AC01 MATHEMATICS—I

1 Multivariate Calculus 18 hours

1.2 Limit and continuity of functions of several variables, Partial derivatives of one and higher order.

1.3 Total differential and its application to approximations and errors, Implicit and homogeneous functions, Euler ‘s theorem.

1.4 Taylor ‘s theorem and series of function of several variables, Maxima and minima of functions of two variables, Method of Lagrange multipliers.

1.4 Double and triple integrals, Change of order of integration, Application to computation of volumes and surface areas of simple solids.

II [2]

2 Ordinary Differential Equations 16 hours

2.1 Separable, homogeneous, exact and linear first order differential equation, Bernoulli ‘s equation.

2.2 Homogeneous and non-homogeneous linear differential equation of second order, method of variation of parameters and method of undetermined coefficients, Euler - Cauchy equation, Higher order linear homogeneous differential equation with constant coefficients.

I [1, 2]; II [4, 5]

3. Matrices 16 hours

3.1 Addition, scalar multiplication and product of matrices, Elementary row operations.

3.2 Rank and inverse of a matrix, Consistency and solution of a system of linear equations.

3.3 Eigenvalues and eigenvectors, Hermitian, skew-Hermitian and unitary matrices, Diagonalization of matrices.

I [6, 7]; II [3]

4 Special Functions 10 hours

4.1 Power series solution of O.D.E., Series solution of Legendre and Bessel Equations.

4.2 Legendre polynomials and their properties, Bessel function of first kind and their properties, Recurrence relations for Bessel functions.

I [4]; II [6, 7]

Text Books

I. Erwin Kreyszig, "Advanced Engineering Mathematics" 8th edition, John Wiley and Sons (Asia) --- 2000

II. R. K. Jain and S. R. K. Iyengar, "Advanced Engineering Mathematics", Narosa Publishing House --- 2002

Reference Books

1. Peter V. O'neil, "Advanced Engineering Mathematics" 4th edition Brooks / Cole Publishing Company ---1995

AC02 COMMUNICATION AND TECHNICAL WRITING

1. Basics of Communication **8 hours**

1.1 Communication Process.
1.2 Speech Act Theory.
1.3 Principles of Communication.
1.4 Communication Barriers
1.5 Listening and Hearing,
1.6 Language as Tool of Communication.
1.7 Oral and Written Communication,
1.8 Body language and Para-language.

II [1, 2, 3, 6]

2. Remedial English **10 hours**

2.1 Errors of Syntax and Accidence.
2.2 Errors of Punctuation.
2.3 Errors of Vocabulary and Usage.

I [1,2, 3]; III [24]; IV [1, 2]

3. Technical English **10 hours**

3.1 Nature of Technical English; Impersonal Style
3.2 Technical Vocabulary.
3.3 Definition, Descriptions, Explanation.
3.4 Argumentative Writing.

IV [1(1.1), 3, 4, 5, 6, 7]

4. Technical Writing 22 hours

4.1 Writer, Audience and Documentation.
4.2 Preparatory Organization.
4.3 Writing Specific Documents (Resumes, Letters, Memos, Specifications, Procedures, Proposals, Product Descriptions).
4.4 Report and Paper Writing (The Beginning, Body and Ending of the Report, The Cover Materials, Graphics).
4.5 Types of Reports
4.6 Writing and Designing for Web.

III [1-21]

5. Technical Presentations 10 hours

5.1 Essentials of Professional Presentation.
5.2 Types of Presentation
5.3 Preparing a Presentation.
5.4 Standards of Delivery.
5.5 Extra Verbal Clues (Body and Paralanguage).
5.6 Handouts.
5.7 Visuals.
5.8 Demonstration Models.

II [4]; III [26, 27, 28]

Text Books:

I. Maison, Margaret M, *Examine Your English*, New Delhi: Orient Longman, 1980.
II. Kaul Asha. *Business Communication*. New Delhi Prentice: Hall of India, 1999.
III. Sides, Charles H. *How to Write & Present Technical Information.* Cambridge: Cambridge University Press 1999 (Third Edition)
IV. Sharma, R.S. *Technical Writing*. New Delhi: Radha Publication, 1999.

Reference Books:

1. Borowick, Jerome N. *Technical Communication and its Application*. New Jersey: Prentice Hall, 2000.
2. Eisenberg, Anne. *Writing Well For the Technical Professions*. New York Harper & Row, Publishers, 1989
3. Forsyth, Sandy & Lesley Hutchison. *Practical Composition.* Edinburgh: Oliver & Boyd, 1981

4. Guffy, Mary Allen. *Business Communication: Process and Product.* Cincinnati: South-Western College Publishing, 2000 (Third Edition)

AC-03/AT-03 BASIC ELECTRONICS AND DIGITAL CIRCUITS

1. Conduction in Semiconductors and Semiconductor Devices **5 hours**

1.1 Intrinsic semiconductor, Donor and Acceptor impurities.
1.2 Fermi level, Hall effect, Avalanche and Zener effects.
1.3 P N Junction. Semiconductor diode and its characteristics.
1.4 Zener Diode, its characteristics and use in Voltage regulators.
1.5 Clipping and Clamping.
1.6 Transistor action (NPN and PNP). Characteristics of a Transistor. CB, CE and CC configurations and their characteristics.
1.7 Biasing of BJT.

I [1, 2, 3]; II [4, 5, 6, 8]

2. Small Signal BJT Amplifiers **6 hours**

2.1 Basic signal amplifier and its parameters (A_v, A_i, R_{in}, R_{out}).
2.2 Hybird – model and pi-models of a BJT.
2.3 R-C coupled amplifiers and Cascaded amplifiers.
2.4 Darlington pair, Cascode and Difference Amplifiers.

I [10]; II [12,13]

3. Field-Effect Transistors (FET) **3 hours**

3.1 J-FET and MOS-FET and their models
3.2 Small signal amplifiers using FETs.

I [4,10]; II [9]

4. Oscillators **3 hours**

4.1 Barkhausen criteria for oscillation.
4.2 R- C phase-shift and Wien-bridge oscillators.
4.3 General network and evolution of different oscillators viz Hartley, Colpitts, and Clapp oscillators.
4.4 Crystal oscillators, frequency stability.

I [15]; II [20]

5. Operational Amplifiers and Circuits **4 hours**

5.1 OPAMP block diagram and its equivalent circuit.
5.2 Applications of OPAMP as a Summer, Differentiator, Integrator, Comparator, Sample and Hold circuit.
5.3 Offset currents, compensation, slew rate.

I [14]; II [25]

6. Rectifiers And Power Supplies **4 hours**

6.1 Half-wave and full-wave rectifiers.
6.2 Capacitor-input Filters.
6.3 Calculation of efficiency, dissipation and ripple factor in rectifiers.
6.4 Regulated power supplies.

I [17]; II [7, 30]

7. Combinational Circuits **8 hours**

7.1 Basic gates, Boolean Algebra
7.2 De Morgan's theorem and Duality theorem
7.3 Karnaugh's map (for 2,3,4 variables)
7.4 Combinational circuits, standard representation for logical function (SOP and POS forms)
7.5 Binary Adders.
7.6 Arithmetic Operations: binary subtraction.
7.7 Digital comparators.

7.8 Parity Check Generators.
7.9 Decoder/Demultiplexer.
7.10 Data Selector, Multiplexer.
7.11 Encoder.
7.12 ROM and its Applications.

I [6, 7]; II [32]

8. Transistor as a Switch **3 hours**

8.1 Switching Characteristics of Diodes.
8.2 Switching Characteristics of BJTs.
8.3 Switching Characteristics of FETs.
8.4 Use of Schottky Diodes in Switching.

I [2, 3, 4, 5]

9. MOS Digital Circuits **4 hours**

9.1 Basic Concepts of Logic Circuits.
9.2 NMOS Logic Circuits.
9.3 CMOS Logic Circuits.
9.4 Transmission Gates.

I [6]

10. Bipolar Logic Circuits. **6 hours**

10.1 The BJT Inverter.
10.2 TTL Family.
10.3 TTL Families with Improved Performance.
10.4 Other TTL Logic Circuits.
10.5 ECL Family.
10.6 Interfacing Between TTL and ECL Family.

I [6], III[7]

11. Sequential Digital Systems **8 hours**

11.1 Various Types of Flip Flops.
11.2 Clocked SR flipflop.
11.3 JK, T and D flipflops.
11.4 Shift Registers and Sequence Generators.
11.5 Counters.
11.6 Applications of Counters.

I [8]

12. LSI Systems **6 hours**

12.1 Dynamic MOS.
12.2 Programmable ROM.
12.3 Erasable PROM and EEPROM.
12.4 RAM.
12.5 Memory Cells.
12.6 Biploar Memory Cells.
12.7 Programmable Array Logic.
12.8 PLA and Programming a PLA.
12.9 CCD.
12.10 Seven-segment Display System.

I [7, 9]

Text Books

I. J. Millman and A Grabel, "Microelectronics", Tata Mc Graw Hill, New Delhi, 2nd Edn. 1999.

II J.B. Gupta, "Electronic Devices and Circuits", S.K. Kataria & Sons, 2nd Edn. 2003.

III H.Taub and D.Schilling, "Digital Integrated Electornics", McGraw-Hill 1997.

AE06/AC04/AT04 SIGNALS AND SYSTEMS

1. Introduction — 3 hours

1.1 Continuous time and discrete time signals.
1.2 Signal energy and power.
1.3 Periodic signals, even and odd signals, exponential and sinusoidal signals.
1.4 The unit impulse and the unit step function.
1.5 Continuous time and discrete time systems.
1.6 Interconnection of systems.
1.7 Classification of systems – linear and nonlinear, memory and memoryless, causal and non-causal, stable and unstable, time-varying and time-invariant.

I [1]

2. Linear Time-invariant Systems — 3 hours

2.1 Convolution for Discrete Time Systems (DTS).
2.2 Convolution for Continuous Time Systems (CTS).
2.3 Properties of Linear Time-Invariant (LTI) systems – commutative, distributive, associative.
2.4 Characterization of LTI systems – with and without memory, stable and unstable, causal and non-causal.
2.5 Unit step response of LTI systems.
2.6 Causal LTI systems described by differential and difference equations.

I [2]

3. Fourier Series Representation of Periodic Signals — 6 hours

3.1 Response of LTI systems to complex exponential.
3.2 Fourier series representation of continuous time periodic signals.
3.3 Convergence conditions.
3.4 Properties of continuous time Fourier series – linearity, time shifting, time reversal, time scaling, multiplication, Parseval's relation.

