THE NATIONAL INSTITUTE OF ENGINEERING
MYSORE – 8
(Autonomous Institution under VTU)

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)

Sl.No.	Code	Subject	Dept./Board	Category	Hrs/week			Credits
					L	T	P	
1	MIT1C01	Advances in Computer Networks	CS&E	FC	4	2	0	5
2	MIT1C02	Storage Area Networks	CS&E	FC	4	2	0	5
3	MIT1C03	Web Services	CS&E	FC	3	2	0	4
4	AMT1C01	Advanced Mathematics	Maths	GC	4	0	0	4
5	MIT1E1XX	Elective-1	CS&E	FE	3	0	0	3
6	MIT1E2XX	Elective-2	CS&E	FE	3	0	0	3
7	MIT1CRM	Research Methodology	CS&E	FC	2	0	0	2
8	MIT1L01	Advanced Computer Networks Laboratory	CS&E	FC	0	0	2	1
				Total	**31**			**27**

SCHEME OF TEACHING AND EXAMINATION
II SEMESTER M.Tech (IT)

Sl.No.	Code	Subject	Dept./Board	Category	Hrs/week			Credits
					L	T	P	
1	MIT2C01	Cyber Security and Cyber law	CS&E	FC	3	2	0	4
2	MIT2C02	Cloud Computing	CS&E	FC	4	2	0	5
3	MIT2C03	Protocol Engineering	CS&E	FC	4	2	0	5
4	MIT2C04	Advanced Database Management Systems	CS&E	FC	4	0	0	4
5	MIT2E3XX	Elective – III	CS&E	FE	3	0	0	3
6	MIT2E4XX	Elective – IV	CS&E	FE	3	0	0	3
7	MIT2IXX	Industry Driven Elective	CS&E	FC	2	0	0	2
8	MIT2L01	Advanced DBMS Laboratory	CS&E	FC	0	0	2	1
				Total	**31**			**27**

SCHEME OF TEACHING AND EXAMINATION
III SEMESTER M.Tech(IT)

Sl.No.	Subject Code	Subject	Category	L	T	P	Cr.
1	MITXXX	Open Elective (MOOC)	OE (MOOC)	2	0	0	2
2	MITXXX	Engineering Management (MOOC)	MOOC	3	0	0	3
3	MIT3C02	Seminar/Paper Presentation	FC	0	0	0	1
4	MIT3C04	Project Phase-I	FC	0	0	0	7
	Total Credits						**14**

SCHEME OF TEACHING AND EXAMINATION
IV SEMESTER M.Tech(IT)

Sl.No.	Subject Code	Subject	Category	L	T	P	Cr.
1	MIT4C01	Project- Phase-2		0	0	0	15
2	MITXXX	Internship	FC	0	0	0	**5**
	Total Credits						**19**

ELECTIVE COURSES

Sl. No	Subject Code	Subject	Category	Teaching Hours/ Week			Credits
				L	T	P	
Elective I							
1	MIT1E101	Advanced Digital Communication	FE	3	0	0	3
2	MIT1E102	OOAD & Design Patterns	FE	3	0	0	3
3	MIT1E103	C# and .NET	FE	3	0	0	3
4	MIT1E104	Multimedia Information Systems	FE	3	0	0	3
Elective II							
1	MIT1E201	Information and Network Security	FE	3	0	0	3
2	MIT1E202	Supply Chain Management	FE	3	0	0	3
3	MIT1E203	Network Management	FE	3	0	0	3
4	MIT1E204	Client Server Computing	FE	3	0	0	3
Elective III							
1	MIT2E301	Distributed systems	FE	3	0	0	3
2	MIT2E302	Information Retrieval	FE	3	0	0	3
3	MIT2E303	4G Technologies	FE	3	0	0	3
4	MIT2E304	Internet of Things	FE	3	0	0	3
5	MIT2E305	Artificial Intelligence	FE	3	0	0	3
Elective IV							
1	MIT2E401	Optical Networks	FE	3	0	0	3
2	MIT2E402	AdHoc Networks	FE	3	0	0	3
3	MIT2E403	PYTHON Application Programming	FE	3	0	0	3
4	MIT2E404	Web Programming	FE	3	0	0	3
5	MIT2E405	Introduction to Machine Learning	FE	3	0	0	3

INDUSTRY DRIVEN ELECTIVE COURSES

Sl.No	Subject Code	Subject	Category	Teaching Hours/ Week			Credits
				L	T	P	
1	MIT2IXX	Offered by Industry	FE	2	0	0	2

OPEN ELECTIVES

Sl.No	Subject Code	Subject	Category	Teaching Hours/ Week			Credits
				L	T	P	
1	MIT3O01	Data warehousing and Data mining	FE	3	0	0	3
5	MIT3O02	Web Commerce	FE	3	0	0	3
6	MIT3O03	System Modeling and Simulation	FE	3	0	0	3

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:

1. **T1**: **Larry Peterson and Bruce S Davis** "Computer Networks :A System Approach" 5th Edition , Elsevier -2014
   (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**)**
2. **T2: Douglas E Comer, "**Internetworking with TCP/IP, Principles, Protocols and Architecture" 6th Edition, PHI - 2014
   (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:

1. **Uyless Black** "Computer Networks, Protocols , Standards and Interfaces" 2nd Edition - PHI **Behrouz A Forouzan** "TCP/IP Protocol Suite" 4th Edition – Tata McGraw-Hill

STORAGE AREA NETWORKS (4:2:0)

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

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

1. **Introduction:** Server Centric IT Architecture and its Limitations; Storage – Centric IT Architecture and its advantages. Case study: Replacing a server with Storage Networks; The Data Storage and Data Access problem.
   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
2. Robert Spalding: Storage Networks The Complete Reference, Tata McGraw-Hill, 2003.

