Bachelor of Computer Application(BCA)

Ordinance, Regulations & Syllabus

Under

CBCS System

(Effective from 2024-2025)

Department of Computer Science

DDU Gorakhpur University, Gorakhpur

Ordinance for Three year Bachelor of Computer Application(BCA)
(Effective from 2024-2025)

(Under Self Finance Scheme)

ORDINANCE

1. The duration for the Bachelor of Computer Application (BCA) shall be of 6 Semesters ,each of six months' duration.

2. A candidate having 10+2 from regular course is eligible for admission.

3. (a) The Examination shall be partly by means of Theory papers and partly by practical/Project Works. The BCA programme will of 120 credits.

   (b) Examination rules will be as per University norms.

4. Candidate shall be required to pay admission, Tuition and examination fees as may be laid down from time to time.

5. The mode of admission to Bachelor of Computer Application (BCA) should be through written test.

6. The total number of seats for Bachelor of Computer Application (BCA) will be 40 in number.

7. Each candidate will have to pay Rs. 50,000 per year (Rs. 25,000 per semester) as laboratory charge, tuition fees .

Department of Computer Science
D.D.U. Gorakhpur University, Gorakhpur

Year wise Structure of BCA COURSE

Year	Sem.	Course Code	Course	Theory/Practical	Credits
1	I	BCA 101N	IT Tools and Applications	Theory	4+0
	I	BCA 102N	Principles of Mathematics	Theory	4+0
	I	BCA 103N	Functional English	Theory	4+0
	I	BCA 104N	Introduction to Computer Programming in 'C'	Theory	4+0
	I	BCA 105N	Lab Work	Practical	0+4
	II	BCA 106 N	Discrete Mathematics	Theory	4+0
	II	BCA 107N	Accounting and Financial Management	Theory	4+0
	II	BCA 108N	Digital Circuit and Logic Design	Theory	4+0
	II	BCA 109N	Introductions to Object Oriented Programming & C++	Theory	4+0
	II	BCA 110N	Lab Work	Practical	0+4
2	III	BCA 201N	Operating System	Theory	4+0
	III	BCA 202N	Computer Oriented Mathematics	Theory	4+0
	III	BCA 203N	Data Structure	Theory	4+0
	III	BCA 204N	Computer Organization and Architecture	Theory	4+0
	III	BCA 205N	Lab Work	Practical	0+4
	IV	BCA 206N	Introduction to Database Management System	Theory	4+0
	IV	BCA 207N	Operation Research	Theory	4+0
	IV	BCA 208N	Computer Graphics	Theory	4+0
	IV	BCA 209N	Software Engineering	Theory	4+0
	IV	BCA 210N	Lab Work	Practical	0+4
3	V	BCA 301N	Internet and JAVA Programming	Theory	4+0
	V	BCA 302N	ORACLE and PL/SQL	Theory	4+0
	V	BCA 303N	Computer Networks	Theory	4+0
	V	BCA 304N	Software Project Management	Theory	4+0
	V	BCA 305N	Lab Work	Practical	0+4
	VI	BCA 306N	Advance Networks and Network Security	Theory	4+0
	VI	BCA 307N	Web Development Tools and Techniques	Theory	4+0
	VI	BCA 308N	Project Work	Practical	0+12

Programme outcomes (POs): Students taking admission into BCA program are expected to get Prepared with following outcomes:	
PO1	Explaining the basic scientific principles and methods.
PO2	Inculcating scientific thinking and awareness among the student.
Programme specific outcomes (PSOs)	
PSO1	To prepare students for career in computer science and its applications in professional Career
PSO2	To develop the student to cope up with the advancements in respective science and application field
PSO3	The student will determine the appropriate level of technology for use in: a) Experimental design and implementation, b) Analysis of experimental data, and
PSO4	Investigate and apply mathematical problems and solutions in a variety of contexts related to science, technology, business and industry, and illustrate the solutions using symbolic, numeric, or graphical methods

Detailed Syllabus of BCA

First Semester

BCA- 101N: IT Tools and Applications   **Credit: 4+0**

Course Outcome	• Understand about the basics of computer. • Understand basic terminologies of software. • Knowledge about working with spreadsheets. • Understand about word processing techniques. • Opportunity of employment in basics of IT and various software package handling

UNIT 1: Computer Basics: Characteristics of Computers, Input, Output, storage units, CPU, Computer system, Binary number system, Binary to Decimal Conversion, Decimal to Binary Conversion; Binary Coded Decimal(BCD) Code, ASCII Code, Applications of IT in different fields.

