Course Name
(B.Sc. Computer/B.A. Computer Applications/B.Com. Computer Applications)

Scheme of Examination:

B.Sc I

Name of Paper	M.M.	Pass Marks
B.Sc.1.1 Computer Organization and Architecture	60	24
B.Sc.1.2 : Programming Methodology	60	24
LAB ASSIGNMENTS (Based on Theory Papers)	80	40
Total	**200**	**88**

B.Sc. II

Name of Paper	M.M.	Pass Marks
B.Sc. 2.1: System Programming	60	24
B.Sc. 2.2: Scientific Computing	60	24
LAB ASSIGNMENTS (Based on Theory Papers)	80	40
Total	**200**	**88**

B.Sc. III

Name of Paper	M.M.	Pass Marks
B.Sc. 3.1: Advanced Programming Techniques & Data Structures	60	24
B.Sc. 3.2: Principles Of Operating Systems	60	24
B.Sc. 3.3: Digital Fundamentals and Microprocessors	60	24
LAB ASSIGNMENTS (Based on Theory Papers)	120	60
Total	**300**	**132**

B.Sc. 1.1 Computer Organisation and Architecture

UNIT 1

Historical Evolution of Computers, Characteristics of Micro, Mini, Mainframe and Super Computers. Data Representation in Computers: Decimal, Binary, Octal and Hexadecimal Number Systems, Interconversions, Positive and Negative Integers and Fractions, Alphanumeric Codes, EBCDIC and ASCII Codes.

UNIT 2

Functional Units of a Digital Computer ,Arithmetic Unit, Control unit, Memory and Input/Out put unit. Simple I/O Devices and their Controllers.

Computer Memory: Elementary Concepts of Sequential and Random Access, Primary Storage Devices, RAM, ROM, PROM, EPROM Auxiliary Storage Devices, Magnetic Core, Disks, Drums and Tapes. Virtual Storage.

UNIT 3

Simplified Structure of a Processor, Instruction Format. Addressing modes, Instruction Set Selection and Example of a Model Machine & its Assembly Language, Program for a Typical processor.

Computer Architecture :Interconnection of Units in a Computer, Bus, Transfer of Information between I/O Devices, CPU and memory, Cache Memory, Direct Memory Access (DMA) Interface, Instruction. Execution. Fetch and Execute Cycle, Interrupt Structure.

UNIT 4

Case Study of a Typical Microcomputer, Minimum Configuration, Parallel to Serial and Serial to Parallel Conversion Special and General-purpose Software and Application programs for Microcomputers.

Elementary Ideas of Operating Systems. Batch, Multiprogramming, Timesharing, On-line and Real Time Operating Systems.

BOOKS:

1. V: Rajaraman : Fundamentals of Computers. (P. Hall).
2. R. Hunt and D. Shelly: Computers and Common Sense (P. Hall).
3. C. J Gear: Introduction to Computer Science (TMH)
4. Computer Arithmetic :I.Koren (University Press)
5.Computer Organization and Architecture : Chalk(University Press)

B.Sc. 1.2 : Programming Methodology

UNIT 1

Computers and Problem solving. Algorithms, Types of Algorithms, Flowcharts, Higher-level programming languages pseudocodes, Constants and variables, Data types, Types of variables, Integer, fixed-point, floating point, logical and string variables, Unary and binary operators. Hierarchy of operations, Expressions.

UNIT 2

Assignment statement, Input/output statements, Decision structures. Conditional and Unconditional transfer of control, Iterative constructs, Nested structures, Arrays.

UNIT 3

Illustration using PASCAL, Syntax diagrams, Separators and symbols. Type taxonomy of simple data- types, Program heading and declaration part. Enumerated and Sub range data types, Array, Record Set and File Data Types. Subprograms , Functions and Procedures, Local and Global variables, Passing of Parameters, Rules for Scope of Identifiers.