Reference books:

1. Richard Barker and Paul Massiglia: Storage Area Network Essentials A Complete Guide to understanding and Implementing SANs, John Wiley India, 2002.
2. G.Somasundaram, AlokShrivastava (Editors): Information Storage and Management, EMC Education Services, Wiley- India, 2009.

WEB SERVICES (3:2:0)

Sub Code	**: MIT1C03**	**CIE**	**: 50%**
Hrs/Week	**: 03**	**SEE**	**: 50%**
SEE Hours	**: 3 Hrs**	**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.
4. Design Web service Architecture.
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
Web Services: Web Services and their Approach to Distributed Computing, Web Services Technologies, Web Services Architecture.
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:
1. Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju: Web Services(Concepts ,Architectures and Applications), Springer International Edition 2009.

Reference Books: NIL

ADVANCED MATHEMATICS (4:0:0)

Sub Code	**: AMT1C01**	**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. 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).

- 9 Hrs

Module II

Functions

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

- 8 Hrs

Module III

Number Theory

Euclidean Algorithm, Chinese Remainder theorem, Generalized Chinese Remainder theorem, Fermat's little theorem, Euler's theorem (no proof), Pseudo primes, Fermat's pseudo primes (SLE: Primality Testing). **9 Hrs**

Module IV

Probability

Random variables – Discrete and continuous random variables, Binomial, Poisson's, Exponential and Normal Distributions (SLE: Basic probability upto Baye's Theorem).

- 9 Hrs

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) **8 Hrs**

Module VI

Joint Distribution and Markov Chains

Concept of joint probability: Joint probability distribution, (discrete) Independent random variables, Expectation, Covariance, Correlation Coefficient. Probability vectors, Stochastic matrices, Regular stochastic matrices, Markov chains, Transition Probability Matrix. Concept of a queue, the M/G/I and M/M/I queuing systems(SLE:Continuous joint probability distributions). **9 Hrs**

Books for Reference :

1. Discrete Mathematics and its Applications – Kenneth.H.Rosen V edition
2. Elements of Discrete Mathematics – C.L. Liu, D.P. Mohapatra.
3. "Elementary Number Theory With Applications", Thomas Koshy, ISBN-13:9788131218594, 2008, Reed Elsevier India Pvt.Ltd..
4. Probability and Statistics – Schaum Series **(**All latest editions**)**
5. Probability, Statistics and Random Processes-3rd Edition,Tata McGraw-Hill Publishing Company Limited, New Delhi,2008 - T.Veerarajan

RESEARCH METHODOLOGY (2:0:0)

Sub Code	**: MIT1CRM**	**CIE**	**: 50%**
Hrs/Week	**: 02**	**SEE**	**: 50%**
SEE Hours	**: 2 Hrs**	**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:

Writing Research Report: Format and style. Review of related literature its implications at various stages of research. (Formulation of research problem, hypothesis, interpretation and discussion of results. Major findings, Conclusions and suggestions.) Layout of a Research Paper, Research proposal, Software for paper formatting like LaTeX/MS Office, effective technical presentation in seminars/workshops/symposiums (oral/paper/poster),

Significance of ethical conduct in research, Ethical issues related to publishing, Plagiarism & latest regulations. Software for detection of Plagiarism.

Self Learning Exercise: *Intellectual property rights, importance and protection, copyrights, patents, Impact factor of Journals* **8 Hours**

TEXT BOOKS:

1. Chawla, Deepak & Sondhi, Neena (2011). Research methodology: Concepts and Cases, Vikas Publishing House Pvt. Ltd. Delhi.
2. Kothari, C.R., (2014), Research Methodology, New Age International second revised edition
3. Ranjit Kumar, (2011). Research Methodology a step by step guide for beginners, Sage Publications

REFERENCE BOOKS:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., (2002). An Introduction to Research Methodology, RBSA Publishers.
2. Sinha S.C. and Dhiman AK, (2002). Research Methodology**,** Ess, Ess Publications
3. Fink A, (2009). Conducting Research Literature Reviews: From the Internet to Paper**,** Sage Publications
4. Donald R. Cooper and Pamela S. Schindler, (2013). Business Research Methods, TMH, New Delhi, 12th Edition.
5. John W. Creswell, (2003). Research Design, Qualitative, Quantitative and Mixed Approaches, 2ndEdition, Sage Publication.
6. William G. Zikmund, Jon C. Carr, Barry Babin, Mitch Griffin, (2013). Business Research Methods, Cengage Learning.

