MADHYANCHAL
PROFESSIONAL UNIVERSITY

Draft Rules and Syllabus for the M.Sc(CS)

Madhyanchal Professional University may reorganize the sequence of courses, units or plans to suit their own situations without compromising the minimum requirements laid down by the Higher Education of Madhya Pradesh.

The course of study for M.Sc(CS) shall extend over a period of two years including four semester examinations The curricula and syllabi for the program shall be prescribed from time to time by Higher Education of Madhya Pradesh.

M.Sc. Computer Science (CS)
Scheme of Examination

I Semester:

Course Code	Title	Scheme of marks		Total
		Theory	Practical	
CS-101	Computer and Communication Fundamentals	50	-	50
CS-102	Programming and Problem Solving Using C	50	50	100
CS-103	Operating Systems	50	50	100
CS-104	Discrete Structures	50	-	50
IC-105	Communication Skills	50	-	50
Total		250	100	350

II Semester:

Course Code	Title	Scheme of marks		Total
		Theory	Practical	
CS-201	Data Structures using C++	50	50	100
CS-202	Database Management System	50	50	100
CS-203	Software Engineering	50	-	50
CS-204	Computer Architecture	50	-	50
CS-205	Computer oriented numerical and statistical method	50	-	50
Total		250	100	350

III **Semester:**

Course Code	Title	Scheme of marks		Total
		Theory	Practical	
CS-301	Object Oriented Programming using JAVA	50	50	100
CS-302	Database Application and Tools	50	50	100
CS-303	Theory of Computation	50	-	50
CS-304	Computer Graphics and Multimedia	50	50	100
CS-305	Computer Networks	50	-	50
Total		250	150	400

IV Semester:

Course Code	Title	Scheme of marks		Total
		Theory	Practical	
CS-401	Linux/Unix Administration	50	50	100
CS-402	Compiler Design	50	-	50
CS-403	Internet & Web Technology	50	50	100
CS-404	Design and Analysis of Algorithms	50	50	100
CS-405	Major Project		50	100
Total		200	200	400

CS- 101 Computer and Communication Fundamentals

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	Computer Organization: Digital and Analog computers, Major components of a digital computer, Memory addressing capability of a CPU, Word length of a computer, Processing speed of a CPU, Definitions of Hardware, Software and Firmware. Definitions of Dumb, Smart and Intelligent terminals. Binary Systems: Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers, Binary Codes: BCD code, Gray Code, ASCII code, Excess 3 Code, Error detecting Code. Computer Arithmetic: Binary representation of Negative Integers using 2's complement and Signed magnitude representation, Fixed point Arithmetic operations on Positive and Signed (Negative) Integers like addition, subtraction, multiplication, Booth algorithm for multiplication, and bit pair (fast) multiplication. Division of positive and negative binary numbers.
Unit 2	Boolean Algebra and Logic Gates: Basic Definitions, Basic Theorems and properties of Boolean Algebra, Boolean Functions, Canonical and standard forms, Other Logic operations, Digital Logic gates, Integrated Circuits. Gate-Level Minimization: The K-Map Method, 3 and 4 variable K-Map, Product of sums simplification, Sum of Products simplification, Don't care conditions, NAND and NOR implementations, Exclusive-OR function.
Unit 3	Combinational Logic: Combinational Circuits, Analysis Procedure, Design Procedure, Binary half adder, binary full adder, binary full subtractor, binary parallel adder, carry propagation delay and Propagation delay calculation of various digital circuits. Fast adder, Decimal Adder, Binary multiplier, magnitude comparator, Parity generator, seven segment display, BCD to excess three code converter, Decoders, Encoders, Multiplexes, and Demultiplexers Synchronous Sequential logic: Sequential circuits, Latches, Flip Flops: SR, D, JK, T. Master Slave JK Flip flop. Characteristic equations and Excitation tables of flip-flops. Analysis of clocked sequential circuits: State diagrams, State equations for D, JK and T Flip flops. State reduction methods using all Flip Flops. Mealy and Moore Models.
Unit 4	Shift Registers- Serial in Serial out, Serial in Parallel out, Parallel in Serial out and Parallel in Parallel out. Designing of Asynchronous (Ripple) Counters, Design of Synchronous Counters. Signal characteristics: frequency, phase and amplitude, Types of communication with and among computers, Characteristics of communication channels, allocation of channel, signal power, amplitude and frequency modulation, space division multiplexing, frequency division multiplexing, Time division multiplexing.
Unit 5	Physical communication media: bounded media and unbounded media, Infrared technology, public switched telephone networks, digital modulation: ASK, PSK and FSK, half duplex and full duplex transmission, asynchronous and synchronous transmission. Need for computer communication networks, Internet and world wide web: E-mail, File transfer, Remote login. Networking topologies. LAN, MAN, WAN, Ethernet LAN. Layer 2 and layer 3 switches, Wireless LAN. Switch hub and router. Wireless LAN, interconnecting networks, IP address and IP data grams, Internet and intranet; inter security, virtual private networks, future of Internet technology.

1. Text Books :
    1. Digital Design by M. Morris Mano.
       Publication: PHI Eastern economy edition (Year-2001)
    2. Computer Architecture By Nicholas Carter, Schaum Series Adaptation, end edition, 2011 .
2. Reference books :
    1. Data communications and networking By A. Forouzan
       Publication: TMH Third edition (Year- 2004)
    2. Computer Fundamentals – Architecture and Organization By B. Ram.
    3. Computer networks by Andrew Tanenbaum
       Publication: PHI Fourth edition (Year- 2003)
    4. Computer organization and architecture by William Stallings.