3.5 Application of Fourier series to analysis of linear systems.
3.6 Discrete time Fourier series – its finiteness and properties, in brief, leading to the Discrete Fourier Transform (DFT).

I [3]

4. Continuous-time Fourier Transform 6 hours

4.1 Aperiodic signals and the Continuous time Fourier Transform (CFT).
4.2 Convergence of CFT.
4.3 CFT of periodic signals.
4.4 Properties of the CFT – linearity, time shifting, conjugation and conjugate symmetry, differentiation and integration, time and frequency scaling, duality, Parseval's relation.
4.5 CFT and convolution.
4.6 Multiplication property.
4.7 Application of CFT to LTI system analysis.

I [4]

5. Discrete-time Fourier Transform 6 hours

5.1 Aperiodic signals and the Discrete Time Fourier Transform (DTFT).
5.2 Convergence of DTFT.
5.3 DTFT of periodic signals.
5.4 Properties of the DTFT – periodicity, linearity, time and frequency shifting, conjugation and conjugate symmetry, differencing and accumulation, time reversal, time expansion, differentiation in frequency, Parseval's relation.
5.5 DTFT and convolution .
5.6 Multiplication property .
5.7 Application of DTFT to LTI system analysis.

I [5]

6. Time and Frequency Characterization of Linear Systems 3 hours

6.1 Magnitude phase representation of the frequency response of LTI systems.
6.2 Importance of linear phase.
6.3 Group delay.
6.4 Time domain properties of ideal frequency selective filters.
6.5 Time and frequency domain aspects of nonideal filters.
6.6 First and second order continuous time systems.
6.7 First and second order discrete time systems.

I [6]

7. Sampling 3 hours

7.1 The sampling theorem.
7.2 Zero order hold.
7.3 Reconstruction of signals from its samples.
7.4 Aliasing.
7.5 Discrete time processing of continuous time signals.

I [7]

8. Laplace Transform 9 hours

8.1 Definition of the Laplace Transform (LT).
8.2 Region of convergence.
8.3 Poles and zeros.
8.4 Inverse LT.
8.5 Graphical evaluation of CFT from LT pole zero plot.
8.6 Properties of the LT – linearilty, time shifting, shifting in the s-domain, time scaling, conjugation, convolution, differentiation in the time domain, differentiation in the frequency domain.
8.7 Initial and final value theorems .
8.8 Standard LT pairs.
8.9 Analysis and characterization of LTI systems using the LT.
8.10 The unilateral LT – Examples, Properties, Applications.

I [9]

9. Z-Transform 9 hours

9.1 Definition of the Z-Transform (ZT) .
9.2 Region of convergence.
9.3 Poles and zeros .
9.4 The inverse ZT .
9.5 Graphical evaluation of the DTFT from pole zero plot.
9.6 Properties of the ZT – linearity, time shifting, scaling in the z-domain, time reversal, time expansion, conjugation, convolution, differentiation in the z-domain.
9.7 Initial and final value theorems .
9.8 Standard ZT pairs.
9.9 Analysis and characterization of LTI systems using the ZT.
9.10 The unilateral ZT; Examples; Properties ; Applications.

I [10]

10. Random Signals and Systems 12 hours

10.1 Basic concepts of probability and Random Variables (RV).
10.2 Distribution and density functions.
10.3 Mean values and moments.
10.4 The Gaussian RV.

10.5 Joint probability.
10.6 Statistical independence.
10.7 Random Processes (RP) – continuous and discrete, deterministic and non-deterministic, stationary and non-stationary, ergodic and non-ergodic.
10.8 Correlation functions – auto and cross, and their properties.
10.9 Sums of RP's.
10.10 Spectral density and its properties.
10.11 Mean squared value from spectral density.
10.12 Spectral density and autocorrelation function (ACF).
10.13 White noise.
10.14 Cross spectral density.
10.15 Response of Linear systems to random inputs – mean and mean squared values of the output, ACF of system output, cross correlation between input and output spectral density at the output, cross spectral density between input and output.
10.16

II [9-12] OR III [4] OR IV [4, 5] OR V [5]

Text Books

I. A V Oppenheim, A S Willsky and S H Nawab, "Signals and Systems", Third Indian Reprint, Prentice Hall, 2002.

II. G R Cooper and C D McGillam, "Methods of Signal and System Analysis", Holt, Rinehart and Winston, 1990.

III. S.Hary Kin, "Communication Systems", 3rd Edition, John Willey, 1994.

5 **IV.** R E Ziemen and W H Tranter, "Principles of Communication", 3rd Edition, Houghton Mifflin, 1990.

6 **V.** B P Lathi, " Modern Digital and Analog Communication System", Indian Edition by Prism Books, 1993.

AC05 PROGRAMMING & PROBLEM SOLVING THROUGH "C"

1. Problem Solving and Algorithm Design **6 hours**

1.1 Introduction to Computer based Problem Solving.
1.2 Program Design concepts : {Top-down design and stepwise refinement, loops basic programming constructs}.
1.3 Programming Environment: {Assemblers, compilers, interpreters, linkers, loaders}.

I [1-3]

2. Algorithm Design **9 hours**

2.1 Algorithm design Issues.
2.2 Complexities of Algorithms.

2.3 Development of Algorithms for various Examples : {Summation of set of numbers and series, sine function computation, Fibonacci sequence, Reversing digits of an integer, Square root of a number, Smallest divisor, Raising a number to a large power, generation of prime numbers}.

I [4, 5]

3. Overview of C Programming 9 hours

3.1 Data types.
3.2 Constants and Variables.
3.3 Expressions and Operators.
3.4 Basic I/O.
3.5 Control Constructs.
3.6 Arrays.
3.7 Examples of arrays:
{Array order reversal, Removal of duplicates from an ordered array, Binary search, Matrix manipulations, finding kth minimum element in an array,
3.8 Simple sorting techniques : {insertion sort, bubble sort, sorting using partitioning}.

I [4, 5]; II [1-7]

4. Advanced Programming Techniques 12 hours

4.1 Handling Strings.
4.2 Scope Rules.
4.3 Functions (Parameter passing: call by value, call by reference, calling functions with arrays, nesting of functions}.
4.4 Recursive functions.
4.5 Structures and union : {Arrays of structures, Arrays within structures, Structures within structures, Structures and functions}.

II [8-10]

5. Dynamic Data Structures in C
18 hours

5.1 Dynamic Memory Allocation.
5.2 Pointers (Pointer arithmetic, pointer vs arrays, pointers to functions, functions with variable number of arguments).
5.3 Linked list concepts
5.4 Various linked list operations : {Insertion and deletion in a singly linked list, Traversal, counting number of nodes, reversal of linked list }
5.5 Applications of linked lists
5.6 File Management in C
5.6.1 Input / Output operations

5.6.2 Error handling during Input / Output operations
5.6.3 Random access files

II [11-13]

6. The Preprocessors **3 hours**

6.1 Macro Substitutions
6.2 File inclusions
6.3 Compiler Control Directives

II [14]

7 Program testing & Documentation **3 hours**

7.1 Coding style- variable names, declarations, statement construction
7.2 Test case design - Basic path testing, Black box testing
7.3 Principles of Documentation

II [15]

Text Books

I. R.G. Dromey, "How to Solve it by Computer", Prentice Hall of India, 1992.
II. E Balagurusamy, Programming in ANSI C, edition 2.1, Tata McGraw-Hill, reprint 2002.

Reference Books

1. B.W. Kernighan & D.M. Ritchie, "The C Programming Language", Prentice Hall of India, 1989.
2. Cooper,Mullish, "The Spirit of C", Jaico Publishing House, New Delhi, 1987.
3. Richard Johnson-Baugh & Martin Kalin, "Application Programming in C", Macmillan International editions, 1990.
4. Kenneth A.,C, "Problem Solving and Programming", Prentice Hall International.

AC06 DATA STRUCTURES AND ALGORITHM DESIGN

1. Analysis **7 hours**

1.1 Abstract data Types.

1.2 Ordered lists and arrays.
1.3 Polynomial representation using arrays.
1.4 Algorithm analysis using frequency count.
1.5 Measuring time complexity using big O notation.
1.6 Recursive calls.

I [1 (1.1, 1.3, 1.4), 2(2.1, 2.2)]; II [1 (1.1), 2, 5 (5.1-5.3)]

2. Linked Lists **10 hours**

2.1 Manipulations on singly linked list.
- 2.1.1 Insertion.
- 2.1.2 Deletion.
- 2.1.3 Copy.
- 2.1.4 Append.

2.2 Circular list.
2.3 Double linked list.
2.4 Polynomial addition using linked lists.
2.5 Sparse matrices.
2.6 Linked list representation of stacks and queues.
2.7 Evaluation of arithmetic _expression.
2.8 Simulation using queues.

I [2 (2.3), 3 (3.3), 4 (4.1, 4.2, 4.4, 4.7)]; II [3 (3.1-3.3), 4 (4.8)]

3. Trees **14 hours**

3.1 Binary trees.
- 3.1.1 Height.
- 3.1.2 Representation using pointers.

3.2 Traversal-Inorder, Preorder and Postorder.
- 3.2.1 Recursive.
- 3.2.2 Non-Recursive.
- 3.2.3 Tree reconstruction using inorder and preorder traversal.
- 3.2.4 Relationship between internal and external nodes.
- 3.2.5 Threaded Binary trees.

I [5 (5.1- 5.6)]; II [6 (6.1-6.4)]

4. Search Trees **8 hours**

4.1 Binary search tree-time complexity of insertion and retrieval.
4.2 Heaps and priority queues.
4.3 AVL trees.
4.4 B-trees.
4.5 Time complexity of all the tree algorithms.

I [9 (9.2)]; II [6 (6.7-6.9), 7(7.1.1)]

5. Searching And Sorting **14 hours**

5.1 Sequential and Binary search.
- 5.1.1 Time complexity.

5.2 Insertion sort.
5.3 Selection and bubble sort.

5.4 Quick sort.
5.5 Merge sort.
5.6 Heap sort.
5.7 Hashing schemes.
5.7.1 Collision handling using linear and quadratic probe.

I [1 (1.1, 1.4), 7 (7.1-7.3, 7.5, 7.6), 9 (9.3)]; II [9 (9.1, 9.3), 10 (10.1,10.2)]

6. Graphs **7 hours**

6.1 Graph operations.
6.1.1 Representation.
6.1.2 Traversal.
6.1.3 Spanning trees.
6.1.4 Kruskal's algorithm for minimum-cost spanning trees.
6.1.5 Dijkstra's algorithm for shortest path.

