Revised Syllabus

Bachelor of Computer Applications (BCA)

Centre of Computer Education

Institute of Professional Studies
University of Allahabad
Allahabad

Revised Structure of BACHELOR OF COMPUTER APPLICATIONS (B.C.A) Curriculum

Semester 1:

Papers:

1. Mathematics-I (BCA101)
2. Statistics (BCA102)
3. Basic Circuit Analysis (BCA103)
4. Fundamentals of Programming (BCA104)
5. Communication Skills (BCA105)
6. Business Systems (BCA106)

Lab.I : Analog Electronics Lab.
Lab.II: Computer Lab.
Lab.III: Communication skills Lab.

Semester 2:

Papers:

1. Mathematics-II (BCA107)
2. Basic Electronics (BCA108)
3. Digital Electronics & Computer Organization (BCA109)
4. Data Structures (BCA110)
5. Linux & Shell Programming (BCA111)
6. Principles of Programming Languages (BCA112)

Lab.I : Digital Electronics Lab.
Lab.II: Computer Lab.
Lab.III: Communication skills Lab.

Semester 3:

Papers:

1. Discrete Structures & Graph Theory (BCA113)
2. Design & Analysis of Algorithm (BCA114)
3. Introduction to System Software (BCA115)
4. Object Oriented Programming using C++ (BCA116)
5. Database Management System (BCA117)
6. Computer Architecture & Microprocessors (BCA118)

Lab. I: Computer Lab.
Lab.II: Communication skills Lab.

Semester 4:

Papers:

1. Operating Systems (BCA119)
2. Operation Research (BCA120)
3. Data Communications & Networks (BCA121)
4. Software Engineering (BCA122)
5. Web Programming using JAVA (BCA123)
6. Numerical Methods (BCA124)

Lab.I: Computer Lab.
Lab.II: Communication skills Lab.

Semester 5:

Papers:

1. .Net Framework & C# (BCA125)
2. Embedded System (BCA126)
3. Computer Graphics (BCA127)
4. Secure Computing (BCA128)
5. Advanced DBMS (BCA129)

Lab.I: Computer Lab.
Lab.II: Communication skills Lab.
Lab. III: MINI PROJECT

Semester 6:

Papers:

1. Image Processing (BCA130)
2. Multimedia Systems (BCA131)

Lab: MAIN PROJECT

CREDIT STRUCTURE OF BACHELOR OF COMPUTER APPLICATIONS (B.C.A)

SEMESTER-I

S.No	Course Code	Course Title	L	T	P	C
		THEORY				
1	**BCA101**	Mathematics-I	2	1	0	3
2	**BCA102**	Statistics	2	1	0	3
3	**BCA103**	Basic Circuit Analysis	2	1	0	3
4	**BCA104**	Fundamentals of Programming	2	1	0	3
5	**BCA105**	Communication Skills	2	1	0	3
6	**BCA106**	Business Systems	2	1	0	3
7	**BCA231**	**Practical**	0	1	5	6
		TOTAL	**12**	**07**	**05**	**24**

SEMESTER-II

S.No	Course Code	Course Title	L	T	P	C
		THEORY				
1	**BCA107**	Mathematics-II	2	1	0	3
2	**BCA108**	Basic Electronics	2	1	0	3
3	**BCA109**	Digital Electronics and Computer Organization	2	1	0	3
4	**BCA110**	Data Structures	2	1	0	3
5	**BCA111**	Linux and Shell Programming	2	1	0	3
6	**BCA112**	Principles of Programming Languages	2	1	0	3
7	**BCA232**	**Practical**	0	1	5	6
		TOTAL	**12**	**07**	**05**	**24**

SEMESTER-III

S.No	Course Code	Course Title	L	T	P	C
		THEORY				
1	**BCA113**	Discrete Structures and Graph Theory	2	1	0	3
2	**BCA114**	Design and Analysis of Algorithm	2	1	0	3
3	**BCA115**	Introduction to System Software	2	1	0	3
4	**BCA116**	Object Oriented Programming using C++	2	1	0	3
5	**BCA117**	Database Management System	2	1	0	3
6	**BCA118**	Computer Architecture and Microprocessors	2	1	0	3
7	**BCA233**	**Practical**	0	1	5	6
		TOTAL	**12**	**07**	**05**	**24**

SEMESTER-IV

S.No	Course Code	Course Title	L	T	P	C
		THEORY				
1	**BCA119**	Operating Systems	2	1	0	3
2	**BCA120**	Operation Research	2	1	0	3
3	**BCA121**	Data Communications and Networks	2	1	0	3
4	**BCA122**	Software Engineering	2	1	0	3
5	**BCA123**	Web Programming using JAVA	2	1	0	3
6	**BCA124**	Numerical Methods	2	1	0	3
7	**BCA234**	**Practical**	0	1	5	6
		TOTAL	**12**	**07**	**05**	**24**

SEMESTER-V

S.No	Course Code	Course Title	L	T	P	C
		THEORY				
1	**BCA125**	.Net Framework & C#	2	1	0	3
2	**BCA126**	Embedded System	2	1	0	3
3	**BCA127**	Computer Graphics	2	1	0	3
4	**BCA128**	Secure Computing	2	1	0	3
5	**BCA129**	Advanced DBMS	2	1	0	3
6	**BCA235**	**Practical**	0	1	5	6
7	**BCA236**	**Mini Project**	0	1	5	6
		TOTAL	**10**	**7**	**10**	**27**

SEMESTER-VI

S.No	Course Code	Course Title	L	T	P	C
		THEORY				
1	**BCA130**	Image Processing	3	1	0	4
2	**BCA131**	Multimedia Systems	3	1	0	4
3	**BCA237**	**Main Project**	0	0	12	12
		TOTAL	**6**	**2**	**12**	**20**

DETAILED STRUCTURE OF BCA CURRICULUM

SEMESTER-I:

Paper-1: Mathematics-I (BCA101)

8 Lectures

1. **Linear Algebra:** Basis and Dimension, Linear transformations and their matrix representations, Matrix algebra, Rank of matrix, Echelon and normal form, Linear systems of algebraic equations, Consistency, Gauss elimination method, Homogeneous and non-homogeneous systems of equations, Inverse of matrices, Determinants, Characteristics polynomial, Eigen values and eigenvectors, Cayley-Hamilton theorem, Eigenvalues of Hermitian unitary matrices, Solution of linear and non-linear systems.

8 Lectures

2. **Differential Calculus:** Limit, Continuity & differentiability of functions of one variable, Mean-value Theorems, Rolle's Theorem, Leibnitz formula for nth derivatives of products of functions, Taylor and Maclaurin Theorems, Maxima, Minima and Tangent plane, Tangent lines and normals,

8 Lectures

3. **Integral Calculus:** Theorems of integral calculus, Evaluation of definite & improper integrals, Introduction to Functions of several variables: Partial differentiation, Change of variables in partial differentiation.