CS - 102 Programming and Problem Solving Using C

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	Introduction to Computer based Problem Solving, Classification of programming languages, Programming Environment {Assemblers, compilers, interpreters, linkers, and loaders}. Introduction to Computer based Problem Solving, Features of good programs – Structured program, modular program, fundamentals of programming. Classification of programming languages: low-level language, middle-level language, high -level language along with examples and differences. Programming Environment: Assemblers, compilers, interpreters, linkers, and loaders. Programming Concepts with Flowcharts and algorithms, How to make flowchart: Introduction of the symbols of flowchart and algorithm. Importance of Flowchart
Unit 2	Overview of C: C character set, identifiers and keywords. Data types (description of different types of data types along with examples.), Coding style (first program of C). Format Specifiers associated with each data type. Constants and Variables: Some examples of constants and variables. Expressions and Operators: Instructions, declaration, arithmetic, unary, relational, logical, assignment and conditional operators. Basic Input/ Output functions like scanf() and printf() along with examples. Introduction of Formatting Characters and how to use them along with examples. Sequence Control Structures, Decision Control Structures (ifelse and nested if-else) along with examples. Some exercises based on decision control statements. Loop Control Structures: Introduction of loops like for loop and some examples of "for loop". Examples of do-while loop, while loop, break, continue. Explanation and examples of Case Control Structures. Nesting of loops
Unit 3	Introduction of Pointers: Pointers declaration, pointer arithmetic and operation. Some programs based on pointers. Concept of Functions: prototype and parameter passing and some programs based on it. Advantages/pitfalls of pointers. Dynamic Memory allocation: malloc() and calloc() functions. Pointers and their Applications: String Handling, Matrices Operations. Call by reference and Call by value. String Handling: Pointers and strings, standard library string functions, pointer to array of characters vs. string and its limitation. Matrices Operations along with examples. Introduction of Storage classes (register, static, auto and extern) and their differences.Introduction of Structures: Structure declaration, program and application.Introduction of Union: Union declaration, program
Unit 4	Introduction of user defined functions along with examples. Functions with arguments, without arguments along with the examples. Communication between functions (how one function calls the other functions). Some exercise based on functions. Arguments to main: Introduction of argc and argv. Enumerations and bit fields and program based on it. Introduction of bit wise operators along with examples. Introduction of Recursion and
Unit 5	Concept of Pre-Processors: macro expansion, file inclusion Conditional compilation. Macros with argument and macro versus function. Concept of local and global variables. Header file creation. Introduction to file handling: Different operations on file like read, write and append. File Creation and programs based on file creation, reading and merging. Advanced

1. Text Book :

Let us C, Yashant Kanetkar, BPB Publications.

2. Reference books :
    1. B.W. Kernighan & D.M. Ritchie, "The C Programming Language", Prentice Hall of India.
    2. Ashok N. Kamthane , “Programming with ANSI and Turbo C”, Pearson Education
    3. Ashok N. Kamthane et. al., Computer Programming and IT (for RTU), Pearson Education, 2011

CS - 103 Operating Systems

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	Introduction: Evolution of operating systems, operating system concepts Processor Management: Concepts, Algorithms for batch processing Processor Management Algorithms for time sharing operating systems, Introduction to real time systems.
Unit 2	Memory Management: Concepts, single user memory management. Partition memory allocation Virtual memory management using paging and segmentation techniques.
Unit 3	Concurrent Processes: Mutual exclusion and synchronization Techniques of inter process Deadlock handling.
Unit 4	File Management: Operations on a file, structure of a file System Free block list, keeping track of blocks allocated to a file, directory structure, sharing and protection of files, file system Reliability, Unix file system Device Management: Goals of input/output software design, Structure of device hardware and software.
Unit 5	Layers of I/O software, structure of device drivers, Disk driver, disk arm scheduling algorithms, terminal driver, clock driver etc. Introduction to network and distributed operating systems.

1. Text Book :
   Operating System Concepts, Addison Wesley, 4th Edition, A. Silberschatz and P. Galvin. 1994.Reference books :
2. Reference books :
    1. Design of Unix operating system, Bach M., Pearson Education.
    2. Operating systems, 4rth Edition, William Stallings, Pearson Education, 2003.

CS - 104 Discrete Structures

Max. Marks : 50 **Min. Marks : 17**

Unit No.	.Topics
Unit 1	**The Foundations:** Logic, Sets and Functions: Introduction to set theory, mathematical logic, prepositions, prepositional equivalences, predicates and quantifiers. Importance of Quantifiers. The Foundations: Logic, Sets and Functions: Sets, set operations, fuzzy sets, functions, functions for computer science, sequences and summations. **Mathematical reasoning:** Introduction to Methods of proof, mathematical induction. Use of mathematical induction to solve different problems. Importance of recursions in computer science, scope of recursions, Recursive definitions, recursive algorithms.
Unit 2	**Combinatorics:** The basics of counting, The sum rule, The product rule, The Pigeonhole Principle, Permutations with repetitions, Permutations without repetitions, Circular Permutations. Applications of combinations. Applications of Combinatorics to solve Committee problems, word problems, puzzle problems etc. Applications of Combinatorics to understand Telephone numbering plan, understanding Internet addresses, Advanced counting techniques, recurrence relations, solving recurrence relations, algorithm design, Basic understanding of complexities, basic problems of complexity of algorithms.
Unit 3	**Relations:** Relation definition , Importance of relations in computer science, Relations and their properties, Unary relations , Binary relations, Ternary relations , n-ary relations and their applications, closures of relations, equivalence relations, partial ordering. Representing relations, relation matrix, relation graph, composite relation. Operations on relations – union, intersection and join. Concepts of least upper bond, Greatest lower bond, maximal element, minimal element, Greatest element, Least element of a partially ordered set, lattices, sub lattices, chains and antichains.
Unit 4	**Graphs:** Introduction to Graphs, Importance of graph theory in computer science, Graph terminology, representing graphs, graph types, graph models, and graph isomorphism. Connectivity, Euler and Hamiltonian Paths, shortest path problems, planar graphs, graph colouring, chromatic number, Euler's formula, kuratowski's theorem. The four colour problem, Applications of Graph Colouring, Introduction to Trees, applications of trees, tree traversal, trees and sorting, Spanning trees, minimum spanning trees.
Unit 5	**Languages and Grammars:** Introduction to Languages and Grammars, solving problems for validity of statements according to the grammar. Importance of Language theory in Computer Science, Importance of Derivation trees, solving problems of Derivation trees, Importance of Parsing, Phrase-Structure Grammars, Types of Phrase structure grammars.

