M.Tech (Information Technology)

Scheme of I-IV Semester
M.Tech (Information Technology)
(2020-2022)

Department of Computer Science and Engineering
Department of Computer Science and Engineering

MASTER OF TECHNOLOGY IN INFORMATION TECHNOLOGY

Vision:
The Department shall contribute globally acceptable computer engineers with value based technology and educational perspective, trained through best in class faculty and infrastructure

Mission
To evolve into a globally acknowledged department with sound contribution in the areas of teaching, research and consultancy, through good infrastructure, well equipped laboratories with highly qualified staff and innovative teaching methodology

Program Educational Objectives
The Department will produce graduates who are able to

**PEO1:** Our graduates will be successful information engineers, serving in academia, research and industry both at supportive and leadership rules, with analytical skills, effective communication and high regards to ethical practices.

**PEO2:** Our graduates will engage in life-long learning, both formal and informal, to remain current in their profession

Program Outcomes
At the time of the graduation, our students will

**PO1:** An ability to independently carry out research/investigation and development work to solve practical problems in the field of information technology

**PO2:** An ability to write and present a substantial technical report/document

**PO3:** Students should be able to demonstrate a degree of mastery over the area with respect to information technology

**PO4:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s work to manage projects and in multidisciplinary environments

**PO5:** Ability to engage in life-long learning, independent and out of box thinking
### SCHEME OF TEACHING AND EXAMINATION
#### I SEMESTER M.Tech (IT)

<table>
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<th>Sl.No.</th>
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### SCHEME OF TEACHING AND EXAMINATION
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# ELECTIVE COURSES

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# INDUSTRY DRIVEN ELECTIVE COURSES

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I SEMESTER
ADVANCES IN COMPUTER NETWORKS (4:2:0)

Sub Code       : MIT1C01                      CIE : 50%
Hrs/Week       : 04                          SEE : 50%
SEE Hours      : 3 Hrs                      Max Marks : 100

COURSE OUTCOMES

On successful completion of the course the students will be able to

1. Comprehend the use of Computer Network by different applications along with the key metrics used to measure the performance of the network
2. Compare Various Network architectures.
3. Apply fundamental protocols for networking
4. Compare protocols involved in process-to-process communication
5. Discuss Resource Allocation techniques , its variations and TCP congestion control
6. Distinguish various congestion control mechanism

1. Foundation
   Building a Network, Requirements, Perspectives, Scalable Connectivity, Cost-Effective Resource sharing, Support for Common Services, Manageability, Protocol layering, Performance, Bandwidth and Latency, Delay X Bandwidth Product, Perspectives on Connecting, Classes of Links, Reliable Transmission, Stop-and-Wait , Sliding Window
   Self learning component: Concurrent Logical Channels.

2. Internetworking- I
   Switching and Bridging, Datagrams, Virtual Circuit Switching, Source Routing, Bridges and LAN Switches, Basic Internetworking (IP), What is an Internetwork ?, Service Model, Global Addresses, Datagram Forwarding in IP, subnetting and classless addressing, Address Translation(ARP), Host Configuration(DHCP), Error Reporting(ICMP)
   Self learning component: Virtual Networks and Tunnels.

3. Internetworking- II
   Network as a Graph, Distance Vector (RIP), Link State(OSPF), Metrics, The Global Internet, Routing Areas, Routing among Autonomous systems(BGP), IP Version 6(IPv6), Mobility
   Self learning component: Mobile IP

4. End-to-End Protocols
   Simple Demultiplexer (UDP), Reliable Byte Stream(TCP), End-to-End Issues, Segment Format, Connecting Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, Record Boundaries
   SLC: TCP Extensions
5. Queuing Disciplines, FIFO, Fair Queuing, TCP Congestion Control, Additive Increase/ Multiplicative Decrease, Slow Start, Fast Retransmit

Self learning component: Fast Recovery.

6. Congestion Control and Resource Allocation

Congestion-Avoidance Mechanisms, DEC bit, Random Early Detection (RED), Source-Based Congestion Avoidance. The Domain Name System (DNS), Electronic Mail (SMTP,POP,IMAP,MIME), World Wide Web (HTTP)

Self learning component: Network Management (SNMP).

Text books:

   (Ch 1.1, 1.2, 1.5.1, 1.5.2, 2.1, 2.5, 3.1, 3.2, 3.3, 4.1.1, 4.1.3, 5.1, 5.2.1 to 5.2.8, 6.2, 6.3, 6.4)

   (Ch 4, Ch 13.1 to 13.18, Ch 18, Ch 23.1 to 23.16, Ch 24, Ch 25, Ch 27.1 to 27.8)

References:

STORAGE AREA NETWORKS (4:2:0)

Sub Code : MIT1C02  
Hrs/Week : 04  
SEE Hours : 3 Hrs  
Designation: CORE  
CIE : 50%  
SEE : 50%  
Max Marks : 100

Course Outcomes

On successful completion of the course the students will be able to

1. Compare server centric and storage centric networks
2. Distinguish between the different types of disks, other storages and their operations useful in SAN
3. Explain I/O techniques and Network Attached Storage architecture of storage systems
4. Compare the local, network file systems and shared disk file systems of NAS
5. Differentiate the various levels of storages virtualization.
6. Analyze a network for storage, using various SAN devices

   Self learning component:- The Battle for size and access

2. Intelligent Disk Subsystems: Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels; JBOD, Storage virtualization using RAID and different RAID levels; Caching: Intelligent disk subsystems, Availability of disk subsystems.
   Self learning component:- Acceleration of Hard Disk Access

3. I/O Techniques and Network Attached Storage: The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage. The NAS Architecture. The NAS Software Architecture, Network connectivity, NAS as a storage system.
   Self learning component:- The NAS hardware Architecture

4. File System and NAS: Local File Systems; Network file Systems and file servers; Comparison of fibre Channel and NAS.
   Self learning component:- Shared Disk file systems;
5. **Storage Virtualization:** Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network.

*Self learning component:* Symmetric and Asymmetric storage virtualization in the Network

6. **SAN Architecture and Hardware devices and Software Components of SAN:** Overview, Creating a Network for storage; SAN Hardware devices; The fibre channel switch; Host us Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective. The switch’s Operating system; Device Drivers; Supporting the switch’s components.

*Self learning component:* Configuration options for SANs.

**Text books:**
1. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2007

**Reference books:**
WEB SERVICES (3:2:0)

Sub Code : MIT1C03
Hrs/Week : 03
SEE Hours : 3 Hrs

CIE : 50%
SEE : 50%
Max Marks : 100

Course outcomes

1. Provide an in-depth knowledge of Web Services.
2. Understand the fundamental concepts of Web services.
3. Understand the fundamental concepts of WSDL Web Services.
5 Study Building Blocks of Web services.

Module-1
Middleware: Understanding the middle ware, RPC and Related Middle ware, TP Monitors, Object Brokers.
SLE: Message-Oriented Middleware.

Module -2
SLE : External Architecture of a Web Service

Module- 3
Basic Web Services Technology: A Minimalist Infrastructure for Web Services,SOAP, WSDL Web Services Description Language, UDDI Universal Description Discovery and Integration, Web Services at work interactions between the Specifications.
SLE: Related Standards.

Module - 4
Service Coordination Protocols: An Introduction to Coordination Protocols, Infrastructure for Coordination Protocols, WSCoordination, WS-Transaction, Rosetta Net.
SLE: Other Standards Related to Coordination Protocols.

Module-5
Service Composition: Basics of Service Composition, A New Chance of Success for Composition, Services Composition Models.
BPEL: Business Process Execution Language for Web Services,
SLE: Web services as a Problem and a Solution : AN Example.

