



BCA Syllabus as per Grading and Credit System according National Education Policy - 2020

National Education Policy-2020
Common Minimum Syllabus for University and Colleges

BACHELOR OF COMPUTER APPLICATION

BCA

(Session 2020-2021 Onwards)

As per Syllabus Development Guidelines

[Three Years Degree Course in Computer Application]

(Restructured and Approved by BoS on 26.10.2021)



**PROF. RAJENDRA SINGH (RAJJU BHAIYA) UNIVERSITY,
MIRZAPUR ROAD, NAINI, PRAYAGRAJ-211010**

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PROF. RAJENDRA SINGH (RAJU BHAIYA) UNIVERSITY, PRAYAGRAJ

Semester wise titles of Courses/Papers of BCA as per NEP 2020 (Credits and Grading System)

Semester	Courses/ Papers	Courses Code	COURSE TITLE	Theory/ Practical	Credits	Evaluation (MM-100)	
						CIE	ETE
BCA-I Sem	I	B230101T	MATHEMATICS	T	4	25	75
	II	B230102T	COMPUTER FUNDAMENTALS	T	4	25	75
	III	B230103T	PROGRAMMING IN C	T	4	25	75
	IV	B230104T	BASIC ELECTRONICS	T	4	25	75
	V	B230105T	COMMUNICATION SKILLS	T	4	25	75
	VI	B230106P	C Programming Lab. Basic Electronics Lab. Communication Skill Lab.	P	5	25	75
BCA-II Sem	I	B230201T	Statistics	T	4	25	75
	II	B230202T	Data and File Structure	T	4	25	75
	III	B230203T	Business System	T	4	25	75
	IV	B230204T	Digital Electronics	T	4	25	75
	V	B230205T	Object Oriented Methodology using C++	T	4	25	75
	VI	B230206P	Data Structure Lab. C++ Programming Lab. Digital Electronics Lab.	P	5	25	75
BCA-III Sem	I	B230301T	DISCRETE MATHEMATICS	T	4	25	75
	II	B230302T	DESIGN ANALYSIS OF ALGORITHMS	T	4	25	75
	III	B230303T	JAVA PROGRAMMING	T	4	25	75
	IV	B230304T	COMPUTER ORGANIZATION	T	4	25	75
	V	B230305T	DATA BASE MANAGEMENT SYSTEM	T	4	25	75
	VI	B230306P	JAVA PROGRAMMING LAB. DATA BASE MANAGEMENT SYSTEM LAB.	P	5	25	75
BCA-IV Sem	I	B230401T	NUMERICAL METHODS	T	4	25	75
	II	B230402T	OPERATING SYSTEM	T	4	25	75
	III	B230403T	DOT NET AND C# PROGRAMMING	T	4	25	75
	IV	B230404T	CYBER LAW AND INTERNET SECURITY	T	4	25	75
	V	B230405T	SOFTWARE ENGINEERING	T	4	25	75
	VI	B230406P	DOT NET AND C# PROGRAMMING LAB. NUMERICAL METHODS PROGRAMMING LAB.	P	5	25	75
BCA-V Sem	I	B230501T	COMPUTER GRAPHICS	T	4	25	75
	II	B230502T	MULTIMEDIA SYSTEMS	T	4	25	75
	III	B230503T	DATA COMMUNICATION AND NETWORKS	T	4	25	75
	IV	B230504T	INTERNET AND WEB DESIGN	T	4	25	75
	V	B230505P	COMPUTER GRAPHICS LAB. WEB PROGRAMMING LAB.	P	4	25	75
	VI	B230506R	MINOR PROJECT	R	5	25	75

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BCA-VI Sem	ELECTIVE (Choose Any Two Papers)	I	B230601T	E- COMMERCE AND APPLICATION	T	4	25	75
		II	B230602T	ADVANCED DATA BASE MANAGEMENT SYSTEM	T	4	25	75
		III	B230603T	ADVANCED COMPUTER ARCHITECTURE	T	4	25	75
		IV	B230604T	NETWORK MANAGEMENT AND SECURITY	T	4	25	75
		V	B230605T	OPTIMIZATION TECHNIQUES	T	4	25	75
		VI	B230606T	IMAGE PROCESSING	T	4	25	75
	VII		B230607R	MAJOR PROJECT	R	16	25	75

Note: Continuous Internal Evaluation (CIE) will be three time as Test-I, Test-II and Test-III as per schedule decided by University and Best of Two test marks will be included in final marks. Each test will be of 12.50 marks.

There is:

CIE: Continuous Internal Evaluation

ETE: End-Term Examination (University Examination)

SEMESTER - I

BCA COURSE STRUCTURE & SYLLABUS

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Mathematics

Trigonometry and Complex Numbers:

Trigonometry: Trigonometry Functions, Functions of angles of any magnitude, Compound and multiple angles, Inverse circular functions. Complex Numbers: Modules, Argument of complex number, Polar form, vector form, Complex conjugate, Algebraic operations, De-Moivre's theorem, Roots of a complex number.