1. Text Book :
   Kenneth H. Rosen "Discrete Mathematics and its Applications" , 5th edition , Tata McGraw-Hill Edition.Let us C, Yashavant Kanetkar, BPB Publications.
2. Reference books :
   1. Kolman, Busby & Ross "Discrete Mathematical Structures" ,5th edition Pearson Education
   2. Narsingh Deo "Graph Theory with Applications to Engineering. & Computer Science", 4th edition, Prentice Hall of India .
   3. Discrete Structures, Logic and Computability by James L. Hein, 2nd edition, Narosa Publishing House.
   4. Discrete and Combinatorial Mathematics, 5th Edition by Ralph P. Grimaldi, Addison-Wesley publication.

IC-105 Communication Skills

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	**Fundaments of Communication (OHP & PPP):** Definitions, importance, forms of communication, process of communication, channels, barriers and strategies to overcome barriers of communication. **Listening (PPP):** Def, Importance, Benefits, barriers, approaches, be a better listener, exercises and cases.
Unit 2	**Advance Communication:** Why communication? Art of communication, V3 communication, Key elements of IP communication, Quizzes, exercises and cases / incidents for practice.
Unit 3	**Group Discussions:(PPP)** Definitions, importance, process, points to be borne in mind while participating, Dos and Don'ts. Practice- if time permits or to be covered in PDP. **Interview (PPP)** Types of Interviews, Points to be borne in mind as an interviewer or an Interviewee, commonly asked questions, Dos and Don'ts. Practice- if time permits or to be covered in PDP.
Unit 4	**Transactional Analysis: (PPP)** Transactional analysis, Johari Window, FIRO-B (PPP) **Written Communication:** Cover letter, Report writing, documentation, business correspondence, preparation of manuals and project reports, Drafting emails.
Unit 5	**Negotiation Skill**: Basic principles, Building understanding, process of negotiation, essentials of negotiations. Contemporary Communication Styles, technology enabled communication

1. Text Book :
   Chturvedi, P.D. and Chaturvedi Mukesh (2004), "Business Communication" Pearson Education, Singapore Pvt. Ltd.
2. Reference books :
   1. Business Communication by ICMR, Feb 2001.
   2. Toropov Brandon (2000), "Last Minute Interview Tips", Jaico Publishing House, Mumbai.
   3. Heller Robert (1998), "Essential DK Managers: Communication Clearly", Dorling Kindersley, London.

CS - 201 Data Structures using C++

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	**Introduction to C++:** Structures, Variables in C++, References, Functions, Function Overloading, Default Values for Formal Arguments of Functions, Inline Functions. **Class and Objects**: Introduction to Classes and Objects Constructors, destructors, friend function, dynamic memory allocation, Inheritance, Overloading, Polymorphism, Templates.
Unit 2	Definition of data structures and abstract data types. Examples and real life applications **Data Structures**: Arrays, Stacks, Queues, Dequeues
Unit 3	Linked Lists, Singly and Doubly linked list Applications of Linked Lists, Linked implementation of queue and stacks **Binary Search Tree :** Definition and Implementation- preorder, post order, inorder traversal, Red Black Tree Definition and implementation
Unit 4	**Graphs:** Definition and implementation, Hash function, Collision Resolution Techniques, Hashing Applications, Time Complexity, Big – Oh - notation, Running Times, Best Case, Worst Case, Average Case, Factors depends on running time, Introduction to Recursion, Divide and Conquer Algorithm, Evaluating time Complexity
Unit 5	Straight Sequential Search, Array implementations, Linked implementation, Binary Search, Interpolation Search. Introduction, Sorting by exchange, selection, insertions, Bubble sort, Selection sort, Insertion sort, Efficiency of above algorithms, Merge sort, Quick sort Algorithm, Heap sort, Heap Construction, Heap sort, Radix sort.

1. Text Book :
   Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.
2. Reference books :
   1. Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original
      edition, Addison-Wesley, 1999, Low Priced Edition.
   2. Fundamentals of Data structures by Ellis Horowitz & Sartaj Sahni, Pub, 1983,AW.

