M.Sc. Computer Science **Prospectus No. 20131216**

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

विज्ञान विद्याशाखा
(FACULTY OF SCIENCE)

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PROSPECTUS

OF
MASTER OF SCIENCE IN
COMPUTER SCIENCE
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I N D E X

M.Sc. (Computer Science) Prospectus No.20131216

Sant Gadge Baba Amravati University, Amravati

Syllabus prescribed for

M.Sc. Part-I and Part-II [Semester I to IV] (Computer Science)

SEM-I (CBCS)

1MCS1 Digital System and Microprocessor
1MCS2 .Net Technologies and C#
1MCS3 Operating System
1MCS4 Computer Networks
1MCS5 Lab I - Based on 1MCS1 and 1MCS3
1MCS6 Lab II – Based on 1MCS2

SEM-II (CBCS)

2MCS1 Java Programming
2MCS2 Data Structures
2MCS3 Software Engineering
2MCS4 (1) Discrete Mathematical Structures
(2) Compiler Construction (GIC)
2MCS5: Lab III - Based on 2MCS1
2MCS6: Lab IV - Based on 2MCS2 and 2MCS3

SEM-III (CBCS)

3MCS1 Data Mining and Data Warehousing
3MCS2 Computer Graphics
3MCS3 Client-Server Computing
3MCS4 (1) Distributed Database System (GIC)
(2) Theory of Computation
3MCS5 Lab V - Based on 3MCS1 and 3MCS2
3MCS6 Lab VI - Based on 3MCS3

SEM-IV (CBCS)

4MCS1 Artificial Intelligence and Expert Systems
4MCS2 Design and Analysis of Algorithms
4MCS3 Network Security
4MCS4 (1) Mobile Communications
(2) Digital Image Processing
(3) Software Testing (GIC)
4MCS5 Lab VII - Based on 4MCS1 and 4MCS2
4MCS6 Project

Syllabus prescribed for

M.Sc.Part-I Semester I and II (Computer Science)

SEMESTER-I

1MCS1: Digital Systems and Microprocessor

Unit I : Representation of integers and floating point nos., Boolean Algebra: laws, simplification of logic equations using Boolean laws, SOP and POS, standard forms of SOP and POS, Karnaugh Maps don't care conditions in K-map,

Unit II : Logic families: classification and characteristics, TTL, ECL, MOS, CMOS, their comparison, Combinational logic design using MSI chips: Multiplexers, De-multiplexers/ Decoders, Digital comparator; parity generator/checker; code converters: BCD to Binary, Binary to BCD, Priority encoder: Decimal to BCD, Octal to Binary.

Unit III : Design of Arithmetic circuits: Half Adder, half subtractor, full adder, full subtractor, parallel binary adder, subtraction using 1's and 2's compliment schemes, use of adder as subtractor, controlled parallel adder, ALU IC 74181.

Unit IV: Flip Flops: construction and working of RS, JK, MS-JK, D and T Flip flops. Shift registers and Counters: Buffer register, controlled buffer register, shift registers: SISO, SIPO, PISO, PIPO, bidirectional shift register, ring counter, twisted ring counter, applications of shift registers; Counters: asynchronous counter designs, synchronous counter, UP/ DOWN counters, lock out in counters.

Unit V : Overview of microcomputer system, evolution of microprocessors, architecture of 8086 microprocessor, pin diagram, signal description, register organisation, concept of pipelining, memory segmentation, memory address generation, modes of operation of 8086 (minimum and maximum).

Unit VI : Stack structure, interrupts in 8086 microprocessor, interrupt responses, Interrupt Vector Table, H/W and S/W interrupt processing; Interfacing: absolute and linear decoding, I/O mapped I/O and Memory Mapped I/O, memory interfacing (Even and Odd Banks), interfacing of keyboards, interfacing of displays, interfacing if ADC and DAC, address mapping.

Books:

1. Digital Integrated Electronics: Taub and Schilling (McHill)
2. Digital Principles and Applications: Malvino and Leach (TMH)

3. Modern digital Electronics: R. P. Jain (TMH)
4. Microprocessor and Interfacing: D. V. Hall (TMH)
5. The Intel Microprocessors: Barry B. Bray (PHI)

1MCS2: .Net Technologies and C#

Unit I : Understanding .net: The C# environment: origins of .net technology, .net framework, the common language runtime, framework base classes, user and program interfaces, visual studio .net, .net languages, benefits, c# and .net

Unit II : Overview of C#: namespaces, comments, aliases for namespaces, command-line arguments, program structure; Literals, variables and data types, operators, expressions, Decision making and branching, looping, methods in c#, Array handling, string manipulation, structures and enumerations,

Unit III : Classes and objects: Principle of OOP, Access modifiers, constructors, destructors, Nesting of classes; Inheritance and Polymorphism: multilevel inheritance, hierarchical inheritance, overriding, hiding methods, abstract methods and classes, sealed classes and methods; Interfaces: defining, extending and implementing interfaces, interfaces and inheritance, explicit interface implementation, abstract class and interfaces.

Unit IV : Operator overloading: unary, binary, comparison, Delegates and events; Console I/O operations: console class, console input-output, formatted output. Errors and Exceptions: types of errors, exceptions, exception handling codes, multiple catch statements, exception hierarchy, catch handler, finally statement, nested try blocks.

Unit V : Multithreading in c#: Introduction, System. Threading namespace, scheduling, synchronizing threads, thread pooling. File Manipulation: Managing File System, Moving, copying, deleting files, Reading, writing to files, Reading Drive information, File Security.

Unit VI : Data Access with .Net: ADO.net overview, Database connections, commands, the Data Reader, the DataSet class, populating a DataSet, persisting a DataSet.

Books:

1. Programming in C# -E. Balagurusamy, Tata McGraw-Hill Publications
2. Professional C# 2005 with .NET 3.0 - Christian Nagel, Bill Evjen, Jay Glynn, Morgan Skinner and Karli Watson Wrox Press

3. Programming C# - J. Liberty, O'Reilly Publications
4. The Complete Reference: C# - Herbert Schildt, Tata McGraw-Hill Publications
5. C# and the .NET Platform -Andrew Troelsen, A! Press

1MCS3 : Operating System

UNIT–I : **Introduction:** Services, Types, User-O.S. Interface: Command Interpreter, Graphical User Interface; System Calls; System Programs; Operating System Structure: Simple, Layered Approach; Micro-kernels, Modules; Virtual Machine; System Boot.