Matrices and Determinants:

Definition of different types of matrix, Algebraic operations, Symmetric & skew symmetric matrix, Transpose of matrix, Orthogonal matrices, Rank of matrix, Determinant of a square matrix, Inverse of a square matrix, Solution of Linear Equations by Cramer's Rule and Gauss-Elimination method, Eigen values & Eigen vectors of a square matrix.

Differential Calculus:

Limit, Continuity and differentiability of functions, Differentiation Rules, Differentiation of functions (Algebraic, Trigonometric, Logarithmic, Exponential and Inverse trigonometric functions), Tangent and normal lines, Condition of tangency, Extreme values of functions.

Integral Calculus:

Indefinite integrals, Basic formulae, Integration by parts, Integration by substitution, Definite integrals, Properties of definite integrals, Evaluation of double integration & triple integration, Application of definite integral to find Area and Volume.

Vector Calculus:

Vectors in a plane, Linear dependence and independence of vectors, Vectors in space, Dot and cross-product of vectors, Gradient of vectors, Divergence of vectors, Curl of vectors, Physical interpretation of gradient, Divergence and curl of vectors.

References:

1. Advanced Engineering Mathematics- Erwin Kreyszig
2. Calculus: Volume I- Aposto
3. Elementary Engineering Mathematics, B S Grewal
4. Higher Engineering Mathematics, B S Grewal

Computer Fundamentals

Introduction:

Characteristics of Computers, Block diagram of computer. Types of computers and features, Mini Computers, Micro Computers, Mainframe Computers, Super Computers. Types of Programming Languages (Machine Languages, Assembly Languages, High Level Languages). Data Organization, Drives, Files, Directories. Types of Memory (Primary And Secondary) RAM, ROM, PROM, EPROM. Secondary Storage Devices (FD, CD, HD, Pen drive) I/O Devices (Scanners, Plotters, LCD, Plasma Display). Number Systems Introduction to Binary, Octal, Hexadecimal system Conversion, Simple Addition, Subtraction, Multiplication.

Algorithm and Flowcharts Algorithm:

Definition, Characteristics, Advantages and disadvantages, Examples Flowchart: Definition, Define symbols of flowchart, Advantages and disadvantages, Examples.

Operating System and Services in O.S.:

Dos – History, Files and Directories, Internal and External Commands, Batch Files, Types of O.S. Windows Operating Environment Features of MS – Windows, Control Panel, Taskbar, Desktop, Windows Application, Icons, Windows Accessories, Notepad, Paintbrush.

Editors and Word Processors:

Basic Concepts, Examples: MS-Word, Introduction to desktop publishing Spreadsheets and Database packages Purpose, usage, command, MS-Excel, Creation of files in MS-Access, Switching between application, MS-PowerPoint.

Reference:

1. Fundamental of Computers – By V.Rajaraman B.P.B. Publications
2. Fundamental of Computers – By P.K. Sinha
- 3 MS-Office 2000(For Windows) – By Steve Sagman

Programming in C

Introduction:

History, Structures of 'C' Programming, Function as building blocks. Language Fundamentals Character set, C Tokens, Keywords, Identifiers, Variables, Constant, Data Types, Comments.

Operators:

Types of operators, Precedence and Associativity, Expression, Statement and types of statements Build in Operators and function Console based I/O and related built in I/O function: printf(), scanf(), getch(), getchar(), putchar(); Concept of header files, Preprocessor directives: #include, #define.

Control structures

Decision making structures: If, If-else, Nested If-else, Switch; Loop Control structures: While, DOWHILE, for, Nested for loop; Other statements: break, continue, goto, exit.

Simple Arithmetic Problems

Addition / Multiplication of integers, Determining if a number is +ve / -ve / even / odd, Maximum of 2 numbers, 3 numbers, Sum of first n numbers, given n numbers, Integer division, Digit reversing, Table generation for n , Factorial, sine series, cosine series, Pascal Triangle, Prime number, Factors of a number, Other problems such as Perfect number, GCD numbers, Swapping, etc.

Functions: Basic types of function, Declaration and definition, Function call, Types of function, Parameter passing, Call by value, Call by reference, Scope of variable, Storage classes, Recursion.

References:

1. Programming in C-Balguruswamy
2. The C programming Lang., Pearson Ed - Dennis Ritchie
3. Structured programming approach using C- Forouzah & Ceilber Thomson learning publication

Basic Electronics

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, Drift 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, Thermistor.

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.

Transistor biasing

Biasing circuits for CB and CE configurations, Leakage currents in CB & CE and its 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.

Field Effect Transistors

Basic configuration of JFET, Biasing, Principle of operation and basic characteristics, Basics of MOSFET.

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

Communication Skills

Introduction to Communication:

Means of Communication: Meaning and Definition – Process – Functions – Objectives – Importance – Essentials of good communication – Communication barriers, 7C's of Communication.

Types of Communication:

Oral Communication: Meaning, nature and scope – Principle of effective oral communication – Techniques of effective speech – Media of oral communication (Face-to-face conversation – Teleconferences – Press Conference – Demonstration – Radio Recording – Dictaphone – Meetings – Rumour – Demonstration and Dramatisation – Public address system – Grapevine – Group Discussion – Oral report – Closed circuit TV). The art of listening – Principles of good listening.

