# ADMISSION & EXAMINATION RULES
*for*
# MASTER OF TECHNOLOGY
# (Computer Science & Engineering)
# M. TECH. (CSE)

## 1. OBJECTIVE

To prepare highly skilled professionals, with a strong conceptual and theoretical background in the fields of information technologies, especially in the emerging areas of software technologies.

## 2. THE PROGRAMME

Highlights of the course are described in the following table:

| | | |
|---|---|---|
| a. | *Name of the Programme* | Master of Technology (Computer Science & Engineering) M. Tech. (CSE) |
| b. | *Nature* | Regular and Full Time |
| c. | *Duration* | Two Years (4 Semesters) |
| d. | *Total number of credits* | 96 |
| e. | *Medium of Instruction and English Examinations* | English |
| f. | *Eligibility Criteria* | i. B.Tech. / B.E. or equivalent degree in Computer Science / Computer Science and Engineering / Computer Engineering / Information Technology / Software Engineering / ICT with atleast 60% marks (or equivalent CGPA) in aggregate.<br>***(OR)***<br>MCA or M.Sc.(CS), M.Sc.(IT), M.Sc.(Software Engineering), M.Sc.(Electronics) with atleast 60% marks (or equivalent CGPA) in aggregate.<br>***(OR)***<br>B.Tech. / B.E. or equivalent degree in Electronics & Communication / Electronics Engineering / Electrical Engineering with atleast 60% marks (or equivalent CGPA) in aggregate.<br>ii. Appeared in the Entrance Test or Interview conducted by Jamia Hamdard. |
| g. | *Selection procedure* | Entrance Test or Interview will be conducted based on the syllabus of B.Tech.(CSE/IT) / MCA programmes of Jamia Hamdard. |
| h. | *Total Seats* | 30; inclusive of seats reserved for NRI / sponsored candidates; additional seats are available for Foreign Nationals. |
| i. | *Period of Completion* | Not more than 04 years (8 Semesters) |
| j. | *Commencement of the Programme* | July of the every academic session |

## 3. PROGRAMME STRUCTURE

Semester-wise course structure, guidelines for teaching, practical and associated assessment of **M. Tech. (CSE)** programme is described in the following tables:

| **Course Type** | **Credits** | **Percentage (%)** *(Approx)* |
|---|---|---|
| Departmental Core (DC) | 64 | 66.7 |
| Departmental Electives (DE) | 20 | 20.8 |
| Open Electives (OE) | 12 | 12.5 |
| **Total** | **96** | **100** |

**L-T-P** stands for number of contact hours as Lecture-Tutorial-Practical in a week.

# Semester – I

| **Paper Code** | **Title of the Paper** | **Course Type** | **Marks** | | | **L-T-P** | **Credits** |
|---|---|---|---|---|---|---|---|
| | | | **Internal Assessment** | **Semester Exam** | **Total** | | |
| MTCSE 101 | Python Programming and Applications | DC | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE 102 | Advanced Data Structures and Algorithms | DC | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE 103 | Modern Operating Systems | DC | 30 | 70 | 100 | 3-1-0 | 4 |
| | OE – 1 | OE | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE 104 | Distributed Database | DC | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE 105 | Python Programming Lab | DC | 50 | 50 | 100 | 0-0-4 | 2 |
| MTCSE 106 | Advanced Data | DC | 50 | 50 | 100 | 0-0-4 | 2 |
| | | | | **Total** | | **15-5-8** | **24** |

## Semester – II

| Paper Code | Title of the Paper | Course Type | Marks | | | L-T-P | Credits |
|---|---|---|---|---|---|---|---|
| | | | Internal Assessment | Semester Exam | Total | | |
| MTCSE 201 | Advanced Java Programming | DC | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE 202 | Object Oriented Software Engineering | DC | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE 203 | Data Warehouse and Data Mining | DC | 30 | 70 | 100 | 3-1-0 | 4 |
| | OE – 2 | OE | 30 | 70 | 100 | 3-1-0 | 4 |
| | DE – 1 | DE | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE 204 | Advanced Java Programming Lab | DC DC | 50 | 50 | 100 | 0-0-4 | 2 |
| MTCSE 205 | Lab based on DE | DE | 50 | 50 | 100 | 0-0-4 | 2 |
| | | | | | **Total** | **15-5-8** | **24** |

## Semester – III

| Paper Code | Title of the Paper | Course Type | Marks | | | L-T-P | Credits |
|---|---|---|---|---|---|---|---|
| | | | Internal Assessment | Semester Exam | Total | | |
| MTCSE 301 | Advanced Computer Architecture and Parallel Processing | DC | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE 302 | Cloud Architecture and Computing | DC | 30 | 70 | 100 | 3-1-0 | 4 |
| | OE – 3 | OE | 30 | 70 | 100 | 3-1-0 | 4 |
| | DE – 2 | DE | 30 | 70 | 100 | 3-1-0 | 4 |
| | DE – 3 | DE | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE 303 | Lab based on DE | DE | 50 | 50 | 100 | 0-0-4 | 2 |
| MTCSE 304 | Lab based Minor Project and Seminar | DC | 50 | 50 | 100 | 0-0-4 | 2 |
| | | | | | **Total** | **15-5-8** | **24** |

## Semester – IV

| Paper Code | Title of the Paper | Course Type | Marks | | | L-T-P | Credits |
|---|---|---|---|---|---|---|---|
| | | | Internal Assessment | Semester Exam | Total | | |
| MTCSE 401 | Research Methodology | DC | 30 | 70 | 100 | 3-1-0 | 4 |
| | DE – 4 | DE | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE 402 | Dissertation* | DC | 300 | 200 | 500 | 0-0-32 | 16 |
| | | | | | **Total** | **6-2-32** | **24** |

**** With atleast one publication in International Refereed Journal/Conference, supported by three presentations.***

**Grand Total of Credits = 96**

### DEPARTMENTAL ELECTIVES (DE)

| Paper Code | Title of the Paper | Marks | | | L-T-P | Credits |
|---|---|---|---|---|---|---|
| | | Internal Assessment | Semester Exam | Total | | |
| **DE – 1** | | | | | | |
| MTCSE DE11 | Artificial Intelligence and its Applications | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE12 | Approximation Algorithms | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE13 | Performances modeling of communication and computer systems | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE14 | Real time systems | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE15 | Logic in Computer science | 30 | 70 | 100 | 3-1-0 | 4 |
| **DE – 2** | | | | | | |
| MTCSE DE21 | Big Data Analytics | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE22 | Network Programming | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE23 | Advanced Soft Computing | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE24 | Cryptography | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE25 | Open Source Software | 30 | 70 | 100 | 3-1-0 | 4 |
| **DE – 3** | | | | | | |
| MTCSE DE31 | Digital Image Processing | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE32 | Mobile Computing | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE33 | Multimedia and Virtual Reality | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE34 | Steganography and Digital Watermarking | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE35 | Computational Geometry | 30 | 70 | 100 | 3-1-0 | 4 |
| **DE – 4** | | | | | | |
| MTCSE DE41 | Storage Management | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE42 | Reverse Engineering | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE43 | Pattern Recognition | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE44 | Computer Graphics | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE DE45 | Computer Vision | 30 | 70 | 100 | 3-1-0 | 4 |

## OPEN ELECTIVES (OE)

| Paper Code | Title of the Paper | Marks | | | L-T-P | Credits |
|---|---|---|---|---|---|---|
| | | Internal Assessment | Semester Exam | Total | | |
| **OE – 1** | | | | | | |
| MTCSE OE11 | Communication networks and security | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE OE12 | Information Security Audit and Assurance | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE OE13 | Biometrics and Security | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE OE14 | Principles of Information Security | 30 | 70 | 100 | 3-1-0 | 4 |
| **OE – 2** | | | | | | |
| MTCSE OE21 | ERP (Enterprise Resource Planning) | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE OE22 | Semantic Web and Social networks | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE OE23 | Operational Research | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE OE24 | Intrusion Detection and prevention | 30 | 70 | 100 | 3-1-0 | 4 |
| **OE – 3** | | | | | | |
| MTCSE OE31 | Cyber Crimes and Cyber Laws | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE OE32 | Strategic analysis of IT | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE OE33 | Disaster Management and Mitigation | 30 | 70 | 100 | 3-1-0 | 4 |
| MTCSE OE34 | Project management & costing | 30 | 70 | 100 | 3-1-0 | 4 |

## 4. MODE OF CURRICULUM DELIVERY

Mode of curriculum delivery includes classroom teaching, assignments, test, lab work, presentations, participation in relevant events and regularity.

## 5. ATTENDANCE

a. All students are supposed to attend every lecture and practical classes. However, the attendance requirement for appearing in the examination shall be a minimum of 75% of the classes held.

b. Each one-period teaching shall account for one attendance unit.

c. The concerned teacher will take a roll call in every scheduled class, maintains and consolidate the attendance record, which would be submitted to the Head of the Department at the conclusion of the semester.

d. Attendance on account of participation (with prior permission from the Head of the Department) in the co-curricular/extra-curricular activities can be granted by the Dean on receipt of certificates or recommendations of the respective activity issued by the Head of the Department.

e. Attendance records displayed on the Notice Board from time to time, in respect of short attendance, shall be deemed to be a proper notification and no individual notice shall be sent to the students/local guardian.

f. In case a student is found to be continuously absent from the classes without information for a period of 30 days, the concerned teacher shall report it to the Head of the Department.

g. Head of the Department may recommend for striking off the name of a student from rolls, after ensuring '**one month continuous absence'**, from all the concerned teachers.

h. A student, whose name has been struck off on account of long absence may apply to the Dean for readmission within 15 days of the notice of striking off the name. The readmission shall be effected on payments of prescribed readmission fees.

i. A student with less than 75% attendance in a subject shall not be allowed to appear in that subject in the semester examination. The Head of the Department shall recommend all such cases to the Dean of the School.

j. The Dean, on the recommendation of the Head of the Department, may consider the relaxation of attendance up to 10% on account of sickness and /or any other valid reason. No application for relaxation of attendance (duly certified by a Registered Medical Practitioner/Public hospital or a competent authority) will be entertained after 15 days from the recovery from illness etc.

## 6. INTERNAL ASSESSMENT

a. Internal assessment, to be made by concerned teachers, will be based on minor tests, quizzes, presentation, programming test, demonstrations and assignments.

b. Maximum of Three minor tests, with a total of 20 marks, for each theory paper shall be mandatory. Other modes of assessment shall account for remaining 10 marks.

c. A minor test each shall be scheduled after the completion of first and second term.

d. Dates for minor test will be announced at the beginning of the semester, by the examination coordinator.

e. The teacher concerned shall maintain a regular record of the marks obtained by students in minor tests and display the same in due course.

f. The concerned teachers shall submit the compiled internal assessment marks to the Head of the Department, on the conclusion of teaching of the current semester.

g. The Head shall display a copy of the compiled sheet, of internal assessment marks of all the papers, before forwarding it to the Controller of Examination, i.e. at the conclusion of the semester.

h. A promoted candidate, who has to reappear in the examination of a paper, will retain internal assessment marks.

i. In the case of re-admission, the candidates shall have to go through the internal assessment process afresh and shall retain nothing of the previous year.

