</td>
<td>Dissertation - II</td>
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<td>-</td>
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<td><strong>Total</strong></td>
<td><strong>-</strong></td>
<td>-</td>
<td><strong>100</strong></td>
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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: 3 Periods/week
Time: 3 Hours
Credits: 3
Internal: 30 Marks
External: 70 Marks
Total: 100 Marks

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

2. Boolean logic – properties and representation, theorems and types of proofs, deductive, inductive, by construction, contradiction and counter-examples.

3. Introduction to Number theory, Divisibility, modular arithmetic (addition modulo and multiplication modulo); Statements and applications of Euler and Fermat Theorems, Primitive Roots, Discrete Logarithms, Primality Test, Finding Large primes, Definition of Elliptic Curves and their applications to Cryptography.


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

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

Text books:
1. Introduction to Automata Theory, Languages and Computations – J.E. Hopcroft, & J.D. Ullman, Pearson Education Asia.

Reference books:
1. Introduction to languages and theory of computation – John C. Martin (MGH)
2. Discrete Mathematical structures with application to Computer Science – J.P. Tremblay and R. Manohar
3. Introduction to Theory of Computation – Michael Sipser (Thomson-Nrools/Cole)
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</table>

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


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


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

Reference Book:
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 and Design:**
   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 programmed Control:**
   Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

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

5. **Input/output Organization:**
   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:**

**Text Book:**


**Reference Book:**

1. **Introduction:**

2. **Output primitives:**

3. **Two Dimensional Transformations:**
   Basic 2D Transformations, Matrix Representations, Homogeneous Coordinates, Composite Transformations, Other Transformations, Transformations between Coordinate Systems, Affine Transformations.

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

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, Line Clipping, Polygon Clipping, Curve Clipping, Text and Exterior Clipping.

6. **Three Dimensional Concepts and Object representations:**
   3D display methods, 3D Graphics, Polygon Surfaces, Curved Lines and Surfaces, Quadratic Surfaces, Super Quadrics, Blobby Objects, Spline Representations, Cubic Spline methods, Bézier Curves and Surfaces, B-Spline Curves and Surfaces.

7. **Color Models and Basics of Computer Animation:**
   Intuitive color concepts, Basics of RGB Color model, YIQ Color Model, CMY & HSV Color models, Design of animation sequences, Raster Animations, Key Frame systems: Morphing, A Simple program on Animation.

**Text Books:**
2. Computer Graphics by Dr. Rajiv Chopra.
Reference Books:
MTCST 14 ELECTIVE-II
ADVANCED DATABASE MANAGEMENT SYSTEMS
COMMON FOR M.TECH (CST, IT, CN)

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

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:

3. Recovery System:

4. Database-System Architectures:

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:

Text Books

Reference Books

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.


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


**Text Book:**


**References:**

2. Computer networks, Mayank Dave, CENGAGE.


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


**Text Book:**


**Reference Book:**


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.


References:

2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
Instruction: 3 Periods/week  Time: 3 Hours  Credits: 0
Internal: 30 Marks  External: 70 Marks  Total: 100 Marks

1. **Organizational Behavior:**
   - Concept of Organization - Concept of Organizational Behavior - Nature of Organizational Behavior - Role of Organizational Behavior - Disciplines contributing to Organizational Behavior.

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:**

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

**Text Books.**

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

**Reference Books.**

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods:
   a) Linear search b) Binary search

2. Write Java programs to implement the following using arrays and linked lists
   a) List ADT

3. Write Java programs to implement the following using an array.
   a) Stack ADT b) Queue ADT

4. Write a Java program that reads an infix expression and converts the expression to postfix form.
   (Use stack ADT).

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

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

7. Write Java programs to implement the following using a singly linked list.
   a) Stack ADT b) Queue ADT

8. Write Java programs to implement the deque (double ended queue) ADT using
   a) Array b) Singly linked list c) Doubly linked list.

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

10. Write a Java program to perform the following operations:
    a) Construct a binary search tree of elements.
    b) Search for a key element in the above binary search tree.
    c) Delete an element from the above binary search tree.

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

12. Write a Java program to implement Dijkstra’s algorithm for Single source shortest path problem.

13. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in
    a) Preorder b) 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:
2. Data Structures with Java, J.R.Hubbard, 2nd edition, Schaum’s Outlines, TMH.
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: 3 Periods/week   Time: 3 Hours   Credits: 2
Internal: 50 Marks   External: 50 Marks   Total: 100 Marks

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
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 javascript on the client side
3. Web enabling of databases
4. Multimedia effects on web pages design using Flash.

Reference Books:
1. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill
PART- I:

1. Simple Assembly Program for Addition | 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 in debug 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 Serial Port on IDE environment use debug terminal to trace the program.
15. Generation of PWM Signal
16. Program to demonstrate SD-MMC Card Interface.

