

# **Directorate of Distance Education**

**J.R.N. Rajasthan Vidyapeeth University  
Pratap Nagar, Udaipur**

## **Syllabus For M. Sc. Computer Science**

## M. Sc. COMPUTER SCIENCE

### (SEMESTER SCHEME)

#### Course Structure for M. Sc in Computer Science

#### I SEMESTER

Course code	Name of the Subject	Total
MSC-501	Discrete Mathematics	100
MSC-502	Introduction to Java and Object Oriented Programming	100
MSC-503	Computer Architecture	100
MSC-504	Data Structure	100
MSC-505	Practical - 1: OOP Using Java	100
MSC-506	Practical - 2: Data Structures Using C	100
<b>Total</b>		<b>600</b>

#### II SEMESTER

Course code	Name of the Subject	Total
MSC-507	Analysis & Design of Algorithms	100
MSC-508	DBMS	100
MSC-509	Linux Internals	100
MSC-510	Computer Networks	100
MSC-511	Practical - 3: ADA and DBMS Laboratory	100
MSC-512	Practical - 4: Linux Internals and Network Programming	100
<b>Total</b>		<b>600</b>

#### III SEMESTER

Course code	Name of the Subject	Total
MSC-513	Software Engineering	100
MSC-514	Visual Technologies	100
MSC-515	Computer Graphics and Visualization	100
MSC-516	Elective - 1	100
MSC-517	Mini Project	100
<b>Total</b>		<b>500</b>

#### IV SEMESTER

Course code	Name of the Subject	Total
MSC-518	Management Information System and ERP	100
MSC-519	Elective - 2	100
MSC-520	Major Project	300
<b>Total</b>		<b>500</b>

## **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 theory 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**

Optimization problems, The Greedy method.

**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 Dependences;

**Unit- 10**

Axiomatization of functional dependencies and Armstrong axioms.

**Unit- 11**

Normal Forms; general definitions of Second and Third Normal Forms; Boyce -Codd Normal Forms;

**Unit- 12**

Algorithms for Relational Database Scheme Design.

**MODULE -4: CONCEPT OF STORAGE AND INDEXING****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 Isolation; Atomicity and Durability Transaction and Schedules;

**Unit- 18**

Concurrent Execution of Transactions; Motivation for concurrent Execution, Serializability, 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**

System V IPC. The Linux File System: Basic Principles, The representation of file systems in the kernel.

### **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**

Example Networks: Arpanet, X.25, Frame Relay, ATM, Ethernet.

#### **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**

Bluetooth - Architecture, Protocol Stack.

### **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**

The www - Architecture, Dynamic web documents, Wireless web.

### **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 Manifest, Compiling CIL to Platform - Specific Instructions, understanding the Common Type System, Intrinsic CTS Data Types, Understanding the Common Language Specification, Understanding the Common Language Runtime.

## **Unit - 3**

A Tour of the .

Net Namespaces, Increasing Your Namespace Nomenclature, Deploying the .NET Runtime.

## **Unit - 4**

Building C# Applications

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

## **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**

Understanding Value Types and Reference Types, The Master Node: System, Object, The System Data Types (and C# Aliases), Converting Between Value Types and Reference Types: Boxing and Unboxing, Defining Program Constants.

### **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 Handling, 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 enumerable 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 Asynchronous 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**

Problems with Classic COM Binaries, An Overview of .Net Assembly, Building a Simple File Test Assembly, A C# Client Application.

### **Unit - 22**

A Visual Basic .Net Client Application, Cross Language Inheritance, Exploring the CarLibrary's, Manifest, Exploring the CarLibrary's Types. Building the Multifile Assembly, Using Assembly.

### **Unit - 23**

Understanding Private Assembles, 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 INTERACTON**

#### **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;

**Unit - 24**

Polygon rasterization; Hidden-surface removal; Antialiasing; Display considerations.

**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:

Management Information System: Concept and Definition, Role of Management Information System, Impact of Management Information system, Management Information System and Computer, Academic, User.

**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](http://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, outlier 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**

Intermediate Code generation and Code Optimization.

**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**

Representing Knowledge Using Rules: Procedural versus Declarative Knowledge, Forward versus Backward Reasoning, matching.

### **MODULE-4: STATISTICAL 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**

Overview, The Minmax Search Procedure, Adding Alfa-Beta Cutoffs, Additional Refinements.

### **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.