UNIT 2: Computer Organization: Central Processing Unit - Control Unit, Arithmetic Unit, Memory: Main Memory: -Storage Evaluation Criteria, Memory Organization, Capacity, RAM, Read only Memories. Secondary Storage Devices, Input Devices, Output Devices.

UNIT 3: Computer Softwares: Hardware and Software, System Software, Application Software, Operating system, Types and Functions of Operating system, simple DOS commands, simple file operations, Directory related commands, An overview of different versions, of Windows, basic Windows elements, file management through Window.

UNIT 4: Multimedia and Word Processing: What is Multimedia, Text, Graphics, Animation, Audio, Images, video, Multimedia Application in different fields. Word Processing concepts; saving, closing, opening an existing document, selecting text, editing text, finding and replacing text, printing documents, creating and printing merged documents, character and paragraph formatting, page design and layout.

UNIT 5:Spreadsheet and Presentation Packages: Spreadsheet concepts, creating, saving and editing a workbook, inserting, deleting worksheets, entering data in a cell / formula copying and moving data from selected cells, handling operators in formula, functions: - mathematical, logical, statistical, text, financial, date arid time functions, using function Wizard. Chart and Graphs. Creating, opening and saving presentations, working, with slides, drawing and working with objects, adding clip art and other pictures, designing slide shows, running and controlling a slide show, printing presentations.

BCA-102N: Principles of Mathematics   **Credit: 4+0**

Course Outcome	- Demonstrate competency in the areas that comprise the core of the mathematics major. - Demonstrate the ability to understand and write mathematical proofs. - Knowledge on the expansion of series will help the young mind to apply logic in solving problems.

UNIT 1: Sets and Relations: elements of a set, methods of describing a set, types of set, Venn diagram, Operations on sets, union, intersection and difference of set, Duality, partitioning of a set, relation between sets, Binary relations, Operations on relations, Equivalence relations, Composition of relations.

UNIT 2: Functions: Function or Mapping, different types of functions, Inverse functions, Composition of Functions, trigonometric .functions, Binomial theorem and principle of mathematics induction.

UNIT 3:Matrix and Determinants: Introduction to matrix, properties of matrix; evaluation of determinant, minor and cofactors and Properties of determinant, different operations on matrices.

UNIT 4: Progression : Introduction to Progression, Arithmetic Progression, Geometric Progression, Harmonic Progression, Arithmetic mean, Geometric mean, Harmonic mean.

UNIT 5: Statistics: introduction to statistics, collection, and tabulation of data, different types of charts and graphs, measure of central tendency, mean, median and mode.

BCA 103N: Functional English   **Credit: 4+0**

Course Outcome	- Express idea more effectively and correctly both in oral and written form of communication. - Competent enough in drafting and editing various types of business correspondence to deal with their professional and organizational needs.

UNIT 1: Introduction to communication: Meaning of Communication, Objectives of Communication, Essentials of Communication, Process of Communication, Barriers of Communication, Types of Communication.

UNIT 2: Basics of Phonetics: introduction to Phonetics, Phonetic Symbols, Stress Patterns, Phonetic Transcriptions.

UNIT 3: Fundamentals of Grammar: Elements of Sentence, Types of Sentences (Meaning and Structure), Kinds of Sentences (Simple, Compound and Complex), Use of Articles and Prepositions

UNIT 4: Vocabulary: Word Formation, Synonyms, Antonyms, Homophones, One Word Substitution, Idioms and Phrases, Expansion of Ideas

UNIT 5: Communication Skill: Précis Writing, Comprehension (Reading and Listening), CV Writing, Letter Writing, Notice and Advertisement Writing, Message Writing, Dialogue Writing

BCA-104N: Introduction to Computer Programming in 'C'   **Credit: 4+0**

Course Outcome	• Understand and apply the basic of C
	• To develop flow chart, algorithm of any problem
	• To write the program on a computer, edit, compile, debug, correct, recompile and run it.
	• To develop the understanding of different decision and iterative statements and loops with the help of various programs.
	• Learn to Implement functions and recursions, understand about the various types of arrays and structures and apply the concepts of pointers
	• Employment opportunity in the field of programming.

UNIT 1: Introduction to Programming: The Basic Model of Computation, Algorithms, Flow-charts, Programming Languages, Compilation, Linking and Loading, Testing and Debugging, documentation. Character set, Variables, and Identifiers, Built-in Data Types, Variable Definition. Arithmetic operators and Expressions, Constants and .Literals. Simple Assignment statement Basic input/output statement, Simple 'C' programs.

UNIT 2: Conditional Statements and Loops: Decision making within a program, Conditions, Relational Operators. If- statements. If-else statement, Switch case Statement. **Loops:** while loop, do- while, for loop, Nested loops, Infinite loops, unconditional branching with goto statement, Structured Programming.