8 Lectures

4. **Ordinary Differential Equations:** Ordinary differential equations of first order, Separable, exact & linear equations, Existence and uniqueness theorems (Statement only)

8 Lectures

5. **Ordinary Differential Equations: Higher Order:** Higher order linear equations, Wronskians Method of variation of parameters for particular solutions, Euler's and Cauchy's equations, Systems of first order equations with constant coefficients

References:

1. Advanced Engineering Mathematics, Erwin Kreyszig
2. Calculus: Volume I, Aposto
3. Calculus and Analytical Geometry, G.B. Thomas & Finney
4. A Course in Ordinary Differential Equations, Rai, Chaudhary & Friedman
5. Higher Engineering Mathematics, B S Grewal
6. Mathematical Methods, Potter and Goldberg
7. Matrix Theory, David Lewis

Paper-2: Statistics (BCA102)

8 Lectures

1. **Elementary Probability:** Random Experiments, Sample space, Events, Definitions of probability, Probability of union of events, Conditional Probability, Bayes' theorem, Independence of events,

8 Lectures

2. **Random Variables:** Random variables, Distribution functions, Probability Mass Function (PMF) of Discrete Random Variables, Probability Density Function (PDF) of continuous random variables, Mathematical expectation, Moments.

8 Lectures

3. **Probability Distribution:** Discrete uniform distributions, Bernoulli distribution, Poisson distribution, Binomial distribution, Continuous uniform distribution, Normal distribution, Exponential distribution, Reliability function and instantaneous failure rate for exponential distribution

8 Lectures

4. **Statistical Methods:** Measures of Central Tendency, Dispersion, Simple linear regression, Method of least squares, Correlation Coefficients, Point and interval estimation, Unbiased, sufficiency, likelihood function and maximum likelihood estimator, Confidence interval for the mean of normal distribution

8 Lectures

5. **Statistical Inferences:** Sampling distributions: $\chi 2$, t and F distributions, Basic concept of testing of hypothesis, Role of p-value, Standard tests based on $\chi 2$, t and F distributions

References:

1. Fourier series and Boundary Value Problems, Churchill R.V. (McGraw Hill)
2. Probability and Statistics for Engineers, Irvrin Miller & Friend (Prentice Hall of India)
3. Engineering Statistics, Bowker and Lieberman (Prentice Hall of India)
4. Introductory Statistics and Probability for Engineering Science and Technology, Kirk – Patrick (PHI)
5. Modern Probability Theory and its Applications, Parzen E. (Wiley Eastern)

Paper-3: Basic Circuit Analysis (BCA103)

8 Lectures

1. **Purpose and role of circuit and electronics in computer engineering:** Difference between analog and digital circuits; Properties of material that make them useful for constructing electronic devices; definition and representation of basic circuit elements: resistance, inductance and capacitance; basic electrical quantities and relation between them (charge, current, voltage, energy and power).

8 Lectures

2. **Basic DC and AC circuit design:** Introduction to solving problems using Ohm's law including its power representation, using ohm's law to analyze basic electrical circuits; difference between resistance and reactance; the meaning of phase and the effect of frequency on capacitance and inductance; role of inductance and capacitance as basic storage elements.

8 Lectures

3. **Analysis of Basic Electrical Circuit:** Analysis of basic electrical circuits using Mesh and Nodal analysis; Kirchoff's law; Superposition theorem; Thevenin Theorem and Norton Theorem; Analysis and design of simple RLC circuits; frequency domain characteristics of electrical circuits; impedance and admittance; characteristics and uses of transformers.

8 Lectures

4. **Introduction to logic families**: RTL, DTL, TTL, ECL, MOS and CMOS circuits and comparison of their performance; interfacing different logic families; mixed signal circuit design; design parameter and issues; circuit modeling and simulation methods; effects of device parameters and various design styles on circuit characteristics such as timing, power and performance.

8 Lectures

5. **Electrical Measurements and Measuring Instruments:** Principles of operation and construction of moving coil, Moving iron, Dynamometer and induction types of Ammeters & Voltmeters; Extension of their ranges; Measurements of power- Three-ammeters and three voltmeters methods of measuring power in Single phase circuits; Construction of Watt meters; Induction and dynamometers types.

References:

1. Electric Circuit Analysis, B. Subramanyam (IKBooks).
2. Fundamentals of Electric Circuits, Charles K. Alexander, Matthew N. O. Sadiku.
3. Schaum's Outline of Basic Circuit Analysis, John O'Malley.
4. Microeletronic Circuits: Theory and Applications, Sedra & Smith.

Paper-4: Fundamentals of Programming (BCA104)

8 Lectures

1. **Algorithm development and C language Programming:** Structure and properties of algorithm, Flow chart, Algorithms for g.c.d., Factorial, Fibonacci series, Prime number generation and other simple problems, searching & sorting techniques. Basics of C Language: History, Introduction to C, Structure of C programs, Compilation & execution of C programs, Debugging techniques, Data types & sizes, Declaration of variables, Modifiers, Identifiers & keywords, Symbolic constants, Operators: Unary operators, Arithmetic & Logical operators, Bit-wise operators, Assignment operators and expressions, Conditional expressions, Precedence & order of evaluation.

8 Lectures

2. **C Language Features:** Control statements: If-else, Switch, Break, Continue, Comma operator, Go-to statement; Loops: For, While, Do-while; Functions: Built-in & User-defined, Function declaration, Definition & function call, Parameter passing: Call by value, Call by reference, Recursive functions, Multi-file programs, Command line parameters.

8 Lectures

3. **Arrays:** Linear arrays, Multi-dimensional arrays, Passing arrays to functions, Arrays & Strings; Storage classes: Automatic, External, Register & Static, Enumerations.

8 Lectures

4. **C Directives:** Macros, C pre-processor;Structures & Union: Definition and differences, Self-referential structure; Pointers: Value at (*) and address of (&) operator, Pointer to pointer, Dynamic memory allocation, Calloc & Malloc functions, Array of pointers, Function of pointers, Structures and pointers.

8 Lectures

5. **File Handling in C:** Opening, Closing and creating a data file, Read and Write functions, Unformatted data files

References:

1. The C Programming Language, B.W. Kernighan and D.M. Ritchie (PHI)
2. Programming using the C language, R.C. Hutchinson and S.B. Just (McGraw Hill)
3. Outline of Theory and Problems of Programming with C, B.S. Gottfried (Schaum McGraw Hill)
4. C: The Complete Reference, H. Schildt (McGraw Hill)

Paper-5: Communication Skills (BCA105)

8 Lectures

1. **Introduction to Communication:** Importance of communication, Communication in primitive societies, Verbal and non-verbal, One way and two way communication, Objectives of communication: Information, Advice, Order, suggestion, Persuasion, Education, Warning, Raising morale, Motivation, Mass communication, Written and oral communication, Visual communication, Audio-visual communication, Role of news papers, Radio, Cinema and TV.

8 Lectures

2. **Principles of communication:** Clarity, Completeness, Conciseness, Consideration, Courtesy, Correctness, Choice of the right word, the art of listening- learning through listening- body language.

8 Lectures

3. **Types of Communication:** Official and business communication, Process of communication, Downward, Upward and horizontal communication, Essential of good communication, Level of communication- inter and intra personal, group to person, group to group, Methods of effective oral, Written and non-verbal communication, Horizons-tone, frequency, rate, volume, depth, Barrier to communication and over coming barriers, Listening skill, Use of audio visual aids for effective communication.

8 Lectures

4. **Comprehension:** Comprehension of ideas in a passage, Expansion of an idea for a particular purpose, Summarizing a passage for official usage, Communication a given idea to suit different contexts, Report writing- importance of reports, preparing a report, technical report writing.