UNIT 4

Introduction to Dynamic Data Structures such as Pointers, Lists, Queues, Stacks . Top-Down Modular Design of Programs and Step wise Refinement. Structured Programming. Testing and Debugging Techniques.

Note - Design of Simple Numeric and Non-Numeric Algorithms will be emphasized

BOOKS:
1. Structure & Interpretation of Computer Programs: Abelson , Harold,Sussman(University Press)

2. Tremblay and Bunt: An Introduction to Computer Science (McGraw).
3. Programming with Pascal : Lipschutz (Schaum Series) (McGraw).
4. K. Jensen and.N. Wirth: Pascal, User Manual and Report. (Springer).
5. T. Swan: Mastering Turbo Pascal (BPB).
6. Smith S. :Thinking about Computer Programming(University Press).

B.Sc. 2.1: System Programming

UNIT 1
Assembly and Machine Language. CPU Architecture, Memory and I/O Organization. Special purpose Functions of Registers, Memory Segmentation and Address Computation .Various Addressing Modes.

UNIT 2
Instruction Formats, Op Codes, Mnemonics, Data Transfer, Arithmetic, Branch, Loop, Logical, Shift and Rotate Instructions. String Instructions, Integer Arithmetic, Text Processing.

UNIT 3
Stacks, Calls, Returns, Near and Far Procedures, Interrupts and their routines, Directives, Pseudo-ops, Macros and Conditional Assembly, Recursive Macros. Disk File Handling, Sequential and Random Accessing of Files. Input and Output Instructions, Simple Device Drivers.

UNIT 4
Assembly Process, Logic Flow of Two-Pass Assemblers, Loaders, Different Loading Schemes, Program Relocatability, Linkage Editing, Compilers and Debuggers. BIOS,. EXE , COM Programs.

BOOKS:
1. Systems Programming :John J. Donovan (Tata-McGraw Hill Edition)
2. An Introduction to Microprocessors : Aditya Mathur (PHI}.
3. Microcomputer System: The 8086/8088 Family: Yu-Cheng Liu and Glenn A. Gibson (Prentice Hall of India)
4. System Programming and Operating System: D.M. Dhamdhere (Tata-McGraw Hill Edition)

B.Sc. 2.2: Scientific Computing

UNIT 1

Overview of FORTRAN 77: Structures such as expressions, statement control and repetitive constructs, arrays, subprograms and files .

UNIT 2

Floating point Arithmetic: Basic concepts of floating point number systems, Implications of finite precision, Illustrations of error due to round off.

Solution of Simultaneous linear equations: Gaussian Elimination, Gauss-Siedel Method, Iterative and Relaxation Methods, Matrix Inversion.

UNIT 3

Eigen values and Eigenvectors of Matrix, Gerschgorin's Theorem, Method of Iteration, Jacobi, and Givens Methods. Solution of Nonlinear Equations: Bisection, False Position, Secant, Newton- Raphson and Linear Iteration Methods, Order of convergence and Reliability. Polynomial Evaluation ,Solving Polynomial Equation, Bairstow's Method.

Polynomial Interpolation, Difference Tables, Numerical Differentiation, Numerical Integration, Trapezoidal rule, Simpson rule, Gaussian Quadrature, Errors in Formulae.

UNIT 4

Solution of ordinary Differential Equations, Taylor Series Methods, Euler's and Modified Euler's method, Runge-Kutta Method ,Predictor-Corrector Method. Systems of Equations and Higher Order Equation. Boundary-Value and Characteristic-Value Problems.

Approximation to Functions with Chebyshev Polynomials, Economized Power Series and Rational Functions. Minimization and Maximization of functions.
Note: Programming in Fortran 77/Pascal.

BOOKS:
1. V . Rajaraman: Computer Oriented Numerical Methods (P.Hall).
2. Numerical Methods : Boehm, Prautzch(University Press).
3. E. V Krishnamoorthy and S. K Sen: Numerical Algorithms (E-West).
4. Computer Programming and Numerical Analysis:An Integrated Approach :
Datta N. (University Press).