CS - 202 Database Management System

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	**Introduction:** Advantages of DBMS approach, Various views of data, data independence, schema & sub-schema, primary concept of data models, database languages, transaction management, database administrator &user, data dictionary, database architectures. **ER model:** Basic concept, design issues, mapping constraint, keys, ER diagram, weak & strong entity-sets, specialization & generalization, aggregation, inheritance, design of ER schema, Reduction of ER Schema to tables. Domains, relation, kind of relation, Relational databases, Various types of keys: candidate, primary, alternate & foreign keys.
Unit 2	**Relational Algebra and SQL:** The structure, relational algebra with extended operations, modification of database, Idea of relational calculus. **Relational Database:** Basic structure of SQL, Set operation, Aggregate functions, Null values, Nested Sub queries, derived relations, views, Modification of database, join relation, Domain, relation & keys, DDL in SQL. **Programming concepts of PL/SQL, Stored procedure, Database connectivity with ODBC/JDBC.**
Unit 3	**Functional dependencies:** Basic definitions, Trivial & non trivial dependencies, closure set of dependencies & of attributes, Irreducible set of dependencies, FD diagram**.** **Normalization:** Introduction to normalization, non loss decomposition, First, second and third normal forms, dependency preservation, BCNF, multivalue dependencies and fourth normal form, join dependencies and fifth normal form. **Database Integrity:** general idea, integrity rules, Domain rules, Attributes rules, assertion, triggers, integrity & SQL
Unit 4	**Transaction Management:** basic concept, ACID properties, transaction state, Implementation of atomicity & durability, Concurrent execution, Basic idea of serializability. **Concurrency & Recovery:** Basic idea of concurrency control, basic idea of deadlock, Failure Classification, storage structure-types, stable storage implementation, data access, recovery & Atomicity: log based recovery, deferred database modification, immediate database modification, checkpoints.
Unit 5	**Storage Structure:** overview of physical storage media, magnetic disk: performance & optimization, RAID. **File Organization:** File organization, Organization of records in files, basic concept of Indexing, ordered indices: B+ tree & B tree index files. **Query processing, Query optimization,** I**ntroduction to data mining and data warehousing.**

1. Text Book :
   "Database System concepts – Henry F. Korth, Tata McGraw Hill" 4th Edition
2. Reference books :
   1. **"**Fundamentals of Database Systems", Elmasri R, Navathe S, Addison Wesley 4th Ed., ISBN 0321122267
   2. An introduction to database system- Bipin C. Desai
   3. An introduction to Database System - C.J Date
   4. SQL, PL/SQL The programming language of Oracle- Ivan Bayross

CS - 203 Software Engineering

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	**Introduction to Software Engineering & Software Processes:** Software problem, Software engineering problem, Software engineering approach, Software characteristics and Applications. **Software processes** and its components, characteristics of software processes, Software development processes: Linear Sequential model, Prototyping model, Iterative Enhancement model, Spiral model, Time boxing model, RAD model, Component based development, Comparative study of various development models.
Unit 2	**Project management process:** The people, product, process and project, Phases of project management process, Project life cycle, the W5HH principle. Software configuration management process, Process management process. Project Planning: Metrics and measurements, Project estimation (Size & Cost), Project Scheduling, Staffing and personnel planning, Software configuration management plans, Quality assurance plans, Project monitoring plans, Risk management.
Unit 3	**Software Requirement Analysis and Specification:** Software requirements, Functional & Non functional requirements, Problem analysis (Structured analysis and Object Oriented analysis, Prototyping approach). Software Requirements specifications (SRS), Validation and Verification, Metrics. **Software Design:** Design principles: Problem partitioning and hierarchy, Abstraction, Modularity, Top-down and Bottom-up strategies. Effective Modular design: functional independency, Cohesion, Coupling. Structured design methodology.
Unit 4	**Software Quality Assurance**: Quality concept, Quality management system, movements and assurance, Software reviews: formal and technical. Formal approaches to SQA, Statistical software quality assurance, Software reliability, Capability Maturity Model (CMM), ISO 9000, Six sigma, SQA plan.
Unit 5	**Software Testing**: Software testing techniques: Testing fundamentals, White box testing, Black box testing, Testing for specialized environments, architectures and applications. Software testing strategies: A strategic approach to software testing, Strategic issues, Unit testing, Integration testing, Validation testing and system testing, The art of debugging.

1. Text Book :
   An Integrated Approach to Software Engineering- Pankaj Jalote, Narosa Publishing House.
2. Reference books :
   1. Software Engineering- Ian Sommerville, Pearson Education, New Delhi.
   2. Software Engineering Concepts-Richard E. Fairly, Tata McGraw Hill Inc. New York.
   3. Software Engineering: Principle & Practice-W. S. Jawadekar, Tata McGraw-Hill, New York.

CS - 204 Computer Architecture and Organization

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	Technological trends, measuring performance, speed up Amdahl's law. Basic structure of computer hardware: Functional units and components in computer organization: The memory unit, the input and output subsystem, the bus structures, ALU. Program development tools: Compiler, interpreter, and assembler. Introduction to 8085 micro processor architecture. pin out diagram of 8085 microprocessor. Addressing modes of 8085 processor.
Unit 2	Instruction set of 8085 processor: data transfer instructions, arithmetic instructions, branch instructions etc. assembly language programming examples. Introduction to 8088 microprocessor. Bit pair multiplication. Integer division. BCD arithmetic, Design of ALU. Concepts of instruction formats and instruction set, Instruction set types, types of operands and operations. Generation of memory address and addressing modes.
Unit 3	STACKS and QUEUS, GPR organization and stack based organizations. Encoding of machine instructions. Features of RISC and CISC processors. Processing unit design: Processor micro architecture –I Fundamentals concepts for data path implementation. Processor micro architecture-II data path implementation.
Unit 4	Instruction pipelining, instruction pipelining hazards, data dependency hazards and control hazards. Overcoming hazards, instruction set design influence on pipelining. Parallel processing and pipelining, pipelining in RISC and CISC processors. Super scalar processors. In order and out of order execution.
Unit 5	Instruction level parallelism, introduction to VLIW processors, vector processors, CACHES: Data caches, instruction caches and unified caches Cache implementations. Fully associative and direct mapped caches. Write back versus write through caches. **Input Output organization, accessing I/O devices, Interrupts. Memory mapped I/O and I/O mapped I/O.**