8 Lectures

5. **Communication Aids:** Prose Text Book, Precis writing, Grammar, Words, Idioms, Antonyms and synonyms, Using Microsoft Office Suite, Antonyms change of words into different parts of speech, Correspondence: Drafting personal letters, CV, Application for jobs, Business letters, Official letters, Project preparation, Report writing, Power-point presentation. Professional practice and related ethical codes.

References:

1. Essentials of Business Communication, Rajendra Pal & J S Korlahalli
2. Business Communication, Gyani
3. Effective Communication, Ludlow and Panthon
4. A Practical English Grammar, Thomson and Marlinet
5. English Conversation Practice, Grount Taylor
6. Developing Communication Skills, Krishna Mohan and Meera Banerji
7. Business Correspondence and Report Writing, R C Sharma and Krishna Mohan
8. Communication Skill, R Datta Roy and K K Dhir

Paper-6: Business Systems (BCA106)

8 Lectures

1. **Introduction to Business Data Processing:** Overview of Business systems; Management Functions, Levels of Management; Sources of Information, Applications like Payroll, Accounting, Inventory, MIS, DSS

8 Lectures

2. **Concept of Files:** File organization and handling: Sequential, Direct and Index Sequential; Usage of Inverted Files, Master & Transaction files, Modes of Processing: Batch, Online & Real Time, Report Generation Techniques, Multiple file handling and updation.

8 Lectures

3. **Business Applications:** Design Analysis & Development of Computerized Financial Accounting, Payroll, and Inventory Control, ERP etc.

8 Lectures

4. **Introduction to fundamental design activities:** Fundamental design activities; Information & Information Systems; relation between knowledge and information; Characteristics of information; Information System Design; Modeling approaches; System development activities; System life cycle; System design methodology; Information system analysis approaches; Structured analysis & design.

8 Lectures

5. **Usage of Design Tools:** DFD, decision tables and trees; Completeness of decision tables; Resolution of data access conflicts; Software design for maintainability; Decision Table; Object oriented analysis & design; Creating systems with acceptable response times, Estimation of design parameters; workload analysis of system design specifications; Context diagram and Data Flow Diagram

References:

1. Business & Information systems by Nickerson, PHI
2. Business Data Communication by Stallings, PHI
3. Business Data Network & Telecommunications, by Panko, PHI

SEMESTER-II:

Paper-1: Mathematics-II (BCA107)

8 Lectures

1. **Infinite Series**: Convergence and divergence of infinite series, Integral test, Comparison test, Ratio test, Cauchy's root test, Series of positive and negative terms, Absolute convergence, Alternating series, Power series and their convergence, Taylor and Maclaurin series

8 Lectures

2. **Complex Variables:** Complex numbers, Complex plane, Modulus and argument representation of complex numbers, Roots of complex numbers, Complex functions and mappings, Complex analytical functions: curves and regions in the complex plane, complex functions, limit, derivative, analytic function, Cauchy-Riemann equations, elementary complex functions such as powers, exponential function, logarithmic, trigonometric and hyperbolic functions, Inverse functions, Harmonic functions.

8 Lectures

3. **Vector Calculus:** Scalar and vector fields, Directional derivative & Gradient operator, Conservative fields and potential functions, Divergence and Curl of vector fields, Applications to different coordinate systems

8 Lectures

4. **Fourier Series & Fourier Transform:** Introduction to Fourier Series , Convergence of Fourier Series and their integration and differentiation, Euler formulae for Fourier coefficients , Functions having arbitrary period, Even and Odd functions , Half range expansions, Sine , Cosine and Exponential Fourier Series, Frequency and Amplitude Spectra of a function ,Fourier integral , Linearity property, Transform of derivatives, Convolution theorem, Fourier Transform Fourier Cosine and Sine Transforms .

8 Lectures

5. **Laplace Transform:** Definitions, Fundamental Ideas, Operational Properties of the Laplace Transform, Linearity property, Transform of elementary functions, Laplace transforms of derivatives and integrals, Differentiation and Integration of transforms, Convolution theorem, Inversion Integral, Use of Laplace transforms in the solution of initial problem, Unit step function, Impulse function-transforms of step functions, Transforms of Periodic functions.

References:

1. Advanced Engineering Mathematics, Erwin Kreyszig
2. Higher Engineering Mathematics, B.S. Grewal
3. Mathematical Methods, Potter and Goldberg
4. Mathematics for Engineers and Physicists, L.A. Pipes
5. Applied Mathematics for Mathematician & Engineers: L A Pipes (TMH)
6. Engineering Mathematics: H K Das (S Chand & Co. Ltd.)
7. Engineering Mathematics: B.S. Grewal (Khanna Pub.)

Paper-2: Basic Electronics (BCA108)

8 Lectures

1. **Semiconductors and PN Junction Diode:** Properties of semiconductors, Intrinsic and extrinsic semiconductors, P and N type of impurities and doping, Charge densities and potential barrier, Draft and diffusion currents, PN junction working and characteristics, It's applications as – Rectifier: Half wave, Full wave, Bridge Rectifier and their calculation for ripple, Efficiency and PIV; Clipper, Clamper and voltage doublers, Zener and Avalanche breakdown diodes, Tunnel diode, Varactor diode, Thermister.

8 Lectures

2. **Bipolar Transistor:** Transistor action with simple bias conditions, Working and basic characteristics, CB, CE & CC configuration of transistor amplifiers, Analysis for CB and CE basic amplifiers- Determination of Q-point, dc load line and calculations for gains and impedances, Effect of load and ac load line

8 Lectures

3. **Transistor biasing:** Biasing circuits for CB and CE configurations, Leakage currents in CB & CE and it's effect, Thermal stabilization & Stability factor, Different biasing arrangements for CE- their advantages and drawbacks, Transistor thermal power dissipation and rating. Equivalent Circuits of Transistor: Transistor as four port device, Impedance, Z-parameters and circuits representation, Admittance Y parameters and circuit representation, h-parameters and circuit representation; Analysis of CB and CE circuits using h-parameters for gains and impedances

8 Lectures

4. **Field Effect Transistors**: Basic configuration of JFET, Biasing, Principle of operation and basic characteristics, Basics of MOSFET

8 Lectures

5. **Power supplies:** Block diagram of Power Supply (PS) and it's constituent circuits , Electronics voltage stabilizer, Zener and transistor circuits for stabilization, Constant current, and current limited PS, Basics of SMPS and UPS.

References:

1. Electronic Devices and Circuits, Allen Motersheid
2. Integrated Electronics, Jacob Millman
3. Electronic Devices and Circuit Theory, L. Boylestad and Nashelsky
4. Handbook of Electronics, Gupta and Kumar

Paper-3: Digital Electronics & Computer Organization (BCA109)

8 Lectures

1. **Introduction:** Generation of Computers, Functional block diagram of a computer, Hardware and Software, Generation of programming languages, CPU, Memory, I/O, Secondary storage, DOS and Windows environment. Digital Integrated Circuits: Characteristics of digital ICs.

8 Lectures

2. **Logic Gates:** Level minimization: realization of switching expressions by Karnaugh map and Quinne-Mclusky methods combinational circuits and their analysis. Realization of switching expressions by two level AND, OR, invert gates, NAND gates only, NOR gates only and Ex-OR and AND gates only.

8 Lectures

3. **Combinational logic circuits:** Binary adder and Subtractor circuits, Magnitude comparator, Decoders, Encoders, Multiplexer and demultiplexer, Realization of switching expressions by decoders, encoders, multiplexer and Demultiplexer, Programmable logic circuits, Tri-state logic, Memory Elements.

