SCHEME OF TEACHING AND EXAMINATIONS 2016-2017
MASTER OF SCIENCE IN COMPUTER SCIENCE

FIRST SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit L+ (T+P)/2	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Th	Ses	Pr	Total	Th	Ses	Pr	Tot
Paper 1	Mathematical Foundation of Computer Science	3	2	-	4	100	50	-	150	40	30		70
Paper II	Advance Operating System	3	2	-	4	100	50	-	150	40	30		70
Paper III	Data Structure through algorithms using 'C'	3	2	-	4	100	50	-	150	40	30		70
Paper IV	Object Oriented Programming using 'C++'	3	2	-	4	100	50	-	150	40	30		70
Paper V	Computer System Architecture	3	2	-	4	100	50	-	150	40	30		70
Practical I	Programming Lab Based on Paper III			3x2	3		25	100	125		15	50	65
Practical II	Programming Lab Based on Paper- IV	-	-	3x2	3	-	25	100	125	-	15	50	65
TOTAL		15	10	12	26	500	300	200	**1000**	200	180	100	480

FIRST SEMESTER : M.Sc.(CS)
Paper I : Mathematical Foundation of Computer Science

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT – I : Mathematical Logic, Sets Relations and functions

Mathematical Logic : Notations, Algebra of Propositions & Propositional functions, logical connectives, Truth values & Truth table Tautologies & Contradictions, Normal Forms, Predicate Calculus, Quantifiers.

Set Theory: Sets, Subsets, Power sets, Complement, Union and Intersection, De-Morgan's law Cardinality, relations: Cartesian Products, relational Matrices, properties of relations equivalence relation functions: Injection, Surjection, Bijection, Composition, of Functions, Permutations, Cardinality, the characteristic functions recursive definitions, finite induction.

UNIT – II : Lattices & Boolean Algebra

Lattices : Lattices as Algebraic System, Sub lattices, some special Lattices(Complement, Distributive, Modular).

Boolean Algebra : Axiomatic definitions of Boolean algebra as algebraic structures with two operations, Switching Circuits.

UNIT – III : Groups Fields & Ring

Groups : Groups, axioms, permutation groups, subgroups, co-sets, normal subgroups, free subgroups, grammars, language).

Fields & Rings : Definition **,** Structure, Minimal Polynomials, Irreducible Polynomials, Polynomial roots & its Applications.

UNIT - IV : Graphs

Graphs : Simple Graph, Multigraph & Psuedograph, Degree of a Vertex, Types of Graphs, Sub Graphs and Isomorphic Graphs, Operations of Graphs, Path, Cycles and Connectivity, Euler and Hamilton Graph, Shortest Path Problems BFS(Breadth First Search, Dijkastra's Algorithm, Representation of Graphs, Planar Graphs, Applications of Graph Theory.

UNIT - V : Trees

Trees : Trees, Properties of trees, pendant vertices in a tree, center of tree, Spanning tree, Binary tree, Tree Traversal, Applications of trees in computer science.

BOOKS RECOMMENDED :

1. A text book of Discrete Mathematics – By Swapan Kumar Sarkar.(S.Chand & company Ltd.).
2. Discrete Mathematical structure with - By J.P Trembly & R.P. Manohar.
   Applications to computer science
3. Discrete Mathematics -By K.A Ross and C.R.B writht.
4. Discrete Mathematics Structures -By Bernard Kohman & Robert C. Bushy.
   for computer science
5. Discrete Mathematics -By Seymour Lipschutz Mare Lipson. Tata McGraw-Hill Edition.

FIRST SEMESTER : M.Sc.(CS)
Paper II : Advance Operating Systems

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT-I

Introduction

What is operating system, basic concept, terminology, batch processing, spooling, multiprogramming, time sharing, real time systems, protection, multiprocessor system, operating system as resource manager, process view point, memory management, process management, device management and information management, other views of operating system, historical, functional job control language and supervisor service control.

UNIT-II

Advanced Processor Management Features

Multi- threaded operating system architecture micro-kernels operating system architecture multiple operating system- subsystem and environments, client-server architecture, protected mode software architecture ,visual machine- JAVA virtual machine and virtual 8086 mode, hard and soft real time operating system, pre-emptive and non-pre-emptive multitasking and scheduling inter process communication shared memory semaphore message queues, signals sessions management, multiprocessor and distributed process synchronization, symmetric multiprocessing systems.

UNIT-III

Advanced Memory Management

Virtual address space, description of user process and kernal, virtual memory architecture of Pentium group of processor. Translation Lookaside Buffers, implementation of file mapping, shared memory through virtual memoryviortual swap space.

UNIT - IV

Advanced Device Management Feature

Device driver framework classifying devices and driver, invoking driver code, devices switch table and driver entry points,dynamic loading and unloading of device drivers

UNIT V

Advanced File Management Features

Virtual file systems and v-node architecture, distributed file system, network file system, remote procedure call

RECOMMENDED BOOKS

1. Principles of Operating System - Peterson.
2. Operating System - Mandinick & Donovan.

FIRST SEMESTER : M.Sc.(CS)
Paper III : Data Structure through algorithms using 'C'

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT – I : Introduction and Preliminaries -

Introduction, Basic terminology, Elementary data organization, Data structure, Data structure operation, Algorithms : complexity , time-space Tradeoff.. Mathematical Notation and functions, Algorithmic Notation, Control Structures, Complexity of Algorithms, Sub algorithms, Variables, Data Type.

UNIT - II : String Processing, Arrays, Records And Pointers –

Basic Terminology, Storing String, Character Data Type, String Operations, Word Processing, Pattern Matching Algorithms. Linear Array, Representation of linear Array in Memory, Traversing Linear Arrays, Inserting And Deleting, Sorting; Bubble Sort, Searching; Liner Search, Binary Search, Multidimensional Array, Pointers; Pointer Array, Records; Record Structures, Representation of Records in Memory; Parallel Arrays, Matrices, Sparse Matrices.

