Syllabus
For
M. Sc. Computer Science
# M. Sc. COMPUTER SCIENCE

(SEMESTER SCHEME)

Course Structure for M. Sc in Computer Science

## I SEMESTER

<table>
<thead>
<tr>
<th>Course code</th>
<th>Name of the Subject</th>
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<tbody>
<tr>
<td>MSC-501</td>
<td>Discrete Mathematics</td>
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<tr>
<td>MSC-502</td>
<td>Introduction to Java and Object Oriented Programming</td>
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<tr>
<td>MSC-503</td>
<td>Computer Architecture</td>
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<tr>
<td>MSC-504</td>
<td>Data Structure</td>
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<tr>
<td>MSC-505</td>
<td>Practical - 1: OOP Using Java</td>
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<tr>
<td>MSC-506</td>
<td>Practical - 2: Data Structures Using C</td>
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## II SEMESTER

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<tr>
<td>MSC-507</td>
<td>Analysis &amp; Design of Algorithms</td>
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<tr>
<td>MSC-508</td>
<td>DBMS</td>
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<tr>
<td>MSC-509</td>
<td>Linux Internals</td>
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<td>MSC-510</td>
<td>Computer Networks</td>
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<td>MSC-511</td>
<td>Practical - 3: ADA and DBMS Laboratory</td>
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<td>MSC-512</td>
<td>Practical - 4: Linux Internals and Network Programming</td>
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## III SEMESTER

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<tr>
<td>MSC-513</td>
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<td>MSC-514</td>
<td>Visual Technologies</td>
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<tr>
<td>MSC-515</td>
<td>Computer Graphics and Visualization</td>
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<tr>
<td>MSC-516</td>
<td>Elective - 1</td>
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<tr>
<td>MSC-517</td>
<td>Mini Project</td>
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## IV SEMESTER

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<tr>
<td>MSC-518</td>
<td>Management Information System and ERP</td>
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<tr>
<td>MSC-519</td>
<td>Elective - 2</td>
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<td>MSC-520</td>
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M.Sc (CS) - FIRST SEMESTER SYLLABUS

MSC-501: DISCRETE MATHEMATICS

MODULE - 1: MATHEMATICAL LOGIC AND SET THEORY

Unit- 1
Introduction, statements and notation- connectives, WFF- tautologies, logical implications, logical equivalence, duality, normal forms.

Unit- 2
Rules of inference, predicate calculus and inference theory7 of the predicate calculus problems.

Unit- 3
Basic concepts of set theory, principles of inclusion and exclusion, mathematical induction.

Unit- 4
Counting principles - rules of sum and products, permutations and combinations, pigeon hole principle - simple problems.

MODULE -2: RELATIONS:

Unit- 5
Properties, relation matrix and digraph of a relation.

Unit- 6
Partition and covering, equivalence relation, compatibility relations, composition of binary relations.

Unit- 7
Manipulation of relations, transitive closures.

Unit- 8
Warshall's algorithm - related problems.

MODULE-3: RECURRENCE RELATION AND GENERATING FUNCTIONS:

Unit- 9
Introduction, linear recurrence relation with constant coefficient (LLR) - backtrack method, homogenous solutions, particular solutions.
Unit- 10
Manipulation of numeric functions and generating functions, solution of LLR by using generating function - problems.

Unit- 11
Functions: Definitions and introduction, various types of functions, composition of functions, inverse function, characteristic function of set.

Unit- 12
Permutation function, hashing function, recursive functions - problems.

MODULE - 4: GRAPH THEORY:

Unit- 13
Introduction, basic terminology, multi graphs of weighed graphs.

Unit- 14
Paths and circuits, Eulerian and Hamiltonian circuits, traveling salesman problem.

Unit- 15
Trees - rooted trees, path lengths in rooted trees, prefix codes, binary search trees.

MSC-503: COMPUTER ARCHITECTURE

MODULE - 1: BASIC STRUCTURE OF COMPUTERS

Unit- 1
Types of computers, functional units, basic operational concepts, bus structures.

Unit- 2
Performance - processor clock, basic performance equation, clock rate, performance measurement, historical perspective.

Unit 3:
Machine instructions and programs - numbers, arithmetic operations and characters.

Unit- 4
Memory location and addresses, memory operations.

MODULE - 2: INSTRUCTIONS

Unit- 5
Instructions and instruction sequencing, addressing modes.

Unit- 6
Assembly language.
Unit- 7
Basic input and output operations, stacks and queues, subroutines.

Unit- 8
Additional instructions, encoding of machine instructions.

MODULE - 3: INPUT/OUTPUT ORGANISATION

Unit- 9
Accessing I/O devices, interrupts - Interrupt hardware, enabling and disabling interrupts.

Unit- 10
Handling multiple devices, controlling device requests, exceptions.

Unit- 11
Direct memory access, buses, interface circuits.

Unit- 12
Standard I.O interfaces - PCI Bus, SCSI Bus, USB.

MODULE - 4: MEMORY SYSTEM:

Unit 13:
Basic concepts, semiconductor RAM memories.

Unit- 14
Read Only Memories (ROM), speed, size, and cost.

Unit- 15
Cache memories - mapping functions, replacement algorithms, performance considerations.

Unit- 16
Virtual memories, secondary storage.