I [6 (6.1, 6.2)]; II [8 (8.1, 8.2, 8.5)]

Text Books

I. E. Horowitz and S. Sahni, "Fundamentals of Data Structures," Galgotia Publications, 2003.
II. A. Drozdek, "Data Structure and Algorithms in C++", Vikas Publishing House Thomson Leaqrning, 2001.

AC07 COMPUTER ARCHITECTURE

1. Introduction and Background **12 hours**

1.1 Evolution of Computers
1.2 Stored Program concept and Von Neumann Architecture
1.3 Information representation and codes (Number System)
1.4 Building blocks of Computers (Combinational blocks, gates, multiplexes, decoders, encoders etc., Sequential building blocks, Flip flops, Registers, Counters, Random Access memory etc.

I [1, 2]

2. Register Transfer Language and Micro-Operations **5 hours**

2.1 Concept of bus, Data movement among registers
2.2 A language to represent conditional data transfer
2.3 Data movement from/to memory
2.4 Arithmetic and logic operations along with register transfer
2.5 Timing in register transfer

I [3, 4]

3. Architecture of a Simple Processor **10 hours**

3.1 A simple Computer organization and instruction set
3.2 Instruction execution in terms of microinstructions
3.3 Concept of interrupt and simple I/O organization
3.4 Implementation of the processor using building locks

I [5 (5.1-5.5, 5.9, 5.10)]

4. CPU organization **5 hours**

4.1 Instruction formats
4.2 Addressing modes instruction formats
4.3 CPU organization with large registers
4.4 Stacks and handling of interrupts and subroutines
4.5 Instruction pipelining : stages, hazards and methods to remove hazards

I [8 (8.4, 8.5, 8.7), 9 (9.4)]

5. Assembly Language Programming **5 hours**

5.1 Machine and Assembly language
5.2 Pseudo-operations
5.3 Subroutine in assembly language
5.4 Interrupt and I/O Programming
5.5 Examples

I [6 (6.1-6.3, 6.7, 6.8)]

6. Micro programmed Control Unit **4 hours**

6.1 Basic organization of micro programmed controller
6.2 Horizontal and vertical formats
6.3 Address sequencer

I, II

7. Arithmetic Algorithms **5 hours**

7.1 Addition and subtraction for sign magnitude and 2’s compliment numbers
7.2 Integer multiplication using shift and add
7.3 Booth’s algorithm
7.4 Integer division

7.5 Floating point representations and arithmetic algorithms

I [10 (10.2-10.5)]

8. I/O organization **4 hours**

8.1 Strobe based and handshake based communication
8.2 Vector and priority interrupts
8.3 DMA based data transfer

I [11 (11.2-11.6)]

9. Memory Organization **10 hours**

9.1 Basic cell of static & dynamic RAM
9.2 Building large memories using chips
9.3 Associative memory
9.4 Cache memory organization
9.5 Virtual memory organization

I [12 (12.1, 12.2, 12.4-12.6)]

Text books

I. M. Morris Mano, " Computer System Architecture", Prentice Hall, International 3rd edition,1993

II. J.P. Hayes, " Computer Organization and Design", McGraw- Hill, New York, 1988.

Reference books

1. Gaonkar, " Microprocessor Architecture, Programming and Architecture", Wiley Eastern Limited
2. P.Pal Choudhary, " Computer Organization and Design", Prentice Hall of India Ltd.,1994

AC08 SYSTEM SOFTWARE

1. Introduction **5 hours**

1.1 System software and Machine Architecture.
1.2 The simplified Instructional Computer (SIC): SIC Machine

architecture, SIC / XE Machine architecture, SIC Programming Examples.

I [1]; II [2]

2. Assemblers 12 hours

2.1 Basic Assembler Functions : A simple SIC Assembler, Assembler Algorithm and Data Structures.
2.2 Machine – Dependent Assembler Features: Instruction Formats and Addressing Modes, Program Relocation.
2.3 Machine – Independent Assembler Features: Literals, symbol – Defining statements, Expressions, Program Blocks, Control sections and Program Linking.
2.4 Assembler Design options : One – Pass Assemblers, Multipass Assemblers.

II [2]; II [4]

3. Loaders and Linkers 8 hours

3.1 Basic Loader Functions:- Design of an absolute loader, A simple Boot strap loader.
3.2 Machine – Dependent Loader Features: Relocation, Program Linking, Algorithm and Data structures for a linking loader.
3.3 Machine – Independent Loader Features: Automatic Library Search, Loader Options.
3.4 Loader Design Options: Linkage editors, dynamic linking, Boot-strap Loaders.

I [3]; II [7]

4. Macro Processors 5 hours

4.1 Basic Macro Processor Functions: Macro definition and Expansion, Macro Processor Algorithm and Data Structures.
4.2 Machine – Independent Macro Processor Features: Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro parameters.
4.3 Macro Processor Design Options: Recursive Macro Expansion, General Purpose Macro Processors, Macro Processing within Language Translators.

I [4]; II [5]

5. Compilers 12 hours

5.1 Basic Complier Functions: Grammars, Lexical Analysis, Syntactic Analysis, Code Generation.
5.2 Machine – Dependent Compiler Features: Intermediate Form of the program, Machine – Dependent Code Optimisation.

5.3 Machine – Independent Compiler Features: Structured variables, Machine – Independent code optimisation, storage Allocation, Block – Structured Languages.

5.4 Compiler – Design Options: Division into Passes, interpreters, P-code Compilers, Compiler – Compilers.

I [5]; II [6]

6. Operating Systems 10 hours

6.1 Basic operating system Functions: Types, user interface, Run – Time Environment.

6.2 Machine – Dependent OS Features: interrupt Processing, Process Scheduling, I/O supervision, Management of Real Memory.

6.3 Machine – Independent OS Features: File Processing, Job Scheduling, Resource Allocation, Protection.

6.4 OS Design Options: Hierarchical Structure, Virtual Machines, Multiprocessor OS, Distributed OS, Object Oriented OS.

I [6]

7. Other System Software 8 hours

7.1 Database Management Systems: Basic Concepts, Levels of Data Description, Use of a DBMS.

7.2 Text Editors: Overview of the Editing Process, User interface, Editor Structure.

7.3 Interactive Debugging Systems: Debugging Functions and Capabilities, Relationship with other parts of the system, user – interface criteria.

7.4 Object – Oriented System Design: [7, 8 (1)]

Principles of Object-Oriented Programming, Object – Oriented Design of an Assembler.

I [7]; II [8]

Text Books

I. Leland L Beck (1985), "System Software-An Introduction to System Programming" 3rd edition Addison Wesley – 1997.

II. D M Dhamdhere, "Systems Programming and Operating Systems" (2nd revised edition) Tata McGraw-Hill Publishing Co. Ltd., New Delhi 2003.

Reference Books

1. Calingaert P, “Assemblers, Compilers and Program Translation” Computer Science Press Meryland (1979)

AC09 NUMERICAL COMPUTING

1. Errors in Numerical Computation 3 hours

1.1 Sources of errors in numerical computation.
1.2 Round off error.
1.3 Truncation error.
1.4 Inherent error.
1.5 Stability of numerical algorithms.

I [1 (1.1, 1.3)]

2. Transcendental and Polynomial Equations 9 hours

2.1 Bisection method.
2.2 Secant method.
2.3 Regula-Falsi method.
2.4 Newton-Raphson method.
2.5 Rate of convergence of iterative methods.
2.6 System of nonlinear equations.

I [2 (2.2, 2.3, 2.5, 2.7)]

3. Systems of Linear Equations and Inverse of a Matrix 9 hours

3.1 Direct methods (Gauss-elimination method, Gauss-Jordan method, LU decomposition method, Cholesky method for symmetric definite systems).
3.2 Iterative methods (Gauss-Jacobi method, Gauss-Seidel method).
3.3 Rate of convergence of iterative methods.

I [3 (3.1, 3.2, 3.4)]

4. Eigenvalue Problems 9 hours

4.1 Power method.
4.2 Inverse power method.
4.3 Jacobi method for symmetric matrices.
4.4 Given’s method for symmetric matrices.

I [3 (3.5, 3.6)]

5. Interpolation and Approximation — 9 hours

5.1 Lagrange interpolation.
5.2 Errors of interpolation.
5.3 Divided differences.
5.4 Newton's divided difference interpolation.
5.5 Finite differences.
5.6 Newton's forward difference interpolation.
5.7 Newton's backward difference interpolation.
5.8 Least squares approximation.

I [4 (4.2-4.4, 4.9)]

6. Numerical Differentiation — 6 hours

6.1 Methods based on interpolation.
6.2 Methods based on finite differences.
6.3 Methods based on undetermined coefficients.
6.4 Choice of optimal step size.
6.5 Richardson extrapolation methods.

I [5 (5.2-5.4)]

7. Numerical Integration — 9 hours

7.1 Newton Cotes methods (Trapezoidal rule, Simpson's rule).
7.2 Composite integration methods.
7.3 Derivation of methods using the method of undetermined parameters.
7.4 Romberg integration.
7.5 Gaussian methods (Gauss-Legendre methods, Gauss-Chebyshev methods, Gauss-Laguerre methods, Gauss-Hermite methods).

I [5 (5.7 - 5.10)]

8. Numerical Solution of First Order Ordinary Differential Equations — 6 hours

8.1 Single step methods (Taylor series method, Euler method, Runge-Kutta methods (Second and Fourth order methods)).
8.2 Multistep methods (Advance).

I [6 (6.4)]

Text Books

I. M.K. Jain, S.R.K. Iyengar and R.K. Jain, "Numerical Methods for Scientific and Engineering Computation", Fourth Edition, New Age International Publishers, 2003.

Reference Books

1. M.K. Jain, S.R.K. Iyengar and R.K. Jain, "Numerical Methods : Problems and Solutions", New Age International Publishers, 1994.
2. A. Ralston and P. Rabinowitz "A First Course in Numerical Analysis", McGraw-Hill, 2nd edition, 1978.

AC10 DISCRETE STRUCTURES

1. Fundamentals **5 Hours**

1.1 Sets and subsets, Set operations.
1.2 Function.
1.3 Sequences and Summation.
1.4 Growth of Functions.
1.5 Matrices.
1.6 Mathematical Structures.

I [1 (1.1 - 1.2, 1.5 - 1.6)]; II [1 (1.6 - 1.8)]

2. Logic **6 Hours**

2.1 Propositions and Logical Operations.
2.2 Conditional Statements.
2.3 Predicates and Quantifiers.
2.4 Methods of Proof.
2.5 Principle of Mathematical Induction.