8 Lectures

4. **Sequential Logic Circuits:** Sequential circuits, latches and Flip Flops, Analysis of clocked sequential circuits. State reduction and assignment, design of synchronous circuits, shift registers, ripple counters, synchronous counters. Asynchronous Sequential Logic: Analysis procedure, circuits with latches, Design procedure, reduction of states and flow tables .Races and race Free State assignments, Hazards.

8 Lectures

5. **Computer Organization:** Basic building blocks of digital computer- Essential & non-essential components; Types of storage elements- Static memory, Dynamic Memory, EDORAM, SDRAM, NVRAM, DDRRAM etc. Basic model of stored program computer, Instruction sets: Reduced, Complex. Addressing schemes, Instruction execution mechanism, Organization of CPU, Memory organization, RAM, ROM, Cache Memory, addressing cells in the cache memory: Associative and Direct memory organization, I/O devices with special reference to modern peripheral devices.

References:

1. Digital Design: M.Morris Mano (PHI)
2. Digital circuits & logic design: S.C.Lee (PHI)
3. Digital electronics (circuits, systems & ICs): S.N.Ali (Galgotia pub.)
4. Digital electronics: W.H.Gothmann (PHI)
5. Switching theory: A.K Gautam (Katsons)

Paper-4: Data Structures (BCA110)

8 Lectures

1. **Introduction:** Data Abstraction and Algorithm, Analysis , Data types / objects / structures, Abstract definition of data structures , Representation and implementation, Time requirements of algorithms, Space requirements of algorithms. Array implementation and addressing with examples Array applications and representation, Polynomials, Sparse matrices, String-pattern Matching. Linked list: Singly linked lists, list heads, circular list, doubly liked lists, orthogonal lists, generalized (recursive) lists, applications.

8 Lectures

2. **Stacks and queues:** Basic ideas, array and linked representation. Prefix/ infix / postfix expressions and their inter-conversion for evaluation, Priority, queues and simulation, Recursion.

8 Lectures

3. **Graph and Trees:** Graphs: Definition, terminologies and properties, Graph representations, Minimum spanning trees, Depth-first search , Breadth-first search , Networks. Trees: Definition, terminologies and properties, Binary tree representation traversals and applications, Threaded binary trees, Binary Search trees, AVL Trees

8 Lectures

4. **Dynamic storage management and garbage collection:** The fragmentation problem, first fit, best fit, next fit boundary tags, buddy system. Garbage collection-free lists, reference counts, marking algorithms.

8 Lectures

5. **Sort and search Algorithms:** Internal and External Sorting algorithms, Heap sort, Merge sort, Quick-sort, General radix sort, Symbol tables, sequential search, Binary search, Interpolation search. Hashing: Hash functions, collision resolution techniques (chaining , linear offset, others).

References:

1. Data Structures and Program Design- Robert Kruse.
2. Data Structures- Horowitz and Sahni
3. Data Structures through C- A. Tennenbaum

Paper-5: Linux & Shell Programming (BCA111)

8 Lectures

1. **Introduction:** Linux introduction and file system - Basic Features, Advantages, Installing requirement, Basic Architecture of Unix/Linux system, Kernel, Shell. Linux File system-Boot block, super block, Inode table, data blocks, How Linux access files, storage files, Linux standard directories.

8 Lectures

2. **Commands for files and directories**: cd, ls, cp, md, rm, mkdir, rmdir, pwd, file, more, less, creating and viewing files using cat, file comparisons – cmp & comm, View files, disk related commands, checking disk free spaces. System startup and shut-down process, init and run levels.

8 Lectures

3. **Commands:** Essential linux commands, Understanding shells, Processes in linux-process fundamentals, connecting processes with pipes, tee, Redirecting input output, manual help, Background processing, managing multiple processes, changing process priority with nice, scheduling of processes at command, cron, batch commands, kill, ps, who, sleep, Printing commands, find, sort, touch, file, file related commands-ws, sat, cut, dd, etc. Mathematical commands- bc, expr, factor, units. Creating and editing files with vi, joe & vim editor

8 Lectures

4. **Shell Programming:** Shell programming- Basic of shell programming, Various types of shell available in Linux, comparisons between various shells, shell programming in bash, read command, conditional and looping statements, case statements, parameter passing and arguments, Shell variables, system shell variables, shell keywords, Creating Shell programs for automate system tasks.

8 Lectures

5. **Filtering:** Simple filter commands – pr, head, tail, cut, paste, sort, uniq, tr; Filter using regular expressions – grep, egrep, and sed; awk programming – report printing with awk.

References:

1. Linux & Shell Programming,
2. Beginning Shell Scripting by Erick Foster-Johnson, Wiley India
3. Beginning Linux Programming, Neil Mathew, Richard Stones, Wiley India

Paper-6: Principles of Programming Languages (BCA112)

8 Lectures

1. **Introduction and Language Processors:** Characteristics of programming Languages, Factors influencing the evolution of programming language, Development in programming methodologies, desirable features and design issues. Language processors: Structures and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time

8 Lectures

2. **Elementary and structured data type:** Data object variables, constants, data type, elementary data types, declaration, assignments and initialization, enumeration, characters, strings. Specification of data structured types, vectors and arrays, records, variable size data structure, pointers and programmer constructed data structure, Set files.

8 Lectures

3. **Imperative and Object Oriented Languages:** Block structure, Scope rules, Parameter Passing, Construct like co-routines, Tasks etc. Object Oriented concepts: The class notion- Information hiding and data abstraction using classes, derived classes and inheritance, Polymorphism, Parameterized types.

8 Lectures

4. **Functional languages:** Functional programming concepts – Referential transparency – Types – Type systems - Names, bindings, environment and scope – Recursive functions – Polymorphic functions – Type variables – High order functions – Curried functions – Lists and programming with lists – Definition of new user defined types in ML – Abstract data types – Evaluation methods.

8 Lectures

5. **GUI Programming:** GUI vs CUI; Event Driven Programming; Visual Programming; VB Environment: Steps in creating & using controls; Notion of Scripting; Scripting via Perl

References:

1. Terrance W Pratt, "Programming Languages: Design and Implementation", PHI.
2. Sethi, "Programming Language", Addison Wesley.
3. E Horowitz, "Fundamental of Programming Languages", Galgotia.

4. Pratt, Zolkowitz, "Programming Languages Design Implementation", Pearson Edition.
5. Tucker Noonan, "Programming languages: Principles and Paradigms", TMH
6. D. A. Watt, "Programming Languages and Paradigms", PHI
7. Julia Case Bradley & A.C.Millspaugh "Programming in VB 6.0"

SEMESTER-III:

Paper-1: Discrete Structures & Graph Theory (BCA113)

8 Lectures

1. **Propositional Logic:** Statements, Connectives, Statement formulas, Truth functional rules, Interpretation of formulas, Tautologies, Equivalence, Functionally complete set of connectives, Normal forms, Inference, Theory of statement calculus, Consistency of premises, Mechanical theorem proving,

8 Lectures

2. **Predicate Logic:** Predicates, Statement functions, Quantification, Interpretation of predicate formulas, Inference theory for predicate calculus, Informal & formal proofs, Prenex normal form

8 Lectures

3. **Set Theory:** Relations, Relation matrix, Transitive closures, Partitions and equivalence relations, Characteristic functions of a set, Principle of inclusion and exclusion, Its applications