UNIT–II: Process Management: Process Concept, Process States, Process Control Block, Process Scheduling: Schedulers, Context Switch; Operations on Process: Creation, Termination, Inter Process Communication; Threads: Concept, Benefits; CPU Scheduling: Burst Cycle, Types of Scheduling, Scheduler, Dispatcher, Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, Priority Scheduling, Round-Robin, [multiple processor scheduling]

UNIT–III: Process Synchronization and Deadlocks: Critical Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors. Deadlock: System Model, Deadlock Characterization, Resource Allocation Grpah, Methods for handling Deadlock: Prevention, Avoidance and Detection; Recovery from Deadlock: Process Termination, Resource Preemption.

UNIT–IV: **Memory Management:** [Basic Hardware, Address Binding]; Logical and Physical Address Space, Swapping, Contiguous Allocation, Dynamic Storage Allocation: First-fit, Best-Fit, Worst-fit; Fragmentation; Paging; Segmentation. **Virtual Memory:** Introduction, Virtual Address Space, Demand Paging, Copy-on-write, Page Replacement: Concept, Page Replacement Algorithms: FIFO, Optimal Page Replacement, LRU, Second-Chance Page Replacement; Thrashing, I/O Interlock.

UNIT-V : File System: File: Concept, Attributes, Operations; File Organization and Access: Sequential, Index Sequential, Indexed, Direct or Hash File. Directory: Operations, Structures.

Protection: Access Control and Permissions. File System Structure, Allocation Methods, Free Space Management. Disk

Structure, Disk Scheduling Algorithms: FCFS, SSTF, SCAN, C-SCAN, LOOK. [Disk Management, Swap Space Management], RAID: Concept. I/O Systems: I/O Hardware, Interrupts, DMA, Application I/O Interface, Kernel I/O Subsystem.

UNIT-VI: Distributed File System: Concept, Naming and Transparency, Remote File Access**,** Stateful Vs Stateless Service, File Replication, Remote Login, Remote File Transfer, Data Migration, Computation Migration, Process Migration. Embedded Operating Systems: Embedded Systems: Definition, Requirements and Constraints, Organization of Embedded System; Characteristics of Embedded Operating Systems.

Case Studies: Linux and Mobile Operating Systems

Books:

1. Operating System Concepts – **Seventh** Edition : Abraham Silberschatz, Peter Galvin, Greg Gagne (John Wiley & Sons)
2. Operating Systems : William Stallings (Pearson)
3. Modern Operating System : Andrew S. Tanenbaum

1MCS4: Computer Networks

UNIT–I : **Digital Communication:** Advantages; **Data Transmission:** Modes: Parallel, **Serial:** Asynchronous, Synchronous, Isochronous; Transmission **Media:** Guided and unguided; **Modulation:** Amplitude, Phase Shift, Frequency, QAM; **Multiplexing:** FDM, WDM, TDM, STDM, CDM; Switching**:** Circuit, Message, Packet; Delays in Packet Switched Network, Packet Loss; **Network Reference Models:** OSI: Layered Architecture and Services, TCP/IP: Layered Architecture and Services

UNIT-II : **Application Layer:** Principles of Application Layer Protocols; **Processes:** Client-Server Model, Socket Interface; Services required by Application Layer; **HTTP:** Introduction, RTT, HTTP Handshake, types of HTTP Connections, HTTP Messages, Authentication and Cookies; **FTP:** Service Model, FTP Commands; Electronic Mail; SMTP; **DNS:** Services and working

UNIT-III: **Transport Layer:** Transport-Layer Services and Principles; Multiplexing and Demultiplexing Applications; Connectionless Transport – UDP; Principles of Reliable of Data Transfer (RDT); Stop-and-wait and Pipelined protocols;

GBN protocol; Connection-Oriented Transport: TCP; Flow Control; Principles of Congestion Control; Approaches towards Congestion Control; TCP Congestion Control

UNIT-IV: **Network Layer:** Introduction; Network Service Model: Datagram, Virtual Circuit; Routing Principles; Routing Algorithms: Classifications; Hierarchical Routing; Internet Protocol: IP Addressing, IPv4: Classes and Packet format, DHCP; ICMP; Routing in the Internet: RIP, OSPF, BGP; Router; IPv6; Multicast Routing

UNIT-V: Data Link Layer: Introduction; Services; Error Detection and Correction; Multiple Access Protocols and LANs; LAN Addresses and ARP; Ethernet; Hubs, Bridges and Switches; Wireless LANs: IEEE 802.11; The Point-to-Point Protocol; ATM, X.25 and Frame Relay.

UNIT-VI: **Network Security and Management:** Secured Communication: Threats and Characteristics; Cryptography: Principles of Cryptography, Symmetric Key Cryptography, Public Key Cryptography; Privacy, Authentication, Integrity, Nonrepudiation; Digital Signature; Key Distribution and Certification. Areas of Network Management; Network Management Architecture; Internet Network Management Framework; SMI, MIB, SNMP.

Books:

1) Computer Networking – James F. Kurose and Keith W. Ross (Addison-Wesley)
2) Data Communication and Networking – Behrouz A. Forouzan (McGraw Hill)
3) Computer Network & Internet - Douglas E. Comer (Pearson)
4) Data and Computer Communication – William Stallings (Pearson)
5) Computer Networks - Andrew S. Tanenbaum (PHI)

1MCS 5 : Lab I - Based on 1MCS1 and 1MCS3

1MCS6 : Lab II - Based on 1MCS2

"Distribution of marks for Computer Lab-I and Lab-II"

A) Each student shall perform two practicals.

B) Question slip for each examinee shall be attached to the answer book.