UNIT 3: Arrays and Functions: One dimensional arrays: -Array manipulation; Insertion. Deletion of an element from an array; Finding the largest/smallest element in an array; two dimensional arrays, Addition Multiplication of two matrices. Transpose of a square matrix; Null terminated strings as array of characters. Modular programming and functions. Standard Library of C functions, Prototype of a function: formal parameter list; Return Type, Function call, Block Structure, Passing arguments to a Function: call by reference. call by value, Recursive Functions, Arrays as function arguments.

UNIT 4:**Structures, Unions and Pointers:** Structure variables, initialization, structure assignment, nested structure structures and functions, structures and arrays: arrays of structures, structures containing arrays. Unions. Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays.

UNIT 5: File Processing: Concept of files, File opening in various modes and closing of a file, Reading from a file, writing onto a file, Dynamic Accessing of file.

BCA 105N : Lab Work: Programming in C Language and IT tools   **Credit: 0+4**

Course Outcome	• Creating simple programs in C
	• Hands on practice of various software packages.
	• Develop applications using file handling.

Familiarizing with PC and WINDOWS commands file creation, editing and directory creation. DOS commands. Learning, to use MS Office: MS WORD, MS EXCEL & MS PowerPoint.

Write program in 'C' language

1. Using input and output statements.
2. Using control statements.
3. Using functions.
4. Using arrays.
5. Using structure.
6. Using files.
7. To generate the Fibonacci series.
8. To generate prime numbers.
9. To sort an array using different methods.
10. To search an element from array.

Note: Program should be fully documented with simple I/0 data. Flow charts should be developed wherever necessary.

Second Semester

BCA 106N: Discrete Mathematics   **Credit: 4+0**

Course Outcome	• To develop an understanding of the basic concepts in discrete mathematical concepts and creating a deeper understanding and knowledge among students.
	• Recognize the context in which a computer system may function, including its interactions with people and the physical world.
	• Understand sets, perform operations and algebra on sets, describe sequences and summations.

UNIT 1: Set theory. Relations and Functions: Set notations and description, subsets, basic set operations. Venn Diagrams, laws of set theory, partition of sets, min sets, duality principle, basic definitions of relations and functions, graphics of relations, properties of relations; injective, subjective and bijective functions. Composition.

UNIT 2: Permutation, Combination and Algebraic System: Combinations: Rule of products, permutations, combinations. Binary operations and general properties, associatively, Identity elements, Universal elements, Group, Subgroup , ring , field.

UNTI 3: Algebra of Logic: Proposition and logical operators, negation, conjunction, disjunction, conditional and biconditional, constructions of truth table, tautologies and contradictions, equivalence of formula, well formed formula, normal forms,

UNIT 4: Recursion and recurrence: recursion, recursion and iteration, close form expression, sequence of integers, recurrence relations, linear homogeneous and non homogeneous recurrence relations, generating functions.

UNIT 5: Graph and Trees: Various types of graphs, simple and multigraphs, directed and undirected graphs, Representation of graphs in computer memory, Adjacency matrix, Incidence matrix, linked representation, Tree terminology , Types of tree, binary tree, tree traversal , binary search tree.

BCA 107N: Accounting and Financial Management   **Credit: 4+0**

Course Outcome	- Understand basic concepts of Accounting. - Demonstrate the role of accounting in business in economic world. - Explain the principles of accounting and book keeping - Knowledge regarding how to create ledgers, journals and balance sheet. - Apply accounting rules in determining financial results and preparation of financial statement.

UNIT 1: Introduction to Accounting: Meaning, Characteristics, Purposes and Limitations; Concepts, Convention and Generally Accepted Accounting Principles.

UNIT 2: Financial Accounting: Double Entry Framework, Basic Concept of Journal, Ledgers-Purchase Book, Sales Book, Cash Book; Trading and Profit & Loss Account, Balance Sheet.

UNIT 3: Management Accounting: Nature, Scope, Advantage and Limitations; Differences between Management Accounting and Financial Accounting.

UNIT 4: Raising Funds: Sources of Raising Funds, Simple Treatment to Issue of Shares, Forfeiture of Shares and Reissue of Forfeited Shares.

Unit 5: Computer Application: Role of Computers in Accounting, Software Packages for Accounting.

