RANI DURGAVATI UNIVERSITY, JABALPUR

SYLLABUS OF M.SC. COMPUTER SCIENCE
Semester-I (Session 2016-17 and Onwards)
Syllabus opted by the Board of studies in Computer Science

M.Sc.(FirstSemester)

S.No.	Title of the Paper	Remark	TH +PR+ Sess.
101	Computer Organization & Assembly Language	TH & PR	40+25+10
102	Programming and Problem Solving through C++	TH & PR	40+25+10
103	Discrete Structure	TH	40+10
104	Numerical and Statistical Analysis	TH & PR	40+25+10
105	Communication Skill & Job oriented Training Program	TH	40+10
		Total	325

M.Sc.(Second Semester)

S.No.	Title of the Paper	Remark	TH+PR+ Sess.
201	Data And File Structure using C++	TH & PR	40+25+10
202	System Programming using Linux	TH & PR	40+25+10
203	Computer System Architecture And Parallel Processing	TH	40++10
204	Design and Analysis of Algorithms	TH	40+10
205	Java Programming	TH & PR	40+25+10
		Total	325

M.Sc. – 101: Computer Organization & Assembly Language

Max. Marks: 40
Pass. Marks: 16

Unit-I: Basic Building Blocks of Computers:- Concepts of Boolean Algebra, Logic Gates, Logic Diagrams of Boolean Expressions, Minimization Techniques, SOP (Sum of Products) and POS (Products of Sum) forms, Combinational Circuits, Adders, Subtractors, Multiplexers, Decoders etc., Sequential Circuits, Flip-Flops (SR, D, JK, T), Registers (Shift Register), Counters (Binary, up, down, Ripple).

Unit-II: Basic Computer Organization:- Block Diagram, Evolution of Computer Systems, Classification of Computers, Data Representation in Computers Binary, Octal & Hexadecimal Numbering systems and their inter-conversion, Fixed Point and Floating representation of numbers, Complements, Alphanumeric Representation, Binary codes-BCD, EBCDIC, Gray, Parity, Error detection and correction codes.

Unit-III: Memory Organization:- Types and Organizations, Memory Hierarchy, Semiconductor Main Memory RAM, ROM, Memory Connection to CPU, Auxiliary Memory (Magnetic disks, Magnetic Tapes, RAID etc.), Associative Memory (Hardware Organization, Match Logic, Read/write Operation), Cache Memory(Associative, Direct, Set-Associative Mapping), Virtual Memory (Address Space and Memory Space) Optical Memories (CD-ROM, WROM, DVD-ROM etc.).

Unit-IV: I/O Organization & Overview of 8086 CPU:- Commonly used Peripheral Devices, Input-Output Interface, Input-Output Techniques (Programmed Input/output, Interrupt driven Input/output, Direct Memory Access), Input-Output Processor(IOP).

Introduction to Microprocessor, Architecture of 8086/8088 Microprocessor, Software model of 8086/8088 Microprocessor, CPU Registers, Addressing Modes & Instruction Formats of 8086/8088.

Unit-V: Introduction to 8086/8088 Programming:- Program Structure of 8086/8088 Assembly Language Program, Format of Assembler Instruction, The Instruction set of 8086/8088, Data Transfer, Arithmetic, Logic, Shift and Rotate Instructions. Flag Control Instructions, Compare Instructions, Jump Instructions, Subroutines and Subroutine-Handling Instructions, The Loop and Loop-Handling Instructions, String and String-Handling Instructions. Use of Assembly language, Instructions for specific programs for typical problems like table Search, subroutines, Symbolic and Numeric Manipulations and I/ O.

Text Books:

1. M. Moris Mano : Computer System Architecture, PHI Unit-I page No. 1-58, Unit – II Page No. 67-69, Unit – III Page No. 445-483, Unit- IV Page No. 381-423.

2. Watter A. Triebel and Avtar singh: 8088 and 8086 Microprocessors Programming, Interfacing- Software, Hardware & Application, PHI.

Reference Books:

1. John P. Hayes: Computer Architecture and Organization McGraw-Hill.
2. Andrew S. Tanenbaum : Structure Computer Organization, PHI.
3. Albert Paul Malvino : Digital Principles, TMH.
4. B. Ram: Microprocessors & Microcomputer, Dhanpat Rai & Sons.
5. Willam Stallings: Computer Organization and Architecture.
6. Yu-Cheng-Liu & Gibson : Microcomputer system, The 8086 family.
7. Peter Norton : Assembly Language for the PC, PHI.