I [2]; II [1 (1.3)]

3. Combinatorics **10 Hours**

3.1 Permutations.
3.2 Combinations.

3.3 The Pigeonhole Principle.
3.4 Elements of Probability.
3.5 Recurrence Relations.

I [3 (3.1 – 3.4)]; II[6 (6.1, 6.5)]

4. Graph Theory **3 Hours**

4.1 Introduction to Graphs and Graph Terminologies.
4.2 Representing Graphs and Graph Isomorphisms.
4.3 Connectivity.
4.4 Euler and Hamiltonian Paths.

II [8 (8.1 – 8.5)]

5. Relations **10 Hours**

5.1 Product sets and Partitions.
5.2 Relation and Diagraph.
5.3 Paths un Relations and Diagraphs.
5.4 Properties of Relations.
5.5 Equivalence Relations.
5.6 Representing Relations.
5.7 Manipulation of Relations.
5.8 Transitive Closure and Warshall's Algorithm.

I [4 (4.1 – 4.5, 4.7 – 4.8)]; II [7 (7.1 – 7.5)]

6. Order Relations and Structures **4 Hours**

6.1 Partial ordering and Posets.
6.2 External Elements of Partially Ordered Sets.
6.3 Lattices.

I [7 (7.1 – 7.3)]; II [7 (7.6)]

7. Boolean Algebra **6 Hours**

7.1 Boolean Functions.
7.2 Representing Boolean Functions.
7.3 Logic Gates.
7.4 Minimization of Circuits.

I [10]

8. Trees **10 Hours**

8.1 Introduction to Trees and their applications.
8.2 Tree traversal.
8.3 Spanning and Minimum Spanning Trees.

II [9]

9. Finite State Machines 6 Hours

9.1 Language and Grammar.
9.2 Finite State machines.

II [11 (11.1, 11.3)]

Text Books

I. Bernard Kolman, Robert C. Busby and Sharon Ross, "Discrete Mathematical Structures", Third Edition, Prentice-Hall of India, 2000.
II. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", Fifth Edition, Tata McGraw-Hill, 2003.

Reference Books

1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, "Discrete Mathematics for Computer Scientists and Mathematicians", Second Edition, Prentice-Hall of India, 2000.
2. John Truss, "Discrete Mathematics for Computer Scientists", Addison Wesley Longman, First Indian Reprint, 2000.
3. N.Ch.S.N. Iyengar, V.M.Chandrasekaran, K.A. Venkatesh and P.S. Arunachalam, "Discrete Mathematics", Vikas Publishing House, 2003.

AC11 OBJECT ORIENTED PROGRAMMING

1. Principles of Object-Oriented Programming 3 hours

1.1 Software Evolution : The Traditional Approach, Structured Methodology Overview, Shortcoming of procedure Oriented Languages
1.2 Object Oriented Paradigm : Basic Concepts of Object oriented Programming, Benefits of OOP, Object Oriented Languages

II [1]

2. Programming Basics 3 hours

2.1 Basic Program Construction : Input/output using cin/cout, Processor Directives
2.2 Basic and user-defined data types- Literal Constant, Variables, Pointer types, String Types, const Qualifier, Reference Types, The bool type, Enumeration Types, Array Types
2.3 Operators : Arithmetic, Equality, Relational, Logical, Assignment, Increment, Decrement, Conditional, sizeof, new, delete, Comma
2.4 Type Conversions.
2.5 Loops : for, while and do
2.6 Decision : if, if .. else, switch
2.7 Control Statements : break, continue and goto
2.8 Simple Functions
2.9 Function prototyping
2.10 Inline Functions
2.11 Pointer to Functions

I [1, 3 (3.1–3.9), 4, 5, 7]

3. Classes 15 hours

3.1 Class : Definition, Class Objects, Class Member Functions, The Implicit this Pointer, Static Class Members, Pointer to Class Member
3.2 Union: A Space-Saving Member
3.3 Other Features: Class Scope, Nested Classes, Local Classes, Objects Arrays and Composite class
3.4 Object Construction : Constructor, Destructor, The Member Initialization List, Copy Constructor
3.5 Special Features : Friends, *this* pointer

I [13, 14]; II [2, 5, 6, 7]

4. Operator Overloading 9 hours

4.1 Overloading unary and binary operators : Arithmetic, Comparison, Assignment
4.2 Special Operators : Operator [ ], Operator ( ), Operator ->, Operator ++ and --, Operator << and >>
4.3 User-Defined Conversions : conversion between basic types, between objects of different classes, Selecting a Conversion
4.4 Other Features : Overload Resolution and Member Functions, Overload Resolution and Operators

I [15]; II [9]

5. Inheritance and Polymorphism 13 hours

5.1 Class hierarchy : Definition, Identifying the members of the hierarchy, Base class member access

5.2 Constructors: Base and derived class construction, Memberwise initialization and assignment
5.3 Virtual functions
5.4 Multiple inheritance
5.5 Access Specifies: Public, private, and protected inheritance, Class scope under inheritance
5.6 Virtual classes

I [17, 18]; II [3, 8]

6. Templates **5 hours**

6.1 Class template : Definition, Instantiation, Member functions of class templates, Specializations
6.2 Function template : Definition, Instantiation, Template argument deduction, Explicit template arguments

I [16]; II [10]

7. Files and Streams **9 hours**

7.1 Stream classes
7.2 Character I/O
7.3 File input and output
7.4 States : Condition states, Format state
7.5 String streams

I [20]

8. Exception Handling **3 hours**

8.1 Exception :Throwing, The try…catch block
8.2 Exception specifications

I [11]

Text Books

I. Stanley B. Lippman and Josee Lajoie, 'C++ Primer', Addison Wesley, Third Edition (1998)
II. Parimala N., 'Object Orientation thourgh C++', Macmillan, 1999

AC12 DATA COMMUNICATION AND NETWORKS

1 Introduction **4 hours**

1.1 Evolution of Network Architecture and Services
1.2 Future Network Architectures and Their Services
1.3 Examples of Protocols, Services, and Layering
1.4 The OSI Reference Model
1.5 Overview of TCP/IP Architecture
1.6 Application Layer protocols and TCP/IP Utilities

I [1 (1.1, 1.2), 2]

2 Data Communication Techniques **8 hours**

2.1 Digital Representation of Analog Signals
2.2 Characterization of Communication Channels
2.3 Fundamental Limits in Digital Transmission
2.4 Line Coding, Modems and Digital Modulation
2.5 Properties of Media and Digital Transmission Systems
2.6 Error Detection and Correction

I [3]

3 Circuit Switching Networks **6 hours**

3.1 Circuit-Switching Networks
3.2 Multiplexing (FDM, TDM-T1/E1Stds, Statistical Muxing, CDM, WDM)
3.3 SONET
3.4 Circuit Switches
3.5 The Telephone Network (Signaling, Traffic and Overload Controls in Telephone Networks)
3.6 Cellular Telephone Networks

I [3]

4 Peer to Peer Protocols and Data Link Layer **8 hours**

4.1 Peer-to-Peer Protocols and Service Models
4.2 ARQ Protocols and Reliable Data Transfer Service
4.3 Other Peer-to-Peer Protocols
4.4 Data Link Controls (Framing, Point-to-Point Protocol, HDLC Data Link Control)

I [4 (4.1-4.3)]

5 LANs and MAC protocols **6 hours**

5.1 Multiple Access Communications
5.2 Local Area Networks
5.3 Random Access
5.4 Scheduling Approaches to Medium Access Control
5.5 LAN Protocols (Ethernet and IEEE 802.3 LAN Standard, Token-Ring and IEEE 802.4 LAN Standard)
5.6 FDDI
5.7 Wireless LANs (IEEE 802.11 Standard)
5.8 LAN Bridges

I [6 (6.1-6.3, 6.6, 6.7)]

6 Packet Switching Networks **8 hours**

6.1 Network Services and Internal Network Operation
6.2 M/M/1 Queues (Littles Formula)
6.3 Packet Network Topology
6.4 Data grams and Virtual Circuits,
6.5 Routing in Packet Networks
6.6 Shortest-Path Routing Algorithms

I [7 (7.1 – 7.4) & Appendix A]

7 TCP/IP Networks **8 hours**

7.1 The TCP/IP Architecture
7.2 The Internet Protocol
7.3 IPv6
7.4 User Data gram Protocol
7.5 Transmission Control Protocol
7.6 Internet Routing Protocols
7.7 Multicast Routing
7.8 DHCP and Mobile IP
7.9 Internet Routing protocols
7.10 Multicast Routing

I [8]

8 ATM Networks **6 hours**

8.1 Broadband ISDN(BISDN Reference Model)
8.2 ATM(ATM Layer, ATM adaptation Layer)
8.3 ATM Signaling
8.4 PNNI Routing

I [9]

9 Advanced Network Architectures/Protocols 6 hours

9.1 IP forwarding Architectures
9.2 Overlay Model
9.3 MPLS
9.4 Integrated services in the Internet
9.5 RSVP,
9.6 Differentiated Services
9.7 Real-Time Transport Protocol,
9.8 Session Control Protocols,
9.9 Network Management

I [10,12(12.3,12.4) & Appendix B]

Text Book

I. Leon Garcia and Widjaja., Communication Networks,2/e, Tata McGraw-Hill,2003

Reference Books

1. W.L.Scheweber "Data Communications" McGraw-Hill International Student Edition, 1999
2. Behrouz ., Forouzan., Data Communication and Networking TMH 1999
3. Stallings W. Data and Computer Communications. PHI Ltd Seventh Edition, 2003

AC13 OPERATING SYSTEMS

1. Introduction 2 hours

1.1 Operating Systems
1.2 Mainframe and Desktop systems
1.3 Time-sharing Systems
1.4 Multiprocessor, Distributed and clustered systems
1.5 Real Time Systems
1.6 Handheld systems
1.7 Feature migration
1.8 Computing Environments

I [1]

2. Computer-System Structures 2 hours

2.1 Computer System operation

2.2 I/O Structure

2.3 Storage Structure and Storage Hierarchy

2.4 Hardware Protection

2.5 Network structure

I [2]

3. Operating-System Structures **3 hours**

3.1 Operating System Services

3.2 System Calls

3.3 System Programs

3.4 System Structure

3.5 Virtual Machines

3.6 System Design and Implementation

3.7 System Generation

I [3]

4. Processes **3 hours**

4.1 Process Concept

4.2 Process Scheduling

4.3 Operation on Processes

4.4 Cooperating Processes

4.5 Inter-process Communication

4.6 Communication in client-server systems

I [4]

5. Threads **3 hours**

5.1 Multithreading Models

5.2 Threading issues

5.3 Pthreads

5.4 Examples: Solaris2, Windows 2000, Linux, Java

1 [5]