## 7. SEMESTER EXAMINATIONS

Prescriptions for conducting semester examinations of theory and lab papers, those shall be conducted after the conclusion of each of the semesters, are presented in the following table:

| | | | |
|---|---|---|---|
| a. | Mode | (Theory Papers) | Written only |
| | | (Lab Papers) | Written, Demo, Programming and viva- voce. |
| b. | Duration | (Theory paper) | 03 Hours |
| c. | Total Marks | (Theory Papers) | 70 (Seventy only) |
| | | (Lab Papers) | 50 (Fifty only) |

## 8. DISSERTATION

a. Each student of the final semester will have to go for a Research based Dissertation work either in the industry or in the Department under the guidance of one or two faculty members.
b. Period of completion of Dissertation work shall be full one semester.
c. There shall normally be two supervisors-one internal and one *external (in the case of industry project form the place where the student is pursuing project-work)*.
d. All the students, who are pursuing the Dissertation work, shall be continuously in touch with the internal supervisor.
e. ***There shall be three presentations by the students for evaluation of the progress*** and the internal supervisors will conduct it. However, an internal supervisor may ask the student to submit a confidential progress-report from the external supervisor *(if any).*
f. It is mandatory by the student to **publish atleast one research paper** related to Dissertation topic (with approval of the supervisor) in International Refereed Journal/Conference.
f. All the candidates shall submit ***Three (03***) hard copies of the project reports that are duly approved and signed by internal as well as external *(if applicable)* supervisors.
g. An external examiner, appointed for the purpose, shall evaluate the project report.
h. The Head of the Department shall fix a date and time for viva-voce examinations, on receipt of the evaluation-report of the project reports from the external examiner.
i. Head of the Department shall forward the compiled total marks (awarded in internal assessment, project Report and Viva-voce Examination), in the project-semester of each of the candidate, to the Controller of Examination.

## 9. EXAMINATION

a. The performance of a student in a semester shall be evaluated through continuous class assessment and end semester examination. The continuous assessment shall be based on class tests, assignments/ tutorials, quizzes/ viva voce and attendance. The end semester examination shall be comprised of written papers, practical and

viva voce, inspection of certified course work in classes and laboratories, project work, design reports or by means of any combination of these methods.

b. The marks obtained in a subject shall consist of marks allotted in end semester theory paper, practical examination and sessional work.
c. The minimum pass marks in each subject including sessional marks (Theory, Practical or Project etc.) shall be 40%.

## 10. PROMOTION SCHEME

a. A student will be promoted from 1st year to 2nd year provided that he/she is not having **more than 06 (Six) backlog papers** (including Labs; excluding non-credit papers) in total. A student who fails to satisfy the criteria mentioned for the promotion shall **detained** in the same year.
b. A **detained** Student is not allowed to re-appear in the minor tests. His/her old internal assessment marks will remain same. However, he/she will be required to re-appear in the semester examination for those papers in which he/she had failed, when these papers are offered again (Examination for Odd semester paper will be held in Odd semester, and for Even semester papers will be held in Even semester).
c. **Supplementary Examination:** For the final year students, students can appear in supplementary examinations in their all backlog papers after the declaration of their Final semester results only.

## 11. THE GRADING SYSTEM

As per University Rule

## 12. CALCULATION OF SGPA AND CGPA OF A STUDENT IN A SEMESTER

As per University Rule

After having passed all the FOUR semesters, the students shall be eligible for the award of **Master Of Technology (Computer Science & Engineering) M. Tech. (CSE)** degree of JAMIA HAMDARD.

## 13. CLASSIFICATION OF SUCCESSFUL CANDIDATES

The result of successful candidates, who fulfill the criteria for the award of **Master of Technology (Computer Science & Engineering) M. Tech. (CSE)**, shall be classified at the end of last semester, on the basis of his/her final CGPA (to be calculated as per university rule).

# SYLLABUS

## MTCSE 101 (PYTHON PROGRAMMING AND APPLICATIONS)

**Unit – I: An Introduction to Python**

A Brief History of Python, Python Versions, Installing Python, Environment Variables, Executing Python from the Command Line, Basic Python Syntax: String Operations, The format Method, String Slices, String Operators, Numeric Data Types, Conversions, Simple Input and Output

**Unit – II: Language Components**

Control Flow and Syntax, Indenting, Loops, Collections: Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections

**Unit – III: Functions and Modules**

Defining Your Own Functions, Parameters, Keyword and Optional Parameters, Passing Collections to a Function, Variable Number of Arguments, Passing Functions to a Function, Mapping Functions in a Dictionary, Lambda, Closures, Modules: sys, math, time, dir

**Unit – IV: Exceptions and I/O**

Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions, raise, assert, Writing Your Own Exception Classes, Input and Output: Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data From a File, Additional File Methods, Using Pipes as Data Streams, Handling IO Exceptions, Working with Directories, Metadata

**Unit – V: Classes and Regular Expressions**

Classes in Python: Creating Classes, Instance Methods, File Organization, Special Methods, Class, Variables, Inheritance, Polymorphism, Type Identification, Regular Expressions: Simple Character Matches, Special Characters, Character Classes, Quantifiers, The Dot Character, Greedy Matches, Grouping, Matching at Beginning or End, Match Objects, Substituting, Splitting a String, Compiling Regular Expressions, Flags

**SUGGESTED READINGS**


- *Beginning Python: From Novice to Professional - Hetland*
- *Learning Python: Powerful Object-Oriented Programming - Lutz*
- *Dive Into Python 3 - Pilgrim*
- *Programming Python - Lutz*
- *Pro Python - Alchin*
- *Python Cookbook - Beazley et al*
- *Foundations of Agile Python Development - Younker*

## MTCSE 102 (ADVANCED DATA STRUCTURES AND ALGORITHMS)

### Unit – I: Iterative and Recursive Algorithms

Iterative Algorithms: Measures of Progress and Loop Invariants, Steps to Develop an Iterative Algorithm, Different Types of Iterative Algorithms, Towers of Hanoi, Examples of Recursive Algorithms, Recursion on Trees

### Unit – II: Advanced Search Structures for Dictionary ADT

Splay trees, Amortized analysis, 2-3 trees, 2-3-4 trees, Red-black trees, Randomized structures, Skip lists, Treaps, Universal hash functions

### Unit – III: Advanced Structures for Priority Queues and Their Extensions

Binomial heaps, Leftist heaps, Skewed heaps, Fibonacci heaps and its amortized analysis, Applications to minimum spanning tree algorithms

### Unit – IV: Optimization Algorithms

Optimization Problems, Graph Search Algorithms, Breadth-First Search, Dijkstra's Shortest Path, Developing a Dynamic Programming Algorithm, Hill Climbing, Recursive Backtracking, Developing Recursive Backtracking Algorithm, Pruning Branches

### Unit – V: Concurrent Data Structures

Paradigms of concurrent programming, shared objects and synchronization, mutual exclusion, producer-consumer problem, readers-writers problem, Amdahl's Law, Concurrent Queues, Concurrent Stacks, Concurrent Hashing and Natural Parallelism, the Java Memory Model

### SUGGESTED READINGS


- *Mark Allen Weiss, —Data Structures and Algorithm Analysis in C++‖, Pearson Education*
- *Aho Hopcroft Ullman, —Data Structures and Algorithms‖, Pearson Education*
- *Horowitz Sahni, Rajasekaran, —Computer Algorithms‖*
- *Tanenbaum A.S, Langram Y, Augestien M.J., ‖Data Structures using C & C++‖, Prentice Hall of India*
- *Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and Mount*
- *Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.*

## MTCSE 103 (MODERN OPERATING SYSTEMS)

### Unit – I: Operating System Overview

Operating System Objectives and Functions, The Evolution of Operating Systems, Developments Leading to Modern Operating Systems, Virtual Machines, OS Design Considerations for Multiprocessor and Multicore architectures, Microsoft Windows Overview, Modern UNIX Systems, Linux, Android, Booting Process of all the above operating systems.

### Unit – II: Process Description and Control

Process: Concept of a Process, Process States, Process Description, Process Control, Threads: Processes and Threads, Concept of Multithreading, Types of Threads, Thread programming Using pthreads, Multicore processors and threads, Linux Process and Thread Management, Android Process and Thread Management, Scheduling: Uniprocessor Scheduling Types of Scheduling, Scheduling Algorithms, and Thread Scheduling, An introduction to Multiprocessor and Real Time Scheduling.

### Unit – III: Concurrency, Mutual Exclusion and Synchronization

Mutual Exclusion: Hardware Support, Operating System Support (Semaphores and Mutex), Programming Language Support (Monitors), Classical synchronization problems: Readers/Writers Problem, Producer and Consumer problem. Concurrency: Deadlock and Starvation Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock detection, An Integrated Deadlock Strategy, Example: Dining Philosophers Problem, Linux inter-process communication and concurrency mechanisms, Android Interprocess communication mechanisms and concurrency mechanisms

### Unit – IV: Memory Management

Memory Management: Memory Management Requirements, Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Buddy System, Relocation, Paging, Segmentation.
Virtual Memory: Hardware and Control Structures, Operating System Software, Linux Memory Management, Windows Memory Management, Android Memory Management.

### Unit – V: Input/output and Files

I/O Management and Disk Scheduling: I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling, Disk Cache, Linux I/O.
File Management: Overview, File Organization and Access, File Directories, File Sharing, Record Blocking, Secondary Storage Management, Linux Virtual File System, Android File Management.

### SUGGESTED READINGS


- *Andrew S. Tanenbaum, Modern Operating System, Prentice Hall*
- *William Stallings, Operating System: Internals and Design Principles, Prentice Hall*
- *Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts*
- *Maurice J. Bach, "Design of UNIX Operating System", PHI*

## MTCSE 104 (DISTRIBUTED DATABASE SYSTEM)

### Unit – I: Characterization of Distributed Systems

Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges, Architectural models, Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks. Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

### Unit – II: Distributed Mutual Exclusion and Deadlock

Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms, Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, entralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

### Unit – III: Agreement Protocols & Distributed Resource Management

Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system, Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

### Unit – IV: Failure Recovery and Fault Tolerance

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems, Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

### Unit – V: Transactions and Concurrency Control

Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control, Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

### SUGGESTED READINGS


- *Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education*
- *Tenanuanbaum, Steen," Distributed Systems", PHI*

## MTCSE 201 (ADVANCED JAVA PROGRAMMING)

### Unit – I: Advanced Java API

Regular Expressions, Nested Classes, Inner Class, Local Classes, Anonymous Classes, Lambda Expressions, Method References, Defining Simple Generics, Generics and Subtyping, Wildcards, Generic Methods, Collections framework, Interfaces, Implementations, Algorithms, Aggregate Operations

### Unit – II: Database Programming using JDBC

JDBC Basics, Two Tier and Three Tier Database Design, Different types of JDBC drivers Processing SQL Statements with JDBC, Establishing a Connection, Using Prepared Statements, Using Transactions, Overview of JDBC 2.0 API.

### Unit – III: Java Servlet Technology

HTML forms and controls, Static Vs Dynamic web pages, Difference between Post and Get, Introduction to Servlet and Java Web Server, Servlet API, Basic Servlet structure, Servlet life cycle, Handling the Client request and FORM data, HttpRequest and HttpResponse, Handling cookies, Session Tracking, Using servlet to access database with JDBC.

### Unit – IV: Java Server Pages Technology

Introduction to JSP, Components of JSP page, JSP Comments, Scripting elements, Declaration, Directives, implicit objects, Introduction to Java bean, Bean naming conventions, Getter and Setter methods, Advantages of Java Bean, Integrating Java Beans with JSP for reading information from forms, Integrating Servlet, JSP and Bean, Accessing database using JSP.