MODULE - 5: ARITHMETIC AND LOGIC UNIT

Unit- 17
Addition and subtraction of signed numbers, design of fast adders.

Unit- 18
Multiplication of positive numbers, signed operand multiplication, fast multiplication.
Unit- 19
Integer division, floating-point numbers and operations.

Unit- 20
Logic operations - Arithmetic Operations on Floating - Point Number.

MODULE - 6: BASIC PROCESSING UNIT

Unit- 21
Some fundamental concepts.

Unit- 22
Execution of a complete instruction.

Unit- 23
Multiple bus organisation.

Unit- 24
Hard wired control, microprogrammed control.

MSC-504: DATA STRUCTURES

MODULE - 1: INTRODUCTION

Unit- 1
Concept of Data Structure and its importance, Relationship with algorithm.

Unit- 2
Classification of data structure, abstract data type/data object (ADT).

Unit- 3
Primitive data types: integers, real, character, Boolean and their representation.

Unit- 4
Arrays - one dimensional and multidimensional arrays storage representation.

MODULE - 2: LINEAR DATA STRUCTURE

Unit- 5
Stacks, Introduction, Stack as ADT, Realization of stacks.

Unit- 6
Applications of Stack, Evaluation of Expressions, Conversion of expressions.

Unit- 7
Recursion - Introduction, examples, Tower of Hanoi problem.
Unit- 8
Queue as ADT, queue applications, dequeue, priority queues.

MODULE - 3: LINEAR DATA STRUCTURE WITH LINKED ALLOCATION

Unit- 9
Linked list, some general linked list operations.

Unit- 10
Singly linked list and its operations.

Unit- 11
Circular and doubly linked list.

Unit- 12
Applications: Polynomial operations, Dictionary Construction; Space matrix multiplication.

MODULE - 4: NON -LINEAR DATA STRUCTURES

Unit- 13
Graphs as a data structure, graph representation based on sequential allocation and linked allocation.

Unit- 14
Binary trees, representation of binary trees based on sequential allocation.

Unit- 15
Representation of binary trees based on linked allocation.

Unit- 16
Traversal of binary tree, operations on binary trees.

MODULE - 5: THREADED BINARY TREES AND FOREST

Unit- 17
Thread binary trees and traversal.

Unit- 18
Representation of forest of trees.

Unit- 19
Traversal of forest.
Unit- 20
Conversion of forest to binary tree.

MODULE - 6: SORTING AND SEARCHING :
Unit- 21
Conventional sort, selection sort, insertion sort.

Unit- 22
Binary search based insertion sort (BSBSI), merge sort, quick sort.

Unit -23:
Heap sort, bucket sort.

Unit- 24
Linear search, binary search, depth first search, breadth first search.

M.Sc. (CS) - SECOND SEMESTER SYLLABUS

MSC-507: ANALYSIS AND DESIGN OF ALGORITHMS

MODULE -1: INTRODUCTION

Unit- 1
Introduction, what is an algorithm, notation for programs, space complexity, time complexity, asymptotic notation.

Unit- 2
Practical complexities, performance measurement.

Unit- 3
Analyzing control structures, using a barometer, supplementary examples.

Unit- 4
Average case analysis, amortized analysis, solving recurrences.

MODULE -2: THE GREEDY METHOD

Unit- 5

Unit- 6
Applications -Container loading, 0/1 Knapsack problem.

Unit- 7
Topological sorting, Bipartite cover.
Unit- 8
Single source shortest paths, Minimum cost spanning trees.

MODULE - 3: DIVIDE AND CONQUER

Unit- 9
The divide- and conquer method, Applications - Defective chessboard.

Unit- 10
Merge sort, quick sort, selection sort.

Unit-11
Closest pair of points, solving recurrence equations.

Unit- 12
Lower bounds on complexity.

MODULE - 4: DYNAMIC PROGRAMMING

Unit- 13
The dynamic programming method, Applications - 0/1 Knapsack problem.

Unit- 14
Image compression.

Unit- 15
Matrix multiplication chains, all pair shortest paths.

Unit- 16
No crossing subset of nets, component folding.

MODULE - 5: BACKTRACKING

Unit- 17
The backtracking method

Unit- 18
Applications - Container loading, 0/1 Knapsack problem.

Unit- 19
Max clique, traveling salesperson.

Unit- 20
Board permutation.
MODULE - 6: BRANCH AND BOUND

Unit- 21
The branch and bound method.

Unit- 22
Applications - Container loading, 0/1 Knapsack problem.

Unit- 23
Max clique, traveling salesperson.

Unit- 24
Board permutation.

MSC-508: DATA BASE MANAGEMENT SYSTEMS

MODULE - 1: INTRODUCTION TO DATA BASE SYSTEMS AND ENTITY - RELATIONSHIP MODEL

Unit- 1
Overview; A historical perspective; File Systems Verses a DBMS; advantages of a DBMS; levels of abstraction in a DBMS;

Unit- 2
Data Independences; Structure of a DBMS; People who deal with Databases and architecture.

Unit- 3
Using High-level Conceptual Data models for Database Design; An Example Database Application; Entity types, Entity Sets, Attributes and Keys; Relationships, relationship types, Roles and Structural constraints;

Unit- 4
Weak Entity types; ER Diagrams, Naming conventions and Design issued and Problems on ER modeling.