C) Marks should be given on the basis of following criteria:

I)	Practical-I	: 30 marks
II)	Practical-II	: 30 marks
III)	Viva-Voce (Each practical 15 marks)	: 30 marks
IV)	Record	: 10 marks
	Total	**: 100 marks**

SEMESTER-II

2MCS1: Java Programming

Unit I : Introduction to java, Java development tools, Java and WWW, Java applications, java building elements: Identifiers, Keywords, variables, constants, operators. Data types and type casting and type conversion. Control Structures: Simple if, If..else, switch statement, Loop structure : For , Do..while, while , loop control using break and continue.

Unit II : Objects and classes: class variable, instance variable, class methods, Access specifier, access modifiers. Methods: main method, creating methods, calling methods, overloading methods, abstraction, recursion. Object: Initialization of object using constructors, parameterized constructor, Dynamic Memory allocation, Garbage collection. Passing objects to methods.

Unit III : Packages: creating and importing packages, Arrays : Declaration, initialization, sorting searching, array of objects. String: String class, StringBuffer, StringTokenizer. Command line arguments. Inheritance: super class, subclass , super keyword, this keyword, final modifier, abstract class, Method overriding. Interface: implementing interfaces.

Unit IV : Applet: Life cycle of an applet, APPLET tag, passing arguments to an applet, paint, repaint, update methods. Graphics class, AWT class hierarchy, Frames, Layout managers, components, containers. Color class, Font class.

Unit V : Exception Handling : Error and Exception class, Error handling routine, try , catch , throw, throws, finally, uncaught exceptions, built-in exception, nested try-catch, user defined exception. Thread: Thread class, Runnable interface, states, priority and synchronization. Java I/O classes, File handling.

Unit VI : User Interface: Button, Label, TextField, TeatArea, Choice, List, CheckBox, CheckBox Group, Dialog Boxes, Menu,

Multiple Windows, Event handling: Event Delegation model, Adapter classes, Event classes, Event Listener Interfaces, Handling Mouse and Keyboard events.

Books:

1. The complete Reference Java- 5th edition – Herbert Schildt and Patrick Naughton- Tata McGraw Hill
2. JAVA2 : Unleashed Techmedia
3. Learning Java- Rich Raposa, Willey, dreamTech Publication
4. Java in a nutshell desktop quick reference Flanagan-SPD, O'reilly
5. Programming in Java 2 – Rajaram, -Scitech Pub. India pvt Ltd.

2MCS2 : Data Structures

Unit I : Introduction, Types of Data Structures, Linear & Nonlinear data structures, **Arrays:** Arrays as ADT, 1D, 2D, Multidimensional Arrays, Memory Representation and Applications. **Linked List** : Concept , Operations : Insert, Delete, Traversal, Static implementation using arrays,Dynamic implementation , Doubly Linked list, Circular list,Linked list applications : Merging of two linked lists.

Unit II : **Stacks:** Introduction, Push and Pop operations, Stack implementation using array, Stack applications, Infix to Postfix conversion of expression, Expression evaluation, Recursion. **Queues:** Introduction, Insert and Delete operations, Queue implementation using array, Types –Priority Queue, Circular queue, Dequeue, Queue applications: CPU Scheduling Algorithms FCFS , Round Robin algorithm, Stacks and Queues as Linked Lists

Unit III : **Trees:**Terminology and Concepts , Binary Tree Representation, Static implementation using arrays , Linked representation, Binary Search Tree, Operations on Binary search tree - Insert, Delete, Tree Traversals, Representing, Threaded binary trees, Height-balanced trees, AVL Rotations. Searching: Sequential binary tree searches.

Unit IV : **Searching and Sorting :**Searching, Concept and need, Techniques, Linear search, Binary search, Indexed sequential search, Sorting, Concept and Need, Performance criteria, Bubble sort, Insertion Sort, Selection Sort, Shell Sort, Quick Sort, Heap Sort, Merge Sort.

Unit V : **Graphs :**Terminology and concepts, Graph Representation: Adjacency matrix, Adjacency list, Adjacency multi-list, Traversals: Depth first and Breadth first. Minimum spanning tree, shortest path algorithm, topological ordering, sparse matrices, linked list implementation of graph and graph traversal.

Unit VI1: **Indexing:** B-tree indexing, Multilevel indexing, B+ tree, Hashing, Collision processing, Bucket hashing, Dynamic hashing, Linear hashing, Extendible hashing, Tries.

Books:

1. "Introduction to Data Structures" - Bhagat Singh & T.L. Naps.
2. "Data structures using C"-Tanenbaum, Langsam, Augenstein PHI
3. "Classic Data Structures", - D. Samanta PHI
4. "Data structure and Program design in C" - Kruse, Leung, Tondo (PHI)
5. "Data structure" - Tenanbaum
6. "Data structure algorithms and Applications in C++ ": Sartaj Sahani Macgraw Hill
7. "Data structure and algorithm analysis in C++ ": Mark Allan Welss, Addison weslay

2MCS3 : Software Engineering

Unit-I : **System Concept:** Definition, Characteristics of System, Elements of System; Types of System: Physical or Abstract Systems, Open or Closed Systems, Man-made Information Systems; Subsystem. **System Analyst:** Role; Skills: Interpersonal, Technical; Information Gathering Tools (Fact Finding Techniques); Feasibility Study.

Introduction to Software Engineering: Definition and Characteristics of Software; Software Application Domains; Software Engineering: Definition, Layered Model.

Unit-II : Software Process Framework; Umbrella Activities. Process Models: SDLC (Waterfall); Incremental; Evolutionary Models: RAD, Prototyping, Spiral; Concurrent Development Model; Components based Development Model. **Agility:** Agile Process: Assumptions, Agility Principles, Human Factors. **Software Engineering Practice:** Essence of Practice, Core Principles, Communication Principles, Planning Principles, Modeling Principles, Construction Principles, Deployment Principles.

Unit-III : **Requirements Engineering:** Requirements Engineering Tasks: Inception, Elicitation, Elaboration, Negotiation, Specification, Validation. Requirements Management; Steps in Requirements Engineering. Requirements Analysis: Objectives; **Requirements Modeling Approaches:** Scenario-Based Modeling: Use-Case; Class Models: E-R Diagram, Class Diagrams; Flow Oriented Modeling: DFD, CFD; Behavioral Models: State Diagram, Sequence Diagrams.