Text Books:

Reference Books: NIL
ADVANCED MATHEMATICS (4:0:0)

Sub Code : AMT1C01
Hrs/Week : 04
SEE Hours : 3 Hrs

CIE : 50%
SEE : 50%
Max Marks : 100

Course Outcomes:
On successful completion of the course the students will be able to:
1. Construct the matrix, digraphs of relations and explain some results on different types of relations and solve problems associated with equivalence relations.
2. Identify different types of functions, compute composition and inverse of a function and solve problems using pigeon-hole principle.
3. Apply Euclidean algorithm, Chinese remainder, Fermat’s and Wilsons theorems to solve the problems in Number Theory.
4. Solve problems associated with discrete & continuous probability distributions.
5. Compute measures of central tendency, dispersion, skewness and kurtosis for a given statistical data.
6. Solve problems on joint distribution, Markov chain using transition probability matrix and also problems on queuing theory.

Module I
Relations
Binary relations, Matrix and Digraph representation of a relation, Operations on binary relations, Properties of relations, Equivalence relations (SLE: Composition of relations).

Module II
Functions
Function, Types of functions, Composition of functions, Invertible functions, Recursive function, The Pigeonhole-principle (SLE: Hash function).

Module III
Number Theory

Module IV
Probability
Random variables – Discrete and continuous random variables, Binomial, Poisson’s, Exponential and Normal Distributions (SLE: Basic probability upto Baye’s Theorem ).
Module V
Statistics
Moments, Skewness – test of skewness, uses of skewness, measure of skewness by Karl pearson’s, Bowley’s methods and skewness based on third moment, Kurtosis (SLE: Measures of central tendency, Measures of dispersion)  

Module VI
Joint Distribution and Markov Chains

Books for Reference :
4. Probability and Statistics – Schaum Series (All latest editions)
RESEARCH METHODOLOGY (2:0:0)

Sub Code : MIT1CRM
Hrs/Week : 02
SEE Hours : 2 Hrs

CIE : 50%
SEE : 50%
Max Marks : 50

Course outcomes:

After studying this course, students will be able to:

1. Understand the basic framework of research process, research design and techniques
2. Understand the processes of quantitative data collection, analysis, interpretation and presentation
3. Understand the components of scholarly writing and ethical issues in research

MODULE-1
OVERVIEW OF RESEARCH:
Introduction to research, Objectives and motivations for research, Significance of research, Research Methods v/s Methodology, Types of research, Quantitative Research Methods, Variables, Conjecture, Hypothesis. Research Process, Criteria of good Research, Importance of literature review in defining a problem - Survey of literature - Primary and secondary sources - Reviews, Identifying gap areas from literature review - Development of working hypothesis.
Research problem-definition, selection and formulation of a research problem selection, criteria of a good research problem. Introduction to research design, Characteristics of good research design.

Self Learning Exercise: Developing a research plan, Department/program specific research problem discussions.

8 Hours

MODULE-2
DATA COLLECTION, PROCESSING AND ANALYSIS:
Sources of data, collection of data, Primary and secondary Data, Collection of Data through various methods, Measurement and scaling (brief introduction only), Sources of error in measurement. Modeling, Mathematical Models for research (brief introduction only)
Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Probability and Non Probability sampling- types and criteria for selection, Hypothesis Testing, Level of Significance and Confidence Interval, Type I and Type II errors, t-test, z-test, Regression Analysis (brief introduction only).

Self Learning Exercise: Tools for data processing, Graphical representation of Data.

10 Hours
MODULE-3
REPORT WRITING AND ETHICS IN RESEARCH:

Self Learning Exercise: Intellectual property rights, importance and protection, copyrights, patents, Impact factor of Journals

TEXT BOOKS:

REFERENCE BOOKS:
ADVANCED COMPUTER NETWORKS LABORATORY

Sub code: MIT1L01

Course Outcome:
At the end of this course the student will be able to
1. Demonstrate compression and decompression of a file, RSA algorithm, Remote command execution, RMI using java
2. Implement ARP, RIP, client and server process to exchange information using protocols
3. Simulate network setup with different tools, protocols and analyze the various parameters using charts.
4. Simulate WLAN and VLAN

PART-A
1. Write a program in java to compress and decompress a file.
2. Implement RSA algorithm using Java.
3. Write client and server programs in java to exchange information.
4. Implement Remote command execution.
5. Implement Remote method invocation.
6. Implement simple client-server application using UDP.
8. Implement RIP protocol

PART-B
1. Simulate a 3 nodes point-to-point network with duplex links between them. Set the queue size, vary bandwidth and find the number of packets dropped.
2. Simulate a wired Internet with hub, switch and router.
3. Simulate a 4 node point-to-point network, and connect the links as follows: n0- n2, n1-n2 and n2-n3. Apply TCP agent between n0-n3 and UDP n1-n3. Apply relevant application over TCP and UDP agents changing the parameter and determine the number of packets by TCP/UDP.
4. Simulate the transmission of PING messages over a network topology (STAR) consisting of 6 nodes and find the number of packets dropped due to congestion.
5. Simulate Ethernet LAN using n (6-10) nodes. Compare the throughput by changing the bit error rate and data rate.
6. Simulate a simple network with TCP and monitor the performance like throughput, link utilization, jitter, delay etc
7. Simulate an Extended Service Set (ESS) with transmitting nodes in wireless LAN and determine the performance with respect to transmission of packets.
8. Simulate WLAN in Ad hoc mode and Infrastructure mode
9. Simulate network flow with bandwidth reservation policy applied on a LAN
10. Simulate the centralized network control of software defined networking (SDN)
11. Simulate VLANs
12. Demonstrate the congestion control mechanism in TCP using a simulator

NOTE: students are requested to use any simulator to simulate Part-B questions
II SEMESTER
CYBER SECURITY and CYBER LAW (3:2:0)

Sub Code : MIT2C01
Hrs/Week : 03
SEE Hours : 3 Hrs

CIE : 50%
SEE : 50%
Max Marks : 100

Course outcomes

1. Introduce the student to the area of cybercrime and forensics.
2. Understand the motive and causes for cybercrime, detection and handling.
3. Areas affected by cybercrime and investigation.
4. Tools used in cyber forensic
5. Have knowledge of Legal Perspectives in cyber security

MODULE -1

SLE: Cloud Computing.

8 Hours

MODULE -2

SLE: Organizational Security Policies and Measures in Mobile Computing, Era, Laptops

8 Hours

MODULE - 3

SLE : SQL Injection

7 Hours
MODULE -4

SLE: Antiforensics.  

8 Hours

MODULE -5

SLE : Software License.  

8 Hours

TEXT BOOKS:


REFERENCE BOOKS:

CLOUD COMPUTING (4:2:0)

Sub Code : MIT2C02  CIE : 50%
Hrs/Week : 04  SEE : 50%
SEE Hours : 3 Hrs  Max Marks : 100

Course Outcomes
On successful completion of the course, the student will be able
1. Use Cloud Services.
2. Comprehend the concept of Virtualization
3. Comparatively evaluate task scheduling algorithms.
4. Apply Map-Reduce concept to applications.
5. Evaluate the needs for Private Cloud building.
6. Comprehend issues of resource virtualization and scheduling.

1. Introduction, Cloud Infrastructure
   Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Energy use and ecological impact, Service level agreements, Exercises
   Self learning component:- User experience and software licensing.

   Self learning component:- Digital content and cloud computing

   Self learning component:- The dark side of virtualization

4. Cloud Resource Management and Scheduling
   Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based Web services, Resourcing bundling: Combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to
deadlines, Scheduling Map Reduce applications subject to deadlines, Exercises and problems.

**Self learning component:** - SLC: Resource management and dynamic scaling

5. **Cloud Security, Cloud Application Development.**
Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor, Amazon web services: EC2 instances, Connecting clients to cloud instances through firewalls, Security rules for application and transport layer protocols in EC2, How to launch an EC2 Linux instance and connect to it SLC.