M.Sc. – 102: Programming and Problem Solving through C++

Max. Marks: 40
Pass. Marks: 16

UNIT-I:- Techniques of Problem solving, Top- down, Bottom up approaches for problem solving. Divide and conquer principles, Algorithm Development, representation of algorithm, stepwise refinement, Algorithm for sorting and searching and Merging lists.

UNIT-II:-Introduction to C language, variable and arithmetic expressions, symbolic constants Declaration, Arithmetic operators, Relational and logical operators, type conversion, Increment and decrement operators, Bitwise operators, Assignment operators and expressions conditional expressions, precedence and order of evaluation on, C control statement, Simple exercises.

UNIT-III:- C functions, Basics of function and functions returning Non integers, external variables, scope Rules, Header files Static variables. Register variable, Block structure initialization, Recursion, Pointers and addresses arithmetic, multidimensional arrays, initialization of pointer arrays command line arguments, pointers to functions.

UNIT-IV :- Basics of structures, structure and functions, Arrays of structure, pointers to structure self-referential structure, Table look-up Typed if, unions Bit-fields, input and output, formatted output, print I/O formatted, input scanf file access error Handling stderr and exit, line input and output.

UNIT-V:- The unix system interface, file descriptors, Low level I/O Read and write open, create, close, unlink, Random access & lseek, Unix system calls, for R ( ), wait( ), signal ( ), etc. example exercise involving the use of above Unix system calls.

Text Books:

1. How to solve it by Computer by R.G. Dromey (P.H.II),1994
2. C Programming Language Dennis Ritchie IInd ed. (P.H.I),1994

Reference Book:-

1. Adv. Unix by stephen Prata (B.P.B. Publication)

M.Sc. – 103: Discrete Structure

Max. Marks: 40
Pass. Marks: 16

Unit-I: Mathematical Logic, Connectives, Negation, Conjunction, Disjunction, Statement formulas and truth tables, Conditional and Bi-conditional, Well formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological implications.

Unit-II: Normal forms, Disjunctive normal forms, Conjunctive normal forms, Principal disjunctive normal forms, Principal conjunctive normal forms, Lattices: examples, Lattices as partially ordered sets, examples, Some properties of lattices, Lattices as algebraic systems, examples, Sub-lattices, Direct product and Homomorphism.

Unit-III: Some special lattices, Boolean algebra, Sub-algebra, Direct product and Homomorphism, minterm and maxterm, Boolean functions, Boolean forms, Values of Boolean expressions.

Unit-IV: Graph Theory: Introduction and Applications of graphs, Incidence and Degree, Isolated vertex, Pendant vertex and Null graph, Paths and Circuits: Isomorphism, Sub-graphs, Walks, Paths and Circuits, Connected graphs, Disconnected graphs and Components.

Unit-V: Euler graph: Introduction, Operations on graphs, Hamiltonian paths and Circuits, Trees, and its Properties, Pendant vertices in a tree, Rooted and Binary trees, Spanning trees, Rank and nullity of a graph.

Text Books:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill Ed., 2003 (For Units I, II, and III).
2. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, PHI, 1995 (For Units IV and V).

Reference Books:

1. C.L. Liu, Elements of Discrete Mathematics, McGraw Hill Book Co.
2. S. Witala, Discrete Mathematics – A Unified Approach, McGraw Hill Book Co.

M.Sc. – 104: Numerical and Statistical Analysis

Max. Marks: 40
Pass. Marks: 16

Unit-I: Probability Distributions and Statistical Inference.

Discrete Probability distribution, Binomial & Poisson distributions. Continuous probability distributions: Exponential and normal distributions (for all prob. Distributions simple properties & applications). Testing of hypothesis, point and interval estimates. Testing of single and two mean z and T- tests for variables. Chi-square for independence of two attributes (mXn) table & goodness of fit. F test for homogeneity of two variances.

Unit-II: Correlation and Regression Analysis.

Objectives, Correlation & regression coefficients & lines, Reliability of estimates and predictions. Partial correlation coefficients and partial regression coefficients. Multiple correlation coefficients. Polynomial curve fitting, Fitting of a regression plane.