6. C P U Scheduling **4 hours**

6.1 Scheduling Criteria
6.2 Scheduling algorithms
6.3 Multiple-Processor Scheduling
6.4 Real Time Scheduling
6.5 Algorithm Evaluation
6.6 Process scheduling models

I [6]

7. Process Synchronization **4 hours**

7.1 Critical-Section problem
7.2 Synchronization Hardware
7.3 Semaphores
7.4 Classical Problems of Synchronization
7.5 Critical Regions
7.6 Monitors
7.7 OS Synchronization
7.8 Atomic Transactions

I [7]

8. Deadlocks **4 hours**

8.1 Deadlock Characterization
8.2 Methods for handling Deadlocks
8.3 Deadlock Prevention
8.4 Deadlock Avoidance
8.5 Deadlock Detection and Recovery

I [8]

9. Memory Management **2 hours**

9.1 Background
9.2 Swapping
9.3 Contiguous Memory Allocation
9.4 Paging, Segmentation, Segmentation With Paging

I [9]

10. Virtual Memory **4 hours**

10.1 Demand Paging & process creation
10.2 Page Replacement
10.3 Allocation of frames
10.4 Thrashing
10.5 Operating-system Examples

I [10]

11. File System Interface and Implementation **5 hours**

11.1 Access Methods
11.2 Directory Structure
11.3 File system mounting & file sharing
11.4 Protection
11.5 File-System Structure and implementation
11.6 Directory implementation
11.7 Allocation Methods
11.8 Free Space Management
11.9 Efficiency & Performance
11.10 Recovery
11.11 Log-structured File system
11.12 NFS

I [11, 12]

12. I/O Systems **3 hours**

12.1 I/O Hardware
12.2 Application I/O Interface
12.3 Kernel I/O Subsystem
12.4 Transforming I/O to Hardware Operations
12.5 STREAMS
12.6 Performance

I [13]

13. Mass-storage Structure **4 hours**

13.1 Disk Structure
13.2 Disk Scheduling & Management
13.3 Swap-Space Management
13.4 RAID structure
13.5 Disk Attachment
13.6 Stable-storage Implementation
13.7 Tertiary storage structure

I [13, 14]

14. Distributed System Structure — 4 hours

14.1 Topology
14.2 Network Types
14.3 Communication
14.4 Communication Protocols
14.5 Robustness
14.6 Design Issues

I [15]

15. Distributed File Systems and Distributed Coordination — 4 hours

15.1 Naming & Transparency
15.2 Remote file Access
15.3 Stateful vs Stateless Service
15.4 File Replication
15.5 Event Ordering
15.6 Mutual Exclusion
15.7 Atomicity
15.8 Concurrency Control
15.9 Deadlock Handling
15.10 Election Algorithms
15.11 Reaching Agreement

I [16, 17]

16. Protection & Security — 4 hours

16.1 Goals of Protection
16.2 Domain of protection
16.3 Access Matrices & its Implementation
16.4 Revocation of Access Rights
16.5 Capability based systems
16.6 Language based protection
16.7 The Security Problem
16.8 User Authentication
16.9 Program and System Threats
16.10 Securing systems & Facilities
16.11 Intrusion Detection
16.12 Cryptography
16.13 Computer Security Classifications

I [18, 19]

17. Case Studies **5 hours**

17.1 The LINUX System
17.2 Windows 2000

I [20, 21]

Text Books

I Silberschatz/Galvin/Gagne, "Operating System Concepts" Sixth Edition, Johnwiley and sons (2002)

Reference Books

1. Andrew S. Tanenbaum, "Modern Operating Systems", Pearson Education, Inc. (2001)
2. D.M. Dhamdhere "Operating systems – A concept based approach" Tata McGraw Hill 2002.
3. A.S. Godbole "Operating Systems" Tata McGraw Hill 2002.

AC14 DATA BASE MANAGEMENT SYSTEMS

1. Introduction **3 hours**

1.1 Database System : Purpose, View of Data, Data Models
1.2 Database Languages
1.3 Management Issues : Transaction, Storage, Database Administrator, Database Users
1.4 Overall System Structure

I [1]

2. Entity-Relationship Model **6 hours**

2.1 Basic Concepts : Design Issues, Mapping Constraints, Keys
2.2 Entity-Relationship Diagram : Entity Sets , Relationship Sets, Weak Entity Sets, Extended E-R Features
2.3 Design and Mapping : Design of an E-R Database Schema, Reduction of an E-R Schema to Tables

I [2]

3. Relational Model **9 hours**

3.1 Structure of Relational Databases
3.2 Manipulation : The Relational Algebra, The Tuple Relational Calculus, The Domain Relational Calculus, Outer Join

I [3]

4. SQL **9 hours**

4.1 SQL Basics : Basic Structure, Set Operations, Aggregate Functions, Null Values,
4.2 Other SQL Features : Nested Subqueries, Derived Relations, Views, Modification of the Database, Joined Relations
4.3 SQL DDL : Data-Definition Language
4.4 Embedded SQL

I [4]

5. Relational Database Design **9 hours**

5.1 Integrity Constraints : Domain Constraints, Referential Integrity, Assertions, Triggers
5.2 Functional Dependencies
5.3 Normalization : Decomposition, Normalization Using Functional Dependencies, Normalization Using Multivalued Dependencies, Normalization Using Join Dependencies, Domain Key Normal Form
5.4 Alternative Approaches to Database Design

I [6, 7]

6. Storage and File Structure **6 hours**

6.1 Physical storage : RAID, File Organization, Data-Dictionary Storage
6.2 Indexing : Ordered Indices, B^+ Tree Index Files, B-Tree Index Files
6.3 Hashing : Static Hashing, Dynamic Hashing
6.4 Comparison of Ordered Indexing and Hashing
6.5 Index Definition in SQL, Multiple-Key Access

I [10 (10.1-10.8), 11]

7. Query Processing **6 hours**

7.1 Computing Query Cost : Selection Operations, Sorting, Join Operation, Evaluation of Expressions
7.2 Transformation of Relational Expressions

I [12]

8. Transactions **3 hours**

8.1 Concepts : Definition, State, ACID properties, Serializability, Recoverability
8.2 Transaction definition in SQL
8.3 Testing for Serializability

I [13]

9. Concurrency Control and Recovery **9 hours**

9.1 Protocols : Lock-Based, Time-Stamp Based, Validation-Based
9.2 Multiple Granularity, Multiversion Schemes
9.3 Deadlock : Handling
9.4 Recovery : Atomicity, Log-Based Recovery, Shadow Paging, Recovery with Concurrent Transactions
9.5 Failure with Loss of Nonvolatile Storage

I [14, 15]

Text Book

I. 'Database System Concepts' by A. Silberchatz, H.F. Korth and S. Sudershan, Third Edition, McGraw Hill 1997

AC15 COMPUTER GRAPHICS

1. Input/Output Devices **3 hours**

1.1 Overview of Computer Graphics
1.2 Representing, presenting and interacting with pictures
1.3 Refreshing display devices
1.4 Random and raster scan display devices
1.5 Tablets, Joysticks, Track balls, Mouse and light pens

I [2 (1-3, 5)] ; II [1 (1-4, 8)]

2. Display Algorithms **7 hours**

2.1 Line drawing algorithms
2.2 Digital differential analyzer, Bresenhem and Integer Bresenhem algorithms
2.3 Circle generation using Bresenhem algorithm

2.4 Scan conversion

2.5 Polygon filling

2.6 Scan line polygon fill algorithm

2.7 Seed fill and scan line seed fill algorithms

2.8 Aliasing and half toning

I [3(11), 4(8), 14(4)] ; II [2(1-4, 10, 15-17)]

3. Windowing and Clipping — 5 hours

3.1 2D line clipping using 4 bit codes

3.2 Cohen Sutherland subdivision algorithm

3.3 Cyrus Beck algorithm

II [3 (1-2, 5)]

4. Transformations — 13 hours

4.1 2D translation, rotation, scaling and mirroring transformations

4.2 Homogeneous coordinates

4.3 Combined transformations

4.4 3D transformations

4.5 Rotation/Reflection about arbitrary line in space

4.6 Affine transformations

4.7 Orthographic/ Axonometric/ Isometric/ Oblique parallel projections

4.8 Perspective projections and vanishing points

4.9 One point/ two point/ three point perspective projections and their matrix representations

4.10 Numeric examples

I [5(1-4, 6), 11(1-5), 12(3)]

5. Space Curves — 9 hours

5.1 Parametric representation of curves

5.2 Cubic Bezier curves and their properties

5.3 Cubic spline curves

5.4 B-spline curves of uniform, non-uniform, open uniform, periodic and non-periodic types

5.5 Bezier curve as a particular case of B-spline curve

I [10(8-9)]

6. Representation of Solids **4 hours**

6.1 Swept solids with examples
6.2 Graph based/ B-rep models, CSG models
6.3 Octree representation

I [10 (14-16)]; II [4 (18)]

7. Hidden Surface Removal **9 hours**

7.1 Back face detection
7.2 Floating horizon algorithm
7.3 Z-buffer algorithm
7.4 Scan line Z-buffer algorithm
7.5 Painters algorithm
7.6 Binary space partitioning (BSP) tree method

I [13 (1-3, 5-7)]; II [4 (1-2, 9, 11, 13, 15)]

8. Rendering **6 hours**

8.1 Introduction to shading and rendering
8.2 Ambient, diffuse and Phongs specular reflection illumination models
8.3 Gouraud shading
8.4 Phong shading
8.5 Advantages and disadvantages of the shading models

I [14 (1-2, 5)]; II [5 (1-7)]

9. Fractals and Animation **4 hours**

9.1 Fractal geometry
9.2 Self similar fractals
9.3 Affine fractal construction methods
9.4 Self squaring fractals, Construction of Mandelbrot set

9.5 Raster animations

9.6 Key frame systems

9.7 Morphing

9.8 Simulating accelerations

I [10 (18), 16(1, 3, 5)]

Text Books

I. Hearn D. and Baker P.M., Computer Graphics, 2nd Edition, Prentice Hall of India, 1997

II. Rogers D.F., Procedural Elements of Computer Graphics, 2nd Edition, TMH Publishing, 2001

Reference Books

1. Foley J.D., van Dam A., Feiner S.K. and Hughes J.F., Computer Graphics, Principles and Practice, 2nd Edition, Addison Wesley Publishing