ADVANCED COMPUTER NETWORKS LABORATORY

Sub code: MIT1L01 **Hrs/week : 02**

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.
7. Implement Address Resolution Protocol.
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**	**CIE**	**: 50%**
Hrs/Week	**: 03**	**SEE**	**: 50%**
SEE Hours	**: 3 Hrs**	**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

Introduction to Cybercrime: Cybercrime: Definition and Origins of the Word,, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian, Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens. Cyberoffenses: How, Criminals Plan Them: How Criminals Plan the Attacks, Social Engineering, Cyberstalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack, Vector.

SLE: *Cloud Computing.*

8 Hours

MODULE -2

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile, and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless, Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for, Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones,, Mobile Devices: Security Implications for organizations, Organizational Measures for, Handling Mobile.

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

8 Hours

MODULE - 3

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and, Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and, Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, Buffer Overflow, Attacks on Wireless Networks. Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).

SLE : *SQL Injection*

7 Hours

MODULE -4

Approaching a Computer, Forensics Investigation, Setting up a Computer Forensics Laboratory: Understanding, the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7, Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective,, Challenges in Computer Forensics, Special Tools and Techniques, Forensics, Auditing.

SLE: *Antiforensics.*

8 Hours

MODULE -5

Introduction to Security Policies and Cyber Laws: Need for An Information, Security Policy,, Information Security Standards – Iso, Introducing Various Security, Policies and Their Review, Process, Introduction to Indian Cyber Law. Intellectual Property Issues, Overview of Intellectual -, Property - Related Legislation in India, Patent, Copyright, Law Related to, Semiconductor Layout and Design.

SLE : *Software License.*

8 Hours

TEXT BOOKS:

1. Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81-265-21791, Publish Date 2013
2. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla, KLSI. "Introduction to information security and cyber laws". Dreamtech Press. ISBN: 9789351194736, 2015

REFERENCE BOOKS:

1. Thomas J. Mowbray, "Cybersecurity: Managing Systems, Conducting Testing, and Investigating Intrusions", Copyright © 2014 by John Wiley & Sons, Inc, ISBN: 978 - 1-118 - 84965 -1
2. James Graham, Ryan Olson, Rick Howard, "Cyber Security Essentials", CRC Press, 15-Dec- 2010

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.*

2. Cloud Computing: Application Paradigms.

Challenges of cloud computing, Architectural styles of cloud computing, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper, The Map Reduce programming model, A case study: The Grep TheWeb application , Cloud for science and engineering, High-performance computing on a cloud, SLC:Cloud computing for Biology research, Social computing.

Self learning component:- *Digital content and cloud computing*

3. Cloud Resource Virtualization.

Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and par avirtualization, Hardware support for virtualization, Case Study:Xen a VMM based paravirtualization, Optimization of network virtualization,vBlades, Performance comparison of virtual machines, Exercises and problems.

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*

6. Cloud-based simulation of a distributed trust algorithm, A trust management service, A cloud service for adaptive data streaming: Exercises and problems.
Self learning component:- *Cloud based optimal FPGA synthesis SLC*

TEXT BOOK:

1. Dan C Marinescu: Cloud Computing Theory and Practice. Elsevier (MK) 2013.

REFERENCES:

1. RajkumarBuyya , James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey 2014.

2. John W Rittinghouse, James F Ransome:Cloud Computing Implementation, Management and Security, CRC Press 2013.

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

Introduction: Communication model, Communication Software, Communication Subsystems, Communication Protocol Definition/Representation, Formal and Informal Protocol Development Methods, Protocol Engineering Phases
Network Reference Model: Layered Architecture, Network Services and Interfaces, Protocol Functions: Encapsulation, Segmentation, Reassembly, Multiplexing, Addressing, OSI Model Layer Functions, TCP/IP Protocol Suite, Application Protocols.

***SLE**: Informal representation of TCP protocol*

8 Hours

MODULE 2
Protocol Specification: Components of specification, Service specification, Communication Service Specification Protocol entity specification: Sender, Receiver and Channel specification, Interface specifications, Interactions, Multimedia specifications, Alternating Bit Protocol Specification, RSVP specification.

***SLE**: FSM specification of RTP protocol by identifying its components*

9 Hours

MODULE 3

Protocol Specification Language (SDL): Salient Features. Communication System Description using SDL, Structure of SDL Data types and communication paths. Examples of SDL based Protocol Specifications: Question and answer protocol, X-on-X-off protocol, Alternating bit protocol, Sliding window protocol specification, TCP protocol specification, SDL based platform for network, OSPF, BGP, Multi Protocol Label Switching.

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

9 Hours

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MODULE 4

Protocol Verification / Validation: Protocol Verification using FSM, ABP Verification, protocol validation, Protocol Design Errors: Deadlocks, Unspecified Reception, Non-executable Interactions, State Ambiguities, Protocol Validation Approaches: Perturbation Technique, Reachability Analysis, Fair Reachability Graphs, SDL Based Protocol Verification: ABP Verification, SDL Based Protocol Validation: ABP Validation.