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

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

MTIT21 WEB SYSTEMS & TECHNOLOGIES

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

1. **Introduction:**
   History of the Internet and worldwide web and HTML, Basic Internet Protocols - HTTP, SMTP, Pop3, Mime, IMAP. Introduction to scripting languages - Java Scripts, Object-based scripting for the web structures, functions, arrays and objects, Dynamic HTML with JavaScript

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

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

4. **Java Beans:**
   Introduction to Java Beans, Advantages of Java Beans, BDK; Introspection, Using Bound properties, Bean Info Interface, Constrained properties; Persistence, Customizes, Java Beans API, Introduction to EJB’s.

5. **Multimedia:**

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

7. **Servlets and JSP:**
   Introduction to Servlets: Servlet Overview Architecture, HTTP package, Handling Http Request & Responses, Using Cookies - Session Tracking, Security Issues, Multitier architecture, JSPOverview, JSP Processing, JSP Application Design with MVC Setting Up and JSP Environment:
8. **JSP Application Development**:
Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing, Displaying Values Using an Expression to Set a Parameter, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Passing Control and Data between Pages, Sharing Session and Application Data – Memory Usage Considerations

**TEXT BOOKS**:  
2. *The complete Reference Java 2, 5/e*, Patrick Naughton, Herbert Schildt, TMH  
3. *Programming worldwide web*, Sebesta, PEA

**REFERENCE BOOKS**:  
1. *Internet, World Wide Web, How to program*, Dietel, Nieto, PHI/PEA  
2. *Jakarta Struts Cookbook*, Bill Siggelkow, SPDO’Reilly  
3. *Web Tehnologies, 2/e*, Godbole, Kahate, TMH, 202,  
4. *An Introduction to web Design, Programming*, Wang, Thomson  
1. **Introduction to Object Oriented Software Engineering**

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:**

4. **Class Design and Class Diagrams:**

5. **Software Design And Architecture:**

6. **Software Testing:**
7. **Software Project Management:**

**CASE STUDY**

1. Simple Chat Instant Messaging System
2. GPS Based Automobile Navigation System
3. Waste Management Inspection Tracking System (WMITS)
4. Geographical Information System

**Text Book:**

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

**References:**

MTIT23 ELECTIVE-III
CRYPTOGRAPHY & NETWORK SECURITY

<table>
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<tr>
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<td>External: 70 Marks</td>
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TextBook:

Reference Books:
MTIT23 ELECTIVE-III
GEO - INFORMATICS

Instruction: 3 Periods/week  
Time: 3 Hours  
Credits: 3

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


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


**Text Book:**


**Reference Books:**

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

MTIT23Elective-III
ARTIFICIAL INTELLIGENCE

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


**Text Book:**

1. Artificial Intelligence, George F Luger, Pearson Education Publications

**References:**

1. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI
3. Artificial Intelligence : A modern Approach, Russell and Norvig, Printice Hall
MTIT24 Elective-IV
BIG DATA ANALYTICS

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<td>Internal: 30 Marks</td>
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<td>Total: 100 Marks</td>
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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. Integrating R and Hadoop Introducing RHIPE, Installing RHIPE, Understanding the architecture of RHIPE, Understanding RHIPE samples, Understanding the RHIPE function, Introducing RHadoop, Understanding the architecture of RHadoop, Understanding RHadoop examples, Understanding the RHadoop function reference.


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.


7. Importing and Exporting Data from Various DBs Learning about data files as database, Understanding MySQL, Understanding Excel, Understanding Mongo DB, Understanding SQLite, Understanding PostgreSQL, Understanding Hive, Understanding HBase.

Text Book:
1. Big Data Analytics with R and Hadoop By Vignesh Prajapati, Packt Publishing Ltd. (OpenSourcee-book available)

Reference Books:
1. Big Data Analytics By Venkat Ankan, Packt Publishing Ltd.
2. Big Data Analytics Made Easy By Y. Lakshmi Prasad, NotionPress.
MTIT24 Elective-IV
MOBILE COMPUTING

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


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.


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, 3G Networks and Applications


**Text Books:**


**Reference Books:**

MTIT24    Elective-IV
SOFT COMPUTING

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

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:

Reference Book:
1. Fuzzy Logic With Engineering Application, Timothy J. Ross, John Wiley & Sons Publishing Company
# MTCST25 ENTREPRENEURSHIP (Audit Course)

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

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## 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 Business organizations: 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:

## Reference Books:
MTIT27 WEB PROGRAMMINGLAB

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<td>Internal: 30 Marks</td>
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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 (Broadcast): Each client opens a socket connection to the chat server and writes to the socket. Whatever is written by one party can be seen by all other parties.

3. Data retrieval from a Remote database: At the remote database a server listens for client connections. This server accepts SQL queries from the client, executes it on the database and sends the response to the client.

4. MailClient:
   POP Client: Gives the server name, user name and password retrieve the mails and allow manipulation of mail box using POP commands.
   SMTP Client: Gives the server name, send e-mail to the recipient using SMTP commands.