UNIT - III : Linked Lists, Stacks, Queues, Recursion -

Linked list, Representation of linked lists in memory, Traversing a linked list, Searching a linked list, Memory Allocation; Garbage Collection, Insertion into a linked List, Deletion from a Linked List, Header Linked List, Two- Way Linked Lists. Stacks, Array Representation of Stack, Arithmetic Expressions; Polish Notation, Quick sort, an application of Stacks, Recursion, Tower of Hanoi, Implementation of Recursive Procedures by Stacks, Queues, Dequeues, Priority Queues.

UNIT - IV : Trees & Graphs -

Binary Trees, Representing Binary Trees in Memory, Traversing binary tree, Traversal Algorithms using stacks, header nodes; threads, Binary Search Tree, Searching and Inserting in Binary Search Tree, Deleting in Binary Search tree, Heap; Heap sort, Path Lengths; Huffmans Algorithms, General Tree. Graph Theory Terminology, Sequential Representation of Graph; Adjacency Matrix, Path Matrix, Linked Representation of Graph.

UNIT - V : Sorting And Searching –

Sorting, Insertion Sort, Selection Sort, Merging, Merge Sort, Radix Sort, Searching and data modification, hashing.

BOOKS RECOMMENDED :

1. Data Structure **- Seymour Lipschutz (Schaum's Series).**

2. Data Structure & Program Design **- Robert L. Kruse, 3rd Ed., Prentice Hall.**

FIRST SEMESTER : M.Sc.(CS)
Paper IV : Object Oriented Programming using 'C++'

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT - I : Language Fundamental

Advantages of OOP, The Object Oriented Approach, and Characteristics of object oriented languages- Object, Classes, Inheritance, Reusability, and Polymorphism.

Overview of C++: History of C++, Data Types, Constants and Variables, Operators and Expression. Control structures : if , if-else, nested if-else, while(), do-while() , for(;;), break, continue, switch, goto, String, Storage class.

UNIT - II : Structure, Function & Array

Structures : A Simple structures ,specify the structures, Defining a structure variable, Accessing structures member, Enumeration data type.

Function: Function Declaration, Calling Function, Function Defines, Passing Argument to function, Passing Constant, Passing Value, Reference Argument, Passing struct variable, Overloaded Function, Inline Function, Default Argument, return statement, returning by reference.

Array: Defining array, array element, initiation array, multi dimensional array, passing array to function.

UNIT - III : Object Classes and Inheritance

Object and Class, Using the class, class construct, class destructors, object as function argument, struct and classes , array as class member, operator overloading. Type of inheritance, Derive class, Base class. Access specifier: protected. Overriding, member function.

UNIT - IV : Pointers

Pointers : & and * operator pointer variables, pointer to void ,pointer and array, pointer and function, pointer and string, memory management, new and delete, pointer to object, pointer to pointer.

UNIT - V : Virtual Function and File & Stream

Virtual Function : Virtual Function, Virtual member function, accesses with pointer, Late binding, pure virtual function, Friend function, Friend class, static function, this pointer, Templates.

File and Stream : C++ streams, Stream class, string I/O, char I/O, Object I/O, I/O with multiple object, File pointer, Disk I/O.

RECOMMENDED BOOKS :

1. Object Oriented Programming : McGregor and Sykes S A, 1992 Van Nostrand.
2. The C++ Programming Language : Strustrp B,Addision Wasley.
3. Object Oriented Programming in C++ : Lafore R, Galgotia Publications.
4. Introduction to Object Oriented Programming : Witt KV, Galgotia Publications.
5. Object Oriented Programming : Blaschek G, Springer Verlag
6. Object Data Management : Cattel R, Addison Wasley.

FIRST SEMESTER : M.Sc.(CS)
Paper V : Computer System Architecture

Max Marks: 100 **Min Marks: 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT - I : Representation of Information

Number system, Integer & Floating point representation Character code (ASCII, EBCDIC), Error Detect and Correct code, Basic Building Blocks, Boolean Algebra, MAP Simplification, Combination Blocks, Gates, Multiplexers, Decoders, etc Sequential building block, flip-flop, registers, counters, ALU, RAM etc.

UNIT - II : Register transfer language and micro operations

Concepts of bus, data movement along registers, a language to represent conditional data transfer, data movement from its memory, arithmetic and logical operations along with register transfer timing in register transfer

UNIT - III : Basic Computer Organization and Design

Instruction code, Computer Instructions, Timing and Control, Execution of Instruction, Input and Output Interrupt, Design of Computer.

UNIT - IV : Computer Software

Programming Language, Assembly Language, Assembler, Program Loops, Input /Output Programming, System Software. Central Processor Organization: - Processor Bus Organization, Arithmetic Logic Unit, Stack Organization, Instruction Formats, Addressing modes, Data transfer and Manipulation, Program Control, Microprocessor Organization, Parallel Processing,.

UNIT - V : Input –Output & Memory Organization

Input –Output Organization : Peripheral Devices, Input/Output Interface, Asynchronous Data Transfer, Direct Memory Access (DMA), Priority Interrupt, Input-Output Processor, Multiprocessor System Organization, and Data Communication Processor**.**

Memory Organization : Auxiliary Memory, Micro Computer Memory, Memory Hierarchy, Associative Memory, Virtual Memory, Cache Memory, Memory Management Hardware.

BOOKS RECOMMENDED:

1. Computer System Architecture - M. Morris Mano (PHI).
2. Digital Computer Electronics - Malvino.
3. Digital Computers and Logic Design - M.Morris Mano (PHI).
4. Structured Computer Organization - Andrew M. Tanenbanm (PHI).