***SLE**: Process Algebra based Validation*

8 hours

MODULE 5

Protocol Conformance: Conformance Testing Methodology and Framework, Local and Distributed Conformance Test Architectures, Test Sequence Generation Methods: T, U, D and W methods, Distributed Architecture by Local Methods, Synchronizable Test Sequence, Conformance Testing of RIP, Testing Multimedia Systems, quality of service test architecture (QOS).

***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

Protocol Synthesis and Implementation: Synthesis methods, Interactive Synthesis Algorithm, Automatic Synthesis Algorithm, Automatic Synthesis of SDL from MSC, Protocol Re-synthesis, Requirements of Protocol Implementation, Objects Based Approach To Protocol Implementation, Protocol Compilers. Code generation from Estelle, LOTOS, SDL and CVOPS.

***SLE**: SDL based performance testing of OSPF*

9 Hours

TEXT BOOKS:

1. Pallapa Venkataram and Sunilkumar S. Manvi: Communication Protocol Engineering, PHI, 2004.

REFERENCE BOOKS:

1. Mohammed G. Gouda: Elements of Protocol Design, Wiley Student Edition, 2004.

ADVANCED DATABASE MANAGEMENT SYSTEMS (4:0:0)

Sub Code	**: MIT2C04**	**CIE**	**: 50%**
Hrs/Week	**: 04**	**SEE**	**: 50%**
SEE Hours	**: 3 Hrs**	**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**;** Statichashing, 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:

1. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill,2003
2. Elmasri and Navathe:Fundamentals of Database Systems,5th Edition,Pearson Education,2007.

Reference Books:

1. Conolly and Begg:Database Systems,4th Edition,Pearson Education,2002.

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**	**CIE**	**: 50%**
Hrs/Week	**: 03**	**SEE**	**: 50%**
SEE Hours	**: 3 Hrs**	**Max Marks**	**: 100**

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.

1. **Digital Transmission Fundamentals:** Digital Representation of Information: Block-Oriented Information, Stream Information; Why Digital Communications? Comparison of Analog and Digital Transmission , Basic properties of Digital Transmission Systems; Digital Representation of Analog Signals: Bandwidth of Analog Signals, Sampling of an Analog Signal, Digital Transmission of Analog Signals; Characterization of Communication Channels: Frequency Domain Characterization, Time Domain Characterization; Fundamental Limits in Digital Transmission: The Nyquist Signaling Rate, The Shannon Channel Capacity; Line Coding ; Modems and Digital Modulation: Binary Phase Modulation, QAM and Signal Constellations, Telephone Modem Standards;
   Self study component:-*Modems and Digital Modulation: Binary Phase Modulation, QAM and Signal Constellations,*

2. **Properties of Media and Digital Transmission Systems**: Twisted Pair, Coaxial Cable, Optical Fiber, Radio Transmission, Infrared Light; Error Detection and Correction: Error Detection, Two Dimensional Parity Checks, Internet Checksum, Polynomial Codes, Standardized Polynomial Codes, Error Detecting Capability of a Polynomial Code.
   Self study component:-*Error Detecting Capability of a Polynomial Code*

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:

1. Alberto Leon – Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition, Tata McGraw Hill, 2006.

2. Simon Haykin: Digital Communication, Wiley India, 2007.

REFERENCE BOOKS:

1. John G Proakis: Digital Communications, 3rd Edition, McGraw Hill, 2008.

OOAD & DESIGN PATTERNS (3:0:0)

Sub Code	**: MIT1E102**	**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. 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*

3. State Modeling, Interaction Modeling and Process Overview, System Conception

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:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005.
2. Frank Buschmann, RegineMeunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2006.

Reference Books:

1. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson,
2. Mark Priestley: Practical Object-Oriented Design with UML, 2nd Edition, Tata McGraw-Hill, 2003.
3. K. Barclay, J. Savage: Object-Oriented Design with UML and JAVA, Elsevier, 2008.
4. Booch, G., Rumbaugh, J., and Jacobson, I.: The Unified Modeling Language User Guide, 2nd Edition, Pearson, 2005.
5. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns- Elements of Reusable Object- Oriented Software, Addison-Wesley, 1995.
6. Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2nd Edition, Tata McGraw-Hill, 2002.

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 andException Handling.
5. Use different system defined interfaces and collections.

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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 Manifast, 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

The Role of the Command Line Complier (csc.exe), Building C # Application using csc.exe Working with csc.exe Response Files, Generating Bug Reports , Remaining C# Compiler Options, Visual Studio .NET IDE, Other Key Aspects of the VS.NET IDE, C# "Preprocessor:" Directives, An Interesting Aside: The System. Environment Class.

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

3. C# Language Fundamentals.

The Anatomy of a Basic C# Class, Creating objects: Constructor Basics, The Composition of a C# Application, Default Assignment and Variable Scope, The C# Member Initialization Syntax, Basic Input and Output with the Console Class, Understanding Value Types and Reference Types, The Master Node: System, Object, The System Data Types (and C# Aliases), Converting Between Value Types and Reference Types: Boxing and Unboxing, Defining Program Constants, C# Iteration Constructs, C# Controls Flow Constructs, The Complete Set of C# Operators, Defining Custom Class

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 (IEnumerable and Enumerator), Building Cloneable objects (ICloneable), Building Comparable Objects (I Comparable), Exploring the system. Collections Namespace
Self study component:-*Building a Custom Container (Retrofitting the Cars Type).*

Text Books:

1. Andrew Troelsen: Pro C# with .NET 3.0, Special Edition, Dream tech Press, India, 2007.
2. E. Balagurusamy: Programming in C#, , 5th Reprint, Tata McGraw Hill, 2004.