1. Text Book :
   Computer Architecture: Scahaum's outlines by Dr. Rajkamal.
2. Reference books :
   1. The 8088 and 8086 Microprocessors by Walter A. Tribel, Avtar Singh.
   2. Computer Organization & Architecture by William Stallings.
   3. Computer Architecture & Parallel Processing, Hwang & Briggs, McGraw Hill
      Microprocessor Archi. Prog. and app. With 8085/8080 By Ramesh S. Gaonkar.

CS - 205 Computer Oriented numerical and statistical method

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	**Solution of non-linear & transcendental equations** Computer Arithmetic: Floating-point representation of numbers, arithmetic operations with normalized floating-point numbers and their consequences, significant figures. Error in number representation-inherent error, truncation, absolute, relative, percentage and round-off error. Iterative Methods: Bisection method, method of false position, newton-rapson method, secant method, method of successive approximation, concept oriented theoretical consideration of above methods.
Unit 2	**Solution of linear equations** Meaning, conditions for solutions, solution of equation by direct methods - (Gaussian elimination, Gaussian jordan), iterative methods - (Jacobi method, gaussian seidel), ill-conditional equations and solution.
Unit 3	**Interpolation and approximation** Introduction, finite differences, Newton's formulae, Central difference formulae, interpolation with unevenly spaced points, divided difference and their properties, inverse interpolation and double interpolation.
Unit 4	**Numerical integration & solution of ordinary differential equations** Concept of numerical integration with geometrical representation, trapezoidal method, simpson - 1/3 rule, simpson - 3/8 rule, veddle's rule, understanding and solution of Ordinary Differential Equation and theoretical consideration, euler method, modified euler's method, R-K 2nd order & 4th order method, predictor corrector methods.
Unit 5	**Statistics** Graphical representation, Frequency distributions, Measures of central tendency, Measures of dispersions, Correlation, Regression.

TEXT BOOK:

I. Rajaraman, Computer Oriented Numerical Methods, Prentice Hall, India.

REFERENCE BOOKS

1. S. S. Sastry, Introductory Methods of Numerical Analysis.
2. M. K. Jain, S.R.K. Iyengar & R. K. Jain, Numerical Methods for Scientific and Engineering Computation.
3. H. C. Saxena, Finite Differences and Numerical Analysis.
4. Modes A., Numerical Analysis for Computer Science.

CS - 301 Object Oriented Programming Using JAVA

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	**Introduction to java:** Features of Java, Object-oriented programming overview, Introduction of Java Technologies, How to write simple Java programs, Data Types, Variables, Memory concepts, decision making operators, Naming Conventions, Introduction to Class, Objects, Methods and Instance Variables, Primitive type Vs Reference Type, Initializing Objects with Constructors. Type conversion & casting, Operators, Control Statements(if Single-Selection Statement, if-else Double Selection), while Repetition Statement, for Repetition Statement, do-while Repetition Statements, switch Multiple-Selection Statement, break and continue Statements. Static Method, static field and Math Class, Method Call Stack and Activation Record, Argument Promotion and Casting, Scope of declaration and Method Overloading.
Unit 2	**String Handling:** The String constructors, String operators, Character Exaction, String comparison, String Buffer. **Arrays:** Declaring and Creating Arrays, Enhanced for Statement, Passing Arrays to Method, Multidimensional Arrays, Variable-Length Argument lists, Using Command-line Arguments. final Instance Variables, this reference, static import, overloaded Constructors, Garbage collection and method finalize , Overloading methods, Parameter passing.
Unit 3	**Inheritance:** Extending classes, protected Members, relationship between Superclasses and Subclasses, Using super, Constructor in Subclasses, The Object Class, Object Copying in Java. **Polymorphism:** Method overriding, upcasting, Dynamic Method Dispatch, final Method and classes, Abstract classes and Methods, instanceof operator, Downcasting, Class class, Runtime type Identification **Packages and Interfaces:** Defining a Package, Understanding CLASSPATH, Access Protection, Importing packages, creating own packages. Defining an Interface, Properties of interface, advantages of interface Achieving multiple inheritance through interfaces, Variables in Interfaces, Comparable interface.
Unit 4	**Exception Handling:** Introduction, overview of doing it and keywords used, when to use it, Java Exception Hierarchy, finally block, chained exceptions, declaring new exception types, preconditions and postconditions. **Streams and Files:** Introduction, Data Hierarchy, Files and Streams, Sequential-access Text Files, Object Serialization, Random-Access files, Java Stream class Hierarchy. **Multithreading:** What are threads, The java thread model, Thread priorities, Thread life cycle, Creating thread and executing thread, Thread Synchronization, producer-consumer problem without Synchronization, Producer-consumer problem with Synchronization, Other class and Interfaces in java.util.concurrent, Monitor and Monitor Locks, Thread Groups, Synchronization, Inter-thread Communication.
Unit 5	**Introduction To GUI :** Introduction, Overview of swing Components, Displaying text and Images in a window, Introduction to Event Handling, Common GUI Event Type and Listener Interfaces, How Event Handling Works, Adapter Classes, Layout Managers **Applets:** Applet basics, Applet Architecture, Applet life cycle methods, Applet HTML Tag and attributes, Executing applet in web browser and in the appletviewer, in Passing parameters to Applets, doing GUI programming in applet **Generic and Collection API:** Introduction, Motivation for Generic Methods, Generic Methods : Implementation and Compile- time Translation Issues, Overloading Generic Methods, Generic Classes, Raw Types, Generic and Inheritance **Database connectivity:** JDBC, The design of JDBC, Typical uses of JDBC, The Structured Query language, Basic JDBC Programming concepts, Executing Queries.