**Self learning component:** - How to use S3 in java


**Self learning component:** - Cloud based optimal FPGA synthesis SLC

**TEXT BOOK:**

**REFERENCES:**

PROTOCOL ENGINEERING (4:2:0)

Sub code: MIT2C03       CIE : 50 %
Hrs / week: 04          SEE : 50 %
SEE Hrs: 3 Hours        Max. Marks: 100

Course Outcome

On successful completion of the course the students will be able to

1. Describe different concepts of protocols along with their representation and discuss the phases of protocol engineering
2. Identify the components of protocol to be specified and to create formal specification of protocol using finite state machine
3. Design and develop SDL based specification of protocols
4. Apply different types of protocol verification and validation techniques
5. Identify efficient procedure for generating a conformance test suite for a given protocol implementation, compare different types of protocol testing methods and to get familiarize with concepts of performance, interoperability and scalability testing of a protocol
6. Discuss methods for interactive building of correct protocol specification and handling its implementation issues

MODULE 1


SLE: Informal representation of TCP protocol

8 Hours

MODULE 2


SLE: FSM specification of RTP protocol by identifying its components

9 Hours
MODULE 3

SLE: Give system specification of UDP and provide SDL specification for all its blocks and processes.

9 Hours

MODULE 4

SLE: Process Algebra based Validation

8 hours

MODULE 5

SLE: Conformance testing with Tree and Tabular Combined Notation (TTCN )

9 Hours

MODULE 6
Protocol performance testing: Performance Test methods, SDL Based Performance Testing of TCP, Interoperability testing, Scalability testing protocol synthesis problem


SLE: SDL based performance testing of OSPF

9 Hours
TEXT BOOKS:

REFERENCE BOOKS:
ADVANCED DATABASE MANAGEMENT SYSTEMS (4:0:0)

Sub Code        : MIT2C04
Hrs/Week       : 04
SEE Hours     : 3 Hrs

CIE               : 50%
SEE               : 50%
Max Marks : 100

Course Outcome

On successful completion of the course the students will be able to
1. Compare the different file storage structures for DBMS
2. Describe the different types of Indexing Techniques
3. Understand the query evaluation and sorting Techniques
4. Estimate the cost of a plan and enumerate alternative plans
5. Understand the physical Database Design and Tuning
6. Discuss the database Applications

1. Over view of Storage and Indexing, Disks and Files
   Data on external storage; File organizations and indexing; Index data structures; Comparison of file organizations; Indexes and performance tuning Memory hierarchy; RAID; Disk space management; Buffermanager; Files of records;
   Self learning component:-Page formats and record formats

2. Tree Structured Indexing
   Intuition for tree indexes ;Indexed sequential access method; B+trees, Search, Insert, Delete, Duplicates, B+tress in practice, Hash-Based Indexing; Static hashing, Extendible hashing.
   Self learning component:-Linear hashing, comparisons

3. Overview of Query Evaluation, External Sorting
   The system catalog, Introduction to operator evaluation; Introduction to query optimization; Alternative plans; A motivating example; what a typical optimizer does. When does a DBMS sort data? A simple two-way merge sort; External merge sort
   Self learning component:-Algorithm for relational operations

4. A Typical Relational Query Optimizer
   Translating SQL queries in to Relational Algebra; Estimating the cost of a plan; Relational algebra equivalences; Enumeration of alternative plans; Nested sub-queries.
   Self learning component:-other approaches to query optimization.
5. **Physical Database Design and Tuning**

   Introduction; Guidelines for index selection, examples; Clustering and indexing; Indexesthatenable index-only plans, Tools to assist in index selection; Overview of database tuning; Choicesin tuning the conceptual schema; Impact of concurrency; DBMS benchmarking.

   *Self learning component:* *Choices in tuning queries and views*

6. **More Recent Applications**

   Mobile databases;Multimediadatabases;Geographical Information Systems;

   *Self learning component:* *Genome data management.*

**Text Books:**


**Reference Books:**

ADVANCED DBMS LABORATORY

Sub code: MIT2L01  Hrs/week : 02

Course Outcomes

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

1. Implement different indexing techniques using suitable programming language.
2. Demonstrate query facilities to formulate queries and manipulate the database.
3. Design and develop a database application which uses triggers.
4. Demonstrate the ability to use BLOB and CLOB.
5. Apply appropriate development methodologies of data analysis, design and use appropriate modeling techniques for databases.

Part – A - Programs & SQL Queries

1. Implement a B+ tree algorithm to illustrate the Search, Insert and Delete.
2. Implement a Hashed Based Index algorithm to illustrate the Search, Insert and Delete.
3. Implement Linear hashing
4. Implement a simple two way merge sort algorithm.
5. Implement an external merge sort algorithm.
6. The following is the list of experiments to be completed by students by designing and developing suitable relational schema.
   a. Simple SQL Statements
   b. SQL Built-in Functions.
   c. Primary Key, Foreign Key and Normalization.
   d. Joins
   e. Views, Union
   f. Procedures
   g. Functions
   h. Triggers
   i. Transactions
7. Design and develop a suitable Student Database application by considering appropriate attributes. Couple of attributes to be maintained is the Attendance of a student in each subject for which he/she has enrolled and Internal Assessment Using TRIGGERS.
8. Develop a database application to demonstrate storing and retrieving of BLOB and CLOB objects.

Part – B – Mini Project

A mini-project should be submitted at the end of the course covering all the concepts and features of database. Demonstrate the operations using suitable front end application.
ELECTIVES
ELECTIVE – I

ADVANCED DIGITAL COMMUNICATION (3:0:0)

Sub Code        : MIT1E101
Hrs/Week        : 03
SEE Hours       : 3 Hrs
Max Marks       : 100

CIE                : 50%
SEE               : 50%

Course Outcomes
1. Comprehend the fundamentals of digital transmission
2. Compare different techniques for Error Detection and Correction
3. Describe the elements of Digital Communication System.
4. Critically compare the different waveform coding techniques.
5. Describe Nyquest Criterion and correlative coding.


3. Brief Review of digital communication systems: Elements of Digital communication systems; Communication channels and their characteristics; Self study component: Historical perspective in the development of digital communication

4. Wave form Coding Techniques: PCM, Channel. Noise and error probability, DPCM, DM. Self study component: Coding speech at low bit rates, Applications
5. **Base band Shaping for data transmission:** Discrete PAM signals, Inter-symbol interference (ISI) Nyquist criterion for distortion-less Base band binary transmission. Eye-pattern, transmission, correlative coding, Eye-patterns Based and M-ary PAM system, Adoptive Equalization, 

*SLC: The zero forcing algorithm, The LMA algorithm*

**TEXT BOOKS:**

**REFERENCE BOOKS:**
OOAD & DESIGN PATTERNS (3:0:0)

Sub Code : MIT1E102
Hrs/Week : 03
SEE Hours : 3 Hrs

CIE : 50%
SEE : 50%
Max Marks : 100

Course Outcome

On successful completion of the course, the students will be able to
1. Comprehend the fundamental concepts of object model and its evaluation.
2. Understand the process of object-oriented analysis.
3. Acquire the knowledge about the state modeling, system conception.
4. Analyze and Design solutions for realistic application using OOAD.
5. Understand the implementation of class modeling.

1. Introduction, Modeling Concepts
   What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development. Modeling as Design Technique: Modeling; abstraction; The three models.
   Self study component:-OO modeling history

2. Class Modeling
   Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models. Advanced object and class concepts; Association ends; N-ary associations; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages.
   Self study component:-Aggregation; Abstract classes

   State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips. Advanced State Modeling; Signal generalization; Concurrency. A sample state model; Relation of class and state models; Practical tips. Interaction Modeling: Use case models; Sequence models; Activity models; Use case relationships; Procedural sequence models; Special constructs for activity models. Process Overview: Development stages; Development life cycle. System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement.
   Self study component:-Nested state diagrams; Nested states

4. Domain Analysis, Application Analysis, System Design
   Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis. Application Analysis: Application interaction model; Application class model; Application state model; Adding operations. Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub systems; Identifying concurrency; Allocation of sub-systems; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.
   Self study component:-Management of data storage; Handling global resources
5. **Class Design, Implementation Modeling**
   
   Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example. Implementation Modeling: Overview of implementation; Realizing associations. Design Patterns What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description. Structural Decomposition: Whole-Part; Organization of Work: Master- Slave; Management: Command processor; View handler; Communication: Forwarder-Receiver.  