### Unit – V: Distributed Server and the Client Communications

An Overview of RMI Applications, Writing an RMI Server, Designing a Remote Interface, Implementing a Remote Interface, Creating a Client Program, Compiling and Running RMI program, Introduction to EJB, Introduction to Spring, Spring MVC, Struts 2, JSF, Hibernate and GWT frameworks.

### Suggested Readings


- *Robert Liguori, Patricia Liguori, Java 8 Pocket Guide, O'Reilly Media*
- *By Marty Hall, Larry Brown, Core Servlets and JavaServer Pages Volume 1: Core Technologies, Pearsons*
- *Budi Kurniawan, Java for the Web with Servlets, JSP, and EJB: A Developer's Guide to J2EE Solutions, New Riders Publishing*
- *Monica Pawlan, Writing Enterprise Applications with Java 2 SDK, Enterprise Edition, Sun Microsystems, Inc.*
- *Raoul-Gabriel Urma, Java 8 in Action: Lambdas, Streams, and functional-style programming*

## MTCSE 202 (OBJECT ORIENTED SOFTWARE ENGINEERING)

### Unit – I: Object Oriented to Unified Process

Approaches of problem solving, Birth of the object, Class and Object, Abstraction and encapsulation, Inheritance and composition, Dynamic binding and polymorphism, Interface and implementation, Object Oriented Methodologies: Coad/Yourdon Methodology, Booch Methodology, Rumbaugh Methodology, Jacobson Methodology, Unified phases (RUP), Model driven architecture: Analysis model, Design model, Implementation model, Deployment model

### Unit – II: UML Diagrams

Use case diagram: Use cases, Actors, Associations, System boundary boxes, Class diagram: Class, Attribute, Operation, Association, Aggregation, Composition, Activity diagram: Activity, Action, Control Flow, Initial Node, Activity Final Node, Decision Node, Guard, Merge Node, Sequence diagram: Lifelines, Messages, Loops, Deployment diagram

### Unit – III: OO design principles

General principles: DRY, KISS, Principle of orthogonality, Hollywood principle, YAGNI, Class structure and relationship principles (SOLID): Single responsibility principle, Open close principle, Liskov's substitution principle, Interface segregation principle, Dependency inversion principle, Package cohesion principle: REP principle, CCP principle, CRP principle, Package coupling principle: ADP principle, SDP principle, SAP principle

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### Unit – IV: Design Pattern

GOF design patterns: Abstract Factory, Singleton, Adapter, Façade, Command, Observer, Strategy, Enterprise Application: MVC, Front controller, DAO

### Unit – V: Implementation, Quality and Testing

Good programming guidelines, Mapping class diagram to database, Mapping class diagram to Java code, Chidamber & Kemerer object,oriented metrics suite, MOOD Metrics Model, object oriented testing

### SUGGESTED READINGS


- *Bernd Bruegge, "Object oriented software engineering", Second Edition, Pearson Education.*
- *Stephan R. Schach, "Object oriented software engineering", Tata McGraw Hill.*
- *Roger Pressman, "Software Engineering", sixth edition, Tata McGraw Hill.*
- *Timothy C. Lethbridge, Robert Laganiere " Object-Oriented Software Engineering – A practical software development using UML and Java", Tata McGraw-Hill, New Delhi*

## MTCSE 203 (DATA WAREHOUSE AND DATA MINING)

**Unit – I: Data Warehousing**

Data warehousing Components, Building a Data warehouse, Mapping the Data Warehouse to a Multiprocessor Architecture, DBMS Schemas for Decision Support, Data Extraction, Cleanup, and Transformation Tools, Metadata.

**Unit – II: Business Analysis**

Reporting and Query tools and Applications, Tool Categories, The Need for Applications, Online Analytical Processing (OLAP), Need of Multidimensional Data Model, OLAP Guidelines, Multidimensional versus Multi, relational OLAP, Categories of Tools, OLAP Tools and the Internet.

**Unit – III: Data Mining**

Types of Data, Data Mining Functionalities, Interestingness of Patterns, Classification of Data Mining Systems, Data Mining Task Primitives, Integration of a Data Mining System with a Data Warehouse, Issues, Data Preprocessing.

**Unit – IV: Association Rule Mining and Classification**

Mining Frequent Patterns, Associations and Correlations, Mining Methods, Mining Various Kinds of Association Rules, Correlation Analysis, Constraint Based Association Mining, Classification and Prediction, Basic Concepts, Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods , Prediction.

**Unit – V: Clustering and Applications and Trends in Data Mining**

Cluster Analysis , Types of Data, Categorization of Major Clustering Methods , K- means, Partitioning Methods, Hierarchical Methods , Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Clustering High Dimensional Data, Constraint Based Cluster Analysis, Outlier Analysis, Data Mining Applications.

**SUGGESTED READINGS**


- *Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition*
- *Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Elsevier*
- *K.P. Soman, Shyam Diwakar and V. Ajay ", Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India*
- *Daniel T.Larose, "Data Mining Methods and Models", Wile, Interscience*

## MTCSE 301 (ADVANCE COMPUTER ARCHITECTURE AND PARALLEL PROCESSING)

### Unit – I: Parallel computer models and Program and network properties

Parallel computer models: The state of computing, Multiprocessors and multicomputers, Multivector and SIMD computers, Architectural development tracks, Program and network properties: Conditions of parallelism, Data and resource dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Program flow mechanisms ,Control flow versus data flow,Data flow architecture, Demand driven mechanisms, Comparisons of flow mechanisms

### Unit – II: System Interconnect Architectures

Network properties and routing, Static interconnection networks, Dynamic interconnection Networks, Multiprocessor system interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network.

### Unit – III: Processors and Memory

Processors and Memory Hierarchy: Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors, Memory Technology: Hierarchical memory technology, Inclusion, Coherence and Locality, Memory capacity planning, Virtual Memory Technology

### Unit – IV: Pipelining

Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch handling techniques, Arithmetic Pipeline Design, Computer arithmetic principles, Static arithmetic pipeline, Multifunctional arithmetic pipelines , Vector Processing Principles: Vector instruction types, Vector-access memory schemes.

### Unit – V: Backplane Bus System & Synchronous Parallel Processing

Backplane Bus System: Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt, Cache addressing models, Direct mapping and associative caches, Synchronous Parallel Processing : SIMD Architecture and Programming Principles, SIMD Parallel Algorithms, SIMD Computers and Performance Enhancement

### SUGGESTED READINGS


- *Kai Hwang, "Advanced computer architecture", TMH.*
- *J.P.Hayes, "computer Architecture and organization", MGH.*
- *Harvey G.Cragon,"Memory System and Pipelined processors"; Narosa Publication.*

## MTCSE 302 (CLOUD ARCHITECTURE AND COMPUTING)

### Unit – I: Cloud Fundamentals

Cloud Computing Fundamental: Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture.

### Unit – II: Developing Cloud Services

Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds, Azure, Google App.

### Unit – III: Using Cloud Services

Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases – Storing and Sharing Files

### Unit – IV: Other Ways to Collaborate Online

Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis

### Unit – V: Cloud Security

Security Concepts: Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defence in depth, least privilege- how these concepts apply in the cloud and their importance in PaaS, IaaS and SaaS. e.g. User authentication in the cloud. Security management standards- SaaS, PaaS, IaaS availability management- access control- Data security and storage in cloud

### SUGGESTED READINGS


- *GautamShroff, Enterprise Cloud Computing Technology Architecture Applications*
- *Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach*
- *Tim Mather, SubraKumaraswamy, ShahedLatif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance*
- *Ronald L. Krutz, Russell Dean Vines, Cloud Security*

## MTCSE 401 (RESEARCH METHODOLOGY)

**Unit – I: Introductory Concepts of Research Methodology**

An introduction, Steps in research, Identification, selection & Formulation of research problem, Hypothesis formulation, Developing a research proposal, Planning your research , Methods of Data Collection, processing and Analysis of data

**Unit – II: Literature Survey**

Finding out about your research area, Literature search strategy, Writing critical reviews, Identifying venues for publishing your research.

**Unit – III: Writing Papers and the Review Process**

Preparing and presenting your paper. The conference review process, Making use of the referees' reports, The journal review process, Group exercise in reviewing research papers.

**Unit – IV: Thesis Writing**

Planning the thesis, Writing the thesis, Thesis structure, Writing up schedule, The Oral examination and Viva Voce.

**Unit – V: Ethical issues and Professional Conduct**

Ethics in general, Professional Ethics, Ethical Issues that Arise from Computer Technology, General Moral Imperatives, More Specific Professional Responsibilities, Organizational Leadership Imperatives.

**SUGGESTED READINGS**


- *Research Methods By Francis C. Dane, Brooks/ Cole Publishing Company, California.*
- *Basic of Qualitative Research By Juliet Corbin & Anselm Strauss, Sage Publications*
- *The Nature of Research: Inquiry in Academic Context By Angela Brew, Routledge Falmer*
- *Research Methods By Ram Ahuja, Rawat Publications*
- *Research Methodology- Methods and Technologies by Kothari C R, Wiley Eastern Ltd.*

## DEPARTMENTAL ELECTIVES (DE)

### MTCSE DE11 (ARTIFICIAL INTELLIGENCE AND ITS APPLICATIONS)

**Unit – I: Problem Solving**

Introduction, Agents, Problem Formulation, Uninformed Search Strategies, Heuristics, Informed Search Strategies, Constraint Satisfaction

**Unit – II: Logical Reasoning**

Logical Agents, Propositional Logic, Inferences, First-Order Logic, Inferences in First Order Logic, Forward Chaining, Backward Chaining, Unification, Resolution, interpretations and satisfiability, normal forms and skolemisation, Modern SAT solvers: DPLL algorithm, non-chronological backtracking, watched literal scheme, branching heuristics. Applications of SAT solvers.

**Unit – III: Planning and Uncertain Knowledge and Reasoning**

Planning with State-Space Search, Partial-Order Planning, Planning Graphs, Planning and Acting in the Real World, Uncertainty, Review of Probability, Probabilistic Reasoning, Bayesian Networks, Inferences in Bayesian Networks, MCMC algorithm, Temporal Models, Hidden Markov Models, Dynamic Bayesian networks

**Unit – IV: Learning**

Learning from observation, Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning

**Unit – V: PROLOG Programming**

Prolog as subset of predicate calculus; Prolog querying as inference rule; Prolog syntax: simple and compound terms, Unification, query evaluation mechanism and search space tree, Meta-level programming: controling backtracking with cut and negation; meta-variables and meta-predicates. Dynamic modification of memory contents. Basic implementation of meta-interpreters and expert systems.

**SUGGESTED READINGS**


- *S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education*
- *David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press*
- *G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Pearson Education*
- *J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers*

## MTCSE DE12 (APPROXIMATION ALGORITHMS)

### Unit – I: NP Hard and NP Complete Problems

Basic Concepts, Cook's Theorem, NP Hard Graph Problems, NP Hard Scheduling Problems, NP-Hard Code Generation Problems.