MODULE -2: RELATIONAL MODEL AND SQL PROGRAMMING

Unit – 5:
Relational model Concepts; Relational Constraints and Relational Database Schemes; Update operations and Dealing with Constraints Violations;

Unit- 6
Basic Relational Algebra Operations; Additional Relational Operations; Examples of Queries in Relational Algebra.
Unit- 7
Data Definitions Constraints and Schemes Changes in SQL; Basic Queries in SQL;

Unit- 8
Insert, Delete and Update Statements in SQL; Views in SQL; specifying General constraints as Assertion; Additional Features of SQL.

MODULE -3: DATABASE DESIGN

Unit- 9
Informal Design Guidelines for Relation Schemes; Functional Dependencies;

Unit- 10
Axiomatization of functional dependencies and Armstrong axioms.

Unit- 11
Normal Forms; general definitions of Second and Third Normal Forms; Boyee -cold Normal Forms;

Unit- 12
Algorithms for Relational Database Scheme Design.

MODULE -4: CONCEPT OF STORAGE AND IDEXING

Unit- 13
Data on External Storage; File Organization and Indexing;

Unit- 14
Clustered Indexes, primary and Secondary Indexes;

Unit- 15
Index Data Structures; Hash-based indexing.

Unit – 16:
Tree-based Indexing, Comparison of File organizations.

MODULE -5: TRANSACTION MANAGEMENT & RECOVERY TECHNIQUES

Unit- 17
The ACID properties: Consistency and Isolocation; Atomicity and Durability Transaction an Schedules;

Unit- 18
Concurrent Execution of Transactions; Motivation for concurrent Execution, Serializibility, Anomalies due to Interleaved Execution, Schedules Involving aborted Transactions.
Unit- 19
Lack based Concurrency Control; Strict Two Phase Locking, Deadlocks; Performance of locking;

Unit- 20
Transaction Support in SQL; Creating and Terminating Transactions, Introduction to Crash recovery; Stealing Frames and Forcing Pages, Recovery-Related Steps during Normal Execution, Overview of ARIES recovery algorithm, Atomicity.

MODULE - 6: CASE STUDIES

Unit- 21
Oracle: Database Design and Querying Tools; SQL Variations and Extensions; Storage and Indexing; Query Processing and Optimization;

Unit- 22
Oracle: Concurrency Control and Recovery; System Architecture, Replication, Distribution and External Data; Database Administration Tools.

Unit- 23
IBM DB2: Universal database; Database Design and Querying Tools; SQL Variations and Extensions Storage and Indexing; Query Processing and Optimization;

Unit- 24
IBM DB2: Concurrency Control and Recovery; System Architecture; Replication, Distribution and External Data; Database Administration Tools.

MSC-509 - LINUX INTERNALS

MODULE -1

Unit- 1
Main Characteristics, Linux Distributions.

Unit- 2
Compiling the Kernel-where is everything? Compiling, Additional configuration facilities.

Unit- 3
INTRODUCTION TO THE KERNEL: Important data structures, Main algorithms.

Unit-4
Implementation of few system calls.
MODULE -2

Unit- 5
Memory Management: The architecture - independent memory model.

Unit- 6
The virtual address space of a process, Block device caching, Paging under Linux.

Unit- 7
Fundamentals of Interprocess Communication.

Unit- 8
Synchronization in the Kernel, Communication via files, Pipes, Debugging using ptrace.

MODULE -3

Unit- 9

Unit- 10
The Ext2 file system, The proc file system

Unit- 11
DEVICE DRIVERS UNDER LINUX; Character and block devices, Hardware, polling.

Unit- 12
Interrupts and waiting queues.

MODULE -4

Unit- 13
Implementing a driver, Dynamic and static drivers.

Unit- 14
Network Implementation, Introduction and overview, Important structures, Network devices under Linux.

Unit- 15
Modules and Debugging: what are Modules? Implementation in the Kernel, the meaning of object sections for modules and kernels, Parameter transfer and examples.

Unit - 16
What can be implemented as a module? The Kernel daemon, simple data swapping between modules, an example module, Debugging.
MODULE - 5

Unit - 17
Kernel Related Commands, Free-overview of the system's memory, ps-output of process statistics, top-the CPU charts.

Unit - 18
Init-primus inter pares, shutdown-shutting down the system, trace-monitoring a process.

Unit - 19
Configuring the network interface, trace - route - Ariadne's paths in the internet, configuring a serial interface.

Unit - 20
Configuring a parallel interface, building a directory tree.

MODULE - 6

Unit - 21
The Proc file system: The PROC / directory.

Unit - 22
The Self / directory, the SYS / directory.

Unit - 23
The Booting Process: Carrying out the booting process.

Unit - 24
LILO - the LINUX loader.

MSC - 510: COMPUTER NETWORKS

MODULE - 1: INTRODUCTION

Unit - 1
Network hardware, Network software.

Unit - 2
Reference Models: OSI and TCP

Unit - 3

Unit - 4
Network Standardization.
MODULE - 2: THE PHYSICAL LAYERS AND TRANSMISSION

Unit - 5
Analog and Digital Signals: Transmission, impairment.

Unit - 6
Digital to Digital, Analog to Digital, Digital to Analog.

Unit – 7:
Guided transmission media - Magnetic media, twisted pair, Co-axial cable, Fiber optics.