BCA-108N: Digital Circuit and Logic Design   **Credit: 4+0**

Course Outcome	• Understand the design of different digital components, its applications, merits and the implementation challenges.
	• Perform conversions among different number systems, became familiar with basic logic gates and understand Boolean algebra and simplify simple Boolean functions by using basic Boolean properties & design of combinational circuits such as MUX, DEMUX, Encoder and Decoder etc.
	• Implement and interpret the analysis and design of circuit design as well as peripheral devices direct access to primary memory.
	• Understand the design of sequential Circuits such as Flip-Flops, Registers, and Counters.
	• Employment opportunity in the field of digital circuit analysis & design

UNIT 1 : Number system : Decimal, Binary, Octal, Hexadecimal number system, inter conversion between different number systems, different codes, gray code, ASCII code, Floating point numbers.

UNIT 2: Logic Gates and Boolean Algebra: Elements and functions of digital Logic gates, Gate propagation delay time, logic gates applications. Boolean algebra: Boolean operations, SOP and POS forms and simplification using Karnaugh maps, Realization of expressions using universal logic gates.

UNIT 3: Combinational logical circuits: design of Binary Adder- half and full, Serial, Parallel, Carry look ahead adder. Full subtracter, code converters, MUX and DEMUX, encoders and decoders, seven segment decoder.

UNIT 4: Sequential logic circuits: latches, key debouncer, Flip flop: SR, J-K, D, T, Master slave J-K, flip-flops with preset and clear . Counters; Binary counter, synchronous counter, mod-10 counter, Generation of control signals; Controlled counter; Up-down counter, Shift register, Parity generator or checker, Synchronization of an asynchronous pulse.

UNIT 5: Microprocessor: Architecture of a basic microcomputer, some general microprocessor system concepts: I/O ports and buses, internal architecture of a microprocessor, Microprocessor fetches, decode, execute cycle memory mapped and I/O mapped ports, I/O controls.

BCA- 109N: Introductions to Object Oriented Programming & C++   **Credit: 4+0**

Course Outcome	• Understand object-oriented programming features in C++.
	• Gain some practical experience of C++.
	• Identifying about the virtual function and friend function and its use.
	• Develop applications using stream I/O and file I/O.
	• Implement Object Oriented Programs using templates.
	• Opportunity of employment in the area of software development.

UNIT 1: Principles of Object Oriented Programming (OOP) Basic Concepts of OOP, Comparison of procedural programming and OOP, Advantages of OOP, OOP Languages, Definitions: .Class, Objects, Concepts of inheritance and encapsulation, Operator overloading, Dynamic binding. Over view of OOP using C++, Basic Program construction: main and functions, Program statements, class declaration, comments++ compilation.

UNIT 2: Elements of C++ Language: Tokens and identifiers: Character set and symbols, Keywords. C++, identifiers. Variables and constants. Data Types: Basic data types, Arrays and strings, User defined data types; Operators, type conversions and type cast operators, Console I/O : cin, cout functions, Control statements: The if statement, if else; else.... if: switch statements, Loops: for and while do statements, Break, continue, go to, **Functions** Simple functions: Declaration of functions. Calling functions, Function definition, Passing arguments and returning values: Passing constants and variables, Pass by value. Return statement, types of functions, Passing and returning structure variables, Inline functions, Default arguments, returning by reference, pointers.

UNIT 3: Classes and Objects: Declaration of classes and objects in C++, Class definition. Declaration of members, objects as date time, Objects as function arguments. Array of objects, Returning objects from function, Structures and classes. Basic constructors, Parameterized constructors. Constructors with default arguments. Dynamic initialization of objects, use of copy constructor, shallow copying and deep copying, Dynamic constructors. Destructors, constraints on constructors and destructors.

UNIT 4: Operator Overloading: Overloading unary operators: Operator keyword, Arguments and return values, Laminations of increment operators, overloading binary operators. Arithmetic operators Examples: Addition of polar coordinates and concatenation of strings Multiple overloading, Comparison" operators, Arithmetic assignment operators. Data and type conversions: Conversion between basic types, Conversion between objects and basic types, conversion between objects of different classes, Constraints on type conversion.

UNIT 5: Derived Classes and Inheritance: Derived, classes and base class: Defining a derived class, accessing the bases class members, the protected access specifier, specifer. Derived class constructors. Overriding the member functions, Class hierarchies: Abstract base class. Inheritance: Public and private inheritance. Types of Inheritance – single level, multi level, multiple, hybrid etc., virtual function, stream classes.

BCA 110N: Lab Work: Object Oriented Programming with C++   **Credit: 0+4**

Course Outcome	• Creating simple programs using classes and objects in C++. • Implement Object Oriented Programs using templates. • Develop applications using stream I/O and file I/O.

Note: Program should be fully documented with simple 1/0 data. Flow charts should be developed wherever necessary.