Unit-IV : **Software Design:** Design Process and Quality; Design Concepts: Abstraction, Architecture, Modularity, Information Hiding, Functional Independence, Refinement. Component Level Design: Component-Definition; Object-oriented View, Traditional View, Cohesion, Coupling. **Designing Traditional Components:** Graphical Design – Notations (Flow Chart), Tabular Design – Notations (Decision Table), Program Design Language (Structured English or Pseudo-code). User Interface Design: Rules; Interface Design Models; Interface Analysis.

Unit-V : **Software Quality:** Definition; Garvin's Quality Dimensions; McCall's Quality Factors; ISO 9126 Quality Factors. Software Quality Assurance: Elements, Goals, ISO 9001-2000 Quality Standards. **Software Metrics:** Attributes, Metrics for Requirements Model: Function-based Model (FP). Metrics for Specification Quality, Metrics for Design Model: Architectural Design Metrics. Metrics for Object-Oriented Design, User-Interface Design Metrics, Metrics for Source Code, Metrics for Testing, Metrics for Maintenance.

Unit-VI : **Software Testing:** Need, Verification and Validation, Unit Testing, Integration Testing, Validation Testing, System Testing, Debugging, Test Characteristics. White Box Testing: Flow Graph Notations, Test Cases, Control Structure Testing. Black Box Testing: Graph-based Testing Methods, Equivalence Partitioning, Boundary Value Analysis, Orthogonal Array Testing.

Books:

1. System Analysis and Design: Ellias M. Awad (Galgotia)
2. Software Engineering–A Practitioner's' Approach (7th Ed): Roger S. Pressman (Mc-Graw Hill)
3. Analysis and Design of Information Systems: James A. Senn (Mc-Graw Hill)
4. Software Engineering Concepts: Richard Fairley

2MCS4(1) : Discrete Mathematical Structures

Unit I : Mathematical logic: Introduction, statements and notations, connectives – negation, conjunction, disjunction, Statement formulas and truth tables, conditional, bi-conditional, well formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological implications, functionally complete sets of connectives, other connectives, Normal and principal normal forms, completely parenthesized infix and polish notations, Theory of inference for statement calculus – validity using truth table, rules of inference, consistency of premises and indirect method of proof.

Unit II : Set theory: Basic concepts of set theory, representation of discrete structures, relations and ordering: relations, properties of binary relations in a set, relation matrix and graph of a relation, partition and covering of a set, equivalence relation, compatibility relations, composition of binary relations, Functions – composition of functions, Inverse function.

Unit III : Algebraic Structures: Algebraic systems: Examples and general properties, Semigroups and monoids, Grammar and Languages, Polish expressions and their compilation, Groups-Definition and examples, subgroups and homomorphism, cosets and Lagrange's theorem, Group codes – the communication model and basic notions, generation of codes by using parity checks, error recovery in group codes.

Unit IV : Lattices and Boolean algebra: Lattice as POSETs, definition, examples and properties, Lattice as algebraic systems, sublattices, Direct product and homomorphism, Special lattices, Boolean algebra - definition and examples, subalgebra, Direct product and homomorphism, Boolean functions, representation and minimization of Boolean Finite state machines.

Unit V : Graph theory: Basic concepts of graph theory – definitions, paths, reachability and connectedness, matrix representation, Storage representation and manipulation of graphs- trees, representation and operations, list structures and graphs, Simple precedence grammars-syntax terminology, a view of parsing, notion and use of precedence relations, formal definition of precedence relations.

Unit VI : Fault detection in combinational switching circuits – Faults in combinational circuits, Notions of Fault detection, Algorithm for generating a fault matrix, procedure for

detection of faults; Introduction to computability theory: Finite-state acceptors and regular grammars, Turing machines and partial recursive functions.

Books:

1. Discrete Mathematical Structures with applications to computer science- J. P. Tremblay & R.. Manohar (McGraw Hill Editions)
2. Discrete mathematics - Semyour Lipschutz, Marc Lipson (MGH), Schaum's outlines.
3. Discrete mathematics and its applications - Kenneth H. Rosen (AT&T Bell Labs) (mhhe.com/ rosen)
4. Discrete Mathematical Structures – Bernard Kolman, Robert Busby, S.C. Ross and Nadeemur- Rehman (Pearson Education).

2MCS4(2) : Compiler Construction

Unit I : Introduction to Compilers**:** Overview, typical compiler Structure, implementation. Programming Language Grammars: Elements of formal language grammars, derivation, reduction, syntax tree, ambiguity, regular grammars and expressions.

Unit II : Scanning and Parsing Techniques: The scanner, top-down and bottom-up parsing, syntax directed translation, Symbol table organization, Hash table organization, Linked List and Tree structured symbol tables, symbol table organization for structures and records.

Unit III : Memory Allocation: Static and dynamic memory allocation, array allocation and access, allocation for strings, structure allocation, common and equivalence allocation. Compilation of expressions.

Unit IV : Compilation of control structures: Control transfers, procedural calls, conditional execution, iteration control constructs.

Unit V : Error detection, indication and recovery. Compilation of I/O statements: Compilation of I/O list, compilation of FORMAT list, the I/O routine, file control.

Unit VI : Code optimization: Major issues, optimizing transformations, local optimizations, program flow analysis, Global optimization, writing compilers.

Books:

1. Compiler construction – D.M. Dhamdhere, Macmillan India Ltd.
2. Principles of Compiler Design – Alfred V. Aho, Jeffrey D. Ullman

3. The Theory and Practice of Complier Writing – J.P. Trembly, P.G. Sorenson McGraw Hill Publication

4. Engineering a compiler – K.D.Cooper and Linda Torczon, Elsevier Direct Publ.

2MCS5 : Lab III - Based on 2MCS1

2MCS6 : Lab IV - Based on 2MCS2 and 2MCS3

"Distribution of marks for Computer Lab-III and Lab-IV"

A) Each student shall perform two practicals.

B) Question slip for each examinee shall be attached to the answer book.