Unit - 8
Wireless transmission: The electromagnetic spectrum, Radio transmission, Microwave transmission, Infrared.

MODULE - 3: DATA LINK LAYER

Unit - 9
Design Issues, Framing, Error control, Flow control.

Unit - 10
Error detection and correction; error correcting codes, error detecting codes.

Unit - 11
Elementary data link protocols; simplex protocol, A simplex stop and wait protocol, A simplex protocol for a Noisy channel, Sliding window protocol.

Unit - 12
Example data link protocols: HDLC, point to point protocol.

MODULE - 4: THE MEDIUM ACCESS CONTROL SUB LAYER

Unit - 13
Multiple Access protocols - CSMA, collision free protocols.

Unit - 14

Unit - 15
Bridges, Repeaters.

Unit - 16
Virtual LANS
MODULE - 5: THE NETWORK LAYER

Unit - 17
Network layer design issues.

Unit - 18
Routing Algorithms

Unit - 19
Congestion control Algorithms.

Unit - 20
Internetworking

MODULE - 6

Unit - 21
DNS - Resource records, Name servers.

Unit - 22
e-mail - Architecture and services.

Unit - 23

Unit - 24
Multimedia - Compression, Steaming, VOIP

M.SC (CS) - THIRD SEMESTER SYLLABUS

MSC - 513: SOFTWARE ENGINEERING

MODULE - 1: INTRODUCTION

Unit - 1
FAQs about software engineering professional and ethical responsibility, computer based system engineering

Unit - 2
Emerging system properties, systems and their environment, system modeling, the system engineering process, system procurement.

Unit - 3
Software process: software process models, process iteration, software specification.
Unit - 4
Software design and implementation, software evolution, software validation, automated process support.

MODULE - 2: REQUIREMENT ENGINEERING

Unit - 5
Software requirements: functional and non-functional requirements, user requirements, System requirements, the Software requirement management.

Unit - 6
Requirement engineering process: feasibility studies, requirements elicitation and analysis, requirements validation, requirement management.

Unit - 7
System models: context models, behavioral models, data models, object models and CASE workbenches.

Unit - 8
Software engineering prototypes: prototyping in software process, rapid prototyping techniques, user interface prototyping.

MODULE - 3: SOFTWARE DESIGN

Unit - 9
Architectural design: system structuring, control models, modular decomposition, domain specific architectures.

Unit - 10
Object oriented design: objects and object classes, an object oriented design process, design evolution.

Unit - 11
User interface design: user interface design principles.

Unit - 12
User interaction, information presentation, user support, interface evolution

MODULE - 4: SOFTWARE TESTING

Unit - 13
Verification and validation: verification and validation planning

Unit - 14
Software inspections, automated static analysis clean room software development
Unit - 15
Software testing: Defect testing, Integration testing.

Unit - 16
Object oriented testing, Testing workbenches.

MODULE - 5: MANAGEMENT

Unit - 17
Project Management: Management activities, project planning.

Unit - 18
Project scheduling, risk management.

Unit - 19
Managing People: Limits of thinking, Group working, Choosing and keeping people.

Unit - 20
The people capability maturity model.

MODULE - 6: COST ESTIMATION AND QUALITY MANAGEMENT

Unit - 21
Software cost estimation: Productivity, estimation techniques.

Unit - 22
Algorithmic cost modeling, project duration and staffing.

Unit - 23
Quality management: Quality assurance and standards, Quality Planning, Quality control, Software measurements and metrics.

Unit - 24
Critical systems: Critical system, Availability and reliability, safety and security.

MSC-514: VISUAL TECHNOLOGIES

MODULE - 1: THE PHILOSOPHY OF NET

Unit - 1
Understanding the Previous State of Affairs, The NET Solution, The Building Block of the. NET Platform (CLR, CTS, and CLS), The Role of the. NET Base Class Libraries, What C# Brings to the Table, An Overview of. NET Binaries (aka Assemblies), the Role of the Common Intermediate Language.
Unit - 2
The Role of .NET
Type Metadata, The Role of the Assembly Manifast, Compiling CIL to Platform - Specific Instructions, understanding the Common Type System, Intrinsic CTS Data Types, Understanding the Common Languages Specification, Understanding the Common Language Runtime.

Unit - 3

Unit - 4
Building C# Applications

MODULE - 2

Unit - 5
C# Language Fundamentals
The Anatomy of a Basic C# Class, Creating objects: Constructor Basics, The Composition of a C# Application, Default Assignment and Variable Scope. The C# Member Initialization Syntax, Basic Input and Output with the Console Class.

Unit - 6

Unit - 7
C# Iteration Constructs, C# Controls Flow Constructs, The Complete Set of C# Operators, Defining Custom Class Methods, Understating Static Methods, Methods Parameter Modifies.

Unit - 8
Array Manipulation In C#, String Manipulation in C#, C# Enumerations, Defining Structures in C#, Defining Custom Namespaces.
MODULE - 3

Unit - 9
Object - Oriented Programming with C#
Forms Defining of the C# Class, Definition the "Default Public Interface" of a Type, Recapping the Pillars of OOP, The First Pillars: C#'s Encapsulation Services, Pseudo-Encapsulation: Creating Read - Only Fields.