   **Self study component:** Client-Dispatcher-Server; Publisher-Subscriber.

**Text Books:**


**Reference Books:**

5. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns- Elements of Reusable Object-Oriented Software, Addison-Wesley, 1995.  
C# and .NET(3:0:0)

Sub Code : MIT1E103  
CIE : 50%  

Hrs/Week : 03  
SEE : 50%  

SEE Hours : 3 Hrs  
Max Marks : 100  

Course Outcome

On successful completion of the course the students will be able to

1. Understand the basic concepts of .Net platform.
2. Use method to Define and deploy the different command line compiler options.
3. Apply different constructs to build the basic c# program.
4. Comprehend the basic of object oriented programming concepts and Exception Handling.
5. Use different system defined interfaces and collections.

1. The Philosophy of .NET

Understanding the Previous State of Affairs, The .NET Solution, The Building Block of the .NET Platform (CLR,CTS, and CLS), The Role of the .NET Base Class Libraries, What C# Brings to the Table, An Overview of .NET Binaries ( aka Assemblies ), the Role of the Common Intermediate Language , The Role of .NET Type Metadata, The Role of the Assembly Manifest, Compiling CIL to Platform –Specific Instructions, Understanding the Common Type System, Intrinsic CTS Data Types, Understanding the Common Languages Specification, Understanding the Common Language Runtime A tour of the .NET Namespaces,

Self study component:- Increasing Your Namespace Nomenclature, Deploying the .NET Runtime.

2. Building C# Applications


Self study component:- The Command Line Debugger (cordbg.exe) Using the

3. C# Language Fundamentals.

Methods, Understating Static Methods, Methods Parameter Modifies, Array Manipulation in C#, String Manipulation in C#, C# Enumerations,

**Self study component:** Defining Structures in C#, Defining Custom Namespaces.

4. **Object-Oriented Programming with C#**

Forms Defining of the C# Class, Definition the “Default Public Interface” of a Type, Recapping the Pillars of OOP, The First Pillars: C#’s Encapsulation Services, Pseudo-Encapsulation: Creating Read-Only Fields The Second Pillar: C#’s Inheritance Supports, keeping Family Secrets: The “Protected” Keyword, Nested Type Definitions, The Third Pillar: C#’s Polymorphic Support, Casting Between Exceptions and Object Lifetime. Ode to Errors, Bugs, and Exceptions, The Role of .NET Exception Handing, the System. Exception Base Class, Throwing a Generic Exception, Catching Exception, CLR System – Level Exception (System, System Exception), Custom Application-Level Exception (System. System Exception), Handling Multiple Exception, The Family Block, the Last Chance Exception Dynamically Identifying mApplication – and System Level Exception Debugging System Exception Using VS. NET, Understanding Object Lifetime, the CIT of “new”, The Basics of Garbage Collection,, Finalization a Type, The Finalization Process, Building an Ad Hoc Destruction Method.

**Self study component:** Garbage Collection Optimizations, The System. GC Type.

5. **Interfaces and Collections**

Defining Interfaces Using C# Invoking Interface Members at the object Level, Exercising the Shapes Hierarchy, Understanding Explicit Interface Implementation, Interfaces As Polymorphic Agents, Building Interface Hierarchies, Implementing, Implementation, Interfaces Using VS .NET, understanding the IConvertible Interface, Building a Custom Enumerator (IEnumerator and Enumerator), Building Cloneable objects (ICloneable), Building Comparable Objects (IComparable), Exploring the system. Collections Namespace

**Self study component:** Building a Custom Container (Retrofitting the Cars Type).

**Text Books:**

**Reference Books:**
MULTIMEDIA INFORMATION SYSTEMS (3:0:0)

Sub Code : MIT1E104
Hrs/Week : 03
SEE Hours : 3 Hrs
CIE : 50%
SEE : 50%
Max Marks : 100

Course Outcomes

On successful completion of the course, the students will be able to

1. Describe multimedia objects and systems
2. Compare representation of different types of multimedia data
3. Identify different compression techniques
4. Analyze and Compare different optical storage medias
5. Describe content analysis and its importance

1. **Introduction, Media and Data Streams, Audio Technology:** Multimedia Elements; Multimedia Applications; Multimedia Systems Architecture; Evolving Technologies for Multimedia Systems; Defining Objects for Multimedia Systems; Multimedia Data Interface Standards; The need for Data Compression; Multimedia Databases. Media : Perception Media, Representation Media, Presentation Media, Storage Media, Transmission Media, Information Exchange Media, Presentation Spaces & Values, and Presentation Dimensions; Key Properties of a Multimedia System : Discrete & Continuous Media, Independence Media, Computer Controlled Systems, Integration; Characterizing Data Streams: Characterizing Continuous Media Data Streams. Sound: Frequency, Amplitude, Sound Perception and Psycho - acoustics; Audio Representation on Computers; Three Dimensional Sound Projection; Music and MIDI Standards; Speech Signals; Speech Output; Speech Input; Speech Transmission.

   **Self learning component:** - Transmission Modes

2. **Graphics and Images, Video Technology, Computer-Based Animation:** Capturing Graphics and Images Computer Assisted Graphics and Image Processing; Reconstructing Images; Graphics and Image Output Options. Basics; Television Systems; Digitalization of Video Signals; Digital Television; Basic Concepts; Specification of Animations; Methods of Controlling Animation; Display of Animation; Transmission of Animation;

   **Self learning component:** - Virtual Reality Modeling Language.

3. **Data Compression:** Storage Space; Coding Requirements; Source, Entropy, and Hybrid Coding; Basic Compression Techniques; JPEG: Image Preparation, Lossy Sequential DCT-based Mode, Expanded Lossy DCT-based Mode, Lossless Mode, Hierarchical Mode. MPEG: Video Encoding, Audio Coding, DataStream.

   **Self learning component:** - MPEG compression types.
4. **Optical Storage Media:** History of Optical Storage; Basic Technology; Video Discs and Other WORMs; Compact Disc Digital Audio; Compact Disc Read Only Memory; CD-ROM Extended Architecture; Further CD-ROM-Based Developments; Compact Disc Recordable; Compact Disc Magneto-Optical; Compact Disc Read/Write.  
   *Self learning component:* Digital Versatile Disc.

5. **Content Analysis:** Simple Vs. Complex Features; Analysis of Individual Images; Analysis of Image Sequences; Audio Analysis; Applications.  
   *Self learning component:* Video Analysis

**TEXT BOOKS:**

**REFERENCE BOOKS:**
ELECTIVE – II

INFORMATION AND NETWORK SECURITY (3:0:0)

Sub Code : MIT1E201
Hrs/Week : 03
SEE Hours : 3 Hrs

CIE : 50%
SEE : 50%
Max Marks : 100

Course outcomes
On successful completion of the course, the students will be able to,

1. Acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.

2. Understand the various key distribution and management schemes.

3. Understand how to deploy encryption techniques to secure data in transit across data networks.

4. Design security applications in the field of Information technology.

5. Understand the issues involved in IP security.

1. Public-Key Cryptography and RSA

Self Learning Component: Elliptic curve encryption/ decryption, security of Elliptic curve cryptography, pseudorandom number generation based on an asymmetric cipher, PRNG based on RSA.

2. Key Management and Distribution
Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates.

3. User Authentication
Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one way Authentication, Kerberos, Motivation, Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption, Mutual Authentication, one way Authentication, federated identity management, identity management, identity federation, personal identity verification.


Self Learning Component: Security, IEEE 802.11i services, IEEE 802.11i phases of operation, discovery phase, Authentication phase, key management phase, and protected data transfer phase, the IEEE 802.11i pseudorandom function.

4. Web Security Considerations


5. IP Security

Self Learning Component: Combining security associations, authentication plus confidentiality, basic combinations of security associations, internet key exchange, key determinations protocol, header and payload formats, cryptographic suits.