8 Lectures

4. **Directed Graphs:** Definition, Simple digraphs, Matrix representations, Paths, Distances, Connectedness of digraphs, Path and reachability matrices, Boolean sum and product of bit matrices, Warshall's algorithm for transitive closure of relations

8 Lectures

5. **Lattices and Boolean Algebra:** Partially ordered sets, Hasse diagrams, Lattices, Distributive and Modular lattices, Complements, Boolean Algebra, Atoms and join irreducibility, Stone representation theorem, Boolean expressions, Free Boolean Algebra, Boolean functions, Normal forms representation and minimization of Boolean functions, Symmetric Boolean functions

References:

1. Discrete Mathematical Structures with Application to Computer Science- Tremblay & Manohar
2. Discrete Mathematical Structures – Preparata and Yeh

Paper-2: Design & Analysis of Algorithms (BCA114)

8 Lectures

1. **Algorithm Analysis Techniques:** Asymptotic notations, Recurrences: substitution, iteration and master methods; Divide-and-conquer: general approach, binary search, merge sort, quick sort, Strassen's matrix multiplication; Greedy algorithms: general approach, activity selection, knapsack problem, minimum-spanning tree, Dijkstra's algorithm, Huffman code.

8 Lectures

2. **Dynamic Programming:** General approach, multi-stage graph, matrix-chain multiplication, all-pairs shortest paths, traveling salesperson, 0/1 knapsack problem, longest common subsequence

8 Lectures

3. **Backtracking:** N-queen problem, sum of subsets, knapsack problem, generation of all cliques, traveling salesperson problem, Graph coloring. Branch-and-Bound: Assignment problem, 0/1 knapsack problem

8 Lectures

4. **Randomizing Algorithms:** Numerical Integration, Primality testing, randomized min-cut, randomized algorithm for n-queens, quick-sort

8 Lectures

5. **Approximation and Lower Bound Theory:** Job scheduling, Bin packing, Set cover, Max cut. Lower Bound Theory: Decision tree; Reduction method; NP-completeness

References:

1. Fundamental of Computer algorithms – Horowitz and Sahni
2. The art of Computer Programming – Donald Knuth
3. Design Methods and Analysis of Algorithms – S.K. Basu
4. The Design and Analysis of Computer Algorithms – Aho, Hopcraft and Ullaman
5. Genetic Algorithm in Search, Optimization and Machine Learning – David E. Goldberg

Paper-3: Introduction to System Software (BCA115)

8 Lectures

1. **General concepts**-Review of assembly and machine language programming, distinction between system software and application software, Language processors:-Introduction , Language processing activities. Assemblers:- Elements of Assembly language programming, A simple assembly scheme, Pass structure of assemblers, Design of two pass assemblers.

8 Lectures

2. **Macros and macro processors**:- Macro definition and call, Macro expansion, Nested macro calls, advanced macro facilities, design of macro pre processor Linker-Relocation and linking concepts-self relocating programs. Loader-Types of loaders Editor-Types of editors-Components of editor-Debug monitor

8 Lectures

3. **Introduction to compiling**:- Compilers, Analysis of a source program, the phases of a compiler, Lexical analysis:-The role of the lexical analyzer, Input buffering, specification of tokens Recognition of tokens, Finite automata, Conversion of an NFA to DFA, From a regular expression to an NFA

8 Lectures

4. **Syntax analysis**:- the role of the parser, Context free grammars, writing a grammer, Top dowm parsing Bottom up parsing, syntax directed translation-syntax directed definition, , Construction of Syntax Tree, L R parsers-LR parsing algorithm, Constructing SLR parsing tables, SLR parsing table

8 Lectures

5. **Intermediate code generation**-postfix notation, syntax tree, three-address code, basic blocks and flow graph, the DAG representation of basic blocks, Backpatching, Code optimization:- The principal sources of optimization, optimization of basic blocks, loops in flow graphs, Peephole optimization Code Generations:- Issues in the design of a code generator, simple code generator

References:

1. Systems Programming- Donovan
2. Introduction to Systems Software- Dhamdhere D.M.

Paper-4: Object Oriented Programming using C++ (BCA116)

8 Lectures

1. **Object Modeling:** Object & Classes, Links & Associations, Generalization and Inheritance, Aggregation, Abstract Classes, Multiple Inheritance, Metadata, Constraints, a sample object model.

8 Lectures

2. **Dynamic Modeling:** Events & States, Operations & methods, State diagrams, concurrency, a sample dynamic model.

8 Lectures

3. **Programming in C++:** Classes, objects, functions, constructors, destructors, inheritance, polymorphism, virtual functions, class templates, Function templates, Working with files.

8 Lectures

4. **Object Oriented Testing:** Difference between structured and OBJECT ORIENTED testing, Test case design model.

8 Lectures

5. **OMT Methodologies:** Comparison of SA/ SD & JSD, Translating OBJECT ORIENTED design into implementation, An example of OBJECT ORIENTED design.

References:

1. Object-Oriented Modeling and Design:Rumbaugh et al
2. Object Oriented Design :Booch
3. Object Oriented Programming in C++ :Lafore
4. Software Engineering: A practitioner's Approach Pressman

Paper-5: Database Management System (BCA117)

8 Lectures

1. **Introduction:** Data, information and knowledge, Characteristics of database approach, Data independence, Architecture of database system, Data dictionary, Types of database language, database system life cycle, Overview of hierarchical, network and relational model. Relations and Codd's rules, Concepts of keys.

8 Lectures

2. **Relation Algebra**: Select, Project, Joins, Set operations, Update operations – tuple relational calculus, Relational Calculus vs. relational algebra.Data definition, data manipulation, view definition, nested queries, updation, Embedded SQL, Handling of nulls and cursors.

8 Lectures

3. **Data Models:** Conceptual, Logical and Physical design, ER models, ER diagrams, Strong and weak entity sets, Generalization, Specialization and Aggregation, Conversion of ER model into relational schemas

8 Lectures

4. **Normalization:** Normalization concepts, Functional dependencies and dependency preservations, Normal forms – 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, DKNF, Indexing, File organization, De-normalization, Clustering of tables and indexes.

8 Lectures

5. **Transaction Handling:** Transaction recovery, System recovery, two phase commit, concurrency problems, locking, deadlocks, security, discretionary and mandatory access control, data encryption

References:

1. Introduction to Database System – C.J. Date
2. Database Systems – Mcfadden et.al.
3. Database Concepts – Navathe et.al.
4. Database Structured Techniques for Design Performance – S. Atre

Paper-6 : Computer Architecture & Microprocessors (BCA118)

8 Lectures

1. **Computer Architecture:** Concept of scalar processors; concept of scalar pipelined processors; pipeline hazards; super pipelining; super scalar architecture.

8 Lectures

2. **Microprocessors:** Essential & non-essential components, functional block diagram of a microprocessor; Addressing modes, Comparative study of 8-bit microprocessors, Comparative study of 16-bit microprocessors.

8 Lectures

3. Detailed study of 8085 and 8086; introduction to peripheral chips: Serial and parallel interface; to design systems around 8085 and 8086

8 Lectures

4. **Memory and I/O management techniques:** memory management, Concept of virtual memory, memory interleaving, I/O methods- Polled I/O, Interrupt driven I/O and Direct I/O: I/O addressing and I/O interfacing.