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

6. Design of the Web pages using various features of HTML and DHTML

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

8. Web enabling of databases

9. Multimedia effects on web pages design using Flash.

References

1. Java Network Programming, Harol OriellyPublications
2. An Introduction to Computer Networking, Kenneth C. Mansfield Jrand James L. Antonakos, Pearson Education Asia
3. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill
1. The purpose of the Software Engineering Lab course is to familiarize the students with modern software engineering methods and tools, Rational Products. The course is realized as a project-like assignment that can, in principle, by a team of three/four students working full time. Typically the assignments have been completed during the semester requiring approximately 60-80 hours from each project team.

2. The goal of the Software Engineering Project is to have a walk through from the requirements, design to implementing and testing. An emphasis is put on proper documentation. Extensive hardware expertise is not necessary, so proportionate attention can be given to the design methodology.

3. Despite its apparent simplicity, the problem allows plenty of alternative solutions and should be a motivating and educating exercise. Demonstration of a properly functioning system and sufficient documentation is proof of a completed assignment.

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

   **Projects**

   - Documentation including
     - A problem statement
     - A requirements document
   - A Requirements Analysis Document.
   - A System Requirements Specification.
   - A Software Requirements Specification.
   - A design document
     - A Software Design Description and a System Design Document.
   - A test specification.
   - Manuals/guides for
     - Users and associated help frames
     - Programmers
     - Administrators (installation instructions)

   - A project plan and schedule setting out milestones, resource usage and estimated costs.
   - A quality plan setting out quality assurance procedures
   - An implementation.

**Reference Books:**

1. Project-based software engineering: An Object-oriented approach, Evelyn Stiller, Cathie LeBlanc, Pearson Education
2. Visual Modelling with Rational Rose 2002 and UML, Terry Quatrini, Pearson Education
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: 70Marks 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 :
2. Jiawei Han and MichelineKamber, “Data Mining: Concepts and Techniques”, Morgan


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. Ubiquitous computing, applications of IOT, Virtualization of network resources and physical devices in IOT.

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

TEXT BOOK

1. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems author. Marina Ruggieri H, River Publishers Series In Communications
MTIT31  Elective-V  E-COMMERCE

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<tr>
<th>Instruction: 3 Periods/week</th>
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<tr>
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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 Added Networks.


7. **E-Business Intelligence**: Data Mining, Web Merchandising and Recommender Systems, Intelligent Agents in e-commerce, Business-to-Business e-commerce and Supply Chain Management

8. **Security of Internet** Hosts and Networks, Public Key Infrastructure, Safety of e-commerce Applications

**Text Books:**


**References**

MTIT32 OPEN ELECTIVE: GPS APPLICATIONS

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

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) in terms 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:

Reference Books:
1. Overview of Operations Research, Types of OR Models, Phases of Operations Research—OR Techniques, Introduction to Linear Programming, Formulation of Linear Programming Problem, Graphical Solution; Graphical Sensitivity Analysis,

2. Standard Form of LPP, Basic Feasible Solutions, Unrestricted Variables, Simplex Algorithm, Artificial Variables, Big M Method, Two Phase Simplex Method, Degeneracy, Alternative Optimal, Unbounded Solutions, Infeasible Solutions, Primal and Dual Problems and Their Relations, Dual Simplex Method

3. Transportation Problem as LPP, Initial Solutions, North West Corner Rule, Lowest Cost Method, Vogel’s Approximation Method, Optimum Solutions of TPP, Degeneracy in Transportation, Transportation Algorithms,


5. Network Representation of a Project, CPM and PERT, Critical Path Calculations, Time-Cost Optimizations, PERT Analysis and Probability Considerations, Resource Analysis in Network Scheduling,

6. Replacement Problems—Individual And Group Replacement Policy, Reliability & System Failure Problems, Inventory—Factors Affecting Inventory—EOQ, Inventory Problems With and Without Shortages, Inventory Problems With Price Breakups, Multi Item Deterministic Problems, Probabilistic Inventory Problems


TextBooks:


MTIT32  OPEN ELECTIVE: BIO-INFORMATICS

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**Unit-1**


**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**


**Unit-6**


**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
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.

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<th>Max. Marks</th>
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GUIDELINES FOR PREPARING THE REPORT OF PROJECT WORK

1. ARRANGEMENT OF CONTENTS:
The sequence in which the project report material should be arranged and bound should be as follows:
   1. Cover Page & Title Page
   2. Bonafide Certificate
   3. Abstract
   4. Table of Contents
   5. List of Tables
   6. List of Figures
   7. List of Symbols, Abbreviations and Nomenclature
   8. Chapters
   9. Appendices
   10. References
The tables and figures shall be introduced at appropriate places.

2. PAGE DIMENSION AND BINDING SPECIFICATIONS:
The dimension of the project report should be in A4 size. The project report should be bound using flexible cover of the thick white art paper. The cover should be printed in black letters and the text for printing should be identical.

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

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 Size 12.

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 Appendix 3.

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 this head.

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 this head.

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

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 into several chapters and each chapter may be further divided into several divisions and sub-divisions.

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

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 central theme.
- Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2, etc.
- Appendices, Tables and References appearing in appendices should be numbered and referred to at appropriate places just as in the case of chapters.
- Appendices shall carry the title of the work reported and the same title shall be made in the contents page also.

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 quoted above.

REFERENCES:


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.