Text Books:

Reference Book:
SUPPLY CHAIN MANAGEMENT (3:0:0)

Sub Code : MIT1E202        CIE : 50%
Hrs/Week  : 03            SEE : 50%
SEE Hours : 3 Hrs        Max Marks : 100

Course outcome
On successful completion of the course, students will be able to:

1. Understand supply chain strategies.
2. Identify performance of supply chain drivers and distribution network design.
3. Understand the role of network design and types of uncertainties in the Supply Chains.
4. Discuss the functions and costs associated with inventory.
5. Explain the management and coordination of the revenue in Supply chains.

1. Introduction to Supply Chain, Performance of Supply Chain
What is a Supply Chain; Decision phases in a supply Chain; Process view of a Supply Chain; The importance of Supply Chain Flows; Examples of Supply Chains. Achieving strategic fit; Expanding strategic scope.

Self study component:- Competitive and Supply Chain strategies

2. Supply Chain drivers and Obstacles, Designing Distribution Network
Drivers of Supply Chain Performance; A framework for structuring drivers; Facilities, Inventory, Transportation, and Information; Obstacles to achieve strategic fit. The role of distribution in the Supply Chain; factors influencing distribution network design; Design options for a distribution network; the value of distributors in the Supply Chain

Self study component:- Distribution Networks in practice

3. Network Design, Demand Forecasting, Aggregate Planning
The role of network design in the Supply Chain; Factors influencing Network design Decisions; A framework for Network Design Decisions; Models for facility Location and Capacity Allocation; making Network Design decisions in practice. The impact of uncertainty on Network design; Discounted cash flow analysis; Representations of uncertainty; Evaluating Network Design decisions using Decision Trees; Making Supply Chain decisions under uncertainty in practice. The role of forecasting in a Supply Chain Characteristics of forecast; Basic approach of Demand forecasting; Time series forecasting methods; Measures of forecast errors; The role of aggregate planning in a supply Chain; The aggregate planning problem; Aggregate planning strategies.

Self study component:- Components of a forecast and forecasting methods

4. Inventory Management, transportation
The role of cycle inventory in a supply Chain; Economies of scale to exploit fixed costs, quantity discounts; Short-term discounting; Managing multi-echelon cycle inventory; Estimating cycle inventory related costs in practice. The role of transportation in the Supply Chain; Modes of transportation and their performance characteristics; Design options for a transportation network; Trade-offs in transportation design; Tailored transportation; Routing and scheduling in transportation; Making transportation decisions in practice.

Self study component:- Factors affecting transportation decisions;
5. **Pricing and Revenue Management, Coordination**

The role of revenue management in Supply Chain; revenue management for multiple customer segments, perishable assets, seasonal demand, and bulk and spot contracts; Using revenue management in practice. Lack of Supply Chain coordination and Bullwhip effect; Effect of lack of coordination on performance; Obstacles to coordination in the Supply Chain; managerial levers to achieve coordination; Achieving coordination in practice.

*Self study component:* Building strategic partnerships and trust within a supply Chain

**Text Books :**


**Reference Books:**


NETWORK MANAGEMENT (3:0:0)

Sub Code : MIT1E203
Hrs/Week : 03
SEE Hours : 3 Hrs

CIE : 50%
SEE : 50%
Max Marks : 100

Course Outcomes:
1. Describe the importance of Network topology.
2. Differentiate between organization model and information model.
3. Analyze management information base with managed objects.
4. Compare RMON1 groups and functions.
5. Explain the broadband network management

1. Introduction


Self study component:- Communications Protocols and Standards- Communication Architectures, Protocol Layers and Services;

2. Basic Foundations: Standards, Models, and Language

Network Management Standards, Network Management Model, Organization Model, Information Model – Management Information Trees, Managed Object Perspectives, Communication Model; ASN.1- Terminology, Symbols, and Conventions, Objects and Data Types, Object Names, An Example of ASN.1 from ISO 8824; Encoding Structure;

Self study component:- Macros, Functional Model.

3. SNMPv1 Network Management


The SNMP Communication Model – The SNMP Architecture, Administrative Model, SNMP Specifications, SNMP Operations, SNMP MIB Group, Functional Model

Self study component:- The History of SNMP Management
4. **SNMP Management – RMON**
Remote Monitoring, RMON SMI and MIB, RMONI1- RMON1 Textual Conventions, RMON1 Groups and Functions, Relationship Between Control and Data Tables, RMON1 Common and Ethernet Groups, RMON Token Ring Extension Groups, RMON2 – The RMON2 Management Information Base, RMON2 Conformance Specifications; ATM Remote Monitoring.

*Self study component:– A Case Study of Internet Traffic Using RMON.*

5. **Broadband Network Management: ATM Networks**

*Self study component:*-ATM Digital Exchange Interface Management.

**Text Books:**

**Reference Books:**
CLIENT SERVER COMPUTING (3:0:0)

Sub Code : MIT1E204  CIE : 50%
Hrs/Week : 03  SEE : 50%
SEE Hours : 3 Hrs  Max Marks : 100

Course outcome
On successful completion of the course, students will be able to:

1. Explain concepts of software interface to network protocols and socket programming.
2. Analyze algorithms and issues in client software design.
3. Illustrate example client side software.
4. Analyze algorithms and issues in server software design.
5. Illustrate connection oriented and connectionless server side software.


Self study component:- Symbolic Constants for Socket Call Parameters.

2. Algorithms and Issues in Client Software Design: Introduction, Learning Algorithms instead of Details, Client Architecture, Identifying the Location of a Server, Parsing an Address Argument, Looking up a Domain Name, Looking up a well-known Port by Name, Port Numbers and Network Byte Order, Looking up a Protocol by Name, The TCP Client Algorithm, Allocating a Socket, Choosing a Local Protocol Port Number, A fundamental Problem in choosing a Local IP Address, Connecting a TCP Socket to a Server, Communicating with the Server using TCP, Reading a response from a TCP Connection, Closing a TCP Connection, Programming a UDP Client, Connected and Unconnected UDP Socket, Using Connect with UDP, Communicating with a Server using UDP, Closing a Socket that uses UDP.

Self study component:- Partial Close for UDP, A Warning about UDP Unreliability.

Service, Accurate Times and Network Delays, A UDP Client for the TIME Service, The ECHO Service, A TCP Client for the ECHO Service,

Self study component:-A UDP Client for the ECHO Service.


Self study component:-The Important Problem of Server Deadlock, Alternative Implementations.

5. **Iterative, Connectionless Servers (UDP), Iterative, Connection-Oriented Servers (TCP):** Introduction, Creating a Passive Socket, Process Structure, An example TIME Server.

Self study component:-Connection Termination and Server Vulnerability.

**Text book:**

ELECTIVE – III

DISTRIBUTED SYSTEMS (3:0:0)

SUB. CODE: MIT2E301
HRS/WEEK: 03
SEE HRS: 03
CIE: 50
SEE: 50
MAX.MARKS: 100

Course Outcome:
On successful completion of the course, students will be able to:
1. Understand the basic concepts of designing a distributed system (DS) and general properties of networked communication for DS
2. Analyze the various schemes for IPC in a DS
3. Identify the security challenges of DS and understand the file systems suitable for DS
4. Understand the importance of synchronization concept in DS
5. Analyze the distributed algorithms for locking and concurrency scheduling

UNIT 1
Characterization of Distributed Systems: Introduction, Examples of DS, Challenges
Networking and Internetworking: Introduction, Types of network, Network Principles
SLE: Resource sharing and the Web

UNIT 2
Inter Process Communication: Introduction, API for Internet Protocols, External data representation and Marshalling, Client – Server Communication, Group Communication
Distributed Objects and RMI: Introduction, Communication between Distributed Objects, RPC, Events and Notifications
SLE: IPC in UNIX

UNIT 3
Distributed File Systems: Introduction, File Service architecture, Sun Network File System
SLE: OS architecture

UNIT 4
Time and Global States: Introduction, Clocks, events and process status, Synchronizing physical clocks, Logical time and logical clocks, Global states
SLE: Distributed debugging

UNIT 5
Transactions and Concurrency Control: Introduction, Transactions, Nested Transactions, Locks, Optimistic Concurrency Control, Timestamp ordering
SLE: Comparison of methods for concurrency control

Text Book:
INFORMATION RETRIEVAL (3:0:0)

Sub Code : MIT2E302               CIE : 50%
Hrs/Week : 03                     SEE : 50%
SEE Hours : 3 Hrs                 Max Marks : 100

Course Outcome

After successful completion of the course, the students will be

1. Understand information retrieval strategies.
2. Analyze variety of information retrieval models and techniques.
3. Understand the design principles for information retrieval systems.
4. Understand the concepts of implementing information retrieval systems.
5. Characterize the operational and experimental information retrieval systems

1. Introduction, Retrieval Strategies - 1
   Introduction; Retrieval Strategies: Vector Space Model;
   Self study component: Probabilistic Retrieval strategies

2. Retrieval Strategies – 2
   Some More Retrieval Strategies: Language Models; Inference Networks; Extended Boolean Retrieval; Latent Semantic Indexing; Neural Networks; Genetic Algorithms; Self study component: Fuzzy Set Retrieval.