Write program in 'C++' language.

1. Using input and output statements.
2. Using control statements.
3. Using functions.
4. Using array.
5. Using Classes and implementation of Constructor and Destructor.
6. Using files.
7. Using OOPS Concept Inheritance.
8. Using OOPS Concept Polymorphism

9. Using OOPS Concept Encapsulation
10. Using OOPS Concepts Friend and Static Functions.

Third Semester

BCA-201N: Operating System   **Credit: 4+0**

Course Outcome	• Characterize the basic functions of operating systems. • Learn different types of operating systems along with concept of file systems. • Learn various CPU scheduling algorithms used in operating system. • Understand memory management and deadlock handling algorithms. • Analyze the File system implementation and disk I/O technique. • Employment opportunity in the area of system programming.

UNIT 1: Introduction to Operating System: Introduction and need of Operating System, functions and services of OS, Operating System Classification - single user, multi-user, simple batch processing, Multiprogramming, Multitasking, Parallel system, Distributed system, Real time system.

UNIT 2: Process Management and CPU scheduling: Process Concept, Process states, Process scheduling, Threads, Overview of Inter-Process communication.CPU Scheduling, Basic concepts, Scheduling Criteria, Scheduling Algorithms – FIFO, SJF, Priority, Round Robin , Multi level scheduling algorithms.

UNIT 3: Process Synchronization and Deadlock: Process Synchronization, Critical-Section Problem, Semaphores, Monitors, Hardware Assistance, Deadlock, Deadlock Characteristics, Prevention, Avoidance, Detection and Recovery, critical section, Synchronization hardware, semaphores, combined approach to deadlock handling.

UNIT 4: Memory Management: Logical Versus Physical addresses space, Swapping Partition, Contiguous Allocation, Single partition allocation, Multiple partition allocation, Fragmentation, paging and Segmentation, concepts of Virtual Memory. Concept of Page Replacement, Page Replacement Algorithms - FIFO page replacement algorithm, Optimal algorithm, LRU page replacement algorithm, Thrashing , Causes for thrashing , Working set model , Page fault frequency.

UNIT 5: File Management and Security: File concept, access methods, Directory Structure, file protection. Allocation methods: Contiguous, linked and index allocation. Security: Authentication, Program Threats, System Threats, and Encryption.

BCA-202N: Computer Oriented Mathematics   **Credit: 4+0**

Course Outcome	• Knowledge about Statistics, Geometric mean, Standard deviation.
	• Understand Calculus as well as formulate Limit, Continuity and Differentiability.
	• Knowledge about Newton Raphson method.
	• Learn to solve numericals of Linear Equation

UNIT 1: Statistics: Measures of central tendency. Preparing frequency distribution table, arithmetic mean. Geometric mean, harmonic mean, median and mode. Measures of dispersion: Range, mean deviation, Standard deviation, co-efficient of variation, moments, Skewness and Kurtosis.

UNIT 2: Calculus: Differentiation, Derivative of a. Function of One Variable, Power Function, Sum and Product of Two. Functions, Function of a Function. Differentiation by method of Substitution, Maxima and Minima. Indefinite Integral, Integration by substitution, integration by parts. Integration by Partial fractions, definite integral.

UNIT 3: Numerical Methods: Introduction, Process of Numerical computing, significant digits, errors, error propagation, roots of non linear equations, bisection methods, false position methods, Newton Raphson method, Secant method.

UNIT 4: Numerical solution of Linear Equation: Matrix and Linear equation, pivotal condensation method, system of linear equations, Gauss elimination method, Gauss Jordan Method, Gauss Seidel iteration Method.

UNIT 5: Numerical Differentiation and Integration : Linear Interpolation, Lagrange Interpolation Polynomial, Newton Interpolation Polynomial, Differentiating Continuous functions. Differentiating tabulated functions, Newton- cotes methods of integration , Trapezoidal rule, Simpson's 1/3 rule, and Simpson's 3/8 rules.

BCA – 203N: Data Structure   **Credit: 4+0**

Course Outcome	• Able to choose appropriate data structure as applied to specified problem definition.
	• To solve problems based upon different data structure & also write programs.
	• Learns linear and non-linear data structures like stacks, queues, linked list etc.
	• Apply the different sorting and searching algorithms
	• Opportunity of employment in the area of programming and software development.

UNIT 1: Basic concepts of Data Structures: Abstract data types: Fundamental and derived data types. Representation, Primitive data Structures. Design and analysis of algorithm: Algorithm definition, comparison of algorithms. Top-down and bottom up approaches to algorithm Design. Analysis of algorithm, Frequency count, complexity measures in terms of time and space, structured approach to programming.