8 Lectures

5. **Assembly Language:** Assembler, Machine language instruction processor, Completeness of instruction set, Assembly language programs for common application problems such as Maximum finding, Summation, Sorting, Searching, Multiple precision arithmetic, Delay routines, etc.

References:

1. Digital Computer Electronics : Malvino
2. Microprocessor Architecture Programming Applications with 8085/8080A: Brey
3. Digital System Design and Microprocessor: Hayes, John P.
4. Computer Architecture and Organization: Hayes, John P.
5. Computer System Architecture: Mano, M. M.

SEMESTER-IV:

Paper-1: Operating System (BCA119)

8 Lectures

1. **Overview:** Introduction to OS – its functional behavior and responsibilities, Need for some of monitor/command interpreter, Types of operating systems, System structure, Hierarchical and layered organization of OS, I/O methods and interrupt structure.

8 Lectures

2. **Process Concepts:** Process definition, Process states and state transitions, Parallel processes and constructs, Process interaction, Operating system kernel, Data structures for processes and resources, Context switching, Process control primitives, Process scheduling.

8 Lectures

3. **Process Synchronization and Deadlock:** The determinacy problem, Mutual exclusion, Semaphores, Process synchronization, Conditional critical regions and monitors, Inter-process communication, Deadlock problem and its solutions.

8 Lectures

4. **Memory Management:** Memory management concepts, Relocation, Linking,_Multiprogramming with fixed partitions, Swapping, Variables partitions, Overlays, Virtual memory, Segmentation, Paging, Storage allocation strategies, Load control and thrashing

8 Lectures

5. **File and I/O Management:** Organization of file and I/O subsystems, Directory management, Basic file system, file descriptors, File manipulation, File organization methods, Management of auxiliary storage space, Command language and file system utilities, I/O subsystems, Programmed I/O, DMA, Interrupt driven I/O, Recovery procedures. Protection and Security: Safeguards, Penetration, Access and Information flow control, Protection problems, Formal models of protection.

References:

1 Introduction to Operating Systems: Deitel
2 Operating System Concepts: Peterson and Silbershatz
3 Modern Operating Systems: Andrew S Tanenbaum

Paper-2: Operation Research (BCA120)

8 Lectures

1. **Network Analysis:** Terminology of network, Shortest route problem, minimal spanning tree problem, max-flow problem.

8 Lectures

2. **Project Scheduling by PERT/CPM:** Diagram, representation, critical path calculation, construction of time chart and resource labeling, probability and cost consideration in project scheduling, project control.

8 Lectures

3. **Linear and Non Linear Programming:** Simplex Method, Revised simplex method, Duality in Linear programming, Application of Linear Programming to Economic and Industrial Problems. Nonlinear Programming: The Kuhn-Tucker conditions, Quadratic programming, Convex programming.

8 Lectures

4. **Replacement Models:** Introduction, Replacement policies for items whose efficiency deteriorates with time, Replacement policies for items that fail completely

8 Lectures

5. **Sequencing Model:** Classification of self problems, processing of n jobs through two machines, three machines, processing of two jobs through m machines

References:

1. Operations Research- Taha
2. Introduction to Operations Research- B.E. Gillet
3. Optimization Theory and Applications- S.S.Rao
4. Linear programming- G.Hadley

Paper-3: Data Communication & Networks (BCA121)

8 Lectures

1. **Introduction:** History of data communication, Open system standard, Definition of communication link and its application in telephony and computer networks, Importance of channel bandwidth and system noise, Protocols in telephony and internet communication, Types of channel, Advantages and disadvantages of analog and digital transmissions, Digitizing Speech, Wave form coding and companding, Voice over IP.

8 Lectures

2. **Data Transmission Basics:** Synchronous/Asynchronous, Error detection and correction methods, Data compression, Protocol basic, Circuit, Message, Packet and Cell switching, Connection oriented and connectionless services, importance of modulation and multiplexing in communication: introduction to different modulation and multiplexing techniques; importance of Nyquist Criterion and Shannon's theorem in communication; delay, bandwidth, throughput and noise.

8 Lectures

3. **Computer Networks:** Advantages and disadvantages of computer networks; classification of computer networks; introduction to various physical media in connection oriented and connection less networks; network protocols and their role in computer network. Layered approach to network design- ISO/OSI and TCP/IP model.

8 Lectures

4. **Network Topology and Network Devices:** Network topology, LAN wired/wireless, Ethernet, CSMA/CD, CSMA/ CA, Token passing rings, FDDI, Introduction to networking devices- repeaters, hubs, Switches, Bridges, Routers and gateways, Switching techniques: Store and forward, Filter, Next-Hop forwarding, Introduction to routing techniques- Link state routing and distance Vector routing.

8 Lectures

5. **Internetworking:** IP addressing, Address binding with ARP, Datagram encapsulation and fragmentation, Sub-netting and implementation of CIDR, UDP and TCP, TCP segment format, Adaptive retransmission, ICMP and error handling. Network applications, Client-Server concepts and application, DNS, HTTP, Email and web browsing, Broadband Multi-Service networks, Cell based networks, ISDN.

References:

1. Computer Networks :Tanenbaum, A.S
2. Data and Computer communication :Stallings, William
3. Inter Networking With TCP/IP Vol I, II,III: Comer, D.E. and Stevens D.L.
4. Computer Network and Distributed Data Processing : Martin.J.
5. Local Networks : Stalling, William
6. Data Communication and Networking : Forouzan, B.A

Paper-4: Software Engineering (BCA122)

8 Lectures

1. **Introduction:** Introduction to Software Engineering: Software development process; Life Cycle models – Waterfall, Spiral, Evolutionary, Prototype. Software Production Process**:** Process Models - ; Methodologies; Standards

8 Lectures

2. **Software Project Management and Design:** 4 Ps; Project Planning; Cost estimation – Loc, Function point, COCOMO; Work estimation; Resource estimation; Risk Analysis; Project Scheduling; Quality Plans; Project control. **Software Design: Abstraction**; Modularity; Cohesion; Coupling

8 Lectures

3. **Software Testing:** Black box vs White Box; Testing in the large vs Testing in the small; System Testing; Debugging; Validation vs Verification

8 Lectures

4. **Software Quality Assurance:** Quality Models; Software Quality Assurance Activities, Software configuration management; Software Reliability; Introduction to SEI-CMM

8 Lectures

5. **Software Maintenance and Case Studies:** Maintenance concepts and tasks; Side effects; Reverse Engineering; Re-engineering. CASE concepts, Use and applications.

References:

1. Software Engineering: Ian Sommerville, Pearson Education
2. Software Engineering: R. S. Pressman, McGraw Hill
3. An Integrated Approach to Software Engineering: Pankaj Jalote

Paper-5: Web Programming Using JAVA (BCA123)

8 Lectures

1. **Introduction to object oriented programming:** Features of Java; constants, variables and data types, Operators and expressions; decision making, branching and looping; Classes, objects and Methods; arrays, strings and vectors.

8 Lectures

2. **Inheritance & File Handling:** Interfaces; Managing Input/Output Files in Java; Packages, Exception Handling, Multithreaded Programming; Utility Classes; String Handling; Generics, Generic Class, Generic methods.

8 Lectures

3. **Applet Programming**: Life cycle of an applet; Adding images to an applet; Adding sound to an applet; Passing parameters to an applet, Event Handling; Introducing AWT: Working with Windows Graphics and Text. Using AWT Controls, Layout Managers and Menus.