Unit-III: Floating point arithmetic, errors, Solution of algebraic and transcendental equations, Newton Raphson and Muller method for real and complex roots, Bairstrow method, rate of Convergence, Eigen values and Eigen vectors ; Jacobi and House hold method.

Unit-IV: Langrange and Newton Interpolation, Hermite Interpolation, Spline Interpolation, Bivariate Interpolation, Least square Approximation, Numerical integration, Simpson rule, Method based on undetermined coefficients, Gauses Legendre method, Gauses chebyshew method, Gauses Laguerre method.

Unit-V: Numerical Solution of the differential equations, Euler method, Taylor series method, Picard method, Runge Kutta method, Predicter Corrector method, Cubic Spline method, Finite difference analogues of partial differential equation in Laplace form, Solution by five point formula, ADI, method.

Text Books:

1. Gupta S.C. and Kapoor, Mathematical Statistics, S. Chand & Co. Ltd.
2. Jain, M.K. Iyengar, S.R.K. and Jain, R.K. , Numerical Methods for Scientific and Engineering Computational, Willy Eastern Ltd., 1993.
3. Shastry, S.S., Introductory Methods of Numerical Analysis, Prentice Hall of India, New Delhi, 1998.

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M.Sc.–105: Communication Skill & Job Oriented Training Program

Max. Marks: 40
Pass. Marks: 16

Unit-I: 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-II: Advance Communication (PPP and Exercises on handouts)
Why communication ? Art of communication, V3 communication, Key elements of IP communication, Quizzes, exercises and cases/incidents for practice.

Unit- III : 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, 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-IV: Transactional Analysis: (PPP)
Transactional analysis, Johari Window, FIRO-B (PPP).

Unit-V: Written Communication:
Report writing, documentation, business correspondence, preparation of manuals and project reports

Text Books:

1. OB by Fred Luthans
2. OB by Stiphen P. Robbins
3. Masterson, Johan & et.al (1989), "Invitation to Effective Speech Communication, Scott, Foreman and Co.
4. Chaturvedi, P.D. and Chaturvedi Mukesh (2004), " Business Communication" Pearson Education, Singapore Pvt. Ltd.

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.
4. Decker Bert(), " The Art of Communication".
5. Bone Diane(), " The Business of Listening", a Fifty-Minute Series Book Crisp Publications, Inc, California.

M.Sc. – 201: Data and File Structure using C++

Max. Marks: 40
Pass. Marks: 16

Unit-I: Information and its storage representation, nature of information, transmission of information, storage of information, primitive data structure, operations on data structure, integer, real numbers, character information, logical and pointer information, representation and manipulation, storage representation of string manipulation application, text handing analysis.

Unit-II: Linear Data structure and their sequential representation, Non- primitive data structures, storage structure for arrays, stacks, definition and operations on stacks, application of stack, recursion, polish expressions and their manipulation, Queues, operations on queues, simulation, priority queues, linked storage representation, pointers and linked allocation, linked linear lists, operations on linked lists, circulatory linked list, doubly links list, application of linked lists, polynomial manipulation, linked dictionary, multiple precision arithmetic.

Unit-III: Nonlinear Data structures: Trees, definitions and concepts of general trees and binary trees, representation of binary trees, binary tree representation of general tree, binary tree traversal, Threaded binary trees, operation on binary trees, application of trees, binary search trees, evaluation of binary search trees, AVL trees, B.B. trees, M. Way search trees and B-trees and B-trees, B* trees,(Chapter 8,9,11,12 from Data Management and file Processing by E.S. Lomis) graphs and their representation, matrix representation, list structure, other representation of graphs, Breadth first search, depth first search, application of graphs, dynamic storage management.

Unit-IV: Sorting and Searching : Notation and concepts, selection sort, bubble sort, merge sort, tree sorts, partition exchange sort, radix sort, address calculation method, Summary of Sorting methods, Searching Haah-table method, Hasning functions, Collision resolution techniques, external sorting, run list sorting, polyphase sorting, oscillating sorting, sorting on disks, generating extended initial runs.