SCHEME OF TEACHING AND EXAMINATIONS 2016-2017
MASTER OF SCIENCE IN COMPUTER SCIENCE

SECOND SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P	L+ (T+P)/2	Th	Ses	Pr	Total	Th	Ses	Pr	Tot
Paper 1	RDBMS (SQL Programming with Oracle)	3	2	-	4	100	50	-	150	40	30		70
Paper II	Advanced Computer Networks	3	2	-	4	100	50	-	150	40	30		70
Paper III	Programming in Visual Basic	3	2	-	4	100	50	-	150	40	30		70
Paper IV	Principles of Compiler Design	3	2	-	4	100	50	-	150	40	30		70
Paper V	Numerical Analysis	3	2	-	4	100	50	-	150	40	30		70
Practical I	Practical Based on Paper I			3x2	3		25	100	125		15	50	65
Practical II	Practical Based on Paper III	-	-	3x2	3	-	25	100	125	-	15	50	65
TOTAL		15	10	26	26	500	300	200	**1000**	200	180	100	480

SECOND SEMESTER : M.Sc.(CS)
Paper I : RDBMS (SQL Programming with Oracle)

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT - I : Overview of Database Management -
Data, Information and knowledge, Increasing use of data as a corporate resource, data processing verses data management, file oriented approach verses database oriented approach to data management; data independence, database administration roles, DBMS architecture, different kinds of DBMS users, importance of data dictionary, contents of data dictionary, types of database languages. Data models: network, hierarchical, relational. Introduction to distributed databases, Client/Server databases, Object-oriented databases, Object-relational databases, Introduction to ODBC concept.

UNIT - II : Relational Model & Relational Algebra -
Entity - Relationship model as a tool for conceptual design-entities, attributes and relationships. ER diagrams; Concept of keys; Case studies of ER modeling Generalization; specialization and aggregation. Converting an ER model into relational Schema. Extended ER features, Introduction to UML, Representation in UML diagram (Class Diagram etc.).
Relational Algebra: select, project, cross product different types of joins (inner join, outer joins, self join); set operations, Tuple relational calculus, Domain relational calculus, Simple and complex queries using relational algebra, stand alone and embedded query languages.

UNIT - III : SQL
Introduction to SQL constructs (SELECT…FROM, WHERE… GROUP BY… HAVING… ORDERBY….), INSERT, DELETE, UPDATE, DROP, VIEW definition and use, Temporary tables, Nested queries, and correlated nested queries, Integrity constraints: Not null, unique, check, primary key, foreign key, references, Triggers. Embedded SQL and Application Programming Interfaces.
Introduction to PL/SQL variables – literals – data types – advantages of PL/SQL; Control statements **:** if ; iterative control – loop, while, for , goto ; exit when; Cursors : Types – implicit, explicit – parameterized cursors – cursor attributes; Exceptions: Types – internal , user-defined , handling exceptions – raise statement.

UNIT - IV : PL/SQL
PL/SQL tables and records: Declaring PL/SQL tables - referring PL/SQL tables, inserting and fetching rows using PL/SQL table, deleting rows; records - declaration of records - deleting records; Sub programs: Functions - procedures – input-output parameters; purity functions - packages - package specification - advantages of packages - private and public items - cursors in packages.

UNIT - V : Relational Database Design-
Normalization concept in logical model; Pitfalls in database design, update anomalies: Functional dependencies, Join dependencies, Normal forms (1NF, 2NF, 3NF). Boyce Codd Normal form, Decomposition, Multi-Valued Dependencies, 4NF, 5NF. Issues in physical design; Concepts of De-normalization, Indexing, Clustering indexes. Data Organization - Fixed length records, variable length records, Organization of records in files, Indexing: - indexed files -B-tree, B+-tree, and Hashing Techniques.

BOOKS RECOMMENDED :

1. Database system concept - **H. Korth and A. Silberschatz, TMH**
3. Data Base Management System - **Ivan Bayross**
4. Data Base Management System - **James Matin**
5. Database Management System - **Leon & Leon, Vikas Publication**
6. An Introduction to database systems - **Bipin Desai, Galgotia Publication.**
7. Database Management System - **A. K. Majumdar & P.Bhattacharya, TMH**

SECOND SEMESTER : M.Sc.(CS)
Paper II : Advanced Computer Networks

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT - I

Introduction to Computer Networking : The Concept of Networking, Data Communication, Required network elements, The role of Standards Organization. Line Configuration, Various Topologies, Transmission Mode, Categories of Networks- LAN, MAN, WAN. The benefits of a Computer Networks.

The OSI and TCP/IP Reference Model : The Concept of Layered Architecture, Design Issues for the Layers. Interfaces and services, Detailed Functions of the Layers. Comparison between OSI and TCP/IP Reference model.

UNIT - II

Transmission of Digital Data : Shannon's and Nyquist theorems for maximum data rate of a channel. Transmission media- Co-axial, UTP, Fiber optic and wireless. Analog and digital data Transmission- parallel and serial transmission. DTE-DCE interface using RS-232C. Study of modems- 56k and Cable Modem. Modem standards.

Multiplexing and Switching : The Concept of Multiplexing- FDM, TDM, WDM. The Concept of Switching- Circuiting, Message switching, Packet switching.

UNIT - III

Data Link Layer and Routing Algorithms : Line Discipline, Flow Control- stop and wait, sliding window, Go back N, Error Control- ARQ stop and wait, sliding window ARQ. HDLC, SLIP, PPP. Multiple access protocols- ALOHA, Slotted ALOHA, CSMA/CD. IEEE standards for LAN's and MAN's. The IP protocol, and its header. IP address classes and subnet mask.

The concept of ICMP, ARP, RARP, RSVP, CIDR and Ipv6. : Routing algorithms- shorted path first, Distance Vector, Link State. Congestion Control-The leaky bucket and Token bucket Algorithms.

UNIT - IV

Transport Layer : The Concept of client and Server in terms of Socket addressing in Transport layer. Two way and three-way handshaking. TCP header.
Network Performance Issues. The Concept of Domain Name System, Various Resource Records. Architecture and services of E-mail (RFC-822 and MIME). The Concept of World Wide Web- server side and client side.