2. Rogers D.F. and Adams J.A., Mathematical Elements of Computer Graphics, 2nd Edition, McGraw-Hill

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AC16 SOFTWARE ENGINEERING

1. Introduction **5 hours**

1.1 Software Crisis: No Silver Bullet, Software Myths
1.2 What is Software Engineering: Definition, Program Versus software, Software Process
1.3 Software Life Cycle Models: Build and Fix Model, Waterfall Model, Prototyping Model, Iterative Enhancement Model, Evolutionary Development Model, Spiral Model
1.4 Capability Maturity Model: Maturity Levels, Key Process Areas, Common Features
1.5 ISO 9000: Mapping ISO 9001 to the CMM, Contrasting ISO 9001 and the CMM, Conclusion

I [1]

2. Software Requirements Analysis and Specification **8 hours**

2.1 Software Requirements: Crucial Process Step, State of Practice, Need for SRS, Requirement process

2.2 Problem Analysis: Analysis Issues, Informal Approach, Data Flow Diagrams, Data Dictionaries, Entity-Relationship diagrams, Structured Analysis, Object-Oriented Modeling, Other modelling approaches, Prototyping
2.3 Requirements Specification: Characteristics of an SRS, Components of an SRS, Specification Languages, Structure of a requirements document
2.4 Validation: Requirement Reviews, other methods

I [4]; II [3]

3. Software Metrics 7 hours

3.1 Software Metrics: What & Why: Definition, Areas of application, Problems during implementation
3.2 Size Metrics: Lines of Code (LOC), token Count, Function Count, Equivalent Size Measures
3.3 Data Structure Metrics: The amount of Data, The Usage of Data within a Module, Program Weakness, The Sharing of Data Among Modules
3.4 Information Flow Metrics: The basic information flow model, A more sophisticated information flow model

I [2]

4. Software Project Planning 6 hours

4.1 Cost Estimation
4.2 Models: Static, Single Variable Models, Static, Multivariable Models
4.3 The Constructive Cost Model: Basic Model, International Model, Detailed COCOMO Model
4.4 The Putnam Resource Allocation Model: Te Norden/Rayleigh Curve, Difficulty Metric, Productivity versus Difficulty, The trade-off-of-time versus cost, Development sub-cycle
4.5 Software Risk Management: What is Risk? Typical Software risks, Risk Management activities

I [3]; II [4]

5. Software Design 13 hours

5.1 What is Design: Conceptual and Technical Designs, Objectives of Design
5.2 Modularity: Module Coupling, Module Cohesion
5.3 Strategy of Design: Bottom-Up Design, Top-down Design, Hybrid Design
5.4 OO Analysis and OO Design
5.5 Concepts: classes and Objects, Relationships among Objects, Inheritance and Polymorphism, Design Concepts
5.6 Design Notation and Specification
5.7 Design Methodology: Dynamic Modeling, Functional Modeling, Defining Internal Classes and Operations, Optimize and Package
5.8 Module Specifications: Specifying Functional Modules, Specifying classes

5.9 Detailed Design: PDL, Logic/algorithm Design, State Modeling of Classes

5.10 Verification: Design Walkthroughts, Critical Design Review, Consistency Checkers

I [5]; II [5, 6, 7]

6. Software Reliability 6 hours

6.1 Importance
6.2 Software Reliability and Hardware Reliability
6.3 Failures and Faults: Enviroment
6.4 Reliability Concept: Uses of Reliability Studies
6.5 Reliability Models: Macro-Models, Basic Model, Logarithmic Poisson Model, Calendar Time Component

I [6]

7. Software Testing 10 hours

7.1 Testing Process: Why should we test? Who should do the Testing? What should we test?
7.2 Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table based Testing, Cause Effect Graphing Technique
7.3 Structural Testing: Path Testing, Data Flow Testing, Mutation Testing
7.4 Test Activities: Unit Testing, Integration Testing, System Testing
7.5 Debugging: Debugging Techniques, Debugging Approaches, Debugging Tools
7.6 Testing Tools: Static Testing Tools, Dynamic Testing Tools, Characteristics of Modern Tools

I [7]

8. Software Maintenance 5 hours

8.1 What is Software Maintenance: Categories of Maintenance, Problems during Maintenance, Potential solutions of maintenance Problems
8.2 The Maintenance Process: Program Understanding, Generating Particular Maintenance Proposal, Ripple Effect, Modified Program Testing, Maintainability
8.3 Maintenance Models: Quick-fix Model, Iterative Enhancement Model, Reuse Oriented Model, Boehm's Model
8.4 Reverse Engineering: Scope & Tasks, Levels of Reverse Engineering, Reverse Engineering Tools
8.5 Software Re-engineering: Source Code Translation, Program Restructuring
8.6 Estimation of Maintenance Costs: Belady & Lehman Model, Boehm Model
8.7 Configuration Management: Configuration Management Activities, Software Versions, Change Control Process
8.8 Documentation: User Documentation, System Documentation, Other classification schemes

I [8]

Text Books

I. K K Aggarwal & Yogesh Singh, “Software Engineering”, New Age International, 2001

II. P. Jalote, “An Integrated approach to Software Engineering”, Narosa, 1991

Reference Books

1 Stephen R Schach, “ Classical & Object Oriented Software Engineering”, IRWIN, 1996

2. James Peter, W Pedrycz, “Software Engineering”, John Wiley & Sons

3. Sommerville, “Software Engineering”, Addison Wesley, 1999

4. Shari Lawrence Pfleeger, “Software Engineering: Theory and Practice”, PHI

5. Roger S Pressman, “Software Engineering: A Practitioner’s Approach”, 5th Ed., Tata, McGrawHill

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AC17 INDUSTRIAL MANAGEMENT

1. Management Concept and Functions **5 hours**

1.1 Management Concept
- 1.1.1 Evolution and Development of Management Thought
- 1.1.2 Principles of Management
- 1.1.3 Levels of Management
- 1.1.4 Industrial Management

1.2 Functions of Management
- 1.2.1 Planning – types of plans, objectives of planning
- 1.2.2 Organizing
- 1.2.3 Staffing – role and definition
- 1.2.4 Directing – Concept, salient features, principles of directing
- 1.2.5 Control – Managerial control, techniques of Managerial Control

I [15]; II [3]

2. Organisation **6 hours**

2.1 Importance of Organisation
2.2 Characteristics of Organisation
2.3 Process of Organisation
2.4 Principles of Organisation

2.4.1 Span of Control

2.4.2 Delegation of Authority – Principles and Problems

2.4.3 Authority and Responsibility

2.5 Organisation – Structure and Need

2.6 Types of Organisation

2.6.1. Line Organisation
2.6.2 Functional Organisation
2.6.3 Line & Staff Organisation
2.6.4 Project Organisation
2.6.5 Matrix Organisation

I [3]; II [9, 10]

3. Organisational Behaviour 9 hours

3.1 Group Dynamics – Concepts, Characteristics of Group, types of Groups, advantages and disadvantages of groups
3.2 Organisational Change – Causes, response and resistance to change
3.3 Organisational Development - Concept, objectives and characteristics
3.4 Organisational Conflict – Stages of conflict, causes of conflict, sources of conflict and conflict resolution
3.5 Managerial Leadership – Concept, styles of managerial leadership
3.6 Motivation – Definition, Need, factors affecting motivation, motivational techniques
3.7 Morale – Concept, high & low morale, factors affecting morale
3.8 Communication – formal & informal communication, communication channel & structure, communication process & systems, barriers to successful communication

I [3,19, 20]; II [11]

4. Personnel Management 7 hours

4.1 Principles of a good personnel policy
4.2 Recruitment and Selection
4.3 Education and Training
4.4 Labour Turnover
4.5 Wages and Salary Administration
4.6 Discipline – Causes, disciplinary action & punishment, disciplinary procedure
4.7 Grievances Handling

I [20]; II [54, 62, 63]

5. Industrial Relations and Labour Laws 8 hours

5.1 Industrial Relations

5.1.1 Trade Unions
5.1.2 Industrial Dispute
5.1.3 Strikes, lockout, Picketing & Gherao
5.1.4 Collective Bargaining
5.1.5 Workers Participation in Management
5.1.6 Union – Management Relations

5.2 Labour Laws – Essential Provisions
5.2.1 Factories Act 1948
5.2.2 Payment Of Wages Act 1943
5.2.3 Workmen Compensation Act 1943
5.2.4 Industrial Disputes Act 1947
5.2.5 Minimum Wages Act 1948

I [21, 22]; II [61, 64 – 66, 68]

6. Productivity and Quality — 8 hours

6.1 Productivity - Factors affecting productivity, Increasing productivity, Productivity measures, Productivity & Quality

6.2 Production, Planning & Control – Forecasting, scheduling, control of production and process control

6.3 Quality Control – Definition, Concepts & basic fundamentals of SQC, Objectives, elements tools & implementation of TQM

6.4 Work Study – objectives, procedures, time study and work measurement

6.5 Inventory Control – Objectives, material requirement planning, ABC Analysis, EOQ and simple inventory models

I [2, 7, 8, 9, 24]; II [79, 25, 27, 34]

7. Decision Making — 7 hours

7.1 Definitions and Importance of Decision Making
7.2 Types of Decisions
7.3 Decision Making Process
7.4 Guidelines for effective decision-making
7.5 Quantitative Techniques in Decision Making
7.5.1 OR
7.5.2 Cost-Benefit Analysis
7.5.3 Linear Programming
7.5.4 Network Analysis – CPM/PERT
7.6 Decision Making under Certainty, Uncertainty and Risk

I [18]; II [81]

8. Finance and Accounting Fundamentals — 7 hours

8.1 Finance Management
- 8.1.1 Finance Management Concepts
- 8.1.2 Working Capital
- 8.1.3 Factors affecting working capital
- 8.1.4 Financial Statement and Financial Ratios

8.2 Cost Accounting
- 8.2.1 Elements of Cost
- 8.2.2 Types of Cost
- 8.2.3 Cost Control and Accounting
- 8.2.4 Break-even Analysis

8.3 Budget
- 8.3.1 Budget and Budgetary Control
- 8.3.2 Types of Budget
- 8.3.3 Preparation of Budget
- 8.3.4 Budget as a process of planning, coordination and control

I [26, 27, 28]

9. Marketing Fundamentals 3 hours

9.1 Marketing – definition, principles and functions

9.2 Market Management and functions

9.3 Market Research

9.4 Product Packaging

9.5 Product Mix

I [31]; II [82]

Text Books

I. O.P.Khanna , ‘ Industrial Engineering and Management,’ Dhanpat Rai and Sons, Delhi (2003).

II. K.K. Ahuja, ‘ Industrial Management,’ Khanna Publishers, Delhi (2003).

Reference Books

1. Ravi Shankar, “Industrial Engineering and Management’, Galgotia Publications Pvt Ltd, New Delhi (2003).

2. “Management Guide Series” (14 Booklets), National Productivity Council, New Delhi (1990).