Reference Books:

1. Tom Archer: Inside C#, WP Publishers, 2001.
2. Herbert Schildt: C# The Complete Reference, Tata McGraw Hill, 2004.

MULTIMEDIA INFORMATION SYSTEMS (3:0:0)

Sub Code	**: MIT1E104**	**CIE**	**: 50%**
Hrs/Week	**: 03**	**SEE**	**: 50%**
SEE Hours	**: 3 Hrs**	**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:

1. Ralf Steinmetz, KlaraNarstedt: Multimedia Fundamentals: Vol1-Media Coding and Content Processing, 2nd Edition, PearsonEducation / PHI, 2003.
2. Prabhat K. Andleigh, KiranThakrar: Multimedia SystemsDesign, PHI, 2003.

REFERENCE BOOKS:

1. K.R Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic: Multimedia Communication Systems: Techniques, Standards, and Networks, Pearson Education, 2002.
2. Nalin K Sharda: Multimedia information Networking, PHI,2002.

ELECTIVE – II

INFORMATION AND NETWORK SECURITY (3:0:0)

Sub Code	**: MIT1E201**	**CIE**	**: 50%**
Hrs/Week	**: 03**	**SEE**	**: 50%**
SEE Hours	**: 3 Hrs**	**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

Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, stream Ciphers and block Ciphers, Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. Public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. **Other Public-Key Cryptosystems:** Diffie-hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, abelian groups, elliptic curves over real numbers, elliptic curves over Zp, elliptic curves overGF(2m), Elliptic curve cryptography, Analog of Diffie-hellman key exchange.

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,

Self Learning Component: *X-509 certificates. Certificates, X-509 version 3, public key infrastructure.*

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.

Wireless network security: Wireless security, Wireless network threats, Wireless network measures, mobile device security, security threats, mobile device security strategy, IEEE 802.11 Wireless LAN overview, the Wi-Fi alliance, IEEE 802 protocol architecture.

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

Web Security Threats, Web Traffic Security Approaches. **Secure Sockets Layer:** SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, and shake Protocol, Cryptographic Computations. **Transport Layer Security:** Version Number, Message Authentication Code, Pseudorandom Functions, Alert Codes, Cipher Suites, Client Certificate Types, Certificate Verify and Finished Messages, Cryptographic Computations, and Padding. **Electronic Mail Security:** Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate processing, enhanced security services, Domain keys identified mail, internet mail architecture, E-Mail threats, DKIM strategy, DKIM functional flow.

Self Learning Component: HTTPS *Connection Initiation, Connection Closure.* ***Secure Shell (SSH) Transport*** *Layer Protocol, User Authentication Protocol, Connection Protocol.*

5. IP Security

IP Security overview, applications of IPSec, benefits of IPSec, Routing applications, IPSec documents, IPSec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating Security payload, ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes.

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:

1. William Stallings: Cryptography and network security, 6th edition, Pearson education, 2014

Reference Book:

1. Behrouz A. Forouzan: Cryptography and Network Security, Special Indian Edition, Tata McGraw-Hill, 2007.

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 Cain 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 :

1. Sunil Chopra, PterMeindl: Supply Chain Management Strategy, Planning, and Operation, 2nd Edition, Prentice-Hall of India, 2004. (Chapters 1, 2, 4, 4, 5, 6, 7, 8.1 to 8.3, 10, 14, 15, 16, 17, 18)

Reference Books:

1. David Simchi-Levi, PhilpKaminky, Edith Simchi-Levi: Designing and Managing The Supply Chain Concepts, Strategies & Case Studies, 3rd Edition, tata McGraw Hill, 2003.

2. R.P. Mohanty, S.G. Deshmukh: Supply Chain Management Theories & Practices, Bizmantra, 2005.

3. Rahul V. Altekar: Supply Chain Management Concepts and Cases, PHI, 2005.

4. M Martin Christopher: Logistics and Supply Chain Management, 2nd Edition, Pearson Education, 1998.

NETWORK MANAGEMENT (3:0:0)

Sub Code	**: MIT1E203**	**CIE**	**: 50%**
Hrs/Week	**: 03**	**SEE**	**: 50%**
SEE Hours	**: 3 Hrs**	**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

Analogyof Telephone Network Management, Data and Telecommunication Network Distributed computing Environments, TCP/IP-Based Networks: The Internet and Intranets, Case Histories of Networking and Management – The Importance of topology , Filtering Does Not Reduce Load on Node, Some Common Network Problems; Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions- Goal of Network Management, Network Provisioning, Network Operations and the NOC, Network Installation and Maintenance; Network and System Management, Network Management System platform, Current Status and Future of Network Management.