### Unit – II: Approximation Algorithms

Introduction, Absolute approximations, ε- approximations, Polynomial time approximation Schemes, Fully Polynomial Time Approximation Schemes, Probabilistically Good Algorithms, Probabilistic Recurrence, Basic Power and Efficiency of Randomization and Approximation, Computation Model and Complexity Classes, Reducibility

### Unit – III: Computational Model and Complexity Classes

Game tree; Moments and Deviations - Markov and Chebyshev Inequalities; Tail inequalities - Chenoff bound, martingales; Probabilistic Method; Markov chains and random walks; Algebraic techniques -pattern matching, IP; Applications - Data structures, Linear programming, Graphs, counting, parallel algorithms and online algorithms, Las Vegas algorithm and one Monte Carlo algorithm

### Unit – IV: Various Algorithms

Vertex-Cover, Rent-Or-Buy Problem, Set cover, Steiner tree and TSP, Knapsack, bin packing, Euclidean TSP, LP duality introduction; set cover randomized rounding, Set cover via primal-dual, k-median on a cycle, Max-Sat, Multiway cut, Steiner forest, Group Steiner trees

### Unit – V: Some New Randomized Approximation Algorithms

Approximation algorithm for Max Set Splitting, Approximability of Max k-Horn Sat, Approximating linear equations mod p, Approximation algorithm for Max p-Section,

### SUGGESTED READINGS


- *Vijay Vazirani, Approximation Algorithms, Springer-Verlag*
- *D. Williamson and D. Shmoys, The Design of Approximation Algorithms, Cambridge University Press*
- *Mitzenmacher and Upfal Probability and Computing: Randomized Algorithms and Probabilistic Analysis, Published Cambridge University Press*
- *Rajeev Motwani and Prabhakar Raghavan, Randomized Algorithms, Cambridge*
- *University Press*
- *Vašek Chvátal, Linear Programming, W. H. Freeman and Company*

## MTCSE DE13 (PERFORMANCES MODELING OF COMMUNICATION AND COMPUTER SYSTEMS)

### Unit – I: Introduction

Role of Modeling and Analysis, Examples of Performance Modeling, Analytic Models, Elements of Stochastic process, Poisson Process

### Unit – II: Basic Queuing models

M/M/1; M/M/∞; M/G/ ∞; M/M/m; M/M/m/m Queues with Product formula. Cell and Burst scale

### Unit – III: Traffic Models

Round trip time distribution, PING data, Markov modulated Poisson Process, Long Range Dependence, Heavy Tail Distribution.

### Unit – IV: Traffic Control

Admission Control, Effective Bandwidth, Statistical Multiplexing gain, Access Control: Leaky bucket System.

### Unit – V: Multi access Modelling

Slotted ALOHA Markov chain, Diffusion Approximation Approach, CSMA, Congestion Control, Window Control, Modelling TCP, Window Size, TCP Window Dynamics.

### SUGGESTED READINGS


- *M. N. O. Sadiku, S. M. Musa, Performance Analysis of Computer Networks, Springer*
- *Kaj, Stochastic Modeling in Broadband Communications Systems, SIAM*
- *H. Kobayashi, B. L. Mark, System Modeling and Analysis, Foundations of System Performance Evaluation, Pearson Prentice Hall*
- *M.H. Balter, Performance Modeling and Design of Computer Systems, Cambridge Univ. Press.*

## MTCSE DE14 (REAL TIME SYSTEMS)

**Unit – I: Introduction Definition, Typical Real Time Applications**

Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

**Unit – II: Real Time Scheduling Common Approaches to Real Time Scheduling**

Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

**Unit – III: Resources Access Control**

Effect of Resource Contention and Resource Access Control (RAC), Nonpreemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

**Unit – IV: Multiprocessor System Environment**

Multiprocessor and Distributed System Model, Multiprocessor Priority-Ceiling Protocol, Schedulability of Fixed-Priority End-to-End Periodic Tasks, Scheduling Algorithms for End-to-End Periodic Tasks, End-to-End Tasks in Heterogeneous Systems, Predictability and Validation of Dynamic Multiprocessor Systems, Scheduling of Tasks with Temporal Distance Constraints.

**Unit – V: Real Time Communication**

Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols, Real Time Protocols, Communication in Multicomputer System, An Overview of Real Time Operating Systems.

**SUGGESTED READINGS**


- *Real Time Systems by Jane W. S. Liu, Pearson Education Publication.*
- *Real-Time Systems: Scheduling, Analysis, and Verification by Prof. Albert M. K. Cheng, John Wiley and Sons Publications.*

## MTCSE DE15 (LOGIC IN COMPUTER SCIENCE)

### Unit – I: Probability and Information theory

Axioms and Probability, Bayes' Formula, Expectations of Random Variables, Jointly Distributed Random Variables, Conditional Expectation, Bivariate and multivariate Gaussian distribution, some applications- A list model, A random graph. Limit theorems, random number Generation, Simulating continuous random variables, Monte Carlo integration. Information theory, Measure of uncertainty, Shannon's Measure, Entropy, Joint and Conditional Entropies, Mutual Information , Kullback-Leibler Directed Divergence, Coding theory and Entropy.

### Unit – II: Stochastic Processes

Stochastic Processes and specifications, Stationary Processes, Markov Chains, Markov processes, Poisson Process, Renewal process, Birth and date Process, Random Walk, Brownian motion.

### Unit – III: Queuing Theory and Performance Evaluation

The M/M/1 Queueing System, State dependent M/M/1 Queueing System, M/M/1/N : Finite buffer case, M/M/∞ Queueing system: Infinite number of servers, The M/G/1 Queueing system, Network of Queues, Open networks and Closed networks.

### Unit – IV: Optimization

Modeling with linear programming, Simplex Method, Dual Problem, Integer Linear programming [Branch and bound algorithm], Deterministic dynamic programming [forward and backward recursions], Introduction to nonlinear programming Karush-Kuhn-Tucker (KKT) condition.

### Unit – V: Laplace and Fourier Transforms

Laplace transform, Inverse transform, Linearity, Shifting, Transforms of Derivatives and Integrals, Differential Equations, Convolution and Integral equations. Fourier series, Integrals, and Transforms: Periodic Functions, Trigonometric Series, Fourier series, Forced Oscillations, Fourier transforms.

### SUGGESTED READINGS


- *K.S.Trivedi, "Probability and Statistics with Reliability, Queuing, and Computer Science Applications" John Wiley*
- *E.K.P.Chong and S.H.Zak, "An Introduction to Optimization", John Wiley*
- *S.Ross, "A First Course in Probability", Pearson*
- *E.Kreyszig, "Advanced Engineering Mathematics," Wiley*
- *T.G.Robertazzi, "Computer Networks and systems:Queueing Theory and performance Evaluation", Springer*
- *R.K.Jain and S.R.K.Iyengar, "Advanced Engineering Mathematics", Alpha Science International*
- *J.C.A Van der Lubbe, "Information Theory", Cambridge*
- *H.A.Taha, "Operations Research:An Introduction", Pearson Education*

## MTCSE DE21 (BIG DATA ANALYTICS)

### Unit – I: Introduction to Big Data

Introduction to Big Data Platform, Challenges of Conventional Systems , Web Data, Evolution of Analytic Scalability , Analytic Processes and Tools , Analysis vs Reporting, Modern Data Analytic Tools , Statistical Concepts: Sampling Distributions , Re, Sampling , Statistical Inference , Prediction Error.

### Unit – II: Data Analysis

Regression Modeling , Multivariate Analysis , Bayesian Modeling , Inference and Bayesian Networks , Support Vector and Kernel Methods , Analysis of Time Series: Linear Systems Analysis , Nonlinear Dynamics , Rule Induction , Neural Networks: Learning And Generalization, Competitive Learning , Principal Component Analysis and Neural Networks , Fuzzy Logic: Extracting Fuzzy Models from Data , Fuzzy Decision Trees , Stochastic Search Methods.

### Unit – III: Mining Data Streams

Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing , Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window , Real time Analytics Platform (RTAP) Applications , Case Studies , Real Time Sentiment Analysis, Stock Market Predictions.

### Unit – IV: Frequent Itemsets and Clustering

Mining Frequent Itemsets , Market Based Model, Apriori Algorithm, Handling Large Data Sets in Main Memory, Limited Pass Algorithm, Counting Frequent Itemsets in a Stream, Clustering Techniques, Hierarchical, K, Means, Clustering High Dimensional Data, CLIQUE And PROCLUS, Frequent Pattern based Clustering Methods, Clustering in Non, Euclidean Space, Clustering for Streams and Parallelism.

### Unit – V: Big Data Security Issues

Deploying Big Data for Security, Big Data Technologies and Risks, Regulatory compliance, Breach detection, Best practices for securing an organization’s big data, Dos and don'ts of big data security

### SUGGESTED READINGS


- *Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.*
- *Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge*
- *University Press, 2012.*
- *Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams*
- *with Advanced Analytics”, John Wiley & sons, 2012.*
- *Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007*
- *Pete Warden, “Big Data Glossary”, O’Reilly, 2011.*

## MTCSE DE22 (NETWORK PROGRAMMING)

### Unit – I: Elementary TCP Sockets

Introduction to Socket Programming – Overview of TCP/IP Protocols –Introduction to Sockets – Socket address Structures – Byte ordering functions – address conversion functions – Elementary TCP Sockets – socket, connect, bind, listen, accept, read, write, close functions – Iterative Server – Concurrent Server.

### Unit – II: Application Development

TCP Echo Server – TCP Echo Client – Posix Signal handling – Server with multiple clients – boundary conditions: Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown – I/O multiplexing – I/O Models – select function – shutdown function – TCP echo Server (with multiplexing) – poll function – TCP echo Client (with Multiplexing)

### Unit – III: Socket Options, Elementary UDP Sockets

Socket options – getsocket and setsocket functions – generic socket options – IP socket options – ICMP socket options – TCP socket options – Elementary UDP sockets – UDP echo Server – UDP echo Client – Multiplexing TCP and UDP sockets – Domain name system – gethostbyname function – Ipv6 support in DNS – gethostbyadr function – getservbyname and getservbyport functions.

### Unit – IV: Advanced Sockets

Ipv4 and Ipv6 interoperability – threaded servers – thread creation and termination – TCP echo server using threads – Mutexes – condition variables – raw sockets – raw socket creation – raw socket output – raw socket input – ping program – trace route program.

### Unit – V: Simple Network Management

SNMP network management concepts – SNMP management information – standard MIB's – SNMPv1 protocol and Practical issues – introduction to RMON, SNMPv2 and SNMPv3.

### SUGGESTED READINGS


- *W. Richard Stevens, "UNIX NETWORK PROGRAMMING Vol-I" Second Edition, PHI / Pearson Education*
- *William Stallings, "SNMP, SNMPv2, SNMPv3 and RMON 1 and 2", Third Edition, Addison Wesley*
- *D.E. Comer, "Intrenetworking*

## MTCSE DE23 (ADVANCED SOFT COMPUTING)

### Unit – I: Genetic Modeling and Optimization

Offspring – Encoding - Fitness Function – Reproduction – Crossover - Inverse and Deletion - Mutation Operator - Generational Cycle – Convergences – Application, Least Square Methods for System Identification System Identification Introduction, Basics of Matrix Manipulation and Least Squares Estimators, Recursive Least Squares Estimators, Introduction to Derivative Based Optimization, Introduction to Derivative Free Optimization

### Unit – II: Neuro-Fuzzy Modeling

Introduction to Neuro-Fuzzy Modeling, Approaches of Neuro-Fuzzy Systems, Fuzzy Neural approach, Cooperative Neuro-Fuzzy Approach, Concurrent Neuro-Fuzzy Approach, Hybrid Neuro-Fuzzy Approach, Applications of Cooperative Neuro-Fuzzy Systems

### Unit – III: Advanced Neuro-Fuzzy Modeling

Framework of Adaptive Neuro-Fuzzy Inference Systems(ANFIS), Hybrid Learning Algorithm, Learning Methods, Universal Approximation, Generalized Adaptive Neuro-Fuzzy Inference Systems(ANFIS), Neuro-Fuzzy Spectrum, Analysis of Adaptive Learning Capability, Rule extraction, and Evolution, Evolution of Antecedents, Evolution of Consequents, Evolving Partitions

### Unit – IV: Neuro-Fuzzy Control

Introduction, Feedback control Systems, Neuro-Fuzzy Control, Expert Control, Inverse Learning, Specialized Learning, Back-propagation through Time and Real Time Recurrent Learning, Reinforcement Learning Control, Introduction to Fuzzy Filtered Neural Network 8.