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Unit-V: File Structure : Magnetic tapes, drums, disks, Mass storage devices and their characteristics, record organization, sequential file structure and processing of fixed sequential files (ISAM, direct files, structure and processing, external searching, multilist organization, inverted list organization, controlled list Length, cellular partitioned structures, maintenance of multilist, inverted list, maintenance of constrained list and cellular structures.

Text Books:

1. J.P. Trembly & P.G. Sorrenson : An Introduction to Data Structure with application, Mc-Graw Hill.
2. E.S. Loomis : Data Management and File Processing, P.H.I.

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Reference Books:

1. H.W. Sahnis : Fundamentals of Data Structures, Comp. Sc. Press.
2. D.E. Knuth : The Art of Computer Programming, Addition Wesly.

M.Sc. – 202: System Programming using Linux

Max. Marks: 40
Pass. Marks: 16

Unit-I: What is system software, Components of s/w, evolution of s/w, Translators and Loaders, Assemblers, Assembly process, Design of two pass assemblers, Macros and Macro processor.

Unit-II: Loading, Linking and Relocation, linking and loading Schemes, program relocatability, overview of Linkage editing schemes, A linkage editor for IBM PC, object Module format, Design of linkage editor, linking for program overlays.

Unit-III: The Arrival of Linux, the Spirit of linux the strengths of linux, linux and Unix history, linux distribution, System specific information, linux Command information, Installing linux, Running a Linux System, Networking overview, Linux Networking.

Unit-IV: Using graphical Systems with Linux. The shell and text files, the Shell prompt, functions of shell, different type of shells, Entering command, The shell start-up process, Customizing shell, Using Text Editors text processing.

Unit-V: The Role of the System Administrator. Principles of maintaining linux system, Using Basic Administrator Tools, Basic Administration Tasks, Hardware Redundancy and Fault Tolerance, Creating Scripts and Automated Procedure.

Text Books:

1. Guide to Linux Installation and Administration by Nicholas Wells
2. Linux Administration Handbook by Evi Nemeth, Trent R. Hein.
3. Linux Complete by Grant Taylor, BPB Publication.

Reference Books:

M.Sc.–203: Computer System Architecture and Parallel Processing

Max. Marks: 40
Pass. Marks: 16

Unit-I: Central Processing Unit : General Register organization, Stack Organization, Register stack, Memory stack, Reverse Polish Notation Evaluation of Arithmetic Expressions, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Subroutine Call and Return, Program Interrupt, Types of Interrupts Reduced Instruction Set Computer (RISC), Characteristics of RISC/CISC.

Unit-II: Computer Arithmetic: Arithmetic algorithms – Addition and Subtraction (with Signed-Magnitude Data, Hardware Implementation, Hardware Algorithm, with 2's Complement Data) Multiplication Algorithms – (Hardware Implementation for Signed-Magnitude data, Hardware Algorithm, Booth's Algorithm, Array Multiplier) Division Algorithm (Hardware Implementation for Signed-Magnitude data, Divide Overflow, Hardware Algorithm), Floating Point Arithmetic Operations- (Register Configuration, Addition and Subtraction, Multiplication, Division).

Unit-III: Introduction to parallel processing : Parallel Processing Mechanisms, Parallelism in Uni-processor System. Parallel Computer Structures : Pipeline Computers, Array Computers, Multiprocessor System, Performance of Parallel Computers, Dataflow and New Concepts, Architectural Classification Schemes. Applications of Parallel Processing.

Unit-IV: **Pipeline and vector processing :** Principles of linear pipelining, General Consideration in pipelining, Arithmetic Pipeline, Instruction Pipeline & RISC Pipeline with examples, Vector Processing, Matrix Multiplication, Memory Interleaving, Supercomputers, Attached Array processor and SIMD Array processor.

Unit-V: Multiprocessors: Characteristic of Multiprocessors, Multiprocessor Architecture and Programming Functional Structure, Interconnection Networks (Time shared or Common bus, Crossbar Switch, Multiport memory, Multistage Switching Network, Hypercube Interconnection), Interprocessor Arbitration, Interprocessor Communication and Synchronization, Mutual Exclusion with a Semaphore, Cache Coherence.

Text Books:

1. M. Moris Mano : Computer System Architecture, PHI
2. Hwang, Briggs : Computer Architecture and Parallel Processing, McGraw-Hill.