Written Communication: Purpose of writing, Clarity in Writing, Principle of Effective writing, Writing Techniques, Electronic Writing Process. Business Letters & Reports: Need and functions of business letters – Planning & layout of business letter – Kinds of business letters – Essentials of effective correspondence, Purpose, Kind and Objective of Reports, Writing Reports. Drafting of business letters: Enquiries and replies – Placing and fulfilling orders – Complaints and follow-up Sales letters – Circular letters Application for employment and resume.

Information Technology for Communication:

Word Processor – Telex – Facsimile(Fax) – E-mail – Voice mail – Internet – Multimedia – Teleconferencing – Mobile Phone Conversation – Video Conferencing –SMS – Telephone Answering Machine – Advantages and limitations of these types. Topics Prescribed for workshop/skill lab Group Discussion, Mock Interview, Decision Making in a Group

References:

1. Essentials of Business Communication, Rajendra Pal & J S Korlahalli
2. Business Communication, Gyan
3. Developing Communication Skills, Krishna Mohan and Meera Banerji
4. Business Correspondence and Report Writing, R C Sharma and Krishna Mohan
5. Communication Skill, R Datta Roy and K K Dhir



SEMESTER - II

BCA COURSE STRUCTURE & SYLLABUS

Semester	Courses/ Papers	Courses Code	COURSE TITLE	Theory/ Practical	Credits	Evaluation (MM-100)	
BCA-II Sem	I	B230201T	Statistics	T	4	25	75
	II	B230202T	Data and File Structure	T	4	25	75
	III	B230203T	Business System	T	4	25	75
	IV	B230204T	Digital Electronics	T	4	25	75
	V	B230205T	Object Oriented Methodology using C++	T	4	25	75
	VI	B230206P	Data Structure Lab. C++ Programming Lab. Digital Electronics Lab.	P	5	25	75

Statistics

Population, Sample and Data Condensation:

Definition and scope of statistics, concept of population and sample with Illustration, Raw data, attributes and variables, classification, frequency distribution, Cumulative frequency distribution.

Measures of Central Tendency:

Concept of central Tendency, requirements of good measures of central tendency, Arithmetic mean, Median, Mode, Harmonic Mean, Geometric mean for grouped and ungrouped data.

Measures of Dispersion:

Concept of dispersion, Absolute and relative measure of dispersion, range variance, Standard deviation, Coefficient of variation. Permutations and Combinations

Sample space, Events and Probability:

Experiments and random experiments, Ideas of deterministic and non-deterministic experiments; Definition of sample space, discrete sample space, events; Types of events, Union and intersections of two or more events, mutually exclusive events, Complementary event, Exhaustive event; Simple examples. Classical definition of probability, Definition of conditional probability, Definition of independence of two events, simple numerical problems

References:

1. S.C.Gupta - Fundamentals of statistics - Sultan chand & sons , Delhi.
2. D.N.Elhance - Fundamentals of statistics - Kitab Mahal, Allahabad.
3. Montgomery D.C. – Statistical Quality Control - John Welly and Sons
4. Goon, Gupta And Dasgupta - Fundamentals of statistics - The world press private ltd Kolkata

Data and File Structure

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:

Representation of single and multidimensional arrays; Sprase arrays – lower and upper triangular matrices and Tridiagonal matrices with Vector Representation

Stacks, Queues and Linked list:

Introduction and primitive operations on stack; Stack application; Infix, postfix, prefix expressions; Evaluation of postfix expression; Conversion between prefix, infix and postfix, introduction and primitive operation on queues, D- queues and priority queues.

Linked List: Introduction, Singly linked lists, list heads, circular linked list, doubly liked lists, operations on linked list such as traversal, insertion, deletion, searching, Applications of Linked list.

Trees and Graph:

Tree: Introduction and terminology; Traversal of binary trees; Recursive algorithms for tree operations such as traversal, insertion, deletion; Binary Search Tree, AVL tree.

Graphs: Definition, terminologies and properties, Graph representations, Minimum spanning trees , Depth-first search , Breadth-first search.

Sorting, Searching and Hashing:

Internal and External Sorting algorithms, Heap sort, Merge sort, Quick-sort, General radix sort, Sequential search and Binary search.

Hashing: Hash functions, collision resolution techniques.

References:

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

Business System

Introduction to Business Data Processing

Overview of Business systems; Management Functions, Levels of Management; Sources of Information, Applications like Payroll, Accounting, Inventory, MIS, DSS.

Business Applications

Design Analysis & Development of Computerized Financial Accounting, Payroll, and Inventory Control etc.

Introduction to fundamental design activities

Information & Information Systems; Types of knowledge; 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

DFDs, 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
4. Introduction to FoxPro by R. K. Taxali

Digital Electronics

Number System and Logic Gates:

Introduction to number systems, Radix, Radix Interconversions, Radix Complement, Diminished radix complement. Basic theorem of Boolean algebra. Boolean function and minimization, Karnaugh map, combinational circuits and their analysis. Universal Gates, Realization of Primary gates using Universal gates only.