### Unit – V: Other Hybrid System

Genetic–Fuzzy Systems, Genetic Algorithms Controlled by Fuzzy Logic, Fuzzy Evolutionary Systems, Evolving Knowledge Base and Rule Sets, Neuro-Genetic Systems, Neural Network Weight Training, Evolving Neural Nets, Genetic Fuzzy Neural Network

### SUGGESTED READINGS


- *Jang J S R, Sun C T, Mizutani, "Neuro-Fuzzy and Soft Computing", Pearson Education Edition*
- *Akerker and Sajja, MS and Jones and Bartlett, MA, USA, "Knowledge-Based Systems",*
- *Ian Cloete and Jacek Zurada, "Knowledge Based Neuro-Computing" University Press, Massachusetts Institute of Technology, USA*
- *Oscar Cordon, Francisco Herrera, Frank Hoffmann, Luis Magdalena, "Genetic Fuzzy Systems", Word Scientific Publishing Ltd*
- *Sivanandam S N and Deepa S N, "Principles of Soft Computing", Wiley India Edition*

## MTCSE DE24 (CRYPTOGRAPHY)

### Unit-I: Foundations of Cryptography

Foundations (Terminology, Steganography, OSI security architecture, Network security model, Substitution Ciphers and Transposition Ciphers, Simple XOR, One-Time Pads), Mathematical Background (Information Theory, Groups, Rings, Fields, Modular arithmetic, Euclid's algorithm, Finite fields, Polynomial, Prime numbers, Fermat's and Euler's theorem, Testing for primality, The Chinese Remainder theorem, Discrete logarithms

### Unit-II: Cryptographic Techniques

Algorithm Types and Modes (Electronic Codebook Mode, Block Replay, Cipher Block Chaining Mode, Stream Ciphers, Cipher-Feedback Mode, Output-Feedback Mode, Counter Mode, Block Ciphers versus Stream Ciphers, Data Encryption Standard (DES), Advance Encryption Standard (AES),Triple DES, Blowfish, RC5 algorithm), Message authentication functions, Hash functions, Hash Algorithms, MD5, Secure Hash Algorithm (SHA).

### Unit-III: Public Key Algorithms

Principles of Public-Key cryptosystems, RSA algorithm, Diffie -Hellman, Elgamal Cryptosystem Public-Key Digital Signature Algorithm Standard, Key exchange, Elliptic curve arithmetic, Elliptic curve cryptography

### Unit-IV: Key Management & Authentication Protocols

Key Management and Distribution (Symmetric Key Distribution Using Symmetric & Asymteric Encryption, Distribution of Public Keys, X.509 Certificates, Public Key Infrastructure), User Authentication Protocols (Remote User Authentication Principles, Remote User Authentication Using Symmetric & Asymmetric Encryption, Kerberos)

### Unit-V: Security in The Real World

Network & Internet Security, Transport Layer Security, Wireless Network Security, Electronic Mail Security, IP Security, Example Implementations (IBM Secret-Key Management Protocol), Privacy Enhanced Mail (PEM), Pretty Good Privacy (PGP), Smart Cards, Public-Key Cryptography Standards (PKCS), Governing Bodies(National Security Agency (NSA), National Institute of Standards and Technology (NIST), RSA Data Security, Inc.

### SUGGESTED READINGS


- *William Stallings, "Cryptography and Network Security"*
- *Alfred J. Menezes, Paul C. van Oorschot, Scott A. Vanstone, "Handbook Of Applied Cryptography"*
- *Charlie Kaufman, Radia Perlman, Mike Speciner, "Network Security: Private Communication in a Public World"*

## MTCSE DE25 (OPEN SOURCE SOFTWARE)

### Unit – I: Introduction

Introduction to Open sources – Need of Open Sources – Advantages of Open Sources– Application of Open Sources. Open source operating systems: LINUX: Introduction – General Overview – Kernel Mode and user mode – Process – Advanced Concepts – Scheduling – Personalities – Cloning – Signals – Development with Linux. .

### Unit – II: Open Source Database

MySQL: Introduction – Setting up account – Starting, terminating and writing your ownSQL programs – Record selection Technology – Working with strings – Date and Time– Sorting Query Results – Generating Summary – Working with metadata – Usingsequences – MySQL and Web.

### Unit – III: Open Source Programming Languages

PHP: Introduction – Programming in web environment – variables – constants – data;types – operators – Statements – Functions – Arrays – OOP – String Manipulation and regular expression – File handling and data storage – PHP and SQL database – PHP and LDAP – PHP Connectivity – Sending and receiving E-mails – Debugging and error handling – Security – Templates.

### Unit – IV: Python

Syntax and Style – Python Objects – Numbers – Sequences – Strings – Lists and Tuples – Dictionaries – Conditionals and Loops – Files – Input and Output – Errors and Exceptions – Functions – Modules – Classes and OOP – Execution Environment.

### Unit – V: Perl

Perl backgrounder – Perl overview – Perl parsing rules – Variables and Data – Statements and Control structures – Subroutines, Packages, and Modules- Working with Files –Data

### SUGGESTED READINGS


- *Remy Card, Eric Dumas and Frank Mevel, "The Linux Kernel Book", Wiley Publications*
- *Steve Suchring, "MySQL Bible", John Wiley*
- *Rasmus Lerdorf and Levin Tatroe, "Programming PHP", O'Reilly*
- *Wesley J. Chun, "Core Phython Programming", Prentice Hall*
- *Martin C. Brown, "Perl: The Complete Reference", 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint*
- *Steven Holzner, "PHP: The Complete Reference", 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint*

## MTCSE DE31 (DIGITAL IMAGE PROCESSING)

**Unit – I**

**Introduction and Fundamentals:** Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

**Image Enhancement in Spatial Domain:** Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

**Unit – II**

**Image Enhancement in Frequency Domain:** Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

**Image Restoration:** A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

**Unit – III**

**Color Image Processing:** Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation.

**Morphological Image Processing:** Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

**Unit – IV**

**Registration:** Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

**Segmentation:** Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

**Unit – V**

**Feature Extraction:** Representation, Topological Attributes, Geometric Attributes

**Description:** Boundary-based Description, Region-based Description, Relationship.

**Object Recognition:** Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching

### SUGGESTED READINGS


- *Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.*
- *Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.*
- *Fundamentals of Digital Image Processing, A.K. Jain. Published by PrenticeHall, Upper Saddle River, NJ.*

## MTCSE DE32 (MOBILE COMPUTING)

### Unit – I: Evolution of Modern Mobile Wireless Communication System

First Generation Wireless Networks, Second Generation (2G) Wireless Cellular Networks, Major 2G standards, 2.5G Wireless Networks, Third Generation 3G Wireless Networks, Wireless Local Area Networks (WLANs), Cellular –WLAN Integration, All IP Network: Vision for 4G

### Unit – II: GSM: Architecture and Protocols

Air Interface, GSM Multiple Access Scheme, GSM Channel Organization, Traffic Channel multiframe, Control (Signaling) Channel Multiframe, Frames, Multi-frames, Super-frames and Hyper-frames, GSM Call Set up Procedure, GSM Protocols and Signaling, Location Update Procedure, Routing of a call to a Mobile Subscriber

### Unit – III: 2.5G Networks - The General Packet Radio Services: (GPRS)

GPRS Networks Architecture, GPRS Interfaces and Reference Points, GPRS Logical Channel, GPRS Mobility Management Procedures, GPRS Attachment and Detachment Procedures, Session Management and PDP Context, Data Transfer Through GPRS Network and Rout, GPRS Location Management Procedures, GPRS Roaming, The IP Internetworking Model, GPRS Interfaces and Related Protocols, GPRS Applications

### Unit – IV: 3G – The Universal Mobile Telecommunication System (UMTS)

UMTS Network Architecture –Release 99, UMTS Interfaces, UMTS Network Evolution UMTS Release 5, UMTS FDD and TDD, UMTS Channels, Logical Channels, UMTS downlink transport and physical channels, UMTS uplink transport and physical channels UMTS Time Slots, UMTS Network Protocol Architecture, Mobility Management for UMTS Network

### Unit – V: Overview Mobile Internet Protocol

Basic Mobile IP, Mobile IP Type-MIPV4 and MIPv6, Mobile IP: Concept, Four basic entities for MIPv4, Mobile IPv4 Operations, Registration, Tunneling, MIPv4 Reverse Tunneling, MIPv4 Triangular Routing, Problems and Limitations of MIP, MIPv4 Route Cellular and WLAN Integration: Heterogeneous Network Architecture, Step towards 4G

### SUGGESTED READINGS


- *Jochen Schiller,"Mobile Communications",Addison-Wesley.*
- *Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley,*
- *Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", Cambridge University Press*
- *Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden , Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", McGraw-Hill Professional*
- *Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer*

## MTCSE DE33 (MULTIMEDIA AND VIRTUAL REALITY)

**Unit – I: Multimedia**

Architecture and issues for distributed multimedia systems – Digital audio representation and processing – Video Technology – Digital video and image compression – Time based media representation and delivery.

**Unit – II: Multimedia Devices**

Multimedia Services over public networks – Requirements – Architecture – Protocols – Multimedia interchange – Multimedia Conferencing – Multimedia groupware – Computer and video fusion approach to open shared workspaces.

**Unit – III: Multimedia Services**

Operating System support for continuous media applications – Middleware system services architecture – Multimedia devices – Presentation devices and user interface – Multimedia File Systems – Information Models - Multimedia presentation and authoring

**Unit – IV: Virtual Reality Systems**

Virtual environment system: An introduction – terminology – classification – system architecture – synthesis – Physiology & perception in virtual environments – Enabling technology: Visual, Auditory, Haptic/Kinaesthetic environment systems.

**Unit – V: Software**

Desktop virtual reality, VPL RB2 system, virtual environmental operating shell, Minimal Reality, World Tool Kit, Multigen, Generic Visual system – Software considerations - Virtual environment displays – position and orientation tracking – visually coupled system requirements – interaction with virtual objects – applications of virtual environments.