3. R.S. Davar, " Personnel Management", Vikas Publshing House, Delhi (1997).

AC18 PROJECT

The Project will consist of hardware/software, design/development, experimental/theoretical work or a critical in-depth literature survey of a contemporary topic or a combination of these. A student is expected to put in about six hours/week spread over a period of three to four months. There will be no joint project work.

The students may work for their project in any industry, in an educational institution, in R&D Laboratory or in a library depending upon the nature of the project. The student will be required to have a supervisor from one of these places who can supervise and guide the project work. In case of difficulties, the students may contact the local centre.

The project work can be taken only after clearing **14 compulsory papers** of Section A& B. Such eligible students are required to submit their project applications to their Local centre with brief write up of the intended project, bio-data of their guide, guide's willingness letter to super wise the project along with a draft of Rs 1000/- as project fee. The Project applications should be submitted so as to reach their Local centre by 20 Oct/20 April. On approval of their application, Local centres will issue the approval letters to the individual students.

On completion of the project, the student will submit two bound copies of the Project Report to IETE Local Centre as per the dates intimated by the Centre. The project work will be assessed by an Assessment Board. The students will be intimated by the local centres of the venue, date & time for presentation of their project report & appearing before the Assessment Board. The result of the project will be finalized at IETE HQ and declared along with the main IETE examination result. Pass marks for the project will be 50%. Students not getting 50% marks will be required to re-register for the project following the usual procedure. The students will have the option of taking up a new project or continue with the earlier project.

AC19 INTERNET AND JAVA PROGRAMMING

1. Internet Technology **12 hours**

1.1 Introduction to Internet – Motivation and Tools
1.2 Internetworking – concepts, architecture, and protocol (TCP/IP)
1.3 IP Addresses
1.4 Binding Protocols
1.5 IP datagram and Datagram Forwarding
1.6 IP Encapsulation, Fragmentation and Reassembly
1.7 Error Reporting Mechanism (ICMP)
1.8 Datagram transport Service (UDP)
1.9 Reliable Transport Service (TCP)

1.10 Future IP (Ipv6)

I [2, 17- 25]

2. Internet Applications — 8 hours

2.1 Client-Server Interaction
2.2 The Socket Interface
2.3 Domain Name System
2.4 Electronic Mail Representation and Transfer
2.5 IP Telephony
2.6 File Transfer and Remote File Access

I [28–34]

3. Internet Service: Word Wide Web — 5 hours

3.1 Browser Interface
3.2 Hypertext, hypermedia, and Document representation
3.3 HTML format and representation
3.4 HTML formatting Tags, Headings, Lists
3.5 Embedding of Images, Audio and Video in web pages
3.6 Identifying a page and hyperlinks
3.7 Client-server interaction
3.8 Web Document transport and HTTP
3.9 Browser Architecture, optional clients, and caching in web browser
3.10 Basic type of web documents, and advantages and disadvantages
3.11 Implementation of Dynamic Documents
3.12 CGI standard, and CGI program, JSP, ASP, PSP and Coldfusion
3.13 Parameters and environment variable
3.14 State information, and CGI script with short and long term information
3.15 Forms and interaction

I [35 - 37]

4. Java Programming — 15 hours

4.1 An Overview of Java
4.2 Data Types, Variables and Array
4.3 Operators and expressions
4.4 Control statements
4.5 Introducing classes
4.6 Methods and Classes: a closer look
4.7 Inheritance
4.8 Packages and Interfaces
4.9 Exception handling
4.10 Multithreaded Programming
4.11 I/O, Applets, and Other topics
4.12 String handling

II [2 - 13]

5. GUI with Java **8 hours**

5.1 Event Handling
5.2 Introducing the AWT: Working with Windows, Graphics, and Text
5.3 AWT Controls, Layout managers, and menus
5.4 Images
5.5 Java Swing - A tour of Swing

II [20-23, 26]

6. Java Programming for Internet **6 hours**

6.1 Networking
6.2 Applet Class
6.3 Servlets
6.4 Remote method Invocation

II [18, 24, 27]

7. Java Programming Utilities **6 hours**

7.1 Wrapper classes - Exploring java.lang
7.2 Collection framework - java.util
7.3 Input/Output - Exploring java.io
7.4 New I/O, Regular Expression
7.5 Java Beans

II [14-16, 24, 25]

Text Books

I. Douglas E. Comer, "Computer Networks and Internets", 4nd Edition, Pearson Education Asia, 2004.

II. Herbert Schildt, "The Complete Reference JAVA 2",5th Edition, Tata Mcgraw-Hill,2002.

Reference Books

1. Douglas E. Comer, "The Internet", 3rd Edition, Pearson Education Asia, 2001.
2. Daniel Minoli, "Inetrnet & Intranet Engineering: technologies, protocol, and Application", Tata McGraw-Hill, 1999.
3. Raj Kamal, "Internet and Web Technologies" Tata McGraw-Hill, 2003.

4. Achyut S Godbole and Atul Kahate, “Web Technologies, Tat McGraw-Hill, 2003.
5. Margaret Levine Young, “ The Complete Reference Internet”, 2nd Edition, Tat McGraw-Hill, 2002.

AC20ARTIFICIAL INTELLIGENCE & NEURAL NETWORKS

1. Scope of AI **1 hour**

1.1 General Issues and overview of AI
1.2 The AI problems
1.3 Characteristics of AI applications

I [1]

2. Problem Solving, Search and Control Strategies **6 hours**

2.1 General Problem solving
2.2 Control strategies
  2.2.1 Forward and backward chaining
2.3 Exhaustive Searches
  2.3.1 Depth first and Breadth first search.
2.4 Heuristic Search Techniques
  2.4.1 Hill climbing
  2.4.2 Branch and Bound technique
  2.4.3 Best first search & A* algorithm
2.5 Constraint Satisfaction problems.

I [2, 3]

3. Game playing **5 hours**

3.1 AND/OR graphs
3.2 Problem reduction & AO* algorithm
3.3 Minimax search procedure
3.4 Alpha-Beta cutoffs
3.5 Additional Refinements

I [12]

4. Knowledge Representations **9 hours**

4.1 First order predicate calculus
  4.1.1 Skolemization
  4.1.2 Resolution Principle & Unification
  4.1.3 Inference Mechanisms
  4.1.4 Horn's clauses
4.2 Semantic Networks
4.3 Frame Systems and Value Inheritance

4.4 Scripts
4.5 Conceptual Dependency

I [9, 10]; II [5, 6, 10]

5. AI Programming Languages (PROLOG) 12 hours

5.1 Introduction to PROLOG
- 5.1.1 General Syntax and Prolog Control Strategy
- 5.1.2 Recursive Programming
- 5.1.3 Lists
- 5.1.4 Iterative Programming

5.2 Advanced Prolog Concepts
- 5.2.1 Cut, Fail predicates
- 5.2.2 Binary Trees and Objects
- 5.2.3 Meta Level Programming and Meta interpreters

II [7-10]

6. Learning 9 hours

6.1 Concept of Learning
6.2 Learning by Induction, Anology
6.3 Example Based Learning
6.4 Neural Networks
- 6.4.1 Perceptrons
- 6.4.2 Multilayer Feedforward Networks
- 6.4.3 Back Propagation Algorithm
- 6.4.4 Hopfield Network
- 6.4.5 Neural Network Applications

I [17, 18]

7. Planning 4 hours

7.1 Overview - An Example Domain: The Blocks Word
7.2 Component of Planning Systems;
7.3 Goal Stack Planning (linear planning)
7.4 Non-linear Planning using goal sets

I [13]

8. Handling Uncertainty 5 hours

8.1 Probabilistic Reasoning and Uncertainty
- 8.1.1 Probability theory
- 8.1.2 Bayes theorem and Bayesian networks

8.2 Fuzzy Logic

I [8]

9. Expert Systems **6 hours**

9.1 Need and justification for Expert systems
9.2 Application of Expert systems
9.3 Expert System Architecture
  9.3.1 Rule Based Expert System (Production Systems)
  9.3.2 Non Production Systems
9.4 Various Expert System Shells
9.5 Knowledge Acquisition
9.6 Case studies: MYCIN and R1

I [20]

10. Natural Language Processing **3 hours**

10.1 Parsing techniques
10.2 Context-free grammar
10.3 Recursive Transitions Nets (RTN)
10.4 Augmented Transition Nets (ATN)
10.5 Definite Clause Grammar (Logic grammar)

I [15]; II [11]

Text Books

I. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hills, 1991.
II. Logic and Prolog Programming - Saroj Kaushik, New Age International Ltd, publisher, 2002.

Reference Books

1. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice all of India, 1992.
2. S Russell & P Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, reprint 2003.
3. N J. Nilsson, "Artificial Intelligence: A New Approach", Morgan Kaufmann, reprint 2000.
4. L. Sterling & E. Shapiro, "Art of Prolog, Advanced Programming Techniques, Prentice Hall of India, reprint 1996.

AC21/T12 MULTIMEDIA SYSTEMS

1. Representation of Multimedia Data **10 hours**

1.1 Concept of Non-Temporal and Temporal Media.

1.2 Basic Characteristics of Non-Temporal Media

1.2.1 Images.

1.2.2 Graphics.

1.2.3 Text.

1.3 Basic Characteristics of Temporal Media.

1.3.1 Video.

1.3.2 Audio.

1.3.3 Animation

1.3.4 Basics of Morphing.

1.4 Hypertext and Hypermedia.

1.5 Multimedia Presetations.

1.5.1 Synchronisation.

I [2,3,4,5,15]; II [1 (1.2 & 1.3)]

2. Compression of Multimedia Data **25 hours**

2.1 Basic concepts of Compression.

2.2 Still Image Compression

2.2.1 JPEG Compression.

2.2.2 Features of JPEG2000.

2.3 Natural Video Compression

2.3.1 MPEG-1&2 Compression Schemes.

2.3.2 MPEG-4 Video Compression.

2.4 Audio Compression

2.4.1 Intoduction to Speech and Audio Compression.

2.4.2 MP3 Compression Scheme.

2.5 Management of Coded Data

2.5.1 Stream management in MPEG-4

2.5.2 BIFS

2.5.3 DMIF

I [6]; II [9 (9.1, 9.2), 11 (11.1, 11.2), 12 (12.1-12.5). 13, 14 (14.2, 14.3), 16.4];

3. Multimedia System Design 10 hours

3.1 General Purpose Architecture for Multimedia Processing

3.2 Operating System Support for Multimedia Data.

3.2.1 Resource Scheduling with real-time considerations.

3.2.2 File System

3.2.3 I/O Device Management.

I [9]; II [9, 15, 16]

4. Delivery of Multimedia data **10 hours**

4.1 Network and Transport Protocols.

4.2 QoS issues.

4.3 RTP and RSVP.

4.4 Video-conferencing and video-conferencing standards.

4.5 Overview of Voice over IP.

I [10, 11]; II [15, 16]

5. Multimedia Information Management **5 hours**

5.1 Multimedia Data base Design

5.2 Content Based Information Retrieval

5.3 Image Retrieval.

5.4 Video Retrieval.

5.5 Overview of MPEG-7.

I [12]; II [18]

Text Books:

I. Multimedia : Computing, Communication & Applications by Ralt Steinmetz and Klara Nahrstedt, Pearson Education

Publications, Indian reprint – 2004.