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.

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.

Digital Integrated Circuits:

Characteristics of digital ICs. Introduction to logic families- RTL, DTL, TTL, ECL, MOS and CMOS circuits and comparison.

References:

1. Digital Design: M.Morris Mano (PHI)
2. Digital circuits & logic design: S.C.Lee (PHI)
4. Digital electronics: W.H.Gothmann (PHI)
5. Switching theory: A.K Gautam (Katsons)

Object Oriented Methodology using C++

Introduction:

Introducing Object – Oriented Approach, Relating to other paradigms {Functional, Data decomposition}. Basic terms and ideas Abstraction, Encapsulation, Inheritance, Polymorphism, Review of C, Difference between C and C++ - cin, cout, new, delete, operators.

Classes and Objects:

Encapsulation, information hiding, abstract data types, Object & classes, attributes, methods, C++ class declaration, State identity and behaviour of an object, Constructors and destructors, instantiation of objects, Default parameter value, object types, C++ garbage collection, dynamic memory allocation, Metaclass / abstract classes.

Inheritance and Polymorphism:

Inheritance, Class hierarchy, derivation – public, private & protected, Aggregation, composition vs classification hierarchies, Polymorphism, Categorization of polymorphism techniques, Method polymorphism, Polymorphism by parameter, Operator overloading, Parameteric Polymorphism. Generic function Template function, function name overloading, Overriding inheritance methods, Run time polymorphism, Multiple Inheritance.

Files and Exception Handling

Streams and files, Namespaces, Exception handling, Generic Classes

References:

1. Object-Oriented Modeling and Design- Rumbaugh et al.
2. Object Oriented Design- Booch
3. Object Oriented Programming in C++ - Lafore

SEMESTER - III

BCA COURSE STRUCTURE & SYLLABUS

Semester	Courses/ Papers	Courses Code	COURSE TITLE	Theory/ Practical	Credits	Evaluation (MM-100)	
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	II	B230302T	DESIGN ANALYSIS OF ALGORITHMS	T	4	25	75
	III	B230303T	JAVA PROGRAMMING	T	4	25	75
	IV	B230304T	COMPUTER ORGANIZATION	T	4	25	75
	V	B230305T	DATA BASE MANAGEMENT SYSTEM	T	4	25	75
	VI	B230306P	JAVA PROGRAMMING LAB. DATA BASE MANAGEMENT SYSTEM LAB.	P	5	25	75

Discrete Mathematics

Mathematical 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,

Predicates, statement functions, Quantification, Interpretation of predicate formulas, Inference theory for predicate calculus, Informal & formal proofs

Set Theory:

Relations Relation matrix, Transitive closures, Partitions and equivalence relations, Characteristic functions of a set, Principle of inclusion and exclusion, its applications

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

References:

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

Design and Analysis of Algorithms

Algorithm Analysis Techniques:

Recurrences: substitution, iteration and master methods.

Divide-and-conquer: general approach, binary search, matrix multiplication.

Greedy algorithms: general approach, activity selection, knapsack problem, minimum-spanning tree, Diskstra's algorithm, Huffman code

Dynamic Programming

General approach, matrix-chain multiplication, all-pairs shortest paths, binary search tree, traveling salesperson, 0/1 knapsack problem

Backtracking

N-queen problem, sum of subsets, knapsack problem, generation of all cliques, traveling salesperson problem, Graph coloring.

Lower Bound Theory

Decision tree; Reduction method; Amortized analysis; NP-completeness; Approximation algorithms

References:

1. Fundamental of Computer algorithms – Horowitz and Sahni
2. Design Methods and Analysis of Algorithms – S.K. Basu
3. The Design and Analysis of Computer Algorithms – Aho, Hopcraft and Ullaman

Java Programming

Basics:

Comparison of C++ and JAVA, JAVA and Internet, JAVA support systems, JAVA environment, JAVA program structure, Tokens, Statements, JVM, Constant and Variables, Data Types, Declaration of variables, Scope of variables, Symbolic constants, Type Casting Operators: Arithmetic, Relational, Logical assignments. Increment and Decrement, Conditional, Bitwise, Special, Expressions and its evaluation.

Classes and Inheritance:

Defining a Class, Adding variables and Methods to classes, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods Inheritance: Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalize Methods, Abstract Methods and Classes, Visibility Control.

Array, Interface and Exception Handling:

Arrays: One Dimensional and Two Dimensional, Strings, Vectors, Wrapper Classes. Interface: Defining Interface, Extending Interface, Implementing Interface, Accessing Interface Variable. Exception Handling: Concepts of Exceptions, Types of Exception, Try and Catch keyword, Nested Try and Catch.

Thread Concepts and Applet:

Threads: Creating Threads, Extending Threads Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization. Package: System Packages, Using System Package, Adding a Class to a Package, Hiding Classes.