**SUGGESTED READINGS**


- *Antonio S. Camara, "Multimedia and Virtual Reality", Addison Wesley*
- *John F. Koegel Bufford, "Multimedia Systems", Addison Wesley*
- *Roy S. Kalawsky, "The science of Virtual Reality and Virtual Environments", Addison Wesley*
- *Alistair Sutcliffe, "Multimedia and Virtual Reality: Designing Multisensory User Interfaces", Lawrence Erlbaum*
- *Howard Rheingold, "Virtual Reality: The Revolutionary Technology of Computer Generated Artificial Worlds - and How It Promises to Transform Society"*

## MTCSE DE34 (STEGANOGRAPHY AND DIGITAL WATERMARKING)

### Unit – I: Introduction

Watermarking and steganography Steganography - basic concepts, definition, attributes, examples, stego tools available on the Internet Steganographic security – theory - basics of information theory - Cachin's definition of steganographic security

### Unit – II: Data hiding in raw (BMP) images

Color representation (RGB, YUV, HSV, transformations) - LSB (least significant bit) embedding - attacking LSB embedding (Sample Pairs Analysis) - imaging sensors, signal processing in digital cameras - data hiding by mimicking device noise (Stochastic Modulation)

### Unit – III: Data hiding in palette (GIF) & JPEG images

Data hiding in palette (GIF) images - palette formats (GIF) - hiding by decreasing color depth, GIFshuffle, EzStego-like algorithms - optimal palette parity assignment - attack on EzStego-like algorithms (Pairs Analysis), Data hiding in JPEG images - the JPEG format - the simplest JPEG data hiding algorithm – the J-Steg, attacking J-Steg - improving J-Steg (OutGuess), attacking OutGuess - F5 algorithm, matrix embedding, attacking F5 - modeling JPEG coefficients, parameter estimation - model based steganography

### Unit – IV: Block codes and Wet paper codes

Basics of block codes - code length, minimal distance, covering radius - sphere-covering bound, Singleton bound, Maximal Distance Separable codes (MDS) - linear codes, generator matrix, parity-check matrix - Reed Solomon codes - codes for computer memory with defective cells, Wet paper codes - random linear codes - LT codes - perturbed quantization Matrix embedding - Matrix embedding theorem - binary Hamming codes, q-ary case - random linear codes for large payloads

### Unit – V: Universal blind steganalysis based on machine learning

Principles, approaches, ROC curves - feature selection for the JPEG domain, calibration by recompression - blind steganalyzer for JPEG format - attacks using histogram characteristic function - blind spatial domain steganalysis using higher order statistics - blind steganalysis using resampling calibration

### SUGGESTED READINGS


- *J. Fridrich, "Steganography in Digital Media: Principles, Algorithms, and Applications," Cambridge University Press*
- *Cox, M. Miller, J. Bloome, J. Fridrich, and T. Kalker, "Digital Watermarking and Steganography," revised*
- *Michael Arnold, et al., "Techniques and Applications of Digital Watermarking and Content Protection*

## MTCSE DE35 (COMPUTATIONAL GEOMETRY)

### Unit – I: Geometric and Algorithm Basics

Fundamentals of Euclidean and Affine Geometry, Convexity; Basic concepts of Algorithms and its complexity, correctness proofs of algorithms; Paradigms of computational geometric algorithms; Degeneracies in Computational Geometry.

### Unit – II: Convex Hulls

Planar convex hulls definition, deterministic, randomized, output-sensitive and dynamic algorithms; applications of convex hull. Intersection: Plane sweep algorithm for line segment intersection.

### Unit – III: Geometric searching

Segment tree, Interval tree and Priority search tree; Point location query; Range searching -- Kd tree, range tree, fractional cascading; Proximity queries -- Nearest neighbor, closest pair

### Unit – IV: Triangulation and Partitioning

Polygon triangulation -- existence and algorithms, Art Gallery Theorem. Voronoi Diagram and Delaunay Triangulation: Voronoi diagram, Delaunay triangulation and their dual relations; algorithms for computing Voronoi diagram and Delaunay triangulation.

### Unit – V: Duality and Arrangement

Duality relation between points and lines; Arrangements and their applications. Basics of Combinatorial Geometry: Unit distance problem, Point line incidences.

### SUGGESTED READINGS


- *M. de Berg, O. Cheong, M. van Kreveld, and M. Overmars. Computational Geometry: Algorithms and Applications. Springer-Verlag*
- *Preparata and Shamos, Computational Geometry - anintroduction, Springer-Verlag*
- *J. O' Rourke, Computational Geometry in C, Cambridge University Press*
- *Jean-Daniel Boissonnat, Mariette Yvinec, Algorithmic Geometry, Cambridge University Press*

## MTCSE DE41 (STORAGE MANAGEMENT)

### Unit – I: Introduction to Storage and Management

Introduction to Information Storage Management - Data Center Environment– Database Management System (DBMS) - Host - Connectivity –Storage-Disk Drive Components-Intelligent Storage System -Components of an Intelligent Storage System- Storage Provisioning- Types of Intelligent Storage Systems

### Unit – II: Storage Networking

Fibre Channel: Overview - SAN and Its Evolution -Components of FC SAN -FC Connectivity-FC Architecture- IPSAN-FCOE-FCIP-Network-Attached StorageGeneral-Purpose Servers versus NAS Devices - Benefits of NAS- File Systems and Network File Sharing-Components of NAS - NAS I/O Operation -NAS Implementations -NAS File-Sharing Protocols-Object-Based Storage DevicesContent-Addressed Storage -CAS Use Cases.

### Unit – III: Backup and Recovery

Business Continuity -Information Availability -BC Terminology-BC Planning Life Cycle - Failure Analysis -Business Impact Analysis-Backup and Archive - Backup Purpose -Backup Considerations -Backup Granularity - Recovery Considerations - Backup Methods -Backup Architecture - Backup and Restore Operations.

### Unit – IV: Cloud Computing

Cloud Enabling Technologies -Characteristics of Cloud Computing -Benefits of Cloud Computing -Cloud Service Models-Cloud Deployment models-Cloud computing Infrastructure-Cloud Challenges.

### Unit – V: Securing and Managing Storage Infrastructure

Information Security Framework -Storage Security Domains-Security Implementations in Storage Networking - Monitoring the Storage Infrastructure - Storage Infrastructure Management Activities -Storage Infrastructure Management Challenges.

### SUGGESTED READINGS


- *EMC Corporation, "Information Storage and Management", WileyIndia*
- *Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill*
- *Marc Farley, "Building Storage Networks", Tata McGraw Hill*
    - *Meeta Gupta, "Storage Area Network Fundamentals", Pearson Education Limited*

## MTCSE DE42 (REVERSE ENGINEERING)

### Unit – I: Introduction to Reverse Engineering

Forward engineering, reengineering, Reverse Engineering and Object Orientation, A taxonomy of reverse engineering, difficulties in reverse engineering, various approaches of reverse engineering, reverse engineering generic process, Methodologies and techniques of reverse engineering, Reverse Engineering Process: development of a Feature Description, Extraction of Source Model, Abstraction of architectural model, Consolidation and utilization.

### Unit – II: Software maintenance, migration and evolution

Software maintenance: corrective, perfective, and adaptive,. Techniques for reverse engineering, software architecture and design for the purpose of program comprehension, System and process re-engineering, Refactoring, Migration, Impact analysis, Release and configuration management, Models of software evolution, Relationship among evolving entities, Legacy systems.

### Unit – III: Reverse Engineering and Program Understanding

Reverse Engineering Tools and Concepts: The Debugger, Fault Injection Tools, The Disassembler, The Reverse Compiler or Decompiler, Approaches to Reverse Engineering: White Box Analysis, Black Box Analysis, Gray Box Analysis, Methods of the Reverser: Tracing Input, Exploiting Version Differences, Making Use of Code Coverage.

### Unit – IV: Reverse Engineering of Object Oriented Code to UML

Identifying class, Identifying states, identifying methods, identifying inheritance, identifying polymorphism, identifying associations, identifying aggregation, using abstract class.

### Unit – V: Database Reverse Engineering

forward engineering of data structures, Database reverse engineering - A general approach, Data structure extraction, Data structure conceptualization: Elimination of DMS-specific optimization constructs, Un-translating the DMS-compliant schema, Elimination of DMS-independent optimization constructs, Expressing the schema in a higher-level model, Integrating schemas.

### SUGGESTED READINGS


- *Reversing: Secrets of Reverse Engineering by Eldad Eilam*
- *Introduction to Reverse Engineering Software by Mike Perry*
- *Reverse Engineering for Beginners by Dennis Yurichev*

## MTCSE DE43 (PATTERN RECOGNITION)

### Unit – I: Introduction

Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

### Unit – II: Statistical Patten Recognition

Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

### Unit – III: Parameter estimation methods

Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

### Unit – IV: Nonparametric Techniques

Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

### Unit – V: Unsupervised Learning & Clustering

Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

### SUGGESTED READINGS


- *Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", John Wiley*
- *C. M. Bishop, "Pattern Recognition and Machine Learning", Springer*
- *S. Theodoridis and K. Koutroumbas, "Pattern Recognition", Academic Press*

## MTCSE DE44 (COMPUTER GRAPHICS)

### Unit – I: Introduction

Fundamentals of Computer Graphics, Applications of computer graphics. Programming in the Simple raster Graphics Package: Drawing with SRGP, Basic Interaction Handling, Raster Graphics Features, Limitation of SRGP Basic Raster Graphics, Algorithms for Drawing 2D Primitives: Overview, Scan Converting Lines, Scan Converting Circles, Scan Converting Ellipses, Filling Rectangles, Filling Polygons, Filling Ellipse Arcs, Pattern Filling, Thick Primitives, Line Style and Pen Style, Clipping in a Raster World, Clipping lines, Clipping Circles and Ellipses, Clipping Polygens, Generating Characters, SRGP- copy pixel, Antialising.

### Unit – II: Graphics Hardware

Hard copy Technologies, Display Technologies, Raster Scan Display Systems, Video Controller, Random Scan Display Processor, Input Devices for Operator Interaction, Image Scanner Geometrical transformations, 2-D transformations, homogenous coordinates & Matrix Representation of 2-D transformations, Window-to-view port transformation, Efficiency, matrix representation of 3-D transformations, composition of 3-D transformations, Transformations as a change in co-ordinate system.

### Unit – III: Viewing in 3-D

Projections, Specifying an arbitrary 3-D view, Examples of 3-D viewing, Mathematics f planar geometric projections, implementing planar geometric projections, co-ordinate systems Visible surface determination, Visible Surface Detection: Back-Face detection, Depth-Buffer method, The Z-Buffer algorithm, The Painter's Algorithm, Scan line algorithms, Area-subdivision algorithms. Illumination and Surface-Rendering Methods: Basic Illumination models, Halftone patterns and Dithering Techniques, PolygonRendering methods, adding surface details.

### Unit – IV: Advance Raster Display System

Simple Raster Display System, Display Processor System, Standard Graphics Pipeline, Introduction to Multiprocessing, Pipeline Front End Architectures, Parallel Front End Architecture, Multiprocessor Rasterization Architecture, Image Parallel Rasterization, Object Parallel Rasterization, Hybrid Parallel Rasterization, Enhanced Display Capabilities.