8 Lectures

4. **JDBC Overview:** JDBC implementation; Connection class; Statements; Catching Database Results, handling database Queries; Networking: InetAddress class – URL class- TCP sockets - UDP sockets.

8 Lectures

5. **Web Page Design:** Web page Designing using HTML, Scripting basics-Client side and server side scripting. Java Script-Object, names, literals, operators and expressions- statements and features- events- windows- documents- frames- data types- built-in functions- Browser object model- Verifying forms; Servlet – life cycle of a servlet. The Servlet API, Handling HTTP Request and Response, using Cookies, Session Tracking. Introduction to JSP.

References:

1. Burdman, "Collaborative Web Development", Addison Wesley.
2. Sharma &Sharma, "Developing E-Commerce Sites", Addison Wesley
3. Ivan Bayross, "Web Technologies Part II", BPB Publications.
4. Margaret Levine Young, "The Complete Reference Internet", TMH
5. Naughton, Schildt, "The Complete Reference JAVA2", TMH
6. Balagurusamy E, "Programming in JAVA", TMH

Paper-6: Numerical Methods (BCA124)

8 Lectures

1. **Linear and Non-Linear Equations:** Numerical Analysis: Floating point representation of numbers, Errors in numerical computations, sources of errors, significant digits. Numerical solution of system of linear equation, LU decomposition, Gauss elimination method, Gauss-Siedel method , Rate of convergence, Matrix Inversion. Roots of Non-linear Algebraic and Transcendental Functions , Bisection, and Newton-Raphson Methods; Regula Falsi, Secant method; Method of iteration , fixed points in iteration.

8 Lectures

2. **Differentiation and Integration**: Polynomial interpolation: Finite differences, Newton's forward and backward differences interpolation polynomials, Numerical differentiation and integration, Formulae for derivatives in the case of equally spaced points, Trapezoidal and Simpson rules, Errors of interpolation and integration formulae

8 Lectures

3. **Differentials Equations:** Numerical solution of ordinary differential equations: Taylor series method, Euler's method, Modified Euler's method, Runge-kutta methods, Solution of linear difference equations with constant coefficients, Numerical solution of boundary value problems, Methods of finite differences, Finite differences methods for solving Laplace's equation in a rectangular region

8 Lectures

4. **Curve Fitting :** Curve fitting, Method of least squares, Correlation and regression, Lines of regression.

8 Lectures

5. **Monte-Carlo Method:** Basic principles, Random sampling, Integration of one dimensional and multi-dimensional integrals by random sampling, Error estimate in Monte-Carlo methods, Metropolis Algorithm, simple applications.

References:

1. Rajaraman V., "Computer Oriented Numerical Methods", PHI
2. Gerald & Wheatley, "Applied Numerical Analyses", AW
3. Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engineering Computations", New Age Int.
4. Grewal B. S., "Numerical methods in Engineering and Science", Khanna Publishers, Delhi
5. T. Veerarajan, T Ramachandran, "Theory and Problems in Numerical Methods", TMH
6. Pradip Niyogi, "Numerical Analysis and Algorithms", TMH
7. Francis Scheld, "Numerical Analysis", TMH

SEMESTER-V:

Paper-1: .Net Framework & C# (BCA125)

8 Lectures

1. **The .Net Framework and OOPS in .Net:** Introduction, DLL Hell, CLR, CTS, MSIL, Base Class Library , Namespace and its importance , System Namespace & Other Important Namespaces , Class / Object , Inheritance , Polymorphism , Abstract Class , Interfaces , Events & Delegates

8 Lectures

2. **Basic C# and Win Forms Programming:** Introduction , Data Types , Identifiers , Arrays , Error Handling, Introduction , Window Controls – TextBox , Radio , CheckBox , Combo , PictureBox , Menu , Tab , Progress Bar , ListView , Report Viewer.

8 Lectures

3. **Process And Threads:** Threads , Creation/Stopping Of Threads , Thread Pool Concept , Monitoring a thread, Synchronizing Multiple Threads

8 Lectures

4. **Assemblies & Their Importance:** Assemblies , Private Assembly , Signing an Assembly , Shared Assemblies, Reflection

8 Lectures

5. **ADO.NET:** ADO.NET classes hierarchy , Connection , Command , Dataset , Datareader , DataAdapter , SqlDataSource

References:

1. C# Black Book by Matt Telles
2. Complete Reference ASP. Net by MacDonand, TMH
3. C# Programming Bible by Jeff Ferguson, Brian-Patterson, Wiley
4. Wrox's Visual C# 2005 Express Edition, by F. Scott-Barker, Wiley

Paper-2: Embedded Systems (BCA126)

8 Lectures

1. **Introduction to Embedded System**: Definition; Real-Time vs Non-Real-Time System; Overview of Embedded System Architecture; Specialities of Embedded System – Reliability, Performance, Power Consumption, Cost, Size, Limited User Interface, Software upgradation facility; Recent trends in Embedded System- Processor Power, Memory, Operating System, Communication Interfaceand Network capability, Programming Languages, Development tools, Programmable Hardware, Microprocessor vs Microcontroller.

8 Lectures

2. **Architecture of Embedded Systems**: **Hardware architecture**: CPU, Memory, Clock circuits, Watchdog Timer/Reset Circuitry, Chip Select, I/O methods, Debug port, Communication Interface, Power Supply,

A/D Converters; Software architecture: Services provided by OS, Architecture of Embedded OS, Categories of Embedded OS, Application software, Communication software.

8 Lectures

3. **Process of Embedded System Development**: Programming of Embedded Systems: GNU development tools, Bit manipulation using C, Memory Management, Device Drivers,, Productivity Tools, Programming in C++, Programming in Java, J2ME, Server side programming, Java Development tools.

8 Lectures

4. **Development of Embedded Systems**: Hardware platforms: Single Board Computers, PC add-on cards, Custom built hardware platforms, Microcontroller development board: Communication interfaces: Serial/Parallel, UART/USART, PPI, USB, Infra Red, IEEE 1394 Firewire, Bluetooth, Ethernet; RFID and its applications; Managing Embedded System Development Projects.

8 Lectures

5. **Embedded/Real-Time OS concepts**: Architecture of kernel, Task and Task Scheduler, Context Switching, Scheduling algorithms: EDF and Rate Monotonic, Interrupt Service Routine, Memory Management, Priority Inversion Problem, Priority Inheritance, Embedded Os, Handheld OS

References:

1. Automatic Control Systems: Kuo, B.C.
2. Real-time Computer Control: Linkens & Bennett
3. Real-time software for small systems: Leigh, A.W.
4. Programming embedded microprocessors: Fowler, R.J.
5. Real-time systems Design & Analysis: Laplante P.A.

Paper-3: Computer Graphics (BCA127)

8 Lectures

1. **Introduction**: Introduction to Graphic Display Devices; Video Basics; LED & LCD Display; Physical Interactive Devices; Output Devices; Data Generation devices; Graphical User Interface.

8 Lectures

2. **Raster Scan Graphics**: Line, Circle & Ellipse Generation Techniques; Scan Conversion; Frame Buffer; Filling algorithms.

8 Lectures

3. **Geometrical Transformations**: Two dimensional transformations; Clipping & Windowing methods for 2D images; Three Dimensional transformations; Parallel and Perspective Projections; Viewing Transformations and Viewing Systems.

8 Lectures

4. **Plane Curves and Surfaces**: Parametric and Non-parametric curves and their representations; Cubic Splines; Bezier and B Splines.