Unit - 10
The Second Pillar
C#'s Inheritance Supports, keeping Family Secrets: The "Protected" Keyword, Nested Type Definitions, The Third Pillar: C#'s Polymorphic Support, Casting Between.

Unit - 11
Exceptions and object Lifetime
Ode to Errors, Bugs, and Exceptions, The Role of. Net Exception Handing, the System. exception Base Class, Throwing a Generic Exception, Catching Exception, CLR System - Level Exception (system. System Exception), Custom Application -Level Exception (System. System Exception), Handling Multiple Exception.

Unit - 12
The Family Block, The Last Change Exception dynamically Identifying Application - and System Level Exception Debugging System Exception Using US. NET, Understanding Object Lifetime, the CIt of "new", The Basics of Garbage Collection, Finalization a Type, The Finalization Process, Building an Ad Hoc Destruction Method, Garbage Collection Optimizations, The System, GC Type.

MODULE-4

Unit - 13
Interfaces and Collections
Defining Interfaces Using C# Invoking Interface Members at the object Level, Exercising the Shapes Hierarchy.

Unit - 14
Understanding Explicit Interface Implementation, Interfaces As Polymorphic Agents.

Unit - 15
Building Interface Hierarchies, Implementing Implementation, Interfaces Using Vs .NET, understanding the I convertible Interface, Building a Custom Enumerator (IE numerable and Enumerator), Building Cloneable objects (ICloneable), Building Comparable Objects (I Comparable), Exploring the system. Collections Namespace, Building a Custom Container (Retrofitting the Cars Type).

Unit - 16
Callback Interfaces, Delegates, and Events, Advanced Techniques.
Understanding Callback interfaces, Understanding the .Net Delegate Type, Members of System. Multicast Delegate.

**MODULE - 5**

**Unit - 17**
The Simplest Possible Delegate Example, Building More a Elaborate Delegate Example, Understanding Asychronous Delegates. Understanding (and Using) Events. The Advances Keywords of C# A Catalog of C# Keywords Building a Custom Indexer.

**Unit - 18**
A Variation of the Cars Indexer Internal Representation of Type Indexer. Using C# Indexer from VB .NET.

**Unit - 19**
Overloading operators, The Internal Representation of Overloading Operators, interacting with Overload Operator from overloaded - Operator - Challenged Languages, Creating Custom Conversion Routines.

**Unit - 20**
Defining Implicit Conversion Routines, The internal Representations of Customs Conversion Routines.

**MODULE - 6: UNDERSTANDING NET ASSEMBLES**

**Unit - 21**

**Unit - 22**

**Unit - 23**
Understanding Private Assemblies, Probing for Private Assemblies (The Basics), Private A Assemblies XML Configuration Files, Probing for Private Assemblies (The Details). Understanding Shared Assembly, Understanding Shared Names, Building a Shared Assembly, Understanding Delay Signing, Installing / Removing Shared Assembly, Using a Shared Assembly.
MSC-515: COMPUTER GRAPHICS AND VISUALIZATION

MODULE - 1: INTRODUCTION

Unit - 1
Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; The synthetic camera model;

Unit - 2
The programmer's interface; Graphics architectures;

Unit - 3
Programmable pipelines; Performance characteristics.

Unit - 4
Graphics Programming: The Sierpinski gasket; Programming two-dimensional applications.

MODULE - 2: OPENGL

Unit - 5
THE OPENGL: the OpenGL API; Primitives and attributes; Color; Viewing;

Unit - 6
Control functions; The Gasket program;

Unit - 7
Polygons and recursion;

Unit - 8
The three-dimensional gasket; plotting implicit functions.

MODULE - 3: INPUT AND INTERACTION

Unit - 9
Interaction; Input devices; Clients and servers; Display lists; Display lists and modeling; Programming event-driven input; Menus; Picking;

Unit - 11
A simple CAD program; Building interacting models; Animating interactive programs;

Unit - 12
Design of interactive programs; Logic operations.
MODULE - 4: GEOMETRIC OBJECTS AND TRANSFORMATIONS

Unit - 13
Scalars, points, and vectors; Three-dimensional primitives; Coordinate systems and frames; Modeling a colored cube;

Unit - 14
Affine transformations; Rotation, translation and scaling.

Unit - 15
Transformations in homogeneous coordinates; Concatenation of transformations;

Unit - 16
OpenGL transformation matrices; Interfaces to three-dimensional applications; Quaternions.

MODULE - 5: VIEWING

Unit - 17
Classical and computer viewing; Viewing with a computer; Positioning of the camera; Simple projections;

Unit - 18
Projections in OpenGL; Hidden-surface removal; Interactive mesh displays; Parallel-projection matrices; Perspective-projection matrices; Projections and shadows.

Unit - 19
LIGHTING AND SHADING: Light and matter; Light sources; The Phong lighting model; computation of vectors; Polygonal shading; Approximation of a sphere by recursive subdivisions;

Unit – 20:
Light sources in OpenGL; Specification of materials in OpenGL; Shading of the sphere model; Global illumination.

MODULE - 6: IMPLEMENTATION

Unit - 21
Basic implementation strategies; The major tasks;

Unit - 22
Clipping; Line-segment clipping; Polygon clipping; Clipping of other primitives;

Unit - 23
Clipping in three dimensions; Rasterization; Bresenham's algorithm;
MSCS-516: ELECTIVE-1

The candidate can chose any of the courses listed under ELECTIVE-1 clause.