### Unit – V: Visible Surface determination techniques

Z- Buffer algorithm, Scanline algorithm, Algorithm for oct-tres, algorithm for curve surfaces visible surfaces, ray tracing, recursive ray tracing

**SUGGESTED READINGS**


- *D. Foley, A.V. Dam, S.K. Feiner, J.F. Hughes, "Computer Graphics – Principles and practice",Addison Wesley*
- *D. Hearn & M.P. Baker, "Computer Graphics", PHI*
- *W.M. Newman, R.F. Sproull,"Principles of Interactive Computer Graphics", McGraw-Hill*
- *R.A. Plastock & G. Kalley, "Computer Graphics", McGraw-Hill*

## MTCSE DE45 (COMPUTER VISION)

### Unit – I: Digital Image Fundamentals

Digital image Representation – Functional Units of an Image processing system. Visual perception – Image Model _ Image sampling and Quantization – grayscale resolution – pixel relationship – image geometry Image Transforms – Unitary Transform, Discrete Fourier Transform, Cosine Transform, Sine Transform, Hadamard Transform, Slant and KL Transform

### Unit – II: Image Enhancement

Histogram processing – Spatial operations – Image smoothing – Image Sharpening – Color Image Processing methods- Color Image Models.

### Unit – III: Image restoration and compression Degradation Model

Discrete Formulation – Circulant matrices – Constrained and Unconstrained restoration geometric transformations fundamentals – Compression Models – Error Free Compression – Lossy Compression – International Image Compression Standards.

### Unit – IV: Image Analysis and Computer Vision: Spatial feature Extraction

Transform feature – Edge detection-Boundary Representation-Region Representation-Moment RepresentationStructure-Shape Features-Texture-Scene Matching and Detection-Image SegmentationClassification techniques-Morphology-Interpolation.

### Unit – V: Sensing 3D shape

how the 3rd dimension changes the problem. Stereo 3D description, 3D model, matching, TINA, Direct 3D sensing-structured light, range finders, range image segmentation Emerging IT applications: Recognition of characters, Fingerprints and facesImage databases.

### SUGGESTED READINGS


- *Image Processing and machine vision-Milan Sonka,Vaclav Hlavae*
- *Pattern Recognition Principles-J.T. Tou and R. C. Gonzalez*
- *Syntactic Pattern Recognition and applications. King Sun Fun 3. Computer vision-Fairhurst (PHI).*
- *Fundamentals of Digital Image Processing-A. K. Jain*

# OPEN ELECTIVES (OE)

## MTCSE OE11 (COMMUNICATION NETWORKS AND SECURITY)

**Unit – I: Introduction on Security**

Security Goals, Types of Attacks: Passive attack, active attack, attacks on confidentiality, attacks on Integrity and availability. Security services and mechanisms, Techniques: Cryptography, Steganography.

**Unit – II: Symmetric & Asymmetric Key Algorithms**

Substitutional Ciphers, Transposition Ciphers, Stream and Block Ciphers, Data Encryption Standards (DES), Advanced Encryption Standard (AES), RC4, principle of asymmetric key algorithms, RSA Cryptosystem

**Unit – III: Integrity, Authentication and Key Management**

Message Integrity, Hash functions: SHA, Digital signatures: Digital signature standards. Authentication: Entity Authentication: Biometrics, Key management Techniques.

**Unit – IV: Network Security , Firewalls and Web Security**

Introduction on Firewalls, Types of Firewalls, Firewall Configuration and Limitation of Firewall. IP Security Overview, IP security Architecture, authentication Header, Security payload, security associations, Key Management. Web security requirement, secure sockets layer, transport layer security, secure electronic transaction, dual signature

**Unit – V: Wireless Network Security**

Security Attack issues specific to Wireless systems: Worm hole, Tunneling, DoS. WEP for Wi, Fi network, Security for 4G networks: Secure Ad hoc Network, Secure Sensor Network

**SUGGESTED READINGS**


- *Behrouz A. Fourcuzan ," Cryptography and Network security" Tata McGraw, Hill*
- *William Stallings,"Cryptography and Network security: principles and practice", Prentice Hall of India*
- *Atul Kahate ," Cryptography and Network security", Tata McGraw, Hill*
- *R. K. Nichols and P.C. Lekkas ," Wireless Security*"

## MTCSE OE12 (INFORMATION SECURITY AUDIT AND ASSURANCE)

**Unit – I**

Essentials of computer security - Sources of security threats – Intruders, Viruses, Worms and related threats - Threat identification - Threat analysis - Vulnerability identification and Assessment - Components of Computer Security - Physical security – System access control - Goals of Security - Efforts to secure computer networks – Ethical issues in Computer SecurityOperational issues, Human issues.

**Unit – II**

Cryptography - Public Key Cryptography – Principles of Public Key Cryptosystems – The RSA Algorithm – Key Management – Authentication – Elements, types and methods – Digital Signature – Intrusion Detection System (IDS) – Types and challenges – Intrusion prevention system (IPS) – Firewalls - Design Principles, Scanning, filtering and blocking.

**Unit – III**

Vulnerabilities – Sources of vulnerabilities, Vulnerability identification and Assessment, Cyber crime and Hackers, Viruses and content filtering - Security Assessment, Analysis and Assurance – Computer network security protocol and standards - Security Policies – Integrity policies – confidentiality policies - Security models - Access Control Matrix Model, Take-Grant Protection Model.

**Unit – IV**

Security Monitoring and Auditing - Assurance and Trust, Need for Assurance, Role of Requirements in Assurance, Audit Assurance in Software Development Phases, Building Secure and Trusted Systems - Designing an Auditing System, Implementation Considerations, Auditing to Detect Violations of a security Policy, Auditing Mechanisms, Audit Browsing.

**Unit – V**

Risk management and security planning – Risk management Process Overview- Cost-Benefit Analysis, Risk Analysis, Laws and Customs, Human Issues, Organizational issues - Information system Risk analysis – System approach to risk management, Threat assessment, Assets and safeguards, modes of risk analysis – Effective risk analysis, Qualitative Risk analysis, Value analysis

**SUGGESTED READINGS**


- *Matt Bishop, "Computer Security: Art and Science", Addison-Wesley Professional*
- *Joseph M.Kizza, "Computer Network security", Springer*
- *Matt Bishop, "Introduction to Computer Security", Addison-Wesley Professional*
- *Thomas R.Peltier, "Information Security Risk Analysis", CRC Press*
- *C.A.Roper, "Risk management for Security professional", Elsevier*

## MTCSE OE13 (BIOMETRICS AND SECURITY)

### Unit – I: Biometrics

Biometrics- Introduction- benefits of biometrics over traditional authentication systems -benefits of biometrics in identification systems-selecting a biometric for a system –Applications - Key biometric terms and processes - biometric matching methods -Accuracy in biometric systems.

### Unit – II: Physiological Biometric Technologies

Physiological Biometric Technologies: Fingerprints - Technical description –characteristics - Competing technologies - strengths – weaknesses – deployment - Facial scan - Technical description - characteristics - weaknesses-deployment - Iris scan - Technical description – characteristics - strengths – weaknesses – deployment - Retina vascular pattern - Technical description – characteristics - strengths – weaknesses –deployment - Hand scan - Technical description-characteristics - strengths – weaknesses deployment – DNA biometrics.

### Unit – III: Behavioral Biometric Technologies

Behavioral Biometric Technologies: Handprint Biometrics - DNA Biometrics - signature and handwriting technology - Technical description – classification - keyboard / keystroke dynamics - Voice – data acquisition - feature extraction - characteristics - strengths – weaknesses-deployment.

### Unit – IV: Multi Biometrics

Multi biometrics: Multi biometrics and multi factor biometrics - two-factor authentication with passwords - tickets and tokens – executive decision - implementation Plan.

### Unit – V: Case Studies

Case studies on Physiological, Behavioral and multifactor biometrics in identification systems.

### SUGGESTED READINGS


- *Samir Nanavathi, Michel Thieme, and Raj Nanavathi, "Biometrics -Identity verification in a network", Wiley Eastern*
- *John Chirillo and Scott Blaul," Implementing Biometric Security", Wiley Eastern Publications*
- *John Berger," Biometrics for Network Security", Prentice Hall*

## MTCSE OE14 (PRINCIPLES OF INFORMATION SECURITY)

### Unit – I: Computer Security Concepts

Introduction-Characteristics of Networks, Security Concepts,–Kinds of security breaches – Threats and Risks, Points of vulnerability, Attacks – Passive and Active, Security Services, Confidentiality, Authentication, Non-Repudiation, Integrity, Access Control, Availability, – Methods of defense – Control measures – Effectiveness of controls, Model for Internetwork Security

### Unit – II: Access Control Models and Encryption techniques

Chinese Wall, Clark-Wilson, Bell-LaPadula, Non Interference and Role Base Model. Encryption techniques – Characteristics of good encryption systems – Secret Key and Public Key Cryptosystems, Symmetric Ciphers, Block Ciphers and Stream Ciphers, DES, IDEA and RSA, cryptanalysis

### Unit – III: Secure sockets and Socket Protocols

Secure sockets – IPSec overview – IP security architecture – IPSec-Internet Key Exchanging (IKE) Real Time communication security – Security standards–. Security protocols – Transport layer protocols – SSL – Electronic mail security – PEM and S/MIME security protocol – Pretty Good Privacy – Web Security - Firewalls design principles – Trusted systems – Electronic payment protocols. Intrusion detection – password management – Viruses and related Threats – Virus Counter measures, Virtual Private Networks.

### Unit – IV: Network Security Applications

Network Security Applications, Authentication Mechanisms: Passwords, Cryptographic authentication protocol, Smart Card, Biometrics, Digital Signatures and seals, Kerberos, X.509 LDAP Directory. Web Security: SSL Encryption, TLS, SET E-mail Security, Pretty Good Privacy (PGPs) / MIME, IP Security, Access and System Security, Intruders, Intrusion Detection and Prevention, Firewall, Hardware Firewall, Software Firewall, Application Firewall, Packet Filtering. , Packet Analysis, Proxy Servers, Firewall setting in Proxy, ACL in Proxy.

### Unit – V: Databases Security Models

Databases Security Models – Introduction Access Matrix Model Take-Grant Model, Bell and LaPadula's Model, The Lattice Model for the Flow Control conclusion

### SUGGESTED READINGS


- *William Stallings, "Network Security Essentials", Pearson Education*
- *Edward Amoroso, "Fundamentals of Computer Security Technology", Prentice-Hall*
- *Charles P. Pleeger, "Security in Computing", Pearson Education*
- *William Stallings, "Cryptography and Network Security: Principles and Standards", Prentice Hall*
- *Database Security by Castano, Silvana; Fugini, Maria Grazia; Martella, Giancarlo, Pearson Edition*

## MTCSE OE21 (ERP (ENTERPRISE RESOURCE PLANNING)

### Unit – I: Introduction to ERP

Overview – Benefits of ERP – ERP and Related Technologies – Business Process Reengineering – Data Warehousing – Data Mining – On–line Analytical Processing – Supply Chain Management.

### Unit – II: ERP Implementation

Implementation Life Cycle – Implementation Methodology – Hidden Costs – Organizing Implementation – Vendors, Consultants and Users – Contracts – Project Management and Monitoring.

### Unit – III: Business Modules

Business Modules in an ERP Package – Finance – Manufacturing – Human Resource – Plant Maintanance – Materials Management – Quality Management – Sales and Distribution.

### Unit – IV: ERP Market

ERP Market Place – SAP AG – PeopleSoft – Baan Company – JD Edwards World Solutions Company – Oracle Corporation – QAD – System Software Associates.

### Unit – V: ERP – Present And Future

Turbo Charge the ERP System – EIA – ERP and E–Commerce – ERP and Internet – Future Directions in ERP.