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

Managed Network:, Internet Organizations and standards, Internet Documents, The SNMP Model, The Organization Model, System Overview. The Information Model – Introduction, The Structure of Management Information, Managed Objects, Management Information Base.

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

Broadband Networks and Services, ATM Technology – Virtual Path-Virtual Circuit, TM Packet Size, Integrated Service, SONET, ATM LAN Emulation, Virtual LAN; ATM Network Management – The ATM Network Reference Model, The Integrated Local Management Interface, The ATM Management Information Base, The Role of SNMP and ILMI in ATM Management, M1 Interface: Management of ATM Network Element, M2 Interface: Management of Private Networks, M3 Interface: Customer Network Management of Public Networks, M4 Interface: Public Network Management, Management of LAN Emulation,

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

Text Books:

1. Mani Subramanian: Network Management- Principles and Practice, Pearson Education Publication, 2003.

Reference Books:

1. J. Richard Burke: Network management Concepts and Practices: a Hands- On Approach, PHI, 2008.

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.

1. **The Client Server Model and Software Design , Program Interface to Protocols, The Socket Interface:** Introduction, Motivation, Terminology and Concepts, Concurrency in Networks, Concurrency in Servers, Terminology and Concepts , Introduction, Loosely Specified Protocol Software Interface, Interface Functionality, Conceptual Interface Specification, System Calls, Two Basic Approaches to Network Communication, The Basic I/O Functions available in UNIX, Using UNIX I/O with TCP/IP. Introduction, Berkley Sockets, Specifying a Protocol Interface, The Socket Abstraction, Specifying an End Point Address, A Generic Address Structure, Major System Calls used with Sockets, Utility Routines for Integer Conversion, Using Socket Calls in a Program.
   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.*

3. **Example Client Software:** Introduction, The Importance of Small Examples, Hiding Details, An Example Procedure Library for Client Programs, Implementation of Connect TCP, Implementation of Connect UDP, A Procedure that Forms Connections, Using the Example Library, The DAYTIME Service, Implementation of a TCP Client for DAYTIME, Reading from a TCP Connection, The Time Service, Accessing the TIME

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.*

4. **Algorithms and Issues in Server Software Design:** Introduction, The Conceptual Server Algorithm, Concurrent Vs Iterative Servers, Connection-Oriented Vs Connectionless Access, Connection-Oriented Servers, Connectionless Servers, Failure, Reliability and Statelessness, Optimizing Stateless Servers, Four Basic Types of Servers, Request Processing Time, Iterative Server Algorithms, An Iterative Connection-Oriented Server Algorithm, Binding to a Well Known Address using INADDR_ANY, Placing the Socket in Passive Mode, Accepting Connections and using them. An Iterative Connectionless Server Algorithm, Forming a Reply Address in a Connectionless Server, Concurrent Server Algorithms, Master and Slave Processes, A Concurrent Connectionless Server Algorithm, A concurrent Connection-Oriented Server Algorithm, Using separate Programs as Slaves, Apparent Concurrency using a Single Process, When to use each Server Types,
   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.
   TCP Introduction, Allocating a Passive TCP Socket, A Server for the DAYTIME Service, Process Structure, An Example DAYTIME Server, Closing Connections.
   Self study component:-*Connection Termination and Server Vulnerability.*

Text book:

1. Douglas E.Comer, David L. Stevens: Internetworking with TCP/IP – Vol. 3, Client-Server Programming and Applications, BSD Socket Version with ANSI C, 2nd Edition, Pearson, 2001.

ELECTIVE – III

DISTRIBUTED SYSTEMS (3:0:0)

SUB. CODE: MIT2E301 **CIE: 50**
HRS/WEEK: 03 **SEE: 50**
SEE HRS: 03 **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
System Models: Introduction, Architectural Models, Fundamental Models
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
Operating System Support: Introduction, The OS layer, Protection, Processes and Threads, Communication and Invocation
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:
George Coulouris, Jean Dollimore, Tim Kindberg: Distributed Systems – Concepts and Design by, Fourth Edition, Pearson Publications, 2009.

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

4. Cross-Language Information Retrieval and Efficiency, Integrating Structured Data and Text: Introduction; Crossing the language barrier; Cross-Language retrieval strategies; Cross language utilities. Duplicate Document Detection. Review of the relational model;
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:

1. David A. Grossman, OphirFrieder: Information Retrieval Algorithms and Heuristics, 2nd Edition, Springer, 2004. (Chapters 1, 2, 3, 4, 5, 6, 7, 8)
2. Ricardo Baeza-Yates, Berthier Ribeiro-Neto: Modern Information Retrieval, Pearson Education, 1999 (Chapters 8, 11, 12)

Reference Books:

1. William B. Frakes, Ricardo Baeza-Yates (Editors): Information Retrieval Data Structures & Algorithms, Prentice Hall PTR, 1992.

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
3G NETWORKS : OFDMA, Air Interface: Physical Layer, Air Interface: Protocol, Stack, Radio Access Network, LTE-A Features.

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
Bell Labs Layered Space Time (BLAST) System, Software-Defined Radio, Cognitive Radio.