8 Lectures

5. **Space Curves and Surfaces**: Parametric surfaces; Surfaces of revolution; Sweep surfaces; Quadric surfaces; Bilear surfaces; B Spline and Bezier Surfaces; Generalized cylinders and cones; Polygon mesh and wire frames.

References:

1. Computer Graphics: Principles and Practice: Foley et al.
2. Computer Graphics: Hern and Baker
3. Procedural elements in Computer Graphics: David F. Rogers
4. Computer Graphics: A. Plastock and Gordon Kelley
5. Computer Graphics for IBM PC: J. Mcgregger and Alan Watt
6. Mathematical Elements for Computer Graphics: David F. Rogers and J.A.Adams

Paper-4: Secure Computing (BCA128)

8 Lectures

1. **Introduction:** History of Computer Crime; Data Communications & information security; Mathematical models of computer security, CIA Triad

8 Lectures

2. **Types of Ciphers:** Terminology; Mono-alphabetic ciphers; Poly-alphabetic substitution ciphers; Transpositions; Stream & block ciphers; Secure encryption systems; Public key encryption systems; RSA encryption; Hash algorithms; Secure secret key systems; DES algorithm.

8 Lectures

3. **System Threats:** Information warfare; Viruses & other Malicious code; Mobile code; Denial-of-service attacks; Social Engineering & low-tech attacks; Spam, Phishing & Trojans; Web based vulnerabilities; Controls against program threats.

8 Lectures

4. **System security mechanism:** Protecting the information infrastructure; Operating system security; Protecting memory & addressing; File protection mechanisms; Database security; Security in networks & distributed systems; LAN & Gateway security devices; Intrusion detection & Intrusion prevention devices; Identification & authentication.

8 Lectures

5. **E-commerce & web server safeguards:** Web monitoring & content filtering; Securing VoIP; Managing software patches & vulnerabilities; Legal & ethical issues in computer security.

References:

1. Bharat Bhaskar, Electronic Commerce: Framework Technologies and Applications, TMH
2. Ravi Kalakota & A.B. Whinston, Frontiers of Electronic Commerce, Pearson Education.
3. Ravi Kalakota & A.B. Whinston, Electronic Commerce – A Manager's Guide, Pearson Education.
4. Agarwala Kamlesh, N and Agarwala Deeksha, Business on the Net_Introduction to the E-Com., Macmillan India.
5. P. T. Joseph, E-Commerce: A Managerial Perspective, PHI, 2002.

Paper-5: Advanced Database Management System (BCA129)

8 Lectures

1. **Query Processing:** Optimization & Database Tuning; Algorithms For Executing Query Operations. Heuristics For Query Optimizations, Estimations Of Query Processing Cost, Join Strategies For Parallel Processors, Database Workloads, Tuning Decisions, DBMS Benchmarks, Clustering & Indexing, Multiple Attribute Search Keys, Query Evaluation Plans, Pipelined Evaluations, System Catalogue In RDBMS.

8 Lectures

2. **Database Models:** Extended Relational Model & Object Oriented Database System; New Data Types, User Defined Abstract Data Types, Structured Types, Object Identity, Containment, Class Hierarchy, Logic Based Data Model, Data Log, Nested Relational Model And Expert Database System.

8 Lectures

3. **Distributed Database System:** Structure Of Distributed Database, Data Fragmentation, Data Model, Query Processing, Semi Join, Parallel & Pipeline Join, Concurrency Control In Distributed Database System, Recovery In Distributed Database System, Distributed Deadlock Detection And Resolution, Commit Protocols.

8 Lectures

4. **Enhanced Data Model For Advanced Applications:** Database Operating System, Introduction To Temporal Database Concepts, Spatial And Multimedia Databases, Data Mining, Active Database System, Deductive Databases, Database Machines, Web Databases, Advanced Transaction Models, Issues In Real Time Database Design.

8 Lectures

5. **Specialized Databases:** Expert Database And Fuzzy Database System: Introduction and overview

References

1. Majumdar & Bhattacharya, "Database Management System", TMH.
2. Korth, Silbertz, Sudarshan, " Database Concepts", McGraw Hill.
3. Elmasri, Navathe, "Fundamentals Of Database Systems", Addison Wesley.
4. Data C J," An Introduction To Database System", Addison Wesley.
5. Ramakrishnan, Gehrke, "Database Management System", McGraw Hill.
6. Bernstein, Hadzilacous, Goodman, " Concurrency Control & Recovery", Addison Wesley.
7. Ceri & Palgatti, "Distributed Databases", McGraw Hill.

SEMESTER-VI:

Paper -1: Image Processing (BCA130)

8 Lectures

1. **Introduction:** Image representation and modeling, 2-D linear system, Luminance, Contrast and Brightness, Color representation, Visibility functions, Monochrome and color vision model.

8 Lectures

2. **Image Quantization and Image Transforms:** Sampling theorem, Anti-aliasing, image quantization, Orthogonal and unitary transforms, DFT, Cosine transform, Hadamard transform, Haar transform, KL transform.

8 Lectures

3. **Image Enhancement:** Point operation, Histogram modeling, Filtering and spatial operations, Transform operations, Multi-spectral Image Enhancement

8 Lectures

4. **Image Restoration:** Image formation models, Noise models, Inverse and Wiener filtering, Least square filters,Recursive filters, Maximum entropy method, Blind de-convolution, Bayesian method of noise removal, Image reconstruction,

8 Lectures

5. **Data Compression:** Data compression vs. Bandwidth, Pixel coding, Predictive coding, Transform coding, Coding of two-tone images.

References:

1. Fundamentals of Digital Image Processing: Anil K. Jain
2. Digital Image Processing: R. Chellappa
3. Image Processing for Scientific Applications: Bernd Jahne
4. Digital Image Processing: R.C. Gonzalez & R.E. Woods
5. The Image Processing Handbook: J.C. Russ
6. Digital Image Processing: W.K. Pratt
7. Digital Image Restoration: Andrews & Hunt

Paper-2: Multimedia Systems (BCA131)

8 Lectures

1. **Multimedia Technology:** Meaning & scope of Multimedia; Elements of Multimedia; Creating multimedia applications; Multimedia file & I/O functions; Multimedia data structures; Multimedia file formats; Multimedia Protocols

8 Lectures

2. **Multimedia Audio:** Digital sound; True Speech; Special effects and Digital Signal Processing; Audio synthesis; FM synthesis; Sound blaster card; Special effect processors on sound cards; Wave table synthesis; MIDI functions; Speech synthesis & Recognition

8 Lectures

3. **Multimedia Video:** Representation of Digital video; Video capture; Frame grabbing; Full motion video; Live video in a window; Video processor; Playback acceleration methods; Video Conferencing

8 Lectures

4. **Audio Video Compression:** Audio compression & decompression; Companding; ADPCM compression; MPEG audio compression; Video compression & decompression; Standards for video compression & decompression.

8 Lectures

5. **Multimedia Authoring Tools:** Project editor; Topic editor; Hot-spot editor; Developing a multimedia title; Multimedia text authoring systems; Usage of authoring tools

References:

1. Multimedia: Computing, Communications & Applications – Nahrstedt & Steinmetz
2. Computer Speech Processing – Fallside F.
3. Speech Analysis, Synthesis & Perception – Flanagan,J.L.
4. Hypertext & Hypermedia- Nielsen J.