C) Marks should be given on the basis of following criteria:

I)	Practical-I	: 30 marks
II)	Practical-II	: 30 marks
III)	Viva-Voce (Each practical 15 marks)	: 30 marks
IV)	Record	: 10 marks
	Total	**: 100 marks**

Syllabus prescribed for

M.Sc.Part -II Semester III and IV (Computer Science)

SEMESTER-III

3MCS1: Data Mining and Data Warehousing

Unit I : Introduction, Data Mining Functionalities, Data Preprocessing: Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

Unit II : Data Warehouse and OLAP Technology: Overview, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining. Data Cube Computation and Data Generalization: Efficient Methods for Data Cube Computation, Data Generalization and Concept Description.

Unit III : Mining Frequent Patterns, Associations, and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining Various Kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

Unit IV : Classification and Prediction: Issues, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Backpropagation. Prediction: Linear Regression, Nonlinear Regression, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor.

Unit V : Cluster Analysis: Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data. Mining Time-Series Data, Mining Sequence Patterns in Biological Data.

Unit VI : Graph Mining, Social Network Analysis and Multirelational Data Mining. Mining Object, Spatial, Multimedia, Text, and Web Data, Data Mining Applications, Trends in Data Mining.

Books:

1. Data Mining: Concepts and Techniques - J. Han, M. Kamber

2. Data Mining: Introductory and Advanced Topics - Margaret H.Dunham, Pearson Education

3. Data Warehousing in the real world - Sam Anahory, Dennis Murry, Pearson Education

4. Principles of Data Mining - David Hand, Heikki Manila, Padhraic Symth, PHI

5. Data Warehousing, Data Mining & OLAP, Alex Bezon, Stephen J.Smith MeGraw-Hill Edition

6. Data Warehousing Fundamentals, Paulraj Ponniah, Wiley-Interscience Publication

3MCS2 : Computer Graphics

Unit I : Geometry and line generation: Introduction, points and lines, planes and coordinates, Line segments, perpendicular line segments, vectors, pixels and frame buffers, vector generation, character generation, displaying the frame buffer. Graphics primitive: Introduction, display devices, primitive operations, the Display-File Interpreter, normalized device coordinates, Display-file structure, Display control, Text line style primitives.

Unit II : Polygon: Introduction, Polygon , Polygon representation, Entering polygon, An inside test, filling polygon, Antialiasing. Transformations: Introduction, matrices, scaling transformations, sin and cos, sum of angles, identifiers, rotation, homogeneous coordinates and translation, rotation about an arbitrary point, other transformations, display procedures.

Unit III : Segments: Introduction, the segment table, segment creation, closing a segment, deleting a segement, renaming a segment, visibility, image transformations, saving and showing segments, other display file structures, some rater techniques, Windowing and clipping: Introduction, viewing transformation, implementation, clipping, clipping the polygon, adding clipping to the system, a voiding division, generalized clipping, position relative to an arbitory line, multiple windowing,

Unit IV : Interaction : Introduction, hardware, input devices, handling algorithm, event handling, sample devices, the detectability attributes, simuating a locator with a pick and pick with a locator, Echoing, Interactive techniques. Three dimension: Introduction, 3D Geometry, primitives and transformations, rotation about an arbitrary axis, parallel projection, perspective projection, viewing parameters, conversion to view plane coordinates, The 3D viewing transformation, , special projection.

Unit V : Hidden surfaces and lines: Introduction, back face removal, the painter algorithm, collection of polygons, remembering the style, the hidden surface check, decomposition into triangles, comparing two triangles, The minima test, Overlapping edges, containment of points, finding a point in the triangle plane, comparing of the entire triangle, establishing depth order, geometrical sorting, linked list, sorting the triangles.

Unit VI : Shading: Introduction, diffusion, illumination, point source illumination, specular reflection, transparency and shadows. Curves: Introduction, curve generation, implementation, interpolating polygons, E-splines, B-Splines and Curves.

Books:

1. " Computer Graphics A Programming approach"- Steven Harington.
2. " Intractive Computer Graphics"- Newmann and Sproul
3. " Computer Graphics"- Rogers.

3MCS3 : Client-Server Computing

Unit I : Networking in Java: Basics, Socket overview, Client-Server concepts, Proxy servers, Internet addressing, Java Networking classes and interfaces, InetAddress, TCP/IP Client Sockets, URL Connection, TCP/IP Server sockets, Creating TCP client-server.

Unit II : Java Database Connectivity: JDBC concepts, JDBC API, DriverManager, Connection, Statement and ResultSet classes with relevant methods. Prepared and Callable statements, Handling queries, inserts, deletes and updates to database. Displaying query results.

Unit III : Servlets: Structure and lifecycle of Servlets, Servlet API: basics, Various classes & interfaces. Servlet requirements, writing. Running and debugging of Servlets, Concepts of Cookies, State and session management with Servlet API. Server side includes and request forwarding. Servlet chaining. Jdbc Servlets.

Unit IV : JavaScript Overview, Variables, Operators, Data Types, Control Statements, Functions and Objects, The Window Object: Dialog Boxes, Status Bar Messages, Window Manipulations; The Document Object: Writing to Documents, Dynamic Documents, The Form Object: Working With Form Elements and Their Properties The String and RegExp Objects, Dates and Math object

UNIT V: Remote Method Invocation (RMI): Object serialization in Java, Concept of remote object, Architecture of RMI application, Java RMI package, classes & Interfaces, Client-Server application using RMI, RMI Servlets, RMI-JDBC Servlets.

UNIT VI: Introduction to JSP; Simple JSP concepts, Request-time expressions. Advanced JSPs: Scripts. conditionals, loops, Try/Catch. Concept of Beans, Properties, Bean instances & serialization; Bean Scopes, Writing Beans, Introspection, Beans & Scriplets..

Books:

1. Dustin R Callaway: Inside Servlets Pearson Education (LPE)
2. Larne Pekowasky: Java Server Pages, Pearson Education (LPE)
3. Dietel & Dietel: WWW: How To Program, Pearson Education (LPE)
4. Dietel, Nieto, Lin, Sadhu : XML: How to Program, Pearson Education.
5. Horstmann & Cornell "Core Java 2" Vol-1 & Vol. II., Sun Microsystems.