UNIT 2: Arrays, Searching and Sorting: Representation of arrays: single and multidimensional arrays, Address calculation using column and row major ordering, various operations on Arrays. Vectors. Application of arrays:

Matrix multiplication, sparse polynomial representation and addition. Searching: Sequential and binary searches, Sorting: Insertion, Selection, bubble. Quick, merge.

UNIT 3: Linked Lists: Singly linked list; operations on list,. Polynomial representation and manipulation using linked lists. Circular linked lists, Doubly linked lists. Generalized list structure. Sparse Matrix representation using generalized list.

UNIT 4: Stacks and Queues: Representation of stacks and queues using arrays and linked list. Circular queues, Priority Queue and D-Queue, Applications of stacks: Conversion from infix to postfix and prefix expressions, Evaluation of postfix expression using stacks.

UNIT 5: Trees and Graphs: Binary tree traversal methods: Preorder. In-order Post ordered traversal. Recursive and non-recursive Algorithms for above mentioned Traversal methods. Representation of trees and its applications; Binary, tree representation of a tree. Graph representation: Adjacency matrix, Adjacency list Adjacency Multicasts. Traversal schemes: Depth first search, Breadth first search. Spanning tree, Shortest Patch algorithms (Prime's and Kruskal's).

BCA-204N: Computer Organization and Architecture   **Credit: 4+0**

Course Outcome	• Understand the basic fundamentals of computer organization • Understand the major components of a computer including CPU, memory, I/O and storage as well as cache memory. • Understand memory technologies both internal and external. • Knowledge about the basic components of the CPU including the ALU and control unit. • All above outcomes provide opportunity of employment in the relevant field.

UNIT 1: Digital Components: overview of computer organization, logic gates, adders, flip-flops, encoders, decoders, multiplexers, registers, and shift registers, counters, RAM, ROM.

UNIT 2: Data Representation and Computer Arithmetic: Number systems, ASCII Codes, r's and (r-1)'s compliments, addition , subtraction, overflow, floating point representation, addition and subtraction with signed magnitude data, multiplication Algorithm, division Algorithm.

UNIT 3: Register transfer and Micro operations: Bus and memory transfers, three state bus buffers, Binary adder, Binary incremented, Arithmetic Circuit, Logic and shift micro operations, ALU.

UNIT 4: Basic computer Organization: Instruction Codes, Addressing modes, timing and control signal, instruction cycle, memory reference instruction, input output instruction, general register organization of CPU, memory stack, one address and two address instruction, software and hardware interrupts.

UNIT 5: I/O and Memory organization: input devices, synchronous and asynchronous communications, modes of data transfer from I/O to Memory, DMA, memory hierarchy, Main memory, Memory management, Cache memory, virtual memory.

BCA 205N: Lab Work: Data Structure lab   **Credit: 0+4**

Course Outcome	• Able to analyze the time and space efficiency of the data structure in all the scenarios and choose the best possible according to the need.
	• Implement arrays, linked list, queue, stack, tree.
	• Implement various sorting and searching algorithms
	• Be capable to identity the appropriate data structure for given problem

Note: Program should be fully documented with sample I/O data Flow charts should be developed wherever necessary.

Write program in C / C++.

1.   To insert and delete a node in a linked list.

2.   To add two polynomials using linked list.

3.   To insert and delete a node in a circular linked list.

4.   To implement a stack using arrays and linked list.

5.   To implement a queue using arrays and linked list.

6.   To invert a linked list.

7.   To merge two arrays.

8.   To solve polish expression using stacks.

9.   for tower of Hanoi problem using recursion.

10.   To insert and delete node in binary search tree.

11.   To find traversals of expressions using binary tree.

12.   To search an element using binary tree.

13.   To sort a List using Bubble, selection, insertion, merge, quick sort.

14.   To search element in the list by linear / binary search.

Fourth Semester

BCA 206N: Introduction to Database Management System   **Credit: 4+0**

Course Outcome	- Knowledge about underlying concepts of database terminologies. - Design ER diagrams to represent simple database application scenarios. - Learns normalization of database tables. - Learns various SQL commands including DML, DDL, DCL commands. - Declare and enforce various constraints on a database and tables - Understand transaction and concurrency. - Develops the ability to get employment in the database field.

UNIT 1: Introduction: Why Database, characteristics of Data in Database, DBMS, Significance of Database, Database System Applications ,Data Independence, advantages and disadvantages of DBMS, DBMS/RDBMS.