1. Text Book :
   Java2 : The Complete Reference by Herbert Schildt, Tata McGraw- Hill, fourth Edition, 2005

2. Reference books :
    1. JAVA How to Program by Deitel & Deitel, Pearson Education, Seventh
    2. Thinking in Java by Bruce Eckel , Prentice Hall, Third Edition, 2005
    3. Core Java 1.2: Volume 1 Fundamentals by Gary Cornell, Cay Horstmann, Prentice Hall, Seventh Edition, 2007

CS - 302 Database Applications and Tools

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	**Database Environment:** Data versus information, traditional file processing, disadvantages, database approach, range of database application, advantages of database approach. Cost and risk factors, components of database environment, evolution of database system.
Unit 2	**Database Development Process:** Information engineering, information architecture, enterprise data model, planning, SDLC, CASE etc. Steps of planning, strategic planning factors, corporate planning objects. Developing preliminary data model, and use of planning matrices, SDLC steps, CASE role, people in database development, three-schema architecture for database development. Examples to demonstrate the development process. **Modeling Data in the Organisation:** Modeling of the rules of organization, data names and definitions, ER model constructs entities and its types, attributes, relationships, degree, unary, binary, ternary, n-ary, cardinalities constraints, ER modeling examples.
Unit 3	**Enhanced ER modeling:** supertype, subtypes, specialization, generalization, specifying constraints in EER models, completeness, Disjointness, discriminators, defining super/sub type hierarchies, EER modeling examples, live demos modeling for few scenarios. Logical database design and relational model development, Relational model properties, keys, primary, secondary, composite, properties of relations. Codd's rules, integrity constraints, creating relational tables, Transform EER diagrams into relations, seven different steps for mapping EER model into relations,
Unit 4	Introduction to normalization, steps, functional dependencies, basic normal forms, definition of first, second, third normal form and removing anomalies from the relations. De-normalization and merging relations.
Unit 5	**Special Topics (Overview) :** Data Warehousing, Data Mining, Distributed Databases, Object oriented modeling, definitions, activities in phases of model development, advantages of OOM, UML class diagrams, Example of a model development.

1. Text Book :
   "Modern Database Management" Seventh Edition, Hoffer, Prescott, McFadden Pearson Education"
2. Reference books :
    1. Database Systems "Thomas M. Connolly, Carolyn E. BeggPearson Education.
    2. Raghu R and Johannes G., "Database management Systems", Mc Hill 3rd Ed 2002, Elmasri R, Navathe S, "Fundamentals of Database Systems", Addison Wesley 4th Ed.

CS - 303 Theory of Computation

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	**The Theory Of Automata:** String, Alphabets and Languages, Finite Automata, Finite State Machine, Basic Definition. Description of a Finite Automaton, Deterministic Finite Accepters- Transition Graphs, Languages, Non- Deterministic Finite Acceptors- Definition, Finite Automata with ϵ- moves Equivalence of Deterministic and Nondeterministic Finite Accepters, Mealy and Moore models- Definitions, Transformation of Mealy Machine into Moore Machine and vice-versa.
Unit 2	Conversion of NDFA to DFA Removal of ϵ transition from ϵ – NDFA. The Myhill-Nerode theorem and Minimization of Finite Automata – Definition and Construction. **Properties of Regular Sets:** Pumping lemma for regular set, Closure properties of regular set.
Unit 3	**Formal Language:** Basic Definition, Chomsky Classification of languages, Initialization of Finite Automata Regular Expression and Language Regular Expressions, Connection between Regular Expressions and Regular Languages Regular Grammars – Right and Left Linear Grammars, Equivalence between Regular Languages and Regular Grammars
Unit 4	**Context-Free Grammars:** Leftmost and Rightmost Derivations, Derivation Trees, Parsing and Ambiguity, Simplification of CFGs, Chomsky Normal Form, Greibach Normal Form, Cocke-Kasami-Younger Algorithm, Properties of Context-Free Languages.
Unit 5	**Pushdown Automata:** Definition, Non deterministic Pushdown Automata, Pushdown Automata for Context Free Languages. Context-Free Grammars for Pushdown Automata. Deterministic Pushdown Automata and Deterministic Context-Free Languages. **Turing Machine:** Definition of Standard Turing Machine, Turing Machine as Language Accepters and Transducers.

1. Text Book :
   Mishra and Chandrasekaran, Theory of Computer Science (Automata, language and Computation), 2nd Ed. Prentice Hall of India.
2. Reference books :
   1. Martin, J.C.: Introduction to Languages and the Theory of Computation, McGraw-Hill, Inc., 3rd ed., 2002. ISBN 0-072-32200-4.
   2. Brookshear, J.G.: Theory of Computation: Formal Languages, Automata, and Complexity,
      The Benjamin/Cummings Publishing Company, Inc, Redwood City, California, 1989. ISBN 0- 805-30143-7
   3. Peter Linz, An Introduction to Formal Languages and Automata, Narosa Publishing House.