ATM : The concept of ATM, ATM Adoption layers- AAL1, AAL2, AAL3/4, AAL5, Comparison of AAL protocols. Cell formats for UNI and NNI. Service Categories, Quality of service, Congestion Control in ATM.

UNIT - V

Comparative study of Networking Technologies : X.25, Frame Relay, ATM, SONET, SMDS, ISDN.
Network Security : The importance of Security in Networking, traditional cryptography, Data Encryption standards, RSA Algorithm.

BOOKS RECOMMENDED :

Computer Networks - A S Tanenbaum
Data Communication and Networking - Forouzan

SECOND SEMESTER : M.Sc.(CS)
Paper III : Programming in Visual Basic

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT – I

Introduction to Visual Basic : The Visual Basic Program Development Process; The Visual Basic Environment; Opening a Visual Basic Project; Saving a Visual Basic Project; Running a Visual Basic Project;

Visual Basic Fundamentals : Numeric Constants; String Constants; Variables; Data Types and Data Declarations; Operators and Expressions; Hierarchy of Operations; String Expressions; Library functions , Branching and Looping Statements, Relational Operators and Logical Expressions; Logical Operators; Branching with the if-Then Block; Branching with if-Then -Else Blocks; Selection: Select-case; Looping with for-Next; Looping With Do-Loop; Looping with While-Wend

UNIT - II

Visual Basic Control Fundamentals : Visual Basic Control Tools; Control tool Categories; Working with controls; Naming Forms and Controls; Assigning Property Values to Forms and Controls; Executing Commands(Event Procedures and Command Buttons); Display Output Data (Labels and Text Boxes);Entering Input data(Text Boxes); selecting Multiple Features(Check Boxes); selecting Exclusive Alternatives(Option Button and Frames);Assigning Properties Collectively(The With Block); Generating Error Messages(The MsgBox Function);Creating Times Events; Scrollbars;

Menus and Dialog Boxes : Building Drop-down Menus; accessing a Menu from the Keyboard; Menu Enhancements; Submenus; Pop-up Menus; Dialog Boxes; Input Box;

UNIT - III

Executing and Debugging a New Project : Syntax Errors; Logical Errors; Setting break Points; Defining Watch Values; Stepping Through a Program; User- Induced Errors; Error Handlers;

Procedures : Modules and Procedures; Sub Procedure; Event Procedures; Function Procedures; Scope; Optional Arguments

Arrays : Array Characteristics; Array declarations; Processing Array Elements; Passing Arrays to Procedures; Dynamic Arrays; Array-Related Functions; Control Arrays;

Using Class Modules : Object Oriented Principles; Creating Class Modules; Using Class Modules Adding Properties and Events and Methods.

UNIT - IV

Using COM Components : Introduction to ActiveX Components and Component Object Model; Benefits of COM; Clients and Servers; Types of ActiveX Components Available in Visual Basic; Creating user defines ActiveX Components; Managing Components; The Visual Component Manager; Registering and UnRegistering Components.

ActiveX Controls : Creating an ActiveX Control; Benefits of ActiveX Control; Adding Properties; Methods and Events to the Control; Managing and Distribution of the Control; Built-in Active X Controls.

ActiveX EXE and ActiveX DLL : Introduction to ActiveX DLL and EXE; Creating ActiveX EXE Component; Creating ActiveX DLL Component

UNIT - V

Data Access using ADO : Data Access Technology with VB ; The ActiveX Data Object Model; Advantages of ADO and OLEDB; Connecting to a Data Source; Retrieving from a Data Source; Sorting and Searching Data; Updating Data; Creating Dynamic Record Sets; Using Cursors; Cursor Types; Locking; Accessing ADO Data Control.

Data Environment and Data Report : Introduction; Data Environment Designers; Working with Data Reports; Cut different types of Data Reports.

BOOKS RECOMMENDED :

1. Programming in Visual Basic - SAHU By BPB Publications.

SECOND SEMESTER : M.Sc.(CS)
Paper IV : Principles of Compiler Design

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT-I

Introduction to Compilers : Overview, Structure, implementation. Programming Language Grammars: Inter Language grammars, derivation, reduction, syntax tree, ambiguity, regular grammars & expressions.

UNIT-II

Scanning and Parsing Techniques : The Scanner, parser, translation, elementary symbol table organization, structures.

UNIT-III

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

UNIT-IV

Compilation of Control Structures : Control transfers, procedural calls, conditional execution, interation control constructs. Error detection, indication & recovery.

Compilation of I/O Statements: Compilation of I/O list, compilation of FORMAT list, IOSUB, file control.

UNIT-V

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

BOOKS RECOMMENDED :

1. Compiler Construction -D.M.Dhandhere (M)
2. Compiler Writing -Tremble-Sorenson (TMH)
3. Computers : Princ, Techniques cools by Aho -Person.
4. The Essence of Compilers by Hanter -Pearson.

SECOND SEMESTER : M.Sc.(CS)
Paper V : Numerical Analysis

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT – I : Solution of Polynomial and Transcendental Algebraic Equations

Bisection method, Regulafalsi method & Newton's method, Solution of Cubic & Biquadrate Equation, Complex roots of polynomial equations.

UNIT – II : Simultaneous Equations and Matrix

Gauss-Jordan method, Cholesky's method, Reduction to lower or upper Triangular forms, Inversion of matrix, method of partitioning, Characteristics equation of matrix, Power methods, Eigen values of matrix, Transformation to diagonal forms.

UNIT - III : Curve-Fitting from Observed Data

Divided difference table for evenly or unevenly spaced data, polynomial curve-fitting - Newton's, Gauss and Langranges form of interpolation and Divided Differences, method of least square for polynomials,.