3. Retrieval Utilities, Indexing and Searching
   Relevance feedback; Clustering; Passage-Based Retrieval; N-Grams; Regression Analysis; Thesauri; Semantic Networks; Parsing; Searching Introduction; Inverted Files; Other indices for text; Boolean queries; Sequential searching; Structural queries; Compression. Self study component: Pattern matching

   Self study component: A historical progression;

5. Information retrieval as a relational application; Semi-structured search using a relational schema.
   Self study component: Multi-dimensional data model

Text Books:

Reference Books:
4G TECHNOLOGIES (3:0:0)

Sub Code : MIT2E303  CIE : 50%
Hrs/Week : 03  SEE : 50%
SEE Hours : 3 Hrs  Max Marks : 100

Course outcomes:

1. Learn various generations of wireless and cellular networks
2. Study the fundamentals of 3G Services, its protocols and applications
3. Study how 4G Networks evolved, its architecture and applications
4. Study about WiMAX networks, protocol stack and standards
5. Gain knowledge about Spectrum characteristics & Performance evaluation

MODULE -1
INTRODUCTION: Introduction: History of mobile cellular systems, First Generation, Second Generation, Overview of 3G, 3GPP and 3GPP2 standards Overview of 4G

MODULE -2

MODULE - 3
WIRELESS LOCAL AREA NETWORKS: WLAN Equipment WLAN Topologies, WLAN Technologies IR Technology UHF Narrowband Technology Spread Spectrum, Technology, IEEE, 802.11, Bluetooth Piconet in the Presence of IEEE, Other WLAN Standards, IEEE 802.16, WiMAX.

MODULE -4
4G LTE NETWORKS: 4G Vision, 4G features and challenges, Applications of 4G, 4G Technologies – Multi carrier modulation, Smart Antenna Techniques, OFDMMIMO, Systems, Adaptive Modulation and Coding with Time-Slot Scheduler,

MODULE -5

Text Books:
1. Introduction to 4G Mobile Communication, JuhaKorhonen, Artech House, (www.artechhouse.com),

Reference Books: NIL
INTERNET OF THINGS (3:0:0)

Sub Code : MIT2E304
Hrs/Week : 03
SEE Hours : 3 Hrs

CIE : 50%
SEE : 50%
Max Marks : 100

Course outcomes:
1. Learn the basic issues, policy and challenges in the IoT
2. Understand the Mechanism and Key Technologies in IoT
3. Understand the Standard of the IoT
4. Learn to manage the resources in the IoT
5. Deploy the resources into business

MODULE -1
What is The Internet of Things? Overview and Motivations, Examples of, Applications, IPV6 Role,, Areas of Development and Standardization, Scope of, the Present Investigation.Internet of Things Definitions and frameworks-IoT, Definitions, IoT Frameworks, Basic Nodal Capabilities. Internet of Things, Application Examples-Overview, Smart Metering/Advanced Metering, Infrastructure-Health/Body Area Networks, City Automation, Automotive, Applications, Home Automation, Smart Cards, Tracking, Over-The-Air-Passive, Surveillance/Ring of Steel, Control Application Examples, Myriad Other, Applications.

MODULE -2

MODULE - 3

MODULE -4

MODULE -5
Data Analytics for IoT – Introduction, Apache Hadoop, Using Hadoop, MapReduce for Batch Data Analysis Apache Oozie, Apache Spark, Apache, Storm, Using Apache Storm for Real-time Data Analysis, Structural Health, Monitoring Case Study.
Text Books:

Reference Books:
ARTIFICIAL INTELLIGENCE (3:0:0)

Sub Code : MIT2E305
Hrs/Week : 03
SEE Hours : 3 Hrs

CIE : 50%
SEE : 50%
Max Marks : 100

On Successful completion of the course, the students will be able to:

1. Define Artificial Intelligence point-out the role of computer engineers in Artificial Intelligence.
2. Categorize the properties of task environment.
3. Devise various strategies in formulation problems.
4. Compare various search techniques used in AI.
5. Computer optimal decisions in games.

MODULE 1:

7 Hours
Introduction, Definition of AI. The foundations of Artificial Intelligence. The history of artificial intelligence. Applications of AI.

Self Learning Exercise: State of the art in AI.

MODULE 2:

8 Hours
Intelligent agent, Agents and environments, behavior. The concept of rationality. The nature of environments. The structure of agents.

Self Learning Exercise: How the components of agent’s program work?

MODULE 3:

8 Hours
Solving problems by searching problem solving agents, example problems, searching for solutions, uninformed search strategies, Informed (heuristic) search strategies, Heuristic functions.

Self Learning Exercise: Learning heuristics from experience.

MODULE 4:

8 Hours
Beyond classical search Local search algorithms and optimization problems – this climbing search, simulated annealing, local beam search, genetic algorithms, local search in continuous spaces, searching with nondeterministic action searching with partial observations. Online search agents and unknown environments

Self Learning Exercise: Learning in online search.

MODULE 5:

8 Hours
Adversarial search Games, optimal decision in games, Alpha-beta pruning, imperfect real-time decision.

Self Learning Exercise: Stochastic games.

TEXTBOOK:


MOOC's:
1. https://www.edx.org/course/artificial-intelligence-ucberkeleyx-cs188-1x
ELECTIVE – IV

OPTICAL NETWORKS (3:0:0)

Sub Code : MIT2E401
Hrs/Week : 03
SEE Hours : 3 Hrs

CIE : 50%
SEE : 50%
Max Marks : 100

Course Outcomes:

1. Discuss the different generations of digital transport networks
2. Diagnose the timing and synchronization in digital networks
3. Describe architecture of Optical Transport Network (OTN)
4. Discuss Wavelength Division Multiplexing (WDM)
5. Analyze the concepts of label switching and its importance in Optical Transport Network (OTN)

1. Introduction, Telecommunications Infrastructure, Characteristics of Optical Fiber:
   Three generations of Digital Transport Networks; A brief introduction to WDM and TDM; The Optical Marketplace; Key Optical Nodes; Other Key Terms; Evolution of Optical Systems; Key attributes of Optical Fiber, The Local Connections; The Backbone Connections; The Digital Multiplexing Hierarchy; The Digital Signaling Hierarchies; T1 / DS1 and T3 / DS3; The Layered Protocol Model in the Transport Network; considerations for Interworking Layer1, Layer 2, and Layer 3 Networks, The Basics; The Wavelength; The Basic Components; Structure of the Fiber; Fiber Types; Key Performance Properties of Fiber; Attenuation; Amplifier Spontaneous Emission; Chromatic Dispersion:

   Self study component: - Wireless Optical Systems, Lasers

2. Timing and Synchronization, SONET and SDH:
   Timing and Synchronization in Digital Networks; Effect of a Timing error; The Clocking Signal; Types of Timing in Networks; Timing Variations; Methods of Clock Exchange; Distribution of Timing Using SONET and DS1; Timing Downstream Devices; Synchronization Status Messages and Timing Loops, The SONET Multiplexing Hierarchy; SONET and SDH Multiplexing Structure; The SONET / SDH Frame Structure; SONET and SDH Functional Components; SONET and SDH Problem Detection; Locating and Adjusting Payload with Pointers; Virtual Tributaries in more detail; Virtual Tributaries in Virtual Containers; The Overhead Bytes;

   Self study component: - Building Integrated Timing Supply, SONET and SDH Concatenation
3. **Architecture of Optical Transport Networks, WDM, Network Topologies and Protection Schemes:** The Digital Wrapper; Control Planes; In-Band and Out-Band Control Signaling; Importance of Multiplexing and Multiplexing Hierarchies; Current Digital Transport Hierarchy; SONET Multiplexing Hierarchy; SDH Multiplexing Hierarchy; Key Indexes and Other Terms; The New Optical Transport and Digital Transport Hierarchy; The OTN Layered Model; Encapsulation and Decapsulation Operations;

*Self study component:* Generic Framing Procedure

4. **The WDM Operation; DWDM, TDM and WDM Topologies:** Relationship of WDM to SONET / SDH; EDF; WDM Amplifiers; Add-Drop Multiplexers; WDM Cross-Connects; Wavelength Continuity Property; Examples of DWDM Wavelength Plan; Higher Dispersion for DWDM; Tunable DWDM Lasers, The Non-Negotiable Requirement Robust Networks; Diversity in the Network; Line and Path Protection Switching; Types of Topologies; Working and Protection Fibers; Point-to-Point Topology; BLSR; Protection Switching on Four-Fiber BLSR; Meshed Topologies; PONs; Ethernet in the Wide Area Backbone,

*Self study component:* Metro Optical Networking.

5. **MPLS and Optical Networks, Architecture of IP and MPLS-Based OTNs:** Label Switching; FEC; Types of MPLS Nodes; Label Distribution and Binding; Label Switching and Traffic Forwarding; MPLS Support of VPNs; MPLS Traffic Engineering; Multiprotocol Lambda Switching; MPLS and Optical TE Similarities; Possibilities for the MPIS Network; Control and Data Planes Interworking, IP, MPLS, and Optical Control Planes; Interworking the three Control Planes; Management of the Planes; A Framework for the IP over Optical Networks; An Opposing View; Generalized MPLS use in Optical Networks; Bi-Directional LSPs in Optical Networks; GMPLS Extensions for G.709;

*Self study component:* GMPLS with SONET and SDH.

**TEXT BOOKS:**


**REFERENCE BOOKS:**

ADHOC NETWORKS (3:0:0)

Sub Code : MIT2E402
Hrs/Week : 03
SEE Hours : 3 Hrs

CIE : 50%
SEE : 50%
Max Marks : 100

Course Outcomes
On successful completion of the course the students will be able to

1. List and explain the various issues and applications of Ad hoc wireless networks.

2. Classify and explain the working of MAC protocols for Ad-hoc wireless networks.

3. Discuss the issues in designing routing protocols and working of Table-Driven Routing protocols and On-Demand Routing protocols.

4. Analyze the challenges in designing Transport layer Protocols for Ad-hoc networks, Compare and contrast the working of Transport protocols.

5. Identify the issues in designing Security Protocols for Ad-hoc networks focusing on the working performance of various security protocols.

MODULE- 1

SLE : Ad hoc wireless Internet. 8 Hours

MODULE- 2

SLE : MACA/PR Protocol 8 Hours

MODULE- 3

SLE: STAR protocol and SSA protocol 8 Hours

MODULE - 4
Transport Layer Solutions, TCP over Ad-hoc wireless Networks: Feedback-Based TCP, TCP with Explicit Failure Notification, TCP-BUS, Split TCP.

**SLE : ATP**

**8 Hours**

**MODULE - 5**


**SLE : ARAN Protocol**

**7 Hours**

**TEXT BOOK**


**REFERENCE BOOKS**


PYTHON APPLICATIONS PROGRAMMING (3:0:0)

Sub Code : MIT2E403  
CIE : 50%  
Hrs/Week : 03  
SEE : 50%  
SEE Hours : 3 Hrs  
Max Marks : 100

Course outcomes

1. Learn Various Paradigms of Python Programming.
2. GUI Programming using Tkinter.
3. handle Files, Lists and Dictionaries in Python.
4. Learn How to combine data structures and functions available in Python to solve Problems.
5. Learning Python through Applications.

MODULE -1
Introduction to Python: Basic features, creating Python programs, Functions, Strings, Lists, Tuples, and sets, Selections, Loops, Programming examples

MODULE -2
Dictionaries, Files, Objects and classes, Object Oriented programming, Regular Expressions, text processing, Programming exercises

MODULE -3
Internet Programming, Multi threaded programming, Programming exercises

MODULE -4
GUI Programming: Tkinter, Database Programming

MODULE -5
Web Development: Web clients and servers, Web application Programming, case studies (A simple Blog, A wiki web, XML to read iTunes Database)

Text Books:

Reference Books:
WEB PROGRAMMING (3:0:0)

Sub Code : MIT2E404  
CIE : 50%  
Hrs/Week : 03  
SEE : 50%  
SEE Hours : 3 Hrs  
Max Marks : 100

Course outcome

On successful completion of the course the students will be able to
1. Create web pages using HTML/XHTML and CSS.
2. Analyze working of simple JavaScript programs on client side.
3. Demonstrate how to embed JavaScript into HTML and handle different types of events.
5. Demonstrate the importance of XML in web page.

1. XHTML and CSS: Internet, WWW, Web Browsers, and Web Servers; URLs; MIME; HTTP; The Web Programmers Toolbox, Origins and evolution of HTML and XHTML; Basic syntax; Standard XHTML document structure; Basic text markup. Images; Hypertext Links; Lists; Tables; Forms; Frames; Syntactic differences between HTML and XHTML. Introduction; Levels of style sheets; Style specification formats; Selector forms; Property value forms; Font properties; List properties; Color; Alignment of text; The Box model; Background images; The <span> and<div> tags;  
   Self study component:-Conflict resolution.

2. Javascript: Overview of JavaScript; Object orientation and JavaScript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input; Control statements; Object creation and modification; Arrays; Functions; Constructor; Errors in scripts; Examples.  
   Self study component:-Pattern matching using regular expressions.

3. JavaScript and HTML Documents: The Javascript execution environment; The Document Object Model; Element access in Javascript; Events and event handling; Handling events from the Body elements, Button elements, Text box and Password elements; The DOM 2 event model; The navigator object.  
   Self study component:-DOM tree traversal and modification.

4. Dynamic Documents with JavaScript: Introduction to dynamic documents; Positioning elements; Moving elements; Element visibility; Changing colors and fonts; Dynamic content; Stacking elements; Locating the mouse cursor; Reacting to a mouse click; Slow movement of elements;  
   Self study component:-Dragging and dropping elements.

5. XML: Introduction; Syntax; Document structure; Document Type definitions; Namespaces; XML schemas; Displaying raw XML documents; Displaying XML documents with CSS; XSLT style sheets; XML processors.  
   Self study component:-Web services.
Text books:

Reference books:
INTRODUCTION TO MACHINE LEARNING (3:0:0)

Sub Code : MIT2E405  
Hrs/Week : 03  
SEE Hours : 3 Hrs  

CIE : 50%  
SEE : 50%  
Max Marks : 100

Course Outcomes

On Successful completion of the course, the students will be able to:

1. Explain is machine learning, supervised learning and some algorithms
2. Understand Bayesian theory and extend it to machine learning, learn few parametric methods
3. Explain different multivariate methods
4. Analyze Clustering and k-Means Clustering mechanisms
5. Understand decision trees and importance

MODULE 1:  
8 Hrs

Introduction.

What Is Machine Learning?, Learning Associations, Classification, Regression, Unsupervised Learning, Reinforcement Learning,

Supervised Learning
Learning a Class from Examples, Vapnik-Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Learning Multiple Classes, Regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm,

Self Learning Exercise: Examples of Machine Learning Applications.