CS - 304 Computer Graphics & Multimedia

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	**Introduction to Computer Graphics**, Application of Graphics, Display Devices: Refresh Cathode -Ray Tubes, Raster Scan Displays, Random Scan Displays, Color CRT Monitors, Flat Panel Displays. Video cards/display cards Input Devices: Mouse, Trackball, Space ball, Data Glove, Joystick, Light pen, Scanner, Digital Camera, Touch Panels, Voice Systems.Hardcopy Devices: Printers and Plotters
Unit 2	**Graphics Primitives:** Line Generation Algorithms: DDA algorithm, Bresenham's algorithm. **Graphics Primitives:** Circle Generation Algorithms: Midpoint Circle algorithm, Bresenham's circle generation algorithm. Ellipse Generation algorithm. **Graphics Primitives:** Polygon filling Algorithms: Scan Line Polygon fill algorithm, Inside - Outside Tests, Boundary-Fill algorithm, Flood - Fill algorithm. Fundamentals of aliasing and Antialiasing Technique.
Unit 3	**Clipping:** Clipping operations, Point clipping, Line clipping: Cohen Sutherland Algorithm, Liang Barsky Algorithm, Nicholl-Lee-Nicholl Algorithm. **Polygon clipping:** Sutherland- Hodgeman Algorithm, Weiler Atherton Algorithm. **Text clipping, Exterior clipping.**
Unit 4	**Two Dimensional Transformations:** Translation, Scaling, Rotation, Reflection, Shear, Homogenous coordinate system, composite transformations, raster method of transformation **Two Dimensional Viewing:** Window to Viewport coordinate transformation, **Three Dimensional:** 3D Geometry, 3D display techniques, transformations. **Projections:** Parallel Projection, Perspective Projection.
Unit 5	**Color Models and Color Application:** Color models: Properties of Light. Standard Primaries and the Chromaticity Diagram, XYZ Color Model, CIE Chromaticity Diagram. RGB Color Model, YIQ Color Model, CMY Color Model, HSV Color Model. Conversion between HSV and RGB Models. HLS Color Model, Color Selection and Application. **Advancements in the technology in Computer Graphics.**

1. **Computer Graphics:** Donald Hearn and M. Pauline Baker, Second Edition, Prentice Hall of India.

CS - 305 Computer Networks

Max. Marks : 50 **Min. Marks : 17**

Unit	TOPIC
Unit-1	Introduction: Computer Network, Goals and Applications, Reference models – OSI and TCP/IP. A Comparative study. LAN, MAN and WAN and topologies, LAN components – File server, Workstations, Network Adapter Cards. Connection Oriented and Connection less services, Switching Techniques – Circuit Switching, Packet Switching.
Unit-2	Data Link Layer**:** Design Issues, Framing, Error Detection: Parity Check, Check Sum and Cyclic Redundancy Check (CRC); Correction Technique: Hamming code. Flow Control: Elementary Data Link Protocols: An Unrestricted Simplex Protocol, Simplex Stop-and-Wait Protocol, Sliding Window Protocols: One-Bit Sliding Window Protocol Go Back N and Selective Repeat. Data link layer in the Internet: SLIP and PPP.
Unit-3	MAC Sublayer**:** Multiple access protocols: Aloha, CSMA Protocols; Collision-Free Protocols; IEEE MAC Sublayer protocols: 802.3 802.4, 802.5 and their management. High speed LANs – Fast Ethernet, FDDI, Wireless LANs
Unit-4	Network Layer: Design issues, Routing Principles. Routing Algorithms: Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing. Link State Routing, Hierarchical Routing, Broadcasting Routing, Multicast Routing, The Network Layer in the Internet: Internet Protocol, Internet addressing and Internet Control protocols.
Unit-5	Transport Layer: Elements of Transport Protocols, Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing. The Internet Transport Protocol UDP: Introduction to UDP. Introduction to TCP, The TCP Service Model, The TCP Protocol. Application layer**:** Client Server Architecture, DNS, WWW and HTTP, Cookies, Proxy Server. E-mail Protocols (SMTP, POP3, IMAP, MIME), FTP, TELNET. Network Security: Cryptography, Symmetric- key Algorithms, Public- key Algorithms, Digital Signatures.

1. Required Text
   - Computer Networks, Andrew S. Tanenbaum, Addison-Wesley, 4th Ed.

2. Essential References
   - Data Communications and Networking, B.A. Frouzan, McGraw-Hill.

CS - 401 Linux/ Unix Administration

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	**Background:** Evolution of Unix OS. Unix implementations. Features of Unix operating system. **Linux operating system:** Development of Linux. Applications of Linux operating system.
Unit 2	**Basic UNIX environment**: Basic commands, directory management, pipes, tee, I/O redirection and other utilities. **Advanced commands:** File system and process management commands, Shell, Pattern matching, Navigating the File Systems.
Unit 3	**Unix editor:** VI editor, Creating new files. Text addition, deletion and changes. Dealing with sentences and paragraphs. Searching. Cut, paste and copy. Running C/C++ programs. **Shell programming**: Features of shell. Shell variables. Control statements. **Advance shell programming**: Command line arguments. Interactive shell scripts. Debugging of shell scripts. Communication facilities in Unix.
Unit 4	**Structure of unix operating system**: Structure of unix kernel, Unix system calls. **Unix system**: File system calls, Process management calls. **Advance Filter:** Awk: Number processing, Interface with shell, functions.
Unit 5	**Unix system administration:** Adding and removing users. User accounting. Adding and removing hardware. Performing backups and restore. Disk space management. **Unix system administration**: Configuring the kernel. Network management in Unix. Performance analysis. Unix Desktop.