UNIT - IV : Numerical Differentiation and Integration

Forward and Backward differential operators, Newton - cotes integration formula: Trapezoidal Rule, Simpson's Rule, Boole's Rule, Weddle Rule, Legendre's rule, method of weighted coefficients.

UNIT - V : Solution of Differential Equations

Numerical Solution of ordinary differential equations, one step method, Taylor's Series, Predictor-Corrector Method, Euler's Method, Runga-Kutta Method, Milne's method.

BOOKS RECOMMENDED

1. Garewal : Numerical methods
2. Gupta & Mallic : Numerical Methods
3. Hamming R.W. : Numerical methods for scientist & Engineers. (McGraw Hill)
4. Conle S.D. : Elementary numerical analysis
   Carl De Boor (International Book Company London)
5. Jain M.K. : Numerical methods for Science and Engineering
   Iyengar S.R.K Calculations (John Willey & Sons)

SCHEME OF TEACHING AND EXAMINATIONS 2016-2017
MASTER OF SCIENCE IN COMPUTER SCIENCE
THIRD SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P	L+ (T+P)/2	Th	Ses	Pr	Total	Th	Ses	Pr	Tot
Paper 1	Programming in Java	3	2	-	4	100	50	-	150	40	30		70
PaperII	Computer Graphics	3	2	-	4	100	50	-	150	40	30		70
PaperIII	LINUX	3	2	-	4	100	50	-	150	40	30		70
Paper IV	Image processing	3	2	-	4	100	50	-	150	40	30		70
Paper V	Object Oriented Analysis and Design	3	2	-	4	100	50	-	150	40	30		70
Pretical I	Practical Based on Paper I			3x2	3		25	100	125		15	50	65
Prectical II	Practical Based on Paper III	-	-	3x2	3	-	25	100	125	-	15	50	65
TOTAL		15	10	12	26	500	300	200	**1000**	200	180	100	480

THIRD SEMESTER : M.Sc.(CS)
Paper I : Programming in Java

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT-I

Introduction: History and features of Java, Difference between C, C++ & JAVA. JAVA and Internet, WWW, Web Browsers, java supports system, Java Environment. JDK, JVM, Byte code Java
Programming Basics: Structure of Java program, JAVA tokens and Statements, Constants & Variables, Data types, Operators, Command line arguments. Java Statements & Arrays: if and switch statement. while, do-while and , for. Introduction to arrays, types of arrays, new operator, Strings. String class & its methods, Vectors. Classes & Objects: Specifying classes, Methods and fields, creating objects. Passing objects to methods, returning objects, static fields & methods. Constructors, Garbage collection, Overloading methods & constructors, this keyword.

UNIT-II

Inheritances: Specifying sub class, types of inheritance, visibility control: public, private, protected, package. super keyword, Overriding methods, Dynamic method dispatch, Abstract methods and classes, final methods & classes,
Packages & Interfaces : Introduction to packages, naming conventions, package statement, creating packages, import statement, accessing package, use of CLASSPATH, adding class to package, hiding classes. Interface, implementing interfaces, multiple interfaces.
Multithreading: Creation threads, Extending Thread class, implements Runnable interface, stopping and blocking thread, Thread life cycle, thread priorities & Thread synchronization, using Thread methods.

UNIT-III:

Exception Handling: Managing errors, types of errors, exceptions, syntax of exception handling code. try, catch, throw, throws and finally statements, multiple catch & nested try statements.
Java Input Output: Java I/O package, Byte/Character Stream, Buffered reader / writer, File reader / writer, File Sequential / Random. Reading numeric, character & strings data from keyboard.
Applet programming: Applet Vs. Application, Creating applets, life cycle, local & remote applets. <APPLET> tag & its attributes, adding applet to HTML file, Running applet.

UNIT-IV:

Abstract Windows Toolkit (AWT): Components and Graphics, Containers, Frames and Panels, Layout Managers, Border layout, Flow layout, Grid layout, Card layout, AWT components. Event delegation Model, Event source and handler, Event categories, Listeners, Interfaces, Controls such as text box, radio buttons, checkboxes, lists, choice, command buttons, text area etc.
JDBC: Java database connectivity, Types of JDBC drivers, Writing JDBC applications, Types of statement objects(Statement, PreparedStatement and CallableStatement), Types of resultset, Inserting and updating , records, JDBC and AWT,

UNIT-V:

Networking with Java : Networking basics, Sockets, port., Internet addressing, java.net – networking classes and interfaces, Implementing TCP/IP based Server and Client
Servlets: Introduction Servlet API Overview, Writing and running Simple Servlet, Servlet Life cycle, Generic Servlet, HTTPServlet, ServletConfig, ServletContest, Writing Servlet to handle Get and Post methods.

BOOKS RECOMMENDED

1. Horstman Cay, Cornell Gary, Core JavaTM2, Vol.1&2, 7edition, Pearson Education.
2. Herbert Schildt, The Complete Reference, seventh edition, [TMH]
3. Programming with JAVA – A Primer by E. Balguruswamy (TMH)
4. Steven Holzner, JAVA 2 Programming Black Book, Wiley India.
5. Ivor Horton, Beginning Java 2, JDK 5 Ed, Wiley India.
6. Java 2 from scratch by Steven Haines the – PHI
7. Java database Programming – Maithew Siple – THM

THIRD SEMESTER : M.Sc.(CS)
Paper II : Computer Graphics

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

Unit-I

Introduction of computer Graphics and its applications, Overview of Graphics systems, Video display devices, Raster scan display, Raster scan systems, video controller, Raster scan display processor, Random scan display, random scan systems, color CRT monitor, Flat panel display, Interactive input devices, Logical classification of input devices, Keyboard, mouse, Trackball and spaceball, Joysticks, Image scanner, Light pens, Graphics software, Coordinates representations, Graphics functions.

Unit-II

Line drawing algorithms, DDA, Bresenham's, Circle generating, Mid-point circle algorithm, Ellipse generating, Polynomials, Scan-line polygon fill, Boundary fill.