Text Books:
1. Introduction to 4G Mobile Communication, JuhaKorhonen, Artech House, (www.artechhouse.com),
2. Vijay Garg, “Wireless Communications and Networking”, Elsevier, Morgan kufmann publisher 2007#
3. 4G LTE/LTE – Advanced for Mobile Broadband, Erik Dahlman, Stefan Parkvall, Johan Skold, Academic Press 2011.

Reference Books: NIL

INTERNET OF THINGS (3:0:0)

Sub Code	**: MIT2E304**	**CIE**	**: 50%**
Hrs/Week	**: 03**	**SEE**	**: 50%**
SEE Hours	**: 3 Hrs**	**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, Apllications, 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

Fundamental IoT Mechanism and Key Technologies-Identification of IoT, Object and Services,, Structural Aspects of the IoT, Key IoT Technologies., Evolving IoT Standards-Overview and Approaches,IETF IPV6 Routing, Protocol for RPL Roll, Constrained Application, Protocol,Representational State, Transfer, ETSI M2M,Third Generation Partnership Project Service

Requirements for Machine-Type Communications, CENELEC, IETF IPv6, Over Lowpower WPAN, Zigbee IP(ZIP),IPSO

MODULE - 3

Layer ½ Connectivity: Wireless Technologies for the IoT-WPAN Technologies, for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M,Layer, 3 Connectivity :IPv6 Technologies for the IoT: Overview and Motivations., Address Capabilities,IPv6 Protocol Overview, IPv6 Tunneling, IPsec in, IPv6,Header Compression Schemes, Quality of Service in IPv6, Migration, Strategies to IPv6.

MODULE -4

Case Studies illustrating IoT Design-Introduction, Home Automation, Cities,, Environment, Agriculture, Productivity Applications.

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:

1. Daniel Minoli, ”Building the Internet of Things with IPv6 and MIPv6:The Evolving World of M2M Communications”, Wiley, 2013
2. ArshdeepBahga, Vijay Madisetti, ”Internet of Things: A Hands on Approach” Universities Press., 2015

Reference Books:

1.Michael Miller,” The Internet of Things”, First Edition, Pearson, 2015.
2.Claire Rowland, Elizabeth Goodman et.al.,” Designing Connected Products”, First Edition, O’Reilly, 2015

ARTIFICIAL INTELLIGENCE (3:0:0)

Sub Code	**: MIT2E305**	**CIE**	**: 50%**
Hrs/Week	**: 03**	**SEE**	**: 50%**
SEE Hours	**: 3 Hrs**	**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:

1. Artificial Intelligence A modern Approach Stuart Russell, Peter Norvig Third edition, Pearson publication, 2015

MOOC's:

1. https://www.edx.org/course/artificial-intelligence-ucberkeleyx-cs188-1x

ELECTIVE – IV

OPTICAL NETWORKS (3:0:0)

Sub Code	**: MIT2E401**	**CIE**	**: 50%**
Hrs/Week	**: 03**	**SEE**	**: 50%**
SEE Hours	**: 3 Hrs**	**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:

1. Uyless Black: Optical Networks, Pearson Education Asia, 2002.

REFERENCE BOOKS:

1. Rajiv Ramaswami and Kumar N.Sivaranjan: Optical Networks - A Practical Perspective, Morgan Kaufuann, 2000.
2. Paul E.Green Jr.: Fiber Optic Network, Prentice Hall, 1993.
3. Jeff Hecht: Understanding Fiber Optics, 4th Edition, PHI 1999.

ADHOC NETWORKS (3:0:0)

Sub Code	**: MIT2E402**	**CIE**	**: 50%**
Hrs/Week	**: 03**	**SEE**	**: 50%**
SEE Hours	**: 3 Hrs**	**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

INTRODUCTION: Cellular and Ad Hoc Wireless networks, Applications of Ad Hoc wireless networks; Issues in Ad hoc wireless networks: Medium Access Scheme, Routing, Multicasting, Transport Layer Protocols, Pricing Scheme, Quality of service positioning, Self-organization, Security, Addressing and Service Discovery, Energy Management, Scalability, Deployment Considerations.

SLE : *Ad hoc wireless Internet.* **8 Hours**

MODULE- 2

MAC PROTOCOLS: MAC Protocols for Ad hoc wireless Networks: Introduction, Issues in designing a MAC protocol for Ad hoc wireless Networks, Design goals of a MAC protocol for Ad-hoc wireless Networks, Classification of MAC Protocols, Contention based protocols with reservation mechanisms: D-PRMA, CATA, SRMA/PA, FPRP.

SLE : *MACA/PR Protocol* **8 Hours**

MODULE- 3

ROUTING PROTOCOLS-I : Routing protocols for Ad-hoc Wireless Networks: Introduction, Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks, Classification of Routing Protocols. Table driven routing protocols**:** DSDV, WRP, CGSR. On-Demand Routing Protocols: DSR, AODV, LAR and ABR.