M.Sc. – 204: Design and Analysis of Algorithms

Max. Marks: 40
Pass. Marks: 16

Unit-I: Elementry Algorithms-examples, problems and instances, characteristics, Problem: Available Tools & Algorithms, Building Blocks of Algorithms, Outline of Algorithms. Some useful Mathematical Functions & Notation, Mathematical Expectation, Principal of Mathematical Induction, Concept of Efficiency of an Algorithm, Well known Asymptotic Function & Notation.

Unit-II: Analysis of Algorithm-simple example, well known Sorting Algorithms Best-Case and Worst –Case Analysis, Analysis of Non-Recursive Control structure, Recursive Constructs, Solving Recurrences, Average Case & Amoritzed Analysis.Resursive algorithms(Tower of Honoi, Permutations).

Unit-III: Design Techniques: Divide and Conquer- Control abstraction binary search, merge sort, Quick sort, Strassen's matrix multiplication, Exponentiation.

Dynamic Programming: The problem of Making Change, The principle of optimality, Chained Matrix Multiplication Matrix multiplication using Dynamic Programming. Greedy methods (Formulization of Greedy Technique, Minimum Spanning Trees, Kruskal's Algorithm).

Unit-IV: **Graph algorithms:** Examples, Traversing Trees, DFS, BFS & Minimax principle, Topological sort, strongly connected component, minimal spanning tree, Kruskal and prims algorithm, Dijkstra's Algorithm, all paths shortest paths, Floyd-Marshall algorithm, Flow networks.

Unit-V: Models for Executing algorithms: Regular Expressions, Regular language, Finite Automata. Formal Language & Grammer, CFG, PDA. Turning machine Formal definition and example, Instantaneous Description and Transition Diagram.

Text Books:

1. T. Cormer & Rivest, Algorithms, MIT Press, 1990.
2. Ellis Sahni, Computer Algorithms, Galgotia.

Reference Books:

1. Aho, Ulman, The Design and Analysis of Computer Algorithms, Wesley's 74.
2. Kurth, The Art of Computer Programming, Wesley.

M.Sc. – 205: Java Programming

Max. Marks: 40
Pass. Marks: 16

Unit-I: Understanding the Internet, What in the Internet, How TCP/IP makes the Internet work, who runs the Internet, Overview of the Internet, Services like E-mail, WWW, FTP, Telnet etc. Domain Name System (DNS), Simple Network Management, Protocols (SNMP), Internet security, Cryptography, Public-key algorithms, Authentication Protocols, Digital Signature, Multimedia, Audio, Video, Data Compression.

Unit-II: Java History, Java features, How Java differs from **C** and **C++** , Java and Internet, Java and WWW, Hardware and Software requirements, Java environments, Simple Java Program, Java Program Structure, Java Tokens, Java statements, Implementations a Java Program, Java virtual machine, Constants, variables and data types.

Unit-III: Operations and expressions, Arithmetic, Relational, Logical, Bit-Wise operators, operator precedence and Associability various control flow statement like if…..else, switch while, do, for etc. classes object and methods, Inheritance extending a Class, Visibility control, Arrays strings and vectors.

Unit-IV: Interfaces, Multiple inheritance defining Interface, extending Interfaces, Implementing Interfaces, Accessing Interface variables, Java API Packages, Naming Conventions, Creating packages, Accessing a package, Adding a class to a package, Hiding classes. Multi threaded programming, Creating threads, extending thread class, life cycle of a Thread, Thread exception, Thread priority.

Unit-V: Exceptions, execution Handling in Java, Applet programming, Applet life Cycle, creating executable Applet, Applet Tag, Running an applet, passing parameters to applet, Graphics programming, GUI Concepts in Java, managing Input/Output files in Java.

Text Books:

1. Programming with JAVA, A Printer. E. Balaguruswamy Publisher: Tata McGraw Hill publication.
2. Computer Networks By A.S. Tanenbaum, P.H.I.

Reference Books:

1. The Complete reference Java 2, 3rd Edi. By Patrick Naaghton, Herbert, Schild Tata Mc-Graw Hill.
2. Exploring Java : Patrick Nieaneyer and Joshna Peck O, Reilley S Associates, Inc.
3. Hareliy Hahn Teacher the Internets, 1999 By Harley Hahn, P.H.I.
4. Java 2 exam Guide : Barry Boone / William Stanck Tata Mc-Graw Hill.