Applets: Local and Remote Applets, Writing Applets, Applets life cycle, Creating an executable Applet, Designing a Web Page, Applet Tag, Adding Applet to HTML File, Running the Applet, Passing parameters to Applets, Aligning the display, HTML Tags and Applets, Getting input from the user.

References:

1. E. Balagurusamy, "Programming in Java", TMH Publications.
2. Peter Norton, "Peter Norton Guide to Java Programming", Techmedia Publications.
3. Naughton, Schildt, "The Complete Reference JAVA 2", TMH.
4. Dustin R. Callway, "Inside Servlets", Addison Wesley.

Computer Organization

Basic building blocks of digital computer- Essential & non-essential components; Types of storage elements- Static memory, Dynamic Memory, EDORAM, SDRAM, NVRAM, DDRAM etc.

Basic model of stored program computer, Organization of CPU. Instruction sets: Reduced, Complex. Addressing schemes, Instruction execution mechanism.

Memory organization: RAM, ROM, Memory hierarchy, Cache memory & its organization. Concept of virtual memory

I/O devices with special reference to modern peripheral devices, Data transfer schemes: Hand shaking, Polling, DMA.

Microprocessor: Basics, block diagrams, components of a microprocessor. Architecture , Instruction set, addressing modes of 8085. Simple assembly language programming.

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)

Data Base Management System

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, 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.

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

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.

Transaction Handling

Transaction recovery, System recovery, two phase commit, concurrency problems, locking, deadlocks, security, discretionary and mandatory access control, data encryption

Distributed databases

Overview of query processing, concurrency control and recovery in distributed databases, overview of client/server architecture and its relationship with distributed databases, performance benchmark and performance tuning of databases.

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

SEMESTER - IV

BCA COURSE STRUCTURE & SYLLABUS

Semester	Courses/ Papers	Courses Code	COURSE TITLE	Theory/ Practical	Credits	Evaluation (MM-100)	
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	IV	B230404T	CYBER LAW AND INTERNET SECURITY	T	4	25	75
	V	B230405T	SOFTWARE ENGINEERING	T	4	25	75
	VI	B230406P	DOT NET AND C# PROGRAMMING LAB. NUMERICAL METHODS PROGRAMMING LAB.	P	5	25	75

Numerical Methods

Floating point representation of numbers, Errors in numerical computations, sources of errors, significant digits.

Roots of Non-linear Algebraic and Transcendental Functions, Bisection, regula-falsi, secant and Newton-Raphson Methods; fixed points iteration, Rate of convergence.

Numerical solution of system of linear equation, Gauss elimination method, ill-conditioned systems, Gauss-seidel and Jacobi methods, Rate of convergence.

Polynomials interpolation: Finite differences, Newton's forward and backward differences interpolation polynomials, Lagrange's interpolation polynomial.

Numerical differentiation and integration, Formulae for derivatives in the case of equally spaced points, Trapezoidal and Simpson rules, Errors in integration formulae

Single-step and multistep methods for solving ordinary differential equations: Taylor series method, Euler's method, Modified Euler's method, Runge-kutta methods,

References:

1. Numerical Methods for Science and Engg.-Ralph G. Stanton Prentice-Hall of India
2. Elementary Numerical Analysis An algorithmic approach. S.D Conte and Carl de Boor

Operating System

Introduction:

Definition and types of Operating systems, Batch Systems, Multiprogramming, TimeSharing, Parallel, Distributed and Real-Time Systems, Operating System Structure, Operating System Components and Services, System Calls, System Programs, Virtual Machines.

Process Management:

Process Concept, Process Scheduling, Cooperating Processes, Threads, Interprocess Communication, CPU Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling and Algorithm evaluation.

Process Synchronization And Deadlocks:

The Critical-Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors, Deadlocks-System Model, Characterization, Deadlock Prevention, Avoidance and Detection, Recovery from Deadlock, Combined approach to Deadlock Handling.

Memory Management:

Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with Paging, Virtual Memory, Demand Paging and its performance, Page Replacement Algorithms, Allocation of Frames, Thrashing, Page Size and other considerations, Demand Segmentation.

File Management and Security:

File Systems, Secondary Storage Structure, File concept, Access methods, Directory implementation, Efficiency and performance, Recovery.

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

Dot Net and C# Programming

The .Net Framework

Introduction, DLL Hell, CLR, CTS, MSIL

Basic C#

Introduction , Data Types , Identifiers , Arrays , Error Handling

Win Forms Programming

Introduction , Window Controls ~ TextBox , Radio , CheckBox , Combo , PictureBox , Menu , Tab , Progress Bar , ListView , Report Viewer

OOPS in .Net

Base Class Library , Namespace and its importance , System Namespace & Other Important Namespaces , Class / Object , Inheritance , Polymorphism , Abstract Class , Interfaces , Events & Delegates

Process and Threads

Threads , Creation/Stopping Of Threads , Thread Pool Concept , Monitoring a thread , Synchronizing Multiple Threads

Assemblies & their Importance

Assemblies , Private Assembly , Signing an Assembly , Shared Assemblies, Reflection

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

Cyber Law and Internet Security

Internet Security:

Security Issues on Web, Importance of Firewall, Components of Firewall, Transaction Security, Emerging Client Server, Security Threats, Network Security, Factors to Consider In Firewall Design. Limitation of Firewalls.