SLE: *STAR protocol and SSA protocol* **8 Hours**

MODULE - 4

TRANSPORT LAYER: Transport Layer Protocols for Ad-hoc wireless Networks: Introduction, Issues in Designing a Transport Layer Protocol for Ad-hoc wireless Networks, Design Goals of a Transport Layer Protocol for Ad hoc wireless Networks, Classification of

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
SECURITY: Security in wireless Ad hoc wireless Networks, Network security requirements, Issues &Challenges in Security Provisioning, Network security Attacks, Key Management: Symmetric and Asymmetric key Algorithms, key Management Approaches, key management in Ad-hoc Wireless Networks: Secure routing in Ad-hoc wireless Networks: Requirements, SAR protocol, Security-Aware AODV protocol.

***SLE** : ARAN Protocol* **7 Hours**

TEXT BOOK

1. **Ad hoc Wireless Networks** – C. Siva Ram Murthy & B. S. Manoj, 2nd Edition, Pearson Education, 2005.

REFERENCE BOOKS

1. **Ad hoc Wireless Networks** – Ozan K. Tonguz and Gianguigi Ferrari, John Wiley, 2006.
2. **Ad hoc Wireless Networking –** Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du, KluwerAcademic Publishers, 2004.
3. **Adhoc Mobile Wireless Networks** - C.K. Toh, Protocols and Systems, Prentice-Hall PTR,2002.

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 Progrmming, case studies (A simple Blog, A wiki web, XML to read iTunes Database)

Text Books:
1. Exploring Python, Timothy A. Budd, McGraw Hill education, Indian edition, ISBN-13: 978-0-07-132122-8
2. Core Phthon Applications Programming, Wesley J. Chun, Pearson, 2016

Reference Books:
1. Kenneth A. Lambert , B.L Juneja , “Fundamentals of Python Programming”, Cengage Learning,ISBN:978-81-315-2903-4, 2015
2. Charles Dierbach. ”Introduction to Computer Science Using Python: A Computational Problem-Solving Focus”, Wiley,ISBN:978-81-265-5601-4,2015
3. Allen B.Downey,”Think Python”,O’Reilly,First Edition,2012,ISBN:978-93-5023-863-9

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
4. Create dynamic documents using JavaScript
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 and 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:

1. Robert W. Sebesta: Programming the World Wide Web**,** 4th Edition, Pearson Education, 2008.

Reference books:

1. M. Deitel, P.J. Deitel, A. B. Goldberg**:** Internet & World WideWeb How to program, 3rd Edition, Pearson Education / PHI,2004.
2. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2006.
3. Xue Bai et al**:** The Web Warrior Guide to Web Programming, Thomson, 2003.

INTRODUCTION TO MACHINE LEARNING (3:0:0)

Sub Code	**: MIT2E405**	**CIE**	**: 50%**
Hrs/Week	**: 03**	**SEE**	**: 50%**
SEE Hours	**: 3 Hrs**	**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:

1. Ethem Alpaydm, Introduction to Machine Learning (Adaptive Computation and machine learning) The MIT Press Cambridge, Massachusetts London, ISBN: 0-262-01211-1, 2004
2. John D. Kelleher, Brian Mac Namee, Aoife D'Arcy, FUNDAMENTALS OF MACHINE LEARNING FOR PREDICTIVE DATA ANALYTICS Algorithms, Worked Examples, and Case Studies, The MIT Press,Cambridge, Massachusetts, London, England

REFERENCE BOOK:

1. Simon Rogers, Mark Girolami, A first course in machine learning, Chapman, & Hall/CRC machine learning& pattern recognition, 2011

MOOC's:

1. https://www.courseera.org/learn/machine-learning [stanford university]

III SEMESTER

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**	**CIE**	**: 50%**
Hrs/Week	**: 03**	**SEE**	**: 50%**
SEE Hours	**: 3 Hrs**	**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
Basics, General approach to solve classification problem, Decision Trees, Rule Based Classifiers, and Nearest Neighbor Classifiers. Bayesian Classifiers, Support Vector Machine, Estimating Predictive accuracy of classification methods, improving accuracy of clarification methods, Multiclass Problem.

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:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Addison-Wesley, 2005.
2. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.

Reference Books:

1. Arun K Pujari: Data Mining Techniques University Press, 2nd Edition, 2009.

2. Jiawei Han and MichelineKamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006.

3. Alex Berson and Stephen J. Smith: Data Warehousing, Data Mining, and OLAP Computing Mc GrawHill Publisher, 1997.

WEB-COMMERCE (3:0:0)

Sub Code	**: MIT3O02**	**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. 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*

2. **Business models for e-commerce:** e-business models based on relationship of transaction parties – B2C, B2B, C2C and C2B; e-business models based on relationship of transaction types – Brokerage model, Aggregator model, value chain model, advertising model, subscription model.
   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:

1. P.T. Joseph, S.J. *"E Commerce – and Indian perspective"* – Third edition, PHI 2010. Ch. 1, 2, 3, 4, 6 and related sections of 7, 8 and 9 only.
2. Daniel Minoli and Emma Minoli *"Web commerce Technology"*, Tata McGraw Hill – 2000.

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

Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling; List processing. Simulation in Java;

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:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 4th Edition, Pearson Education, 2007.

Reference Books:

1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson Prentice-Hall, 2006.
2. Averill M. Law: Simulation Modeling and Analysis,4th Edition, Tata McGraw-Hill, 2007.

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