B.Sc. 3.1: Advanced Programming Techniques & Data Structures

PROGRAMMING IN "C"
UNIT 1
Data types and storage class (Automatic, Register, static, External), Operators and expressions, Control flow statements, If else, else if, switch, loops:While, For, Do While, GoTo and Labels,

UNIT 2

Library functions, Recursion, Pointers and arrays, Structures and Unions, Input, Output and File I/O.

DATA STRUCTURES

UNIT 3

Stack and its representation. Primitive operations. Infix, prefix and postfix notations. Application of stacks in evaluation and conversion of an expression. Queues and array implementation of Queues. sets and Strings. Circular lists.

UNIT 4
Recursion and Recurrence, Direct recursion with examples, Binary search. Binary trees (BT), operations on BT. Memory implementation of BT. Expression as Trees. Internal and External Sorting, Insertion sort, selection sort, heap sort and quick sort, merge sort, algorithms and their relative evaluation. Introduction to searching, Hashing Methods.

Books:1. E. Balaguruswamy: Programming in C
2..Ritchie & Kerninghan : The C Programming Language
3.A.M. Tanenbaum & M.J.Augenstein: Data Structure Using C
4. S.Lipschutz: Data Structure(Schaum).
5. D.E.Knuth: Fundamental Algorithms(Narosa).

B.Sc. 3.2: Principles of Operating Systems

UNIT 1

Historical perspectives of OS. Batch Processing, Multiprogramming. Time sharing .Real time and Multi processor systems. OS services .File management, File type, Operation on files, Device Directory, Access Methods Allocation methods and free space management, Directory systems, file protection.

UNIT 2

Multiprogramming and CPU Scheduling, Process control block, Schedulers, Schedulers, scheduling queues, first come first served, short job first priority, Preemptive and Round Robin algorithms and their Relative Evaluation.

UNIT 3

Memory management, Bare machine, resident monitor, Relocation, Swapping, memory fragmentation and compaction, fixed and variant partition allocation, paging, shared pages, segmentation, virtual memory, overlays, demand paging, page replacement.

UNIT 4

Deadlocks and their characteristics, detection and prevention. Concurrent processes, definition, conditions, precedence graphs, Fork and join Constructs, Concurrent statement, State of Process, Operation on Process, Mutual Exclusion, Synchronization.

Case Study of UNIX OS.

B.Sc. 3.3: Digital Fundamentals and Microprocessors

UNIT 1

NOT (Inverter), AND, OR NAND, NOR, Exclusive NOR gates, positive and negative logic. Symbolic representation, Associated electronic circuits. Boolean operations and related algebraic laws Correspondence with logic gates. DeMorgans theorem, Boolean expressions for logic. circuits, Karnaugh map.

UNIT 2

Combinational logic and design of combinational logic circuits, Gate minimization, NAND and NOR as universal gates, Serial and Parallel adders, subtractors, Arithmetic logic unit, multiplication and division systems, Comparators, Encoders and Decoders Multiplexer, Demultiplexer, Parity, generation and checking.

UNIT 3

Latches and flip flops. Pulse triggered flip-flop. Timer circuits. Read/Write random access memories' Synchronous and asynchronous counters. Binary, Decade, Up down Counters, Parallel to-serial data conversion. Serial-in serial- out, serial-in-parallel-out,Parrallel-in-serial-out and Parallel-in-parallel-out shift register. Serial - to - Parallel data conversion.

UNIT 4

Microprocessor configuration. Processor, Memory and I/O units, Bit slices   and 8/16/32-bit microprocessors, Interfacing with data bus. Bi-directional bus. D/A and A/D converters. Modulator-Demodulator, RS-232 interface, . Interrupts, Block transfer and DMA , Memory management.