3MCS4(1) : Distributed DBMS

UNIT I : Introduction to distributed systems: goals of distributed system, hardware and software concepts, design issues. Communication in distributed systems: Layered protocols, ATM networks, the client-server model, remote procedure call and group communication.

UNIT II: Synchronization in distributed systems: Clock Synchronization, mutual exclusion, Election Algorithms, the Bully algorithm, a ring algorithm, atomic transactions, dead lock in distributed systems, distributed dead lock prevention, and distributed dead lock detection.

UNIT III: Processes and processors in distributed systems: Threads, system, models, processor allocation, scheduling in distributed system, fault tolerance and real time distributed systems.

UNIT IV: Distributed file systems: Distributed file systems design, distributed file system implementation, trends in distributed file systems. Distributed shared memory: What is shared memory, consistency models, page based distributed shared memory, shared variable, distributed shared memory, object based DSM.

UNIT V : Case study MACH: Introduction to MACH, Process management, in MACH, Memory management in MACH, communication in MACH, UNIX emulation in MACH. Case study DCE: Introduction to DCE threads, RPC's, Time service, directory service, security service, distributed file system.

Books:

1. Andrew. S. Tanenbaum, Distributed operating system, PHI
2. Ceri & Palgathi, Distributed Database System, McGraw Hill
3. Raghu Rama Krishnan and Johannes Gechrib, Database Management System, McGraw Hill
4. Date C.J, An Introduction to Database system, Vol-I & II, Addition Wesley
5. Korth, Silbertz, sudarshan, Database Concepts, McGrew Hill
6. Elmasari, Navathe, Fundamentals of Database Systems, Addition Wesley
7. Data C.J. An introduction to database system, Addition Wesley
8. Rama Krishnan, Gehke, Database Management system, McGraw Hill

9. M. Tamer Ozsu and Patrick Valduriez, Principles of Distributed Database Systems II Edition Pearson Education Asia
10. Stefano Ceri and Giuseppo Pelagatti Distributed Database , Principles and Systems McGraw Hill

3MCS4(2) : Theory of Computation

Unit I : Strings, alphabets and languages, Graphs and trees, Inductive proofs, set notations, relations, Finite automata and regular Expression: Finite state system, Non deterministic finite automata, Finite automata with •-moves. Deterministic finite automata, equivalence between NFA and DFA, Conversion of NFA to DFA.

Unit II : Regular set and regular expression, Two way finite automata, finite automat with output, Applications of finite automata. Equivalence of RE and FA, Inter conversion, pumping lemma, closure propery of regular sets, Regular grammars, Right linear and Left linear grammar, equivalence between Regular linear grammar and FA inter conversion between RE and RG.

Unit III : Context free grammar, derivation trees, Chomsky Normal Form, Greibach Normal Form. Push Down Automata: Definition, model, acceptance of CFL, equivalence of CFL and PDA , Interconversion, Enumeration of properties of CFL.

Unit IV : Turing Machine: Definition, model, Design of turing machine, computable languages and function, Techniques of turing machine construction, Modifications of Turing machine, Church's Hypothesis.

Unit V : Chomsky Hierarchy of languages, Linear bounded automata and context sensitive languages, Introduction of DCFL and DPDA, Decidability of problems.

Unit VI: Undecidability : Properties of recursive & non recursive enumerable languages, universal turing machine, post correspondence problem, introduction to recursive function theory.

Books:

1. "Introduction to Automata theory, Languages and Computation"- Hopcraft J.E. & Ullman J.D.
2. "An Introduction to Formal Languages and automata"- Peter Liz.
3. "Introductory theory of Computer Science"- V.Krishnamurthy (EWP)

4. "Elements of Theory & Computations"- Lavis and Padadimitron-PHI.

3MCS5 : Lab V - Based on 3MCS1 and 3MCS2

3MCS6: Lab VI - Based on 3MCS3

"Distribution of marks for Computer Lab-V and Lab-VI"

A) Each student shall perform two practicals.

B) Question slip for each examinee shall be attached to the answer book.

C) Marks should be given on the basis of following criteria:

I)	Practical-I	: 30 marks
II)	Practical-II	: 30 marks
III)	Viva-Voce (Each practical 15 marks)	: 30 marks
IV)	Record	: 10 marks
Total		**: 100 marks**

SEMESTER-IV

4MCS1: Artificial Intelligence and Expert Systems

UNIT-I : **Prolog Programming:** Introduction to turbo prolog, introduction to language, structure of language, cut, fail, recursion, lists and complex structures, interactive programming, expert system in prolog.

Unit II : **Introduction:** Definition of AI, AI technique, tic-tac-toe, pattern recognition, level of the model, criteria for success, problems and problem spaces, defining the problems, production systems, control strategies, heuristic search, problem characteristics, decomposition of problems, solution steps, predictability, absolute and relative solutions.

Unit-III : Basic problem solving methods, reasoning, problem trees and graphs, knowledge representation, matching indexing with variables, heuristic functions, weak methods, problem reduction, constraints satisfaction, means-ends analysis, analysis of search algorithms.

Unit-IV : **Game Playing:** Minimax search procedure, adding alphabeta cutoffs, additional refinements, waiting for quiescence, secondary search, using book moves limitations.

Unit-V : Knowledge representation using predicate logic: representing simple facts in logic, augmenting the representation, structural representation of knowledge: some common knowledge structures, choosing the level of representation, finding the right structure as needed, declarative representation.