Unit-III

Basic transformation's, Translation, Rotation, Scaling, Matrix representation's & homogeneous co-ordinates, Composite transformation's, Reflection, Two dimensional viewing, Two dimensional clipping, Line, Polygon, Curve, Text. 3D-transformation, Projection, Viewing, Clipping.

Unit-IV

Spline representation, Cubic spline, Bezier curve, Bezier surfaces, Beta spline, B-spline surfaces, B-spline curve, Hidden surfaces, Hidden lines, Z-buffer.

Unit-V

Fractal's geometry Fractal generation procedure, Classification of Fractal, Fractal dimension, Fractal construction methods. Color models, XYZ, RGB, YIQ, CMY & HSV, Shading algorithms, Shading model, Illumination model, Gouraud shading, Phong shading.

BOOKS RECOMMENDED

1. Computer Graphics by M. Pauline Baker, Donald Hearn PHI.
2. Mathematical Element for Computer Graphics By. David F. Roger., J. Alan Adamsnd
3. Principles of Interactive Computer Graphics By. William. M. Newmann.
4. Procedural Element for Computer Graphics By. David F. Roger. Mc. Graw Hill.
5. Computer Graphics By A.P. Godse, TPPublication,
6. Computer Graphics By V.K. Pachghare, Laxmi Publication

THIRD SEMESTER : M.Sc.(CS)
Paper III : LINUX

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT - I

Introduction : Introduction to Multi-user System, Emergency and history of Unix, Feature and benefits, Versions of Unix. System Structure:-Hardware requirements, Kernel and its function, introduction to System calls and Shell.

File System : Feature of Unix File System, Concept of i-node table, links, commonly used commands like who, pwd, cd, mkdir, rm, ls, mv, lp, chmod, cp, grep, sed, awk, pr, lex, yacc, make, etc. Getting started (login / logout), File system management, file operation, system calls, buffer cache .Vi Editor:- Intro to text processing, command and edit mode, invoking vi, command structure, deleting and inserting line, deleting and replacing character, searching strings, yanking, running shell command, command macros, set windows, set auto indent, set number, intro to exrc file.

UNIT - II

Shell Programming : Introduction to shell feature, wild card characters, i/out redirections, standard error redirection, system and user created shell variables, profile files, pipes/tee, background processing, command line arguments, command substitution, read statement, conditional execution of commands, special shell variables $ #, #?, $* etc. Shift commands, loops and decision making- for, while and until, choice making using case…esac, decision making if ….fi, using test, string comparison, numerical comparison, logical operation, using expr.

UNIT - III

Introduction to Shell : Features, changing the login shell, cshrc, login, logout files, setting environment, variables, history and alias mechanism, command line arguments, redirection/appending safely, noclobber, noglob, ignore eof, directory stacks (pushd, popd), feature of other shell (rsh, vsh).

Process Control : Process management, process states and transition, regions and control of process, sleep and waking, process creation, process killing, signals, system boot and init process, traps, sitting process priorities.

UNIT - IV

Inter-process Communication : I/O Sub system, terminal drives, disk drives, messages, shared memory, semaphores, memory management, swapping, demand paging.

System Calls and Unix -C Interface : File handling calls like - access (), open(), create(), read(), write(), close(), fseek(), process control system calls like kill(), exec(), fork(), wait(), signal(), exit(), comparing stdio library and calls.

UNIT - V

System Administration : Process and Scheduling, Security, Basic System Administration:- Adding a User, User Passwords, Delete of a User, Adding a Group, Deleting a Group, Super User, Startup and Shutdown. Advanced System Administration:-Managing Disk Space, Backup and Restore, Managing System Services. Xwindows:- Introduction to Xwindows concept

RECOMMENDED BOOKS:

1. Arnold Robbins, “Linux Programming by Examples The Fundamentals”, Pearson Education, 2Ed., 2008.
2. Cox K, “Red Hat Linux Administrator’s Guide”, PHI, 2009.
3. R. Stevens, “UNIX Network Programming”, PHI, 3Ed., 2008.
4. Sumitabha Das, “Unix Concepts and Applications”, TMH, 4Ed., 2009.

THIRD SEMESTER : M.Sc.(CS)
Paper IV : Image Processing

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT - I

Digital Image fundaments: Introduction, An image model, sampling & quantization, basic relation ships between Pixels, imaging geometry.

UNIT - II

Image Transforms: Properties of 2 – D Fourier transform, FFT algorithm and other separable image transforms. Walsh transforms. Hadamard, Cosine, Haar, Slant transforms, KL transforms and their properties.

UNIT - III

Image Enhancement: Background, enhancement by point processing, histogram processing, spatial filtering and enhancement in frequency domain, color image processing.

Image filtering and restoration : degradation model, diagnolisation of circulant and block circulate matrices, Algebraic approach to restoration, inverse filtering, least mean squares and interactive restoration, geometric transformations.

UNIT - IV

Image compression: Fundamentals, image compression modes, error free compression, lossy compression, image compression standards.

Image segmentation: Detection of discontinuities, edge linking and boundary detection thresholding, region – oriented segmentation, use of motion in segmentation.

UNIT - V

Representation and description: Various schemes for representation, boundary descriptors, and regional descrip

Image reconstruction from Projections, Radon Transforms; Convolution/Filter back – Project Algorithms.

Reference:

1. Fundamentals of Digital Image Processing - A. K. Jain, Prentice Hall
2. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods

THIRD SEMESTER : M.Sc.(CS)
Paper V : Object Oriented Analysis And Design

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

Unit-I

Introduction: Two views of software Developments: SSAD and OOAD, Why Object –Orientation? Object and classes, Abstraction and encapsulation, Methods and Message, Interfaces, Inheritance and Polymorphism, Access Control, The Business case for OO Developments.