Encryption:

Encryption Techniques. Symmetric Encryption- Keys and Data Encryption Standard, Asymmetric Encryption- Secret Key Encryption. Public and Private Pair Key Encryption, Digital Signatures and its requirement.

Fundamentals of Cyber Law:

Jurisprudence of Cyber Law, Object and Scope of the IT Act, Introduction to Indian Cyber Law, Indian Perspective, Overview of Intellectual property related legislation in India, Patent, Copy Right, Trademark law.

Investigation and Ethics:

Cyber Crime, Cyber Jurisdiction, Cyber Crime and Evidence Act, Ethical Issues in Data and Software Privacy, Plagiarism, Software Piracy, Viruses, Trojan horse, Malicious Code & Logic Bombs, Introduction to Biometric Security and its Challenges.

References:

1. Harish Chander "Cyber Law and IT Protection", PHI Publication
2. Merkov, Breithaupt, "Information Security", Pearson Education
3. Farooq Ahmad, "Cyber Law in India", Pioneer books.
4. K. K. Singh, Akansha Singh "Information Security and Cyber law", Umesh Publication.

Software Engineering

Evolution & Scope of Software Engineering

Introduction to Software Engineering: Software development process, Life Cycle models – Waterfall, Spiral, Evolutionary, Prototype

Software Production Process

Process Models - ; Methodologies; Standards

Software Project Management

4 Ps; Project Planning; Cost estimation – Loc, Function point, COCOMO; Work estimation; Resource estimation; Risk Analysis, Project Scheduling; Quality Plans; Project control

Software Testing

Black box vs White Box; Testing in the large vs Testing in the small; System Testing; Debugging; Validation vs Verification

Software Design

Abstraction; Modularity; Cohesion; Coupling

Software Quality Assurance

Quality Models; Software Quality Assurance Activities, Software configuration management; Software Reliability; Introduction to SEI-CMM

Software Maintenance

Maintenance concepts and tasks; Side effects; Reverse Engineering; Re-engineering

References:

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

SEMESTER - V

BCA COURSE STRUCTURE & SYLLABUS

Semester	Courses/ Papers	Courses Code	COURSE TITLE	Theory/ Practical	Credits	Evaluation (MM-100)	
BCA-V Sem	I	B230501T	COMPUTER GRAPHICS	T	4	25	75
	II	B230502T	MULTIMEDIA SYSTEMS	T	4	25	75
	III	B230503T	DATA COMMUNICATION AND NETWORKS	T	4	25	75
	IV	B230504T	INTERNET AND WEB DESIGN	T	4	25	75
	V	B230505P	COMPUTER GRAPHICS LAB. WEB PROGRAMMING LAB.	P	4	25	75
	VI	B230506R	MINOR PROJECT	R	5	25	75

Computer Graphics

Introduction:

The Advantages of Interactive Graphics, Representative Uses of Computer Graphics, Classification of Hardware and software for Computer Graphics, Conceptual Framework for Interactive Graphics, Overview, Scan: Converting Lines, Converting Circles, Converting Ellipses

Display Technologies:

Raster-Scan Display System, Video Controller, Random-Scan Display Processor, Input Devices for Operator Interaction, Image Scanners, Working Exposure on Graphics Tools like Dream Weaver, 3D Effects. Clipping: Sutherland- Cohen Algorithm, Cyrus-Beck Algorithm, Midpoint Subdivision Algorithm.

Geometrical Transformation:

2-D Transformation, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Composition of 2D Transformations, Window-toViewport Transformations.

Curves and Surfaces

Parametric and non-parametric curves and their representations, Cubic splines, Bezier and B-splines, Parametric surfaces, Surfaces of revolution, Sweep surfaces, Quadric surfaces, Bilinear surfaces, B-spline and Bezier surfaces, Generalized cylinders and cones, Polygon mesh and wire-frames.

References:

1. Computer Graphics: Hern and Baker
2. Procedural elements in Computer Graphics: David F. Rogers
3. Mathematical Elements for Computer Graphics: David F. Rogers and J.A.Adams

Multimedia

Introduction:

Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work, Convergence of Computer, Communication and Entertainment products.

Stages of Multimedia Projects:

Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, Tools for object generations, Video, Sound, Image capturing, Authoring tools, Card and page based authoring tools.

Multimedia Building Blocks:

Text, Sound MIDI, Digital Audio, Audio file formats, MIDI under windows environment, Audio & Video Capture.

Data Compression:

Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding, Higher Order Modeling, Finite Context Modeling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio, Loss less & Lossy compression.

Speech Compression & Synthesis:

Digital Audio concepts, Sampling Variables, Loss less compression of sound, Loss compression & silence compression

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. Hypertext & Hypermedia- Nielsen J.