Unit VI : **Natural Language Understanding:** Concept of understanding, keyword matching, syntactic and semantic analysis, understanding, language generation and matching translation. General concepts of implementation of AI systems. Introduction to pattern recognition. Rule based systems, semantics of CFL, semantic network, frames, frame kit. Application, introduction to knowledge engineering, artificial neural network: introduction, learning: single and multilayer networks

Books:

1. Artificial Intelligence by Elaine Rich, Mcgrawhill Inc.
2. Artificial Intelligence and Expert Systems - Jankiraman, Sarukesi (M)
3. Expert System: Theory and Practice - Ermine (PHI)
4. Introduction to Turbo Prolog – Carl Townsend
5. Rule Based Expert System - M. Sasikumar (Narosa)
6. Artificial Intelligence - Russell - Pearson - 1st Text Book
7. Prolog : Prog. for A.I. by Bratko - Pearson
8. Prolog Programming and Applications - Burnhan & Hall
9. ES: Theory and Practice - Ermine - PHI

4MCS2 : Design and Analysis of Algorithms

Unit I : Introduction: algorithm, writing algorithms in SPARKS, structured program, analyzing algorithms, Divide and conquer: The general method, Binay Search, Finding minimum and maximum, merge sort, quick sort, selection sort, Strassen's matrix multiplication.

Unit II : Greedy Method: The general method, Optimal storage on tapes, Knapsack problem, Job sequencing with deadlines, Optimal merge patterns, minimum spanning trees, Single source shortest path. Dynamic programming: General

method, multistage graph, all pair shortest paths, Optimal binary search trees, 0/1 knapsack , Travelling salesperson problem, flow shop scheduling.

Unit III : Basic Search and Traversal techniques: General method, code optimization, AND/OR graph, game trees, biconnected components and depth first search , Back tracking : General method, 8-queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, Knapsack problem.

Unit IV : Branch and bound: General method, 0/1 knapsack problem, Travelling salesperson, efficiency considerations, Algebric simplification and transformations: General method, evalution and interpolation, fast Fourier transform, modular arithmetic.

Unit V : Lower bound theory: comparison trees for sorting and searching, Oracle and adversary arguments, techniques for algebraic problems, some lower bounds and parallel computation.

Unit VI : NP-Hard and NP-Complete problems: basic concept, cook's theorem, NP-Hard graph problem, NP-Hard scheduling problem, NP-Hard code generation problem.

Books:

1. Fundamentals of computer Algorithms, E.Horowitz & S.S.Sahani. (Galgotia).
2. A. V. Aho and J.D. Ullman, "Design and Analysis of Algorithms", Addison Wesley
3. Hopcroft , "Analysis of algorithm" (Addision-Wesely)
4. Coreman: "Design and analysis of algorithm" (PHI)
5. Aho : "Data structure and algorithm" (Addision-wesely)

4MCS3 : Network Security

Unit-I : **Introduction:** Terminology, Notation, Networking Security Attacks, Layers And Cryptography, Authorization, Tempest, Keys, Viruses, Worms, Trojan Horses, Multilevel Model of Security, Legal Issues.

Unit-II : **Cryptography:** Introduction, Breaking an Encryption Scheme, Types of Cryptographic Function, Respective Algorithms, Standards and Modes of Operation, Hashes and Message Digests.

Unit-III : **Authentication:** Overview of Authentication System, Password-based Authentication, Address-based Authentication, Cryptographic Authentication Protocols,

Keys, Trusted Intermediaries, Authentication of People, Security Handshake Pitfalls: Login Only, Mutual Authentication, Integrity / Encryption for Data, Mediated Authentication, Performance Considerations.

Unit-IV : **Standards:** Kerberos V4: Tickets, Kerberos V5: ASN.1, Names, Delegation of Rights, Ticket Lifetimes, Key Versions, Optimizations.

Cryptographic Algorithms, Kerberos V5 Messages, Real Time Communication Security: IPSec: AH & ESP: Overview of IPSEC, IP and IPV6, AH (Authentication Header), ESP (Encapsulating Security Payload).

Unit-V : **E-mail Security:** Distribution Lists, Store and Forward, Security Services for E-Mail, Establishing Keys, Privacy, Authentication of Source, Message Integrity, Non Repudiation, Proof of Submission, Proof of Delivery, Message Flow Confidentiality, Anonymity, Containment. PEM and S/MIME, PGP.

Unit-VI : **Firewalls:** Packet Filters, Application Level Gateways, Encrypted Tunnels, Comparisons. Security Systems: Netware V3, Netware V4, Microsoft Windows Security. Web Issues: URLs/URIs, HTTP, Cookies. Web Security Problems.

Books:

1) Network Security: Private Communication in a Public World, Second Edition : Charlie Kaufman; Radia Perlman; Mike Speciner (Prentice Hall)
2) Network Security Essential by Stallings – Pearson
3) Cryptography & Network Security by Stallings - Pearson

4MCS4(1) : Mobile Communications

Unit-I : **Mobile Communication:** Applications, History, Market, Simplified Reference Model. Frequencies, Signals, Antennas, Signal Propagation, Multiplexing, Modulation, Spread Spectrum, Cellular System.

Unit-II : **Medium Access Control:** Need, SDMA, FDMA, TDMA, CDMA, Comparison of S/T/F/CDMA. Telecommunication Systems: GSM, DECT, TETRA, UMTS and IMT-2000.

Unit-III : **Satellite Systems:** History, Applications, Basics, Routing, Localization, Handover, Examples. **Broadcast Systems:** Overview, Cyclical Repetition of Data, Digital Audio Broadcasting, Digital Video Broadcasting, Convergence of Broadcasting and Mobile Communications.

Unit-IV : **Wireless LAN:** Infrared Versus Radio Transmission, Infrastructure and Adhoc Network, IEEE 802.11, HIPERLAN, Bluetooth.

Unit-V : **Layers:** Mobile Network Layer: Mobile IP, DHCP, Mobile Adhoc Networks. Mobile Transport Layer: Traditional TCP, Classical TCP improvements, TCP over 2.5/3G Wireless Networks.

Unit-VI : **Support For Mobility:** File Systems, World Wide Web, Wireless Application Protocol, i-Mode, SyncML, WAP2.0.

Books:

1) Mobile Communication: Jochen Schiller (PE)

2) Principles of mobile communication: Gordon L. Stuber (Springer)

3) Wireless Communications: Principles and Practice: Theodore S. Rappaport (Pearson)

4) Mobile Computing: Raj Kamal (Oxford)

4MCS4(2) : Digital Image Processing

UNIT-I : **Introduction:** Definition, Origins, Examples: X-ray Imaging, Ultraviolet Band, Visible and Infrared Bands, Microwave Band, and Radio Band Imaging; Fundamental Steps, Components of an Image Processing System

Digital Image Fundamentals: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, A Simple Image Formation Model; Image Sampling and Quantization; Basic Relationships Between Pixels; Linear and Nonlinear Operations.