II. Fundamentals of Multimedia by Ze-Nian Li. Mark S. Drew Pearson Education First Indian reprint 2004.

AC 22 MANAGEMENT INFORMATION SYSTEMS

1. Overview of management Information Systems **4 hours**

1.1 Definition and concepts of MIS, Need of MIS, Business Operations & Strategy

1.2 Role of Managers, Business & Technology Trends; Re-Engineering

1.3 Management & Decision Levels

I [1]; II [1]

2. Information Technology & E-commerce. **6 hours**

2.1 Foundations of Information Technology

2.2 Security, privacy and anonymity

2.3 Transactions and e-commerce

I [2,4,5]

3. MIS and Organizations 4 hours

3.1 Organizations as a concept, basic model of organization structure, development of organizational theory, management and organizational behavior

3.2 Management strategy in an organization, concept of information, sources of information gathering

3.3 Concept of information management

II [2]

4. Business Integration 6 hours

4.1 Database management: Database management approach, queries, design of data-base, database applications and administration

4.2 Integration of information in business, enterprise resource planning (ERP)

4.3 Customer relationship management: Multiple contest points, feedback, individual needs and cross selling

4.4 Work group integration and data warehousing, integration of different systems, group decisions

I [6,7]

5. Decisions 10 hours

5.1 Models and decision support – Decision support system(DSS), data mining, role of models in analytical processing

5.2 Expert systems: role of expert systems in complex decisions, building of expert systems, management issues of expert systems

5.3 Knowledge management: machine intelligence, importance of intelligent systems in e-business

I [8, 9]; II [5]

6. Strategic Analysis 6 hours

6.1 Influential factors for analysis, competitive environment, external agents.

6.2 IS techniques to gain completive advantage, distribution channels, switching costs, product differentiation and new products, quality management, the value chain.

6.3 Operations, tactics and strategy ; the role of economics.

I [10]

7. Electronic Business and Entrepreneurship 6 hours

7.1 Production chain, sales promotion, cost reduction, e-business strategy.

7.2 Entrepreneurship and its foundations, ideas and plans, competition and market analysis, forecast, cashflow, marketing.

7.3 implementation issues – ownership structure, financing according and bench marks.

I [11]

8. Systems Development 10 hours

8.1 Building information system – custom programming outsourcing, assembling applications from components.

8.2 System development life cycle (SDLC), strength and weakness of SDLC.

8.3 Altranatives to SDLC, analyzing systems, object oriented design, object-oriented and event driven developments.

I [12]; II [7, 9]

9. Organization of Information System Resources 4 hours

9.1 Management of IS functions, MIS organization, centralization and decentralization.

9.2 Involvement of network technologies in information management, internet,intranet.

9.3 Project management steps.

9.4 Maintenance of MIS.

I [13]; II [9]

10. Case Studies 4 hours

II (Part IV)

Text Books

I. Gerald V. Post and David L. Anderson, “Management Information Systems”, Third Edition, Tata McGraw Hill, 2003.

II. Robert G. Murdick, Joel E. Ross and James R. Claggett, “Information System for modern Management” Third Edition, Prentice Hall of India, 2003.

Reference Books

1. Kenneth C. Laudon and Jane P. Laudon, “Management Information Systems”, Eighth Edition, Pearson Education, 2004.
2. James A. O’Brien, “Management Information Systems”, Fifth Edition, Tata McGraw-Hill, 2004.
3. S. Sadagopan, “Management Information Systems”, Prentice-Hall of India, 2003.

AC23 MICROPROCESSOR BASED SYSTEM DESIGN

1. Introduction to Microprocessors **4 Hours**

1.1 A Historical Background
1.2 Overview of Intel (4004-Pentium IV/current state of art) and Motorola Microprocessors (6800-68060/current state of art)
1.3 Microprocessor-based computer system: its history, operation and methods to store data

I [1 (1.1-1.3)]

2. Architecture of 80x86 Intel family of microprocessors **4 Hours**

2.1 Internal architecture of microprocessor family: the programming model
2.2 Real mode memory addressing
2.3 Introduction to protected mode memory addressing
2.4 Introduction to memory paging

I [2 (2.1-2.4)]

3. Assembly Language Programming **12 Hours**

3.1 Addressing Modes: Data Addressing Modes, Program memory, Addressing Modes Stack memory Addressing Modes

3.2 Data transfer Instructions, Arithmetic and Logic Instructions, Program Control Instructions, Loop and String Instructions
3.3 Assembler Directives, Introduction to MASM and Debug
3.4 Parameter Passing and Recursive Procedures
3.5 Introduction to Modular programming
3.6 Introduction of Using assembly language with C/C++

I [3 (3.1-3.3), 4 (4.1-4.7), 5 (5.1-5.6), 6 (6.1-6.3, 6.5), 7 (7.1), 8 (8.1-8.2)]; 1 [4 (4.2)]

4. CPU Module Design 6 Hours

4.1 Signal Description of pins of 8086 and 8088
4.2 Clock Generation (8284A)
4.3 Address and Data Bus demultiplexing
4.4 Bus Buffering and Latching
4.5 Bus Timings, Ready and the Wait state
4.6 Minimum mode vs. Maximum mode
4.7 Basic Interrupt processing
4.8 Hardware interrupts
4.9 Expanding the Interrupt structure

I [6 (6.4), 9 (9.1-9.6), 12 (12.1-12.3)]

5. Memory Interfacing 4 Hours

5.1 Memory devices
5.2 Address decoding and RAM and ROM interfacing
5.3 8-bit, 16-bit, 32-bit and 64-bit memory interface
5.4 Dynamic RAM interfacing

I [10 (10.1-10.7)]

6. Basic I/O Interfacing 12 Hours

6.1 Introduction to I/O interface: Programmed I/O, Interrupt driven I/O, DMA
6.2 I/O port address decoding
6.3 The Programmable Peripheral Interface- 8255
The Programmable keyboard and Display Interface-8279
6.4 The Programmable Interval Timer/Counter -8253/8254

6.5 Serial I/O - 8251/8250 and Introduction to RS-232C standard

6.6 Programmable Interrupt Controller -8259

6.7 DMA Controller-8237

6.8 A/D and D/A conversion

I [11 (11.1-11.7), 12 (12.4), 13 (13.1-13.2)]; 1 [10 (10.2)]

7. Advanced Microprocessors 10 Hours

7.1 The arithmetic Coprocessor- 8087: its data formats, architecture and instruction set

7.2 Introduction to MMX technology

7.3 Introduction to Intel 80186/80286-basic architecture

7.4 Introduction to Intel 80386 and 80486- basic architecture, special registers

7.5 Introduction to memory management, protected and virtual 8086 mode

7.7 Introduction to Pentium Microprocessors and its series

7.9 New Directions

I [14 (14.1-14.5), 16 (16.1-16.5), 17 (17.1, 17.4-17.5, 17.7), 18 (18.1), 19 (19.1)]

8. Case Study of a microprocessor based system 6 Hours

8.1 Basic System Architecture of a PC: The motherborad, Graphics Adapters and monitors, drive controllers, floppy and hard disk drives, parallel interfaces and serial interfaces, network adapters and LAN, CMOS RAM and Real Time Clock, Keyboard, and the power supply

8.2 Introduction to ISA, EISA and PCI bus structure

I [15 (15.1-15.3)]; 2 [1]

9. System Development 2 Hours

9.1 Introduction to DOS and BIOS Calls

9.2 Hardware debugging and development systems

I [Appendix A]; 1 [4 (4.2-4.3)]

Text Books

I. The Intel Microprocessors: Architecture, Programming and Interfacing, sixth edition, Barry B. Brey, Pearson Education

Reference Books

1. The 80x86 family: Design, Programming and Interfacing, third Edition, John Uffenbeck Pearson Education
2. The Indispensable PC Hardware Book, Third Edition, Hans-Peter Messmer, Addison Wesley

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AC35 MATHEMATICS—II

1. Complex Analysis **22 hours**

1.1 Analytic function, Cauchy- Riemann equations, Elementary functions of complex variable, Harmonic functions.
1.2 Conformal mapping, Linear fractional transformations.
1.3 Complex line integral, Cauchy integral theorem,Cauchy integral formula, Cauchy inequality, Lioville and Morera theorems.
1.4 Taylor and Laurent series, Singularities and zeros, Poles, Residues and Residue theorem.
1.5 Evaluation of real integrals by contour integration.

I [12, 13, 14, 15]; II [10, 11, 12, 13, 14]

2. Vector Analysis **20 hours**

2.1 Vector and scalar function and fields, Differentiation of vector function, Tangent vector to a curve in space.
2.2 Gradient, Divergence, Curl.
2.3 Line integral of vector functions, Independence of path, Green's theorem.
2.4 Surface integrals, Divergence theorem, Stoke's theorem.

I [8, 9]; II [15]

3. Partial Differential Equations **8 hours**

3.1 Solution of Partial Differential Equations by method of separation of variables.
3.2 One dimensional wave and heat conduction equation, Laplace equation in two variables.

I [11]; II [9]

4. Probability Concepts **10 hours**

4.1 Random variable, Probability mass function and density function.
4.2 Expectation, Mean and variance of a random variable.
4.3 Binomial, Poisson and Normal distributions.

I [22]

Text Books

I. Erwin Kreyszig, "Advanced Engineering Mathematics" 8th edition, John Wiley and Sons (Asia) --- 2000

II. R. K. Jain and S. R. K. Iyengar, "Advanced Engineering Mathematics", Narosa Publishing House --- 2002

Reference Books

1. Peter V. O'neil, "Advanced Engineering Mathematics" 4th edition Brooks / Cole Publishing Company ---1995