UNIT 2: Database Architecture and Modeling: Three level architecture of database, Conceptual, Physical and logical database models. Role of DBA, Database Design Entity Relationship Model, Components of ER Model, ER Modeling symbols. Super class and sub class types, Attribute inheritance, Specialization, Generalization, and Categorization.

UNIT 3: Relational DBMS and Relational Algebra and Calculus: Introduction to Relational DBMS. RDMBS Terminology. Database normalization, Keys, Relationships, First Normal Form, Functional dependencies, Second Normal form, third Normal form, Boyce-Codd Normal form, fourth Normal form, Fifth Normal form, case study, Relational Algebraic operations, tuple Relational calculus(TRC), Domain Relational Calculus(DRC).

UNIT 4: Introduction to SQL : History of SQL. Characteristics cf SQL. Advantages of SQL. SQL in Action. SQL data types and Literals. Types of SQL commands. SQL Operators and their precedence. Tables. Views and indexes. Queries and Sub queries. Aggregate functions. Insert. Update and Delete operations. Joins. Unions. Inter section. Minus. Cursors in SQL. Embedded SQL.

UNIT 5: Backup, Recovery AND Database Security: Database backups. Why plan backups? Hardware protection and redundancy, Transaction logs, Importance of backups, Database recovery, Types of Integrity constraints, Restrictions on integrity constraints, Data security risks, Authenticating users to the database.

BCA 207N: Operation Research   **Credit: 4+0**

Course Outcome	- Formulate a real-world problem as a mathematical programming model. - Solve specialized linear programming problems like the transportation and assignment Problems. - Familiar with workings of the simplex method for linear programming. - Understand about game theory and its applications. - Employment Opportunity in the field of Operations Research.

UNIT 1: Introduction: Historical development, Meaning of OR, Modeling in OR, Principles of Modeling, Application and role of OR in decision making.

UNIT 2: Linear Programming Problem: Main components of LPP, Formulation of LPP, convex set, graphical solution of LPP, slack and surplus variables, matrix form of LPP, Simplex method for solving LPP.

UNIT 3: Assignment Problem: Introduction, Mathematical formulation of Assignment problem, Fundamental theorems, application of assignment problem, Balanced and unbalanced assignment problem, Hungarian method for solving assignment problem.

UNIT 4: Transportation Problem: Introduction, Transportation Matrix, mathematical model of TP, Balanced and Unbalanced TP, Matrix minima method, Column minima method, Vogel's approximation method for solving TP.

UNIT 5: Network Analysis and Game Theory: Introduction of NA, definitions for Network, Fulkerson's rules, construction of Network, PERT and CPM method, Introduction to Game Theory, competitive game, Finite and Infinite game, Zero sum game, fundamental theorems of game.

BCA 208N: COMPUTER GRAPHICS   **Credit: 4+0**

Course Outcome	- Knowledge about basics of Computer Graphics. - Understand and analyze about the projection - To understand the 2d and 3d transformation, clipping, hidden surface removal. - Learns about types of dimension. - Develops ability to get employment in the field of Graphical software development.

UNIT 1: Introduction to Computer Graphics and Devices: Overview of Computer Graphics, Advantages of Interactive Graphics. Visualization, RGB color model, CMYK color model, Direct Table. Over View of Graphic System, Cathode Ray tube, direct view storage tubes, Raster scan display, 3D display devices, Plotters, Printers, Digitizers, Light pens. Active and Passive Graphic Devices, Computer Graphics Software.

UNIT 2:Raster Graphics Algorithms: Overview of Simple Raster Graphics Package(SRGP) **Line Drawing:** Basic concept in Line Drawing, Line Drawing Algorithms – Incremental Algorithm, Digital Difference Analyzer (DDA), Bresenham's Line Algorithm, Generalized Bresenham's Algorithm, Midpoint Line Algorithm. **Circle Drawing:** Basic

Concepts, Representation of Circle – polynomial Method, Trigonometric Method, Circle Drawing Algorithms – DDA Circle Drawing Algorithm, Bresenham's Circle Algorithm, Midpoint Circle Algorithm

UNIT 3: Clipping and Filling Rectangles and Polygons: Types of polygon- Concave, Convex, Polygon Filling – Seed Fill, Boundary Fill, Flood Fill, Scan Line Algorithms, Scan Conversion Algorithm for Polygon Filling, pattern Filling. Clipping Lines - Sutherland and Cohen Subdivision Line Clipping Algorithm,   Generalized Clipping with Cyrus-beck Algorithm, Liang-Barsky Line Clipping Algorithm, Clipping Circles and Ellipses, Sutherland – Hodgeman Polygon Clipping

UNIT 4:Geometrical Transformations: Two dimensional transformations – Translation, Rotation, Scaling, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Reflection, Shear, X shear, Y shear, Inverse Transformation, Viewing Transformation, Normalization Transformation, Workstation Transformation, 3D transformation.