Data and Communication Networks

Basic Concepts:

Components of data communication, distributed processing, standards and organizations. Line configuration, topology, Transmission mode, and categories of networks. OSI and TCP/IP Models. Layers and their functions, comparison of models. Digital Transmission: Interfaces and Modems: DTE-DCE Interface, Modems, Cable modems.

Transmission Media:

Guided and unguided, Attenuation, distortion, noise, throughput, propagation speed and time, wavelength, Shannon capacity, comparison of media.

Telephony:

Multiplexing, error detection and correction: Many to one, One to many, WDM, TDM, FDM, Circuit switching, packet switching and message switching. Data link control protocols: Line discipline, flow control, error control, synchronous and asynchronous protocols, character and bit oriented protocols, Link access procedures. Point to point controls: Transmission states, PPP layers, LCP, Authentication, NCP. ISDN: Services, Historical outline, subscriber's access, ISDN Layers and broadcast ISDN.

Devices:

Repeaters, bridges, gateways, routers, The Network Layer; Design issues, Routing algorithms, Congestion control Algorithms, Quality of service, Internetworking, Network-Layer in the internet. Transport and upper layers in OSI Model: Transport layer functions, connection management, functions of session layers, presentation layer and application layer.

References:

1. Computer Networks : Tanenbaum, A.S
2. Data Communication and Networking : Forouzan, B.A

Internet and Web Programming

Internet and WWW:

What is Internet?, Introduction to internet and its applications, E- mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, internet address World Wide Web (WWW) : World Wide Web and its evolution, uniform resource locator (URL). browsers - internet explorer, netscape navigator, opera, firefox, chrome, mozilla. Search engine, web saver - apache, IIS, proxy server, HTTP protocol.

Web Programming:

Programming in Java: Core Java: Introduction, Operator, Data type, Variable, Arrays, Control Statements, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread

programming, I/O, Java Applet, String handling, Networking, Event handling, Introduction to AWT, AWT controls, Layout managers, Menus, Images, Graphics.

Communication Issues, the Client, Multi-departmental & Large scale Websites, Quality Assurance and testing, Technological advances and Impact on Web Teams.

HTML:

Formatting Tags, Links, List, Tables, Frames, forms, Comments in HTML, DHTML.

JavaScript:

Introduction, Documents, Documents, forms, Statements, functions, objects in JavaScript, Events and Event Handling, Arrays, FORMS, Buttons, Checkboxes, Text fields and Text areas.

XML:

Introduction, Displaying an XML Document, Data Interchange with an XML document, Document type definitions, Parsers using XML, Client-side usage, Server Side usage.

Common Gateway Interface (CGI), PERL, RMI, COM/DCOM, VBScript, Active Server Pages (ASP).

References:

1. Shishir Gundavarma, "CGI Programming on the World Wide Web", O'Reilly & Associate
2. DON Box, "Essential XML", Addison Wesley.
3. Greg Buczek, "ASP Developer's Guide", TMH.

SEMESTER - VI

BCA COURSE STRUCTURE & SYLLABUS

Sem.	Courses/ Papers		Courses Code	COURSE TITLE	Theory/ Practical	Credits	Evaluation (MM-100)	
BCA-VI Sem	ELECTIVE (Choose Any Two Papers)	I	B230601T	E- COMMERCE AND APPLICATION	T	4	25	75
		II	B230602T	ADVANCED DATA BASE MANAGEMENT SYSTEM	T	4	25	75
		III	B230603T	ADVANCED COMPUTER ARCHITECTURE	T	4	25	75
		IV	B230604T	NETWROK MANAGEMENT AND SECURITY	T	4	25	75
		V	B230605T	OPTIMIZATION TECHNIQUES	T	4	25	75
		VI	B230606T	IMAGE PROCESSING	T	4	25	75
	VII		B230607R	MAJOR PROJECT	R	16	25	75

1. E-Commerce and Applications

Introduction:

The Scope of Electronic Commerce, Definition of Electronic Commerce, Electronic E-commerce and the Trade Cycle, Electronic Markets, Electronic Data Interchange, Internet Commerce, E-Commerce in Perspective Business Strategy in an Electronic Age. Supply Chains, Porter's Value Chain Model, Inter Organizational Value Chains. Competitive Strategy, Porter's Model, First Mover Advantage Sustainable Competitive Advantage, Competitive Advantage using E-Commerce, Business Strategy, Introduction to Business Strategy, Strategic Implications of IT. Technology, Business Environment, Business Capability, Exiting Business Strategy, Strategy Formulation & Implementation Planning, E-Commerce Implementation, E-Commerce Evaluation.

Business-to-Business Electronic Commerce:

Characteristics of B2B EC, Models of B2B Ec, Procurement Management Using the Buyer's Internal Marketplace, Just in Time Delivery, Other B2B Models, Auctions and Services from Traditional to Internet Based EDI. Intergration with Back-end Information System, The Role of Software Agents for B2B EC, Electronic marketing in B2B, Solutions of B2B EC, Managerial Issues, Electronic Data Interchange (EDI), EDI: The Nuts and Bolts, EDI & Business.