MASC-517: MINI PROJECT

M.SC (CS)-FOURTH SEMESTER SYLLABUS

MSCS-518: MANGEMENT INFORMATION SYSTEMS AND ERP

MODULE - 1

Unit - 1
Introduction to Management Information Systems:

Unit - 2
Role and Importance of management
Introduction to Management; Approaches to Management; Functions of the Manager; Managers and the Environment; Management as a control System; Management by Exception; MIS: A support to the Management.

Unit - 3
Process of Management
Management Effectiveness; Planning, Organizing, Staffing; Coordination and Directing, Controlling; MIS: A Tool for Management Process.

Unit - 4
Organization Structure and Theory
Basic Model or Organization Structure; Modifications to the Basic Model of Organization Structure; Organizational Behavior; Organization as a system; MIS Organization.

MODULE - 2

Unit - 5
Strategic Management of Business
The concept of Corporate Planning; Essentiality of Strategic Planning. Development of the Business Strategic; Type of Strategies. Short range Planning; Tools of Planning; MIS: Business Planning.
Unit - 6
Decision making
Decision Making concepts
Decision Methods, Tools and Procedures
Behavioral Concepts in Decision Making
Organizational Decision Making
MIS and Decision Making Concepts.

Unit - 7
Information
Information Concepts
Information: A Quality Product
Classification of the Information
Methods of Data and Information Collection
Value of the Information

Unit - 8
General Model of a Human as an Information Processor Summary of Information Concepts and their Implications Organization and Information MIS and the Information Concepts

MODULE - 3

Unit - 9
Systems
System Concepts Systems Control Types of System Handling System Complexity

Unit - 10
Post Implementation Problems in a System System Stress and system Change MIS and System Concepts

Unit - 11
Development of MIS
Development of Long Range Plans of the MIS Ascertaining the class of Information Determining the Information Requirement Development and Implementation of the MIS

Unit - 12
Management:
Management of Quality in the MIS Organization for Development of the MIS MIS: The factors of Success and Failure

MODULE - 4

Unit - 13
Choice of Information Technology Nature of IT Decision Strategic Decision Configuration Design
Evaluation
Information Technology Implementation Plan Choice of the 'Information Technology' and the 'MIS'

Unit - 15
Decision Support System
Decision Support System: Concept and Philosophy DSS: Deterministic Systems

Unit - 16
AI and KBES
Artificial Intelligence System Knowledge Based Expert System MIS and the Role of DSS

MODULE - 5

Unit - 17
Introduction
Introduction to ERP, The Enterprise, Benefits of ERP

Unit - 18
Technologies:
ERP and Related Technologies, BPR

Unit - 19
Data Mining
Data Warehousing, Data Mining, OLAP

Unit - 20
Overview of Supply Chain Management.

MODULE - 6

Unit - 21
ERP implementation lifecycle, Implementation Methodology.

Unit - 22
Package selection, ERP implementation - The Hidden Costs, Organizing the Implementation.

Unit - 23
Vendors, consultants and Users, Contracts with Vendors, Consultants and Employees.

Unit - 24
Project Management and Monitoring, After ERP Implementation.
MSCS-519: ELECTIVE-2

The candidate can chose any of the courses listed under ELECTIVE-2 Clause.

MSCS-520: MAJOR PROJECT

Methodology
Model of the dissertation will be available in the website: www.soumysore.edu.in. Minimum pages in the thesis should not be less than 60 pages. The prototype (Working Model) developed as a project should be demonstrated during the project viva-voce examination.

ELECTIVE-1

MSCS-516A: DATA MINING

MODULE-1: INTRODUCTION TO DATA WAREHOUSING

Unit - 1
What is data warehouse? A multidimensional data model.

Unit - 2
Data warehouse architecture

Unit - 3
Data warehouse implementation

Unit - 4
Data cube technology

MODULE-2: INTRODUCTION TO DATA MINING

Unit - 5
From data warehousing to data mining

Unit – 6:
Data mining functionalities, data cleaning

Unit - 7
Data integration and transformation

Unit - 8
Data reduction
MODULE-3: DATA MINING PRIMITIVES, LANGUAGES AND SYSTEM ARCHITECTURES

Unit - 9
Data mining primitives

Unit - 10
Presentation and visualization and discovered patterns.

Unit - 11 & 12
A data mining query language.

MODULE-4: MINING ASSOCIATION RULES IN LARGE DATA BASES TRANSLATION

Unit - 13
Association rule mining

Unit - 14
Single-dimensional Boolean association rules from transactional data bases.

Unit - 15 & 16
Mining multilevel association rules from transactional databases.

MODULE-5: CLASSIFICATION AND PREDICTION

Unit - 17
What is cluster analysis? Types of cluster analysis.

Unit - 18
A categorization of major clustering methods, partitioning methods, hierarchical methods.

Units - 19
Density based methods, model-based clustering methods: statistical approach.

Unit - 20
Neural network approach, outliner analysis.

MODULE-6: APPLICATION AND TRENDS IN DATA MINING

Unit - 21
Data mining application, data mining system products and research prototypes.

Unit - 22
Additional themes on data mining.
Unit - 23
Data mining and intelligent query answering.

Unit - 24
Trends in data mining.