MODULE 2:  
9 Hrs

Bayesian Decision Theory
Introduction, Classification, Losses and Risks, Discriminant Functions, Utility Theory, Value of Information, Bayesian Networks, Influence Diagrams, Association Rules,

Parametric Methods
Introduction, Bernoulli Density, Multinomial Density, Gaussian (Normal) Density, Evaluating an Estimator: Bias and Variance, The Bayes' Estimator, Parametric Classification, Regression, Tuning Model Complexity: BiasjVariance Dilemma, Model Selection Procedures,

Self Learning Exercise: Maximum Likelihood Estimation

MODULE 3:  
9 Hrs

Multivariate Methods
Multivariate Data, Parameter Estimation, Estimation of Missing Values, Multivariate Normal Distribution, Tuning Complexity, Discrete Features, Multivariate Regression,
Dimensionality Reduction
Introduction, Principal Components Analysis, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis,

Self Learning Exercise: Multivariate Classification, Subset Selection

MODULE 4: 8 Hrs
Clustering
Introduction, Mixture Densities, k-Means Clustering, Expectation-Maximization Algorithm, Mixtures of Latent Variable Models, Supervised Learning after Clustering,

Self Learning Exercise: Hierarchical Clustering, Choosing the Number of Clusters.

MODULE 5: 9 Hrs
Decision Trees
Introduction, Univariate Trees, Classification Trees, Regression Trees, Pruning, Rule Extraction from Trees, Learning Rules from Data, Multivariate Trees,

Self Learning Exercise: Case Study: Customer Churn

Business Understanding, Data Understanding, Data Preparation, Modeling, Evaluation Deployment

TEXT BOOKS:


REFERENCE BOOK:


MOOC’s:

MITXXX  Open Elective (MOOC)
MITXXX  Engineering Management (MOOC)
Course Code  : MIT3C02

Course: Seminar/ paper Presentation

On successful completion of the course, the students will be able to:
1. Identify current trends in a specific area of interest.
2. Identify real world issues by conducting literature survey of the area.
3. Understand and interpret the results of technical work as indicated by the literature.
4. Present a proper report, both orally and in writing on their seminar topic

Course Code: MIT3C04

Course: Project Phase-I

On successful completion of the course the students will be able to

1. Identify a real world engineering problem and formulate it.
2. Outline a software project plan to check the feasibility of the solution in terms of both time and cost.
3. Describe the problem to identify both software and hardware requirement.
4. Carry out extensive literature survey to evaluate the available tools and adapt it to develop a suitable design.
IV SEMESTER
Course Code: MIT4C01

Course: Project Phase-II

On successful completion of the course the students will be able to
1. Construct the proposed design of Phase- I using appropriate tools and technology.
2. Implement the constructed design to get working results.
3. Verify and validate the obtained results
4. Prepare a detailed technical report of the project work carried out
5. Also suggest limitations and further extensions for the work.

MITXXX Internship
OPEN ELECTIVES
DATA WAREHOUSING AND DATA MINING (3:0:0)

Sub Code : MIT3O01
Hrs/Week : 03
SEE Hours : 3 Hrs

CIE : 50%
SEE : 50%
Max Marks : 100

Course Outcomes:

On successful completion of the course the students will be able to

1. Understand the concepts of Data Warehousing, modeling and Online Analytical Processing
2. Identify the challenges, tasks, technologies and the kind of applications demanded by Data Mining
3. Decide about the data, data preprocessing and applications
4. Use the algorithms for association analysis and evaluate the association patterns
5. Understand and use the various data classification methods

1. **Data Warehousing and OLAP**
   Data Warehouse basic concepts, Data Warehouse Modeling, Data Cube.
   *Self learning component:* OLAP

2. **Data Mining**
   Introduction, What is Data Mining, Motivating Challenges, Which technologies are used, which kinds of applications are targeted by Data Mining
   *Self learning component:* Data Mining Tasks

3. **Data Mining - Which type of data**
   Types of Data, Data Preprocessing, Measures of Similarity and Dissimilarity
   *Self learning component:* Data Mining Applications

4. **Association Analysis: Basic Concepts and Algorithms**
   Frequent Itemset Generation, Rule Generation, Compact Representation of Frequent Itemsets, Alternative methods for generating Frequent Itemsets, FP Growth Algorithm,
   *Self learning component:* Evaluation of Association Pattern

5. **Classification & Clustering Techniques**
Overview, Features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods and Validity of Cluster Analysis. Outlier detection methods, Classification based approached

**Self learning component:-** Statistical Approaches, Clustering based applications

**Text Books:**


**Reference Books:**

2. Jiawei Han and MichelineKamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006.
WEB-COMMERCE (3:0:0)

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Course outcome
On successful completion of the course, students will be able to:
1. Interpret the scope and challenges of e-commerce in the Indian business context.
2. Analyze the various business models of e-commerce.
3. Comprehend the enabling technologies of WWW used to support various e-commerce applications.
4. Evaluate the different marketing methods used in e-commerce.
5. Evaluate the legal and regulatory framework involved in different E-payment systems.

1. **E-commerce in Indian business context**: Definition of e-commerce advantages of e-commerce, disadvantages of e-commerce, e-transition challenges for Indian corporate.
   **Self learning component**: e-commerce opportunities for industries

   **Self learning component**: Info-mediary model, community model

3. **Enabling Technologies of www**: Internet client-server applications, Networks and Internets, IPV4, IPV6, Search Engines, software agents, Internet standards and specifications, ISP, Broadband technologies.
   **Self learning component**: types of broadband technology

4. **E-marketing**: Traditional marketing, identifying web-presence goods, Browsing behavior model, online marketing, e-advertising, e-branding.
   **Self learning component**: Marketing strategies

5. **E-payment Systems**: Main concerns in Internet banking, Digital payment, requirements, Digital token based e-payment systems, classification of new payment systems, Properties of e-cash, cheque payment on Internet, Risk of e-payment systems, Designing e-payment systems.
   **Self learning component**: digital signatures.

Text Books:
SYSTEM MODELING AND SIMULATION (3:0:0)

Sub Code : MIT3O03  CIE : 50%
Hrs/Week : 03  SEE : 50%
SEE Hours : 3 Hrs  Max Marks : 100

Course Outcome

On successful completion of the course, the student will be able to

1. Recall situations where one should use simulation and where not to.
2. Analyze various probability distribution functions.
3. Explain the methods Generate and test random number sequences.
4. Select suitable data collection methods and build and run simulation methods.
5. Interpret Input Modeling and Output Analysis for a Single Model

1. Introduction
   When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study. Simulation examples: Simulation of queuing systems; Other examples of simulation.
   **Self study component:-Simulation of inventory systems**

2. General Principles, Simulation Software
   **Self study component:-Simulation in GPSS.**

3. Statistical Models in Simulation, Queuing Models
   Review of terminology and concepts; Useful statistical models; Discrete distributions; Continuous distributions; Poisson process; Empirical distributions. Characteristics of queuing systems; Queuing notation; Long-run measures of performance of queuing systems; Steady-state behavior of M/G/1queue;
   **Self study component:-Networks of queues.**

4. Random-Number Generation, Random-Variate Generation
   Properties of random numbers; Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random Numbers. Random-Variate Generation: Inverse transform technique; Special properties.
   **Self study component:-Acceptance-Rejection technique**
5. **Input Modeling, Output Analysis for a Single Model**
   - Data Collection; Identifying the distribution with data; Parameter estimation; Goodness of Fit Tests; Fitting a non-stationary Poisson process; Selecting input models without data; Multivariate and Time-Series input models. Types of simulations with respect to output analysis; Stochastic nature of output data; Measures of performance and their estimation; Output analysis for terminating simulations;
   - Variance Reduction, Verification and Validation, Optimization; Variance reduction techniques; Model building, verification and validation; Verification of simulation models; Calibration and validation of models

**Self study component:-** *Optimization via Simulation*

**Text Books:**

**Reference Books:**

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