Internet and Extranet:

Automotive Network Exchange, The Largest Extranet, Architecture of the Internet, Intranet and Extranet, Intranet software, Applications of Intranets, Intranet Application Case Studies, Considerations in Intranet Deployment, The Extranets, The structures of Extranets, Extranet products & services, Applications of Extranets, Business Models of Extranet Applications, Managerial Issues. Electronic Payment Systems : Is SET a failure, Electronic Payments & Protocols, Security Schemes in Electronic payment systems, Electronic Credit card system on the Internet, Electronic Fund transfer and Debit cards on the Internet. Stored – value Cards and E- Cash, Electronic Check Systems. Prospect of Electronic Payment Systems, Managerial Issues.

Public Policy:

From Legal Issues to Privacy : EC- Related Legal Incidents, Legal Incidents, Ethical & Other Public Policy Issues, Protecting Privacy, Protecting Intellectual Property, Free speech, Internet Indecency & Censorship, Taxation & Encryption Policies, Other Legal Issues: Contracts, Gambling & More, Consumer & Seller Protection In EC Infrastructure For EC . It takes more than Technology, A Network Of Networks, Internet Protocols, Web- Based client/ Server, Internet Security, selling on the web, Chatting on the Web, Multimedia delivery, Analyzing Web Visits, Managerial Issues.

References:

1. E-Commerce- David Whiteley, Tata McGraw Hill
2. Electronic Commerce- Eframı Turban, Jae Lee, David King, K. Michale Chung.

2. Advanced Data Base Management System

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.

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.

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.

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. Introduction To Expert Database And Fuzzy Database System.

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.

3. Advanced Computer Architecture

CPU architecture:

Comparative study of 32-bit processors, Comparative study of Microcontrollers; Future Trends.

Parallel Processing Systems:

Flynn's Classification, Pipeline Processors, Instruction Pipelining, Internal Forwarding, Pipeline Hazards, Job Sequencing & Collision prevention, Interleaved Memory, Vector Processing, Design of Vectorizing compilers, Automatic detection of parallelism, Amdahl's law, Case studies of vector processors, Array processors. Network design issues, Mesh Network, Barrel Shifter, Cube, Hypercube, Parallel algorithms on hyper cubes, Multiprocessor system, Multiprocessor interfacing schemes, Tightly & loosely coupled systems

Other Architectures:

RISC; Comparison with CISC; Parameter passing in RISC, Comparison of commercial RISC systems; Data flow architectures; Comparison with control flow systems; Template implementation; Transputer architecture; Communication channels; Occam & programming environment.

References:

1. Computer Architecture & Parallel processing – Hwang & Briggs
2. Advanced Computer Architecture- K Hwang
3. Designing Efficient Algorithms for parallel Computers- M.J.Quinn
4. Introduction to Parallel Algorithms- Joseph JA

4. Network Management and Security

Introduction:

Attack, Services and Mechanism, Model for Internetwork Security. Cryptography: Notion of Plain Text, Encryption, Key, Cipher Text. Decryption and cryptanalysis; Public Key Encryption, digital Signatures and Authentication.

Network Security:

Authentication Application: Kerveros, X.509, Directory Authentication Service, Pretty Good Privacy, S/Mime

IP security Architecture:

Overview, Authentication header, Encapsulating Security Pay Load combining Security Associations, Key Management. Web Security: Requirement, Secure Socket Layer, Transport Layer Security, and Secure Electronic Transactions.

Network Management Security:

Overview of SNMP Architecture-SMMPV11 Communication Facility, SNMPV3. System Security: Intruders, Viruses and Related Threats, Firewall Design Principles. Comprehensive examples using available software platforms/case tools. Configuration Management

References:

1. Networks Security Essentials: Application & Standards- W. Stallings
2. Cryptography and Network Security, Principles and Practice.- W. Stallings

5. Optimization Techniques

Linear programming:

Central Problem of linear Programming various definitions included Statements of basic theorem and also their properties, simplex methods, primal and dual simplex method, transport problem, tic-tac problem, and its solution. Assignment problem and its solution. Graphical Method Formulation, Linear Programming Problem.

Queuing Theory:

Characteristics of queuing system, Classification of Queuing Model Single Channel Queuing Theory, Generalization of steady state M/M/1 queuing models(Model-I, Model-II).

Replacement Theory:

Replacement of item that deteriorates replacement of items that fail. Group replacement and individual replacement. Inventory Theory Cost involved in inventory problem- single item deterministic model economics long size model without shortage and with shorter having production rate infinite and finite.

Job Sequencing:

Introduction, solution of sequencing problem Johnson's algorithm for n jobs through 2 machines.

1. Gillet B.E. "Introduction to Operation Research"
2. Taha, H.A. "Operation Research - an introduction"
3. Kanti Swarup "Operation Research" 4. S.D.Sharma "Operation Research"

6. Image Processing

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

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

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

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, Tomography, Radan transform, Back-projection, Reconstruction algorithm, Algebraic method of reconstruction, Fan-beam reconstruction.

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.C. Gonzalez & R E. Woods
3. Digital Image Processing: W.K. Pratt