1. Text Book :
   UNIX Operating Systems: Sumitabh Das, Tata McGraw Hills publication.
2. Reference books :
   1. **UNIX System Administration Handbook**(Second edition): Evi Nemeth, Garth Synder, Scott Seebass, Trent R Hein, Pearson Education - Asia, 2000.
   2. C: **Design of UNIX Operating System**: Maurice J. Back, Pearson Education - Asia.

CS - 402 Compiler Design

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	Compiler, Translator, Interpreter definition, Phase of compiler introduction to one pass & Multi pass compilers. Analysis of source program, duties of 6 phases. Review of Finite automata lexical analyser, Input, buffering, Recognition of tokens, Idea about LEX: A lexical analyser generator, Error handling.
Unit 2	Introduction to parsing. Bottom up parsing Top down parsing techniques. Shift reduce parsing, Operator precedence parsing, Recursive descent parsing predictive parsers. LL grammars & passers error handling of LL parser. LR parsers, Construction of SLR.
Unit 3	Conical LR & LALR parsing tables, parsing with ambiguous grammar, Syntax directed definitions; Construction of syntax trees, L~attributed definitions, Top down translation. Intermediate code forms using postfix notation and three address code.
Unit 4	Representing TAC using triples and quadruples, Translation of assignment statement. Boolean expression and control structures. Definition of basic block control flow graphs, DAG representation of basic block.
Unit 5	Advantages of DAG, Sources of optimization, Loop optimization, Idea about global data flow analysis, Loop invariant computation, Peephole optimization Issues in design of code generator, A simple code generator, Code generation from DAG. Code Optimization.

1. Text Book :
   Aho-Ullman, Principles of compiler Design, Narosa Publishing House.
2. Reference books :
   1. Aho-Ullman, Compilers: Principles Techniques & Tools, Addison Wesley.'
   2. Dhamdhere, Compiler Construction.

CS - 403 Internet and Web Technology

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	Introduction Dynamic Web Programming, HTML Forms, scripting languages, Introduction to HTTP, web Server and application Servers, Installation of Application servers, Configuration files, Web.xml. Java Servlet, Servlet Development Process, Deployment Descriptors, The Generic Servlet Lifecycle.
Unit 2	Servlet Packages, Classes, Interfaces, and Methods, Handling Forms with Servlets. Various methods of Session Handling. Various elements of deployment descriptors. Java Database Connectivity: various steps in process of connection to the database, Various type of JDBC Driver.
Unit 3	Connection of JSP and Servlet with different database viz. Oracle, MS-SQL Server, MySQL. java.sql Package. Accessing metadata from the database. Type of Statement, Connection pooling: multiple users and need of connection pooling.
Unit 4	JSP Basics: JSP lifecycle, Directives, scripting elements, standard actions, implicit objects. Writing JSPs. Expression Language (EL), Separating Business Logic and Presentation Logic, Building and using JavaBean.
Unit 5	Session handling in JSP, Types of errors and exceptions handling, Standard Tab Library in JSP, Building Custom Tag Library, JSP Tag Library, MVC Design pattern Advances in J2EE and Other Web technology

1. Text Book :
   Kevin Mukhar, Chris Zelenak, James L Weaver, "Beginning Java EE 5: From Novice to Professional" Apress
2. Reference books :
   1. Marty Hall, Larry Brown, "Core Servlets and Java Server Pages", 2nd edition, Pearson Education
   2. JavaDoc for various technologies
   3. Internet and Web technologies, TMH, 2002

CS - 404 Design and Analysis of Algorithms

Max. Marks : 50 **Min. Marks : 17**

Unit No.	Topics
Unit 1	**Order Analysis:** Objectives of time analysis of algorithms; Big-oh and Theta notations. Master Theorem and its proof, solution of divide and conquer recurrence relations. Searching, Sorting and Divide and Conquer Strategy: Linear Search, Binary Search.
Unit 2	**Searching, Sorting and Divide and Conquer Strategy:** Merge-sort; Quick-sort with average case analysis. Heaps and heap-sort. Lower bound on comparison-based sorting and Counting sort. Dynamic Programming: methodology and examples (Fibonaci numbers, Knapsack problem and some other simple examples) **Dynamic Programming:** Longest integer subsequence, Longest common subsequence ,Weighted interval scheduling.
Unit 3	**Greedy Method:** Methodology, examples (lecture Scheduling, process scheduling) and comparison with DP (more examples to come later in graph algorithms) **Greedy Method:** Knapsack problem and some other simple examples. **Graph Algorithms:** Basics of graphs and their representations. BFS. DFS. Topological sorting.
Unit 4	Minimum spanning trees (Kruskal and Prim'salgorithms and brief discussions of disjoint set and Fibonacci heap data structures). Shortest Paths (Dijkstra, Bellman-Ford, Floyd-Warshall). Hard problems and approximation algorithms. Problem classes P, NP, NP-hard and NP-complete, deterministic and nondeterministic polynomial-time algorithms, Approximation algorithms for some NP-complete problems.
Unit 5	Backtracking, Branch and Bound technique, String Matching, Knave algorithm, KMP algorithm, Parallel Algorithms

1. Text Book :
   Cormen, Leiserson, and Rivest. *Algorithms*, MIT Press 2001
2. Reference books :
   1. Essential References ALGORITHMS IN C++ by Robert Sedgewick (Pearson Education)2008
   2. Fundamentals of Computer Algorithms by Ellis Horowitz and Sartaj Sahni (Galgotia Publication 1998