### SUGGESTED READINGS


- *Alexis Leon, "ERP Demystified", Tata McGraw Hill*
- *Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, "Concepts in Enterprise Resource Planning" , Thomson Learning*
- *Vinod Kumar Garg and N.K .Venkata Krishnan, "Enterprise Resource Planning – concepts and Planning", Prentice Hall*
- *Jose Antonio Fernandz, " The SAP R /3 Hand book", Tata McGraw Hill*

## MTCSE OE22 (SEMANTIC WEB AND SOCIAL NETWORKS)

### Unit – I: Web Intelligence

Thinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

### Unit – II: Knowledge Representation for the Semantic Web

Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web – Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema.

### Unit – III: Ontology Engineering

Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

### Unit – IV: Semantic Web Applications, Services and Technology

Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods,

### Unit – V: Social Network Analysis and semantic web

Social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks. Building Semantic Web Applications with social network features.

### SUGGESTED READINGS


- *Thinking on the Web - Berners Lee, Godel and Turing, Wiley inter scienc*
- *Social Networks and the Semantic Web, Peter Mika, Springer*
- *Semantic Web Technologies, Trends and Research in Ontology Based Systems, J.Davies, R.Studer, P.Warren, John Wiley & Sons*
- *Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)*
- *Information Sharing on the semantic Web - Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications*
- *Programming the Semantic Web, T.Segaran, C.Evans, J.Taylor, O'Reilly, SPD.*

## MTCSE OE23 (OPERATIONAL RESEARCH)

**Unit – I: Queuing Models**

Poisson Process – Markovian Queues – Single and Multi-server Models – Little's formula – Machine Interference Model – Steady State analysis – Self Service Queue.

**Unit – II: Advanced Queuing Models**

Non- Markovian Queues – Pollaczek Khintchine Formula – Queues in Series – Open Queueing Networks –Closed Queueing networks.

**Unit – III: Simulation**

Discrete Even Simulation – Monte – Carlo Simulation – Stochastic Simulation – Applications to Queueing systems.

**Unit – IV: Linear Programming**

Formulation – Graphical solution – Simplex method – Two phase method Transportation and Assignment Problems.

**Unit – V: Non-Linear Programming**

Lagrange multipliers – Equality constraints – Inequality constraints – Kuhn – Tucker conditions – Quadratic Programming

**SUGGESTED READINGS**


- *Winston.W.L. "Operations Research", Fourth Edition, Thomson – Brooks/Cole*
- *Taha, H.A. "Operations Research: An Introduction", Pearson Education Edition, Asia, New Delhi*
- *Robertazzi. T.G. "Computer Networks and Systems – Queuing Theory and Performance Evaluation", Springer*
- *Ross. S.M., "Probability Models for Computer Science", Academic Press*

## MTCSE OE24 (INTRUSION DETECTION AND PREVENTION)

**Unit – I: Introduction**

Understanding Intrusion Detection – Intrusion detection and prevention basics – IDS and IPS analysis schemes, Attacks, Detection approaches –Misuse detection – anamoly detection – specification based detection – hybrid detection THEORETICAL FOUNDATIONS OF DETECTION: Taxonomy of anomaly detection system – fuzzy logic – Bayes theory – Artificial Neural networks – Support vector machine – Evolutionary computation – Association rules – Clustering

**Unit – II: Architecture and Implementation**

Centralized – Distributed – Cooperative Intrusion Detection - Tiered architecture

**Unit – III: Justifying Intrusion Detection**

Intrusion detection in security – Threat Briefing – Quantifying risk – Return on Investment (ROI)

**Unit – IV: Applications and Tools**

Tool Selection and Acquisition Process - Bro Intrusion Detection – Prelude Intrusion Detection - Cisco Security IDS - Snorts Intrusion Detection – NFR security

**Unit – V: Legal Issues and Organizations Standards**

Law Enforcement / Criminal Prosecutions – Standard of Due Care – Evidentiary Issues, Organizations and Standardizations.

**SUGGESTED READINGS**


- *Ali A. Ghorbani, Wei Lu, "Network Intrusion Detection and Prevention: Concepts and Techniques", Springer*
- *Carl Enrolf, Eugene Schultz, Jim Mellander, "Intrusion detection and Prevention", McGraw Hill*
- *Paul E. Proctor, "The Practical Intrusion Detection Handbook ",Prentice Hall*
- *Ankit Fadia and Mnu Zacharia, "Intrusiion Alert", Vikas Publishing house Pvt., Ltd*
- *Earl Carter, Jonathan Hogue, "Intrusion Prevention Fundamentals", Pearson Education*

## MTCSE OE31 (CYBER CRIMES AND CYBER LAWS)

**Unit – I: Introduction to Cyber Law and Cyber Ethics**

Introduction to Cyber Crimes and Ethical Issues in IT, Basic concepts of Law and Information Security, overview of Information Security obligations under ITA 2008, Privacy and data protection concepts.

**Unit – II: Law of Contracts applicable for Cyber Space transactions**

introduction to Contract law, legal recognition of Electronic Documents, Authentication of Electronic Documents, Authentication of Electronic Documents, Cyber space contracts, Resolution of Contractual disputes, stamping of Contractual document.

**Unit – III: Intellectual Property Law for Cyber Space**

Concept of Virtual assests, nature of Intellectual property, Trade marks and domain names, copyright law, law of patents.

**Unit – IV: Law of cyber Crimes**

Different types of Cyber Crimes-Technical Perspective, Provisions of ITA 2008 on Cyber Crimes, System of Adjudication of Contraventions of ITA 2008, case studies.

**Unit – V: Miscellaneous Issues in Cyber Crimes and Cyber Security**

Cyber Crime Investigation and Prosecution, Digital evidence and Cyber forensics, Jurisdiction issues, Information Security Management in corporate Sector.

**SUGGESTED READINGS**


- *Cyber Laws for Engineers, Naavi, Ujvala Consultants Pvt Ltd*
- *Deborah G Johnson, Computer Ethics, Pearson Education Pub*
- *Earnest A. Kallman, J.P Grillo, Ethical Decision making and Information Technology: An Introduction with Cases, McGraw Hill Pub*
- *John W. Rittinghouse, William M. Hancock, Cyber security Operations Handbook, Elsevier Pub.*
- *Michael E. Whitman, Herbert J. Mattord, Principles of Information Security, Cengage Learning Pub.*
- *Randy Weaver, Dawn Weaver, Network Infrastructure Security, Cengage Learning Pub.*

## MTCSE OE32 (STRATEGIC ANALYSIS OF IT)

**Unit – I**

Concepts in Strategic Management, Strategic Vision, Mission, Goals, Objectives, Policies and Core competency Environmental Scanning: Industry and Competitive Analysis - Methods.

**Unit – II**

Evaluating company resources and competitive capabilities SWOT Analysis - Strategy and Competitive advantage Strategic Analysis and Choice: Tools and techniques- Porter's Five Force Model, BCG Matrix, GE Model, Market Life Cycle Model

**Unit – III**

Capability Maturity Model (CMM) and Organisational Learning, Impact Matrix and the Experience Curve, Generic Strategies. Strategy Formulation: Framework for analysing competition, Porter's Value Chain analysis, Competitive Advantage of a Firm, Exit and Entry Barriers;

**Unit – IV**

Types of Strategies: Offensive strategy, Defensive strategy, vertical integration, horizontal strategy; Tailoring strategy to fit specific industry and company situations. Strategy Implementation: Strategy, Structure, Leadership and Culture; Operationalizing and institutionalizing strategy - Strategies for competing in Global markets and Internet economy, Organisational values, Resource allocation and Planning systems for implementation. Turnaround Strategy, Management of Strategic Change, Strategies for Mergers, Acquisitions,

**Unit – V**

Takeovers and Joint ventures Diversification Strategy: Reasons for diversification, Types of diversification strategies, Strategies and competitive advantage in diversified companies and its evaluation. Strategy Evaluation and control - Establishing strategic controls - Measuring performance - using qualitative and quantitative benchmarking methods

**SUGGESTED READINGS**


- *Strategic Management, Concepts and Cases. Thompson & Strickland, Tata McGraw-Hill*
- *Crafting the Strategy: Concepts and Cases in Strategic Management, Ranjan Das, TMH*
- *Business Models: A Strategic Management Approach, Allan Afuah, TMH*
- *Concepts in Strategic Management and Business Policy, Wheelen & Hunger, Pearson Education*

## MTCSE OE33 (DISASTER MANAGEMENT AND MITIGATION)

**Unit – I**

Overview of Natural disasters- Tropical cyclones, Floods, Droughts, Earthquakes & Tsunamis, Severe Thunderstorms & Tornadoes- Need for Disaster Management Plan;

**Unit – II**

Cyclone warning system in India- cyclone disaster management plan, Floods-Flood management in India; Warning system for major river basins-Role of Central Water Commission; Water purification technologies in flood affected areas, Droughts-Meteorological drought and agricultural drought; monsoon long range Forecasts- Drought management plan-parameters & assessment; Drought Monitoring

**Unit – III**

Earthquakes-seismity in India-status of prediction and disaster management; Tsunamis; Landslides and Avalanches; Volcanoes

**Unit – IV**

Hazards associated with convective clouds-Thunderstorms-Lightning; Tornadoes Waterspouts-Hail storms, Aviation hazards and safety measures.

**Unit – V**

Key Factors in Disaster management – Early warning, communications, Response by administration, Disaster Management & Mitigation- National Disaster Management Authority (NDMA) Govt of India, Role of technology in disaster mitigation, applications of GPS, GIS, Remote Sensing and IT in disaster management and mitigation measures.

**SUGGESTED READINGS**


- *Natural Disaster Management: New Technologies and Opportunities by Subir Ghosh; Icfai University Press*
- *Earth and Atmospheric Disasters Management by N.Pandharinath and C.K.Rajan, BS Publication*
- *Natural Hazards and Disaster Management by R.B.Singh; Rawat Publication*
- *Disaster Management –Future Challenges & Opportunities by Jagbir Singh, I.K. International Publishing House.*
- *Earthquake Resistant Design of Structures –Shrikhande & Agrawal, PHI*

## MTCSE OE34 (PROJECT MANAGEMENT & COSTING)

**Unit – I**

Project Feasibility Analysis: Technical feasibility, commercial and financial viability, Environment Analysis. Project Engineering: Project Management Techniques: Network Techniques, PERT, CPM, Project Scheduling Crashing, PERT / COST, Line of Balance (LOB).

**Unit – II**

Projects Financing alternatives, Sources of finance, their advatages, Choice of Financing mix, Capital budgeting. Project Organisation, management and control: Project organisation and control staffing, monitoring: cost, time and control and progress monitoring techniques.

**Unit – III**

Costing: Fixed and variable cost. Marginal Costing, Break even analysis, Overhead allocation Techniques. Product and service pricing: Availability and quality based pricing for services. Capacity planning and expansion, capacity decision considering and models.

**Unit – IV**

Software Project Management – Project Scheduling, Staffing, Software Configuration Management, Quality Assurance, Project Monitoring.

**Unit – V**

Issues in Project Management, Management Functions, Software Project Management Plan, Software Management Structure, Personnel Productivity, Software Project Complexity, Software Metrics – Basic Consideration, Size Oriented and Function Point Oriented; Software Cost Estimation Techniques, Algorithmic Cost Modeling, The COCOMO Model, Project Scheduling, Software Project Planning, Scheduling Risk Management.

**SUGGESTED READINGS**


- *Prasanna Chandra: Project Engineering and Management, Prentic*
- *Levy and Weist: Management guide to PERT / CPM, Prentice Hall*