MSCS-516B: SIMULATION AND MODELING MODULE-1: INTRODUCTION TO SIMULATION

Unit - 1
When simulation is the appropriate tool; when simulation is not appropriate; advantages and disadvantages of simulation; areas of application.

Unit - 2
Systems and system environment; components of a system; discrete and continuous systems.

Unit - 3
Model of a system; types of models; discrete-event system simulation; steps in a simulation; steps in a simulation study.

Unit - 4
Simulation examples; characteristics of queuing systems; queuing notation; simulation of queuing system; simulation of inventory systems.

MODULE-2: GENERAL PRINCIPLES

Unit - 5
Concepts in discrete-event simulation.

Unit - 6
The event-scheduling/time-advance algorithm.

Unit - 7
World views.

Unit - 8
Manual simulation using event scheduling.

MODULE-3: RANDOM-NUMBER GENERATION

Unit - 9
Properties of random numbers, generation of pseudo-random numbers.
Unit - 10
Techniques for generating random numbers, tests for random numbers.

Unit - 11
Random variate generation; inverse transform technique; exponential distribution, uniform distribution.

Unit - 12
Discrete distribution; acceptance-rejection technique; Poisson distribution.

MODULE-4: INPUT MODELING

Unit-13
Data collection; identifying the distribution with data; parameter estimation.

Unit - 14
Goodness of fit tests.

Unit - 15
Selecting input models without data.

Unit - 16
Multivariate and time-series input models.

MODULE-5: OUTPUT ANALYSIS FOR A SINGLE MODEL

Unit - 17
Type of simulations with respect to output analysis.

Unit - 18
Stochastic nature of output data; measures of performance and their estimation.

Unit - 19
Output analysis for terminating simulations.

Unit - 20
Output analysis for steady-state simulation.

MODULE-6: VERIFICATION AND VALIDATION OF SIMULATION MODELS

Unit - 21
Model building, verification and validation; verification of simulation Models; calibration and validation of models.
Unit - 22
Simulation of computer systems: Introduction; Simulation tools; model input; high-level computer system simulation.

Unit - 23
CPU simulation.

Unit - 24
Memory simulation.

MSCS-516C: THEORY OF COMPUTATION

MODULE-1: INTRODUCTION TO FINITE AUTOMATA

Unit - 1
Introduction to Finite Automata, the central concepts of Automata theory, deterministic finite automata.

Unit - 2
Non-deterministic finite automata, and application.

Unit - 3
Finite automata with Epsilon transitions and conversion from NFA to DFA.

Unit - 4
Various problems on NFA/DFA design.

MODULE-2: REGULAR LANGUAGES

Unit - 5
Regular Expression, Finite Automate and Regular Expressions.

Unit - 6
Applications of Regular Expressions, Proving languages not to be regular.

Unit - 7
Closure Properties of Regular Languages, Decision Properties of Regular Languages.

Unit - 8
Construction of NFA/DFA for a regular expression and Equivalence and minimization of automata.

MODULE-3: CONTEXT-FREE GRAMMARS AND PUSHDOWN AUTOMATA

Unit - 9
Context-free grammars, Parse trees, Applications.
Unit - 10
Ambiguity in grammars and languages and method resolving ambiguity.

Unit - 11
Definition of the Pushdown automata, The languages of a PDA.

Unit - 12
Equivalence of PDA's and CFG's. Deterministic Pushdown Automata.

MODULE-4: PROPERTIES OF CONTEXT FREE LANGUAGES

Unit - 13
Elimination of none productions and unit productions.

Unit - 14
Elimination of useless symbols and Normal forms for CFGs.

Unit - 15
The pumping lemma for CFGs, proving a language not to be context free.

Unit - 16
Closure properties of CFLs and associated theories.

MODULE-5: INTRODUCTION TO TURING MACHINES

Unit - 17
Problems that computers cannot solve, introduction to the Turing Machine.

Unit - 18
Programming techniques for Turing machines, extension to the basic Turing machine.

Unit - 19
Restricted Turing Machine, Turing Machine and Computers;

Unit - 20
Introduction to un-decidability and its significance.

MODULE-6: INTRODUCTION TO COMPILERS

Unit - 21
Different stages of Compilation and typical architecture of a compiler.

Unit - 22
Design of Lexical analyzers, Patterns, tokens and lexemes.
Unit - 23
Syntactic analysis and semantic analysis.

Unit - 24

**ELECTIVE-2**

**MSCS-519A: IMAGE PROCESSING**

**MODULE-1: INTRODUCTION**

**Unit - 1**
Motivation and perspective, Applications, A simple Image formation Model.

**Unit - 2**
Fundamental steps in digital image processing system, components of an image processing system.

**Unit - 3**
Elements of visual perception, Image sensing and acquisition, Image sampling and quantization.

**Unit - 4**
Basic relationship between pixels-Neighbors of a pixel, Adjacency, Connectivity, Regions and Boundaries, Distance Measures, Image Operations on a Pixel Basis.

**MODULE-2: IMAGE ENHANCEMENT**

**Unit - 5**
Introduction, Basic gray level transformations, Histogram processing, Arithmetic/Logical operations.

**Unit - 6**
Smoothing spatial filters, sharpening spatial filters.

**Unit - 7**
Fourier Transform and the Frequency Domain, Filtering in the Frequency Domain, Smoothing Frequency domain Filters, Sharpening Frequency Domain Filters.

**Unit - 8**
Homomorphic Filtering, The Convolution and Correlation Theorems.
MODULE-3: RESTORATION

Unit - 9
Image degradation/restoration process, noise models.

Unit – 10
Restoration in the Presence of Noise only Spatial Filtering, Estimating the Degradation Function.

Unit - 11
Inverse filtering, minimum mean square error filtering, geometric mean filter.

Unit - 12
Geometric transformations.

MODULE-4: COLOR IMAGE PROCESSING

Unit - 13
Color Fundamentals, Color Models.

Unit - 14
Pseudocolor Image Processing, Basics of full Color Image Processing.

Unit - 15
Color Transformations.

Unit - 16
Smoothing and Sharpening, Color Segmentation.

MODULE-5: MORPHOLOGICAL IMAGE PROCESSING AND IMAGE SEGMENTATION

Unit - 17
Dilation and erosion, opening and closing.

Unit - 18
Hit-or-Miss transformations, basic morphological algorithms.

Unit - 19
Detection of discontinues.

Unit - 20
Edge linking and boundary detection, thresh holding, region-based segmentation.
MODULE-6: IMAGE ANALYSIS AND COMPUTER VISION

Unit - 21
Spatial feature extraction, transform features

Unit - 22
Edge detection, boundary extraction, boundary and region representation

Unit - 23
Shape features, textures, classification techniques

Unit - 24
Image understanding

MSCS-519B: INTERNET TECHNOLOGIES

MODULE-1: PERL, CGI PROGRAMMING

Unit - 1
Origins and uses of Perl; Scalars and their operations; Assignment statements and simple input and output; Control statements;

Unit - 2
Fundamental of arrays; Hashes; References; Functions; Pattern matching;

Unit - 3
File input and output; Examples.

Unit - 4
The common gate way Interface;

MODULE-2

Unit - 5
CGI linkage; Query string format;

Unit – 6
CGI.pm module;

Unit - 7
A survey examples;

Unit - 8
Cookies.
MODULE-3: SERVLETS AND JAVA SERVER PAGES

Unit - 9
Overview of Servlets; Servlet details;

Unit - 10
A survey example;

Unit - 11
Storing information on Clients;

Unit - 12
Java Server Pages.

MODULE-4: PHP

Unit - 13
Origins and uses of PHP; Overview of PHP;

Unit - 14
General Syntactic characteristics; Primitives, operations and expressions; output; Control statements;

Unit - 15
Arrays; Functions; Pattern matching; Form Handling; Files;

Unit - 16
Cookies; Session tracking.

MODULE-5: DATABASE ACCESS THROUGH THE WEB

Unit - 17
Relational Databases: An introduction to SQL; Architectures for Database access;

Unit - 18
Data system; Database access with PERL and My SQL.

Unit - 19
Database access with PHP and MySQL.

Unit - 20
Database Unt 4 access with JDBC and MySQL.
MODULE-6: INTRODUCTION TO RUBY, RAILS

Unit - 21
Origins and uses of Ruby; Scalar types and their Operations;

Unit - 22
Simple input and output statements; Fundamentals of arrays; Hashes;

Unit - 23
Methods; Classes; Code blocks and iterators; Pattern matching. Overview of Rails;

Unit - 24
Document requests; Processing forms; Rails applications with Databases; Layouts.

MSCS-519C: ARTIFICIAL INTELLIGENCE

MODULE-1: INTRODUCTION

Unit - 1
What is Artificial Intelligence; The AI Problems and Techniques, Problems.

Unit - 2
Problem Spaces and Search: Defining the problem, as a state space search.

Unit - 3
Production systems, problem characteristics, Production system characteristics.

Unit - 4
Issues in the design of search programs.

MODULE-2: HEURISTIC SEARCH TECHNIQUES AND KNOWLEDGE REPRESENTATION

Unit - 5
Generate-and-Test, Hill Climbing, Best-First Search.

Unit - 6
Problem Reduction, Constraint Satisfaction Means-Ends Analysis;

Unit - 7
Approaches to knowledge representation.

Unit - 8
Issues in knowledge representation.
MODULE-3: USING PREDICATE LOGIC AND RULES

Unit - 9
Representing Simple Facts in Logic, Representing Instance and ISA Relationships.

Unit - 10
Computable, Functions and Predicates.

Unit - 11
Resolution, Natural deduction.

Unit - 12

MODULE-4: ATATISTICAL REASONING

Unit - 13
Probability and Bayes Theorem.

Unit - 14
Certainty Factors and Rule-Based Systems.

Unit - 15
Bayesian Networks.

Unit - 16
Dempster-Shafer Theory, Fuzzy Logic

MODULE-5: WEAK SLOT-AND FILLER STRUCTURES

Unit - 17
Semantic Nets

Unit - 18
Frames

Unit - 19
Strong Slot-and-Filler Structures

Unit - 20
Conceptual Dependency Scripts.
MODULE-6: GAME PLAYING AND PLANNING

Unit - 21

Unit - 22
Iterative Deepening, Planning: Overview, and Example Domain.

Unit - 23
The Blocks World, Components of a Planning System, Goal Stack Planning.

Unit - 24
Nonlinear Planning using Constraint Posting, Hierarchical Planning.