UNIT 5: 3D Viewing: overview of 3D viewing, Specifying an Arbitrary 3D View, Right handed viewing coordinate system, View reference point , View plane normal vector, Transformation from World Coordinate to Viewing Coordinates, Projection - Parallel Projection, Perspective Projection, Orthographic projection, Oblique projection.

BCA- 209N: Software Engineering   **Credit: 4+0**

Course Outcome	- Understand the steps in Software Development, i.e SDLC. - Select and implement different software development process models. - Learn about the concepts of cost estimation, scheduling and reviewing the progress. - Analyze software requirements specifications for different projects. - Identify and implement of the software metrics. - Employment opportunity in the field of software development.

UNIT 1: Introduction: Characteristics, Components. Applications, Software Development Lifecycle Models: Waterfall, Iterative Waterfall, Spiral. Prototyping, incremental development, JAD, RAD models , Fourth Generation Techniques, Concepts of Project Management, Role of Metrics & Measurements.

UNIT 2: Software Project Planning: Objectives, Decomposition techniques: S/W Sizing, Problem-based estimation, Process based estimation. Cost Estimation Models: COCOMO Model, the S/W Equation, and System.

UNIT 3: Analysis: Principles of Structured & Object Oriented Analysis, Requirement analysis, DFD, Entity Relationship diagram, Data dictionary.

UNIT 4: Software Design: Objectives, Principles; Concepts, Design methodologies: Data design, Architectural Design, procedural design, Object -oriented concepts.

UNIT 5: Software Testing: Objectives, principles, testability. Test cases: White box & Black box testing, Unit testing, Integration testing, testing strategies: verification & validation, unit test, integration testing, validation testing, system Testing.

BCA 210N: Lab Work: DBMS Practical   **Credit: 0+4**

Course Outcome	• Understand SQL Fundamentals. • Learn to make use of DDL, DML, DCL commands • Learn to use triggers, cursors, join • Understand correlated queries of SQL • Learn about various Built-in functions of SQL • Understand the use of Commit& Rollback. • Knowledge about Transactions and Deadlocks.

1. SQL Command.

2. Creating Table.

3. Insert record in to the table.

4. Create a database file to keep record.

5. Entering records in to the data base file.

6. Checking database records.

7. Queries and sub queries.

8. Performing different Join operations natural, left outer, right outer, full outer.

9. Use of aggregate function.

10. Implementation of View.

11. Implementation of relation algebraic operators.

Fifth Semester

BCA 301N: Internet and JAVA Programming   **Credit: 4+0**

Course Outcome	• Understand the java basics
	• Implement java classes and objects
	• Understand Interface and package
	• Competence in the use of Java Programming language in the development of small to medium sized application programs.
	• Opportunity of Employment in the area of web based application development.

UNIT 1:Internet: Internet, Connecting to Internet: Telephone, Cable, Satellite connection, Choosing an ISP, Introduction to Internet services, E-Mail concepts, Sending and Receiving secure E-Mail, Voice and Video Conferencing.

UNIT 2: 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.

UNIT 3: Java Swing: Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner frame.

UNIT 4: JDBC: The connectivity Model, JDBC/ODBC Bridge, java.sql package, connectivity to remote database, navigating through multiple rows retrieved from a database.

UNIT 5: Java Servlets: Servlet basics, Servlet API basic, Life cycle of a Servlet, Running Servlet, Debugging Servlets, Thread-safe Servlets, HTTP Redirects, Cookies, Introduction to Java Server pages (JSP). Introduction to RMI (Remote Method Invocation), a simple client-server application using RMI.

BCA 302N: ORACLE and PL/SQL   **Credit: 4+0**

Course Outcome	• Understand SQL fundamentals.
	• Knowledge about Backup and Recovery.
	• Practical knowledge about PL/SQL.
	• Learns Oracle Database Objects.
	• Develops the ability to get employment in field of DBMS.

UNIT 1: The SQL Language: Introduction, Oracle Architecture Tools and Components, Client-Server Architecture, Characteristics of SQL, SQL *Plus, Data definition, Data manipulation, SQL commands, SQL operators, Queries, Functions, Constraints,.

UNIT 2: Backup and Recovery: Database recovery ,Transaction recovery, System recovery, Exporting and Importing Data, Dump files, SQL support, Hardware protection and redundancy, Transaction logs, Importance of backups.

UNIT 3: Integrity and Security: General considerations, Controls, Audit trail, Data encryption, Integrity rules, Granting and Revoking