Object Oriented Methodologies: Object Oriented Design –Booch, Object Modeling Techniques-Rumbaugh, Object – Oriented Analysis – Coad-Yourdan, Object – Oriented Software Engineering – Ivar Jacbson,

Unit-II

Unified Approach: Diagramming and Notational Techniques using the UML, UML Notation, {Analysis Diagramming Techniques.} == Introduction to all (ten) Diagram, {Design Diagramming Techniques}, Generalization/Specialization, Aggregation and composition, Association, Cardinality, Navigability, Icons, relationships and adornments.

Object-Oriented Systems Development Process:

Rational Unified Process, Four Major phases: Inception, Elaboration, Construction, Transition, Requirements Engineering: Problem analysis, Understanding Stockholders need, Type of requirements, Use-case Model : Writing Requirements

Unit-III

Analysis: Behavioral Analysis, Domain Analysis or Business Object Analysis, Use-case Driven Object Oriented analysis : The UML approach., Develop use-case Model, Use-case Description, Documentation, Activity Diagram, Identify the classes., Introduction to different approaches for identifying classes, “Noun Phrase” approach OR ,“Conman Class Pattern” approach Or , “CRC” approach Or, Use case Driven Approach. Containment and Composition, Aggregation, Inheritance, SubTypes and IS-A Hierarchies, Association and Link Relationships, Diagramming System Events.

Unit IV

Design Phases: Translating Analysis Concept into Design, Optimizing classes and Objects: The Multi-tiered Architecture View, ,Mapping System functions to objects., Object to Object Visibility, Collaboration Diagram, Sequential Diagram, Specification Class Diagram, Specifying Object Interfaces, Designing the Data Access layer, Design User Interface layer, Designing System Interfaces, Controls and Security.

Unit V

Design Refinement : Designing for Extensibility, Design for reusability, Portioning class space, Checking Completeness and correctness.

Persistent Object and Database Issues: The Cood Data Management Domain, Object Persistence, Object-oriented Database Management System, Object-Oriented verses Relational Database, Mapping object to Relational Data structure. **Testing:** Introduction to Testing Strategies, Impact of Object Orientation on Testing. Testing Business Process, Design Matrix, Discovering reusable pattern.

RECOMMENDED BOOKS

1. Object Oriented Analysis and Design with Applications - Grady Booch, Benjamin/Cummings.
2. Object Oriented Modeling and Design. – J Rumbaugh, M Blaha, W .Premerlani
3. Principles of Object-Oriented Software Development - Anton Eliens, Addison Wesley.
4. Object Oriented System Development - Ali Bahrami McGRAW-HILL.
5. Object Oriented Software Engineering – Ivar Jacobson Pearson Education INC
6. Design Object-Oriented Software - Rebecea Wrifs-Brock. Brian Wilkerson, Lauren Wiener,

SCHEME OF TEACHING AND EXAMINATIONS 2016-2017
MASTER OF SCIENCE IN COMPUTER SCIENCE
FORTH SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P	L+ (T+P)/2	Th	Ses	Pr	Total	Th	Ses	Pr	Total
Paper 1	Software Engineering	3	2	-	4	100	50	-	150	40	30		70
Paper II	Artificial intelligence and Expert System	3	2	-	4	100	50	-	150	40	30		70
Paper III	Elective : 1. Data Mining & Data Warehousing 2. Advanced Computer Architecture	3	2	-	4	100	50	-	150	40	30		70
Project	Major Project	-	-	6x2	6	-	50	300	350		30	150	180
TOTAL		09	06	15	18	300	200	300	**800**	120	120	150	390

FOURTH SEMESTER : M.Sc.(CS)
Paper I : Software Engineering

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT-I

Introduction: Software Crisis, Software Processes & Characteristics, Software life cycle models, Waterfall, Prototype, Evolutionary and Spiral Models.

Software Requirements analysis & specifications: Requirement engineering, requirement elicitation techniques like FAST, QFD & Use case approach, requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS, Requirement Management, IEEE Std. for SRS.

UNIT-II

Software Project Planning: Size Estimation like lines of Code & Function Count, Cost Estimation Models, COCOMO, Putnam resource allocation model, Validating Software Estimates, Risk Management.

Software Design: Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design.

UNIT-III

Software Metrics: Software measurements: What & Why, Token Count, Halstead Software Science Measures, Data Structure Metrics, Information Flow Metrics.

Software Reliability: Importance, Hardware Reliability & Software Reliability, Failure and Faults, Reliability Models-Basic Model, Logarithmic Poisson Model, Software Quality Models, CMM & ISO 9001.

UNIT-IV

Software Testing: Testing process, Design of test cases, Introduction to functional testing & Structural testing, Unit Testing, Integration and System Testing, Debugging, Alpha & Beta Testing.

Software Maintenance: Management of Maintenance, Maintenance Process, Maintenance Models, Regression Testing, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation.

RECOMMENDED BOOKS

1. K. K. Aggarwal and Yogesh Singh, “Software Engineering”, New Age International,
2. R. S. Pressman, “Software Engineering – A Practitioner’s Approach”, McGraw Hill Int. ,
3. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Narosa,

REFERENCES:

1. Stephen R. Schach, “Classical & Object Oriented Software Engineering”, IRWIN,
2. James Peter, W. Pedrycz, “Software Engineering: An Engineering Approach
3. I. Sommerville, “Software Engineering”, Addison Wesley,8Ed., 2009.
4. Frank Tsui and Orlando Karan, “Essentials of Software Engineering”, Joes and Bartlett,

2 Ed., 2010.

5. Kassem A. Saleh, “Software Engineering”, Cengage Learning, 2009.
6. Rajib Mall, “Fundamrntal of Software Engineering”, PHI, 3Ed., 2009.
7. Carlo Ghizzi , Mehdi Jazayeri and Dino Mandrioli, “ Fundamental of Software Engineering”,

FOURTH SEMESTER : M.Sc.(CS)
Paper II : Artificial Intelligence and Expert System

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT - I

General Issues and overview of AI : The AI problems; what is an AI technique; Characteristics of AI applications

Problem solving, search and control strategies : General problem solving; production systems; control strategies: forward and backward and backward chaining Exhaustive searches: Depth first Breadth first search

UNIT - II

Heuristic Search techniques : Hill climbing; Branch and Bound technique; Best first search and A* algorithm; AND/Or Graphs; problem reduction and AO* algorithm; constraint satisfaction problems.