UNIT-II : **Image Enhancement in the Spatial Domain:** Basic Gray Level Transformations; Histogram Processing - Histogram Equalization, Histogram Matching (Specification), Local Enhancement; Enhancement Using Arithmetic/Logic Operations; Basics of Spatial Filtering, Smoothing Spatial Filters: Smoothing Linear, Smoothing Order-Statistics Filters; Sharpening Spatial Filters : The Laplacian, The Gradient; Combining Spatial Enhancement Methods

UNIT-III: **Image Enhancement in the Frequency Domain:** Introduction to the Fourier Transform and the Frequency Domain: One-Dimensional Fourier Transform and its Inverse, Two-Dimensional DFT and Its Inverse, Filtering in the Frequency Domain, Correspondence between Filtering in the Spatial and Frequency Domains; Smoothing and Frequency-Domain

Filters - Ideal , Butterworth, and Gaussian Lowpass Filters; Sharpening Frequency Domain Filters - Ideal , Butterworth, and Gaussian Highass Filters, Laplacian in the Frequency Domain, Unsharp Masking, High-Boost Filtering, and High-Frequency Emphasis Filtering; Homomorphic Filtering; Implementation: Additional Properties of the 2-D Fourier Transform, Inverse Fourier Transform Using a Forward Transform Algorithm, Need for Padding, Convolution and Correlation Theorems, The Fast Fourier Transform;

UNIT-IV: Image Restoration: Model of the Image Degradation/ Restoration Process, Noise Models: Restoration in the Presence of Noise Only Spatial Filtering: Mean, Order-Statistics, and Adaptive Filters; Periodic Noise Reduction by Frequency Domain Filtering: Bandreject, Bandpass, and Notch Filtering; Estimating the Degradation Function - Estimation by Image Observation, Experimentation and Modeling; Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Geometric Mean Filter; Geometric Transformations: Spatial Transformations, Gray-Level Interpolation.

UNIT-V: Color Image Processing: Color Fundamentals, Color Models; Pseudocolor Image Processing; Full-Color Image Processing, Color Transformations: Formulation, Color Complements, Color Slicing, Tone and Color Corrections, Histogram Processing; Smoothing and Sharpening, Color Segmentation, Noise in Color Images.

Morphological Image Processing: Preliminaries, Dilation and Erosion, Opening and Closing, The Hit-or-Miss Transformation, Some Basic Morphological Algorithms: Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening, Skeletons, Pruning; Extensions to Gray-Scale Images.

UNIT-VI: Image Segmentation: Detection of Discontinuities: Point, Line, Edge Detection; Edge Linking and Boundary Detection: Local Processing, Global Processing via the Hough Transform, Global Processing via Graph-Theoretic Techniques; Thresholding: Role of Illumination, Basic Global Thresholding, Basic Adaptive Thresholding, Optimal Global and Adaptive Thresholding, Use of Boundary Characteristics for Histogram Improvement and Local Thresholding, Thresholds Based on Several Variables; Region-Based Segmentation: Region Growing, Region Splitting and Merging.

Books:

1. Gonzalez, R. C. and Woods, R. E. : Digital Image Processing, 2nd/ 3rd ed., Prentice Hall
2. Sonka, M., Hlavac, V., Boyle, R. : Image Processing, Analysis and Machine Vision (2nd edition), PWS Publishing, or (3rd edition) Thompson Engineering
3. Anil K. Jain : Fundamentals of digital image processing (2nd Edition), Prentice-Hall, NJ
4. Willian K. Pratt : Digital Image Processing (3rd Edition), John Wiley & Sons

4MCS4(3) : Software Testing

Unit-I : **Testing:** Introduction and Outline - Introduction to testing and test outline, sample application, incremental testing approach, outline approach steps, evaluation and schedule estimation.

Unit-II : Introduction to test outline to test cases, creating test cases, documentation short cuts, introduction to using tables and spreadsheets, sample application, Documenting test cases.

Unit-III : Other types of tablets, State machines, test case table with multiple inputs, decision tables, applications with complex data, managing tests, testing object-oriented software, comparison, System testing example, Unit testing of Classes.

Unit-IV : **Testing Web Applications:** Introduction, sample application, functional and usability issues, configuration and compatibility testing, reliability and availability, security testing, database testing, post implementation testing.

Unit-V : **Reducing the No. of test cases:** Introduction, prioritization guidelines, priority category scheme, Risk analysis, interviewing to identify problem areas, combination schemes, tracking selected test cases.

Unit-VI : **Creating Quality Software:** Introduction, development environmental infrastructure, software testing environment, software testing tools, applying software standards to test documentation.

Books:

1. Introducing Software Testing: Louise Tamres (PE)
2. Software Testing in the Real World by Kit – Pearson
3. Effective methods for software testing – William E. Perry
4. Foundations of Software Testing – Aditya P. Mathur

4MCS5: Lab VII - - Based on 4MCS1 and 4MCS2

"Distribution of marks for Computer Lab-VII"

A) Each student shall perform two practicals.

B) Question slip for each examinee shall be attached to the answer book.

C) Marks should be given on the basis of following criteria:

I)	Practical-I	: 30 marks
II)	Practical-II	: 30 marks
III)	Viva-Voce (Each practical 15 marks)	: 30 marks
IV)	Record	: 10 marks
	Total	**: 100 marks**

4MCS6 : Project

The subject of the project will be given to the student independently on any current topic belonging to the subject. The topic should be assigned at the beginning of the semester. The examinee shall be required to produce two typed hard-bound and one soft copy (C.D.) copies of project report signed by teacher in-charge and certified by head of the department as bonafide work of him/her.

Distribution of Marks:

1.	Project Submission	:	40 marks
2.	Project Presentation	:	40 marks
3.	Viva	:	20 marks
	Total	**:**	**100 marks**

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