Game playing : Minimax search procedure; Alpha-Beta cutoffs; Additional Refinements.

UNIT - III

Knowledge Representation : First order predicate calculus; Skolemization Resolution principle and unification; Inference Mechanisms; Horn's clauses; semantic Networks; frame systems and value inheritance. Scripts; conceptual dependency;

AI Programming Languages : Introduction to Lisp, Syntax and Numeric functions; List manipulation functions; Iteration and Recursion; Property list and Arrays, Introduction to PROLOG.

UNIT - IV

Natural language processing : Parsing technique; context—context- free grammar; Recursive Transition Nets (RTN); Augmented Transition Nets ((ATN); case and logic grammars; semantic analysis.

Planning : Overview- An example Domain: The Blocks Word; Component of planning systems: Goal Stack Planning (linear planning); Non-linear planning using goal sets; probabilistic reasoning and Uncertainty; probability theory; Bayes Theorem and Bayesian networks; certainty factor.

UNIT - V

Expert Systems : Introduction to expert systems and Applications of expert systems; various expert system shells: vidwan; frame work; knowledge acquisition; case studies; MYCIN.

Learning : Role learning; learning by induction; Explanation based learning.

BOOKS RECOMMENDED :

1. Artificial Intelligence - Elaine Rich and Kevin knight, Tata McGraw hill.
2. Introduction to Artificial Intelligence and Expert Systems - Dan W. Patterson, Prentice hall of India.
3. Principles of Artificial Intelligence - Nills j. Nilson, Narosa publishing house.
4. Programming in PROLOG - Clocksin & C.S. Melish, Narosa publishing house.
5. Rule based expert system (A practical Introduction) - M.sasikumar, S.Ramani, narosa publishing house.

FOURTH SEMESTER : M.Sc.(CS)
Paper III : Elective 1. Data Mining & Data Warehouse

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT – I : Introduction & Data Warehousing and OLAP Technology for Data Mining –
What is data mining?, Data Mining: On what kind of data?, Data mining functionality, Are all the patterns interesting?, Classification of data mining systems, What is a data warehouse?, A multi-dimensional data model, Data warehouse architecture, Data warehouse implementation, Further development of data cube technology, From data warehousing to data mining. Concept of Transaction, Transactional database, Distributed Database, Commit Protocols.

UNIT - II : Data Preprocessing, Data Mining Primitive, Languages and System Architecture –
Why preprocess the data?, Data cleaning ,Data integration and transformation, Data reduction, Discrimination and concept hierarchy generation, Data Mining Primitive, Data Mining Query Language, Architecture of data mining system.

UNIT - III : Mining Association Rules in Large Databases-
Association rule mining, Mining single-dimensional Boolean association rules from transactional databases, Mining multilevel association rules from transactional databases, Mining multidimensional association rules from transactional databases and data warehouse, From association mining to correlation analysis, Constraint-based association mining.

UNIT - IV : Classification and Prediction & Cluster Analysis –
What is classification? What is prediction? Issues regarding classification and prediction, Classification by decision tree induction, Bayesian Classification, Classification by back propagation, Classification based on concepts from association rule mining, Other Classification Methods ,Prediction, Classification accuracy, What is Cluster Analysis?, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.

UNIT - V : Mining Complex Types of Data & Applications and Trends in Data Mining -
Multidimensional analysis and descriptive mining of complex data objects, Mining spatial databases, Mining multimedia databases, Mining time-series and sequence data, Mining text databases, Mining the World-Wide Web, Data mining applications, Data mining system products and research prototypes, Additional themes on data mining, Social impact of data mining, Trends in data mining.

BOOKS RECOMMENDED

1. Data Mining: Concepts and Techniques - Jiawei Han and Micheline Kamber
2. Data Mining Concepts - H. Marget

FOURTH SEMESTER : M.Sc.(CS)
Paper III : Elective 2. Advanced Computer Architecture

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT I

Introduction:- Feng's and Flynn's classification schemes, multiprocessor and multicomputer, UMA, NUMA, COMA, NORMA, memory models, parallel computers and its type. Application of ParallelComputers.

UNIT II

System Interconnect Architecture-Static & dynamic, Hypercube interconnection network, multistage interconnection networks-architecture & routing, design consideration, throughput, delay, blocking and non-blocking properties. Performance Metrics and Benchmarks.

UNIT III

Principle of Pipelining-overlapped parallelism, Linear and non-Linear pipelining, reservation table, calculation of MAL. Types of instruction pipeline. Arithmetic pipeline designs example-Floating point adder, pipelined multiplier.

UNIT IV

Advance processor Technology-RISC, CISC,VLIW architectures. Hazard detection and resolution, functional organization of instruction in IBM 360/91.

UNIT V

Exploring parallelism in program- multidimensional arrays, Parallel Algorithm- Matrix addition, subtraction, multiplication-block and SIMD. Bitonic sort, sorting on linear array processors. Bernstein's condition, Iso efficiency Concept.

TEXT BOOKS:.

1. Computer Architecture & Parallel Processing by Kai Hwang and F.A. Briggs-Mc Graw Hill.
2. Advanced Computer Architecture By Kai Hwang –Mc Graw Hill.
3. Parallel Computer Architecture & Programming by- V Raja Raman and C. Shiarammuty-PHI

REFERENCE BOOKS:

Parallel Computing Theory and practice by Michael J. Quinn –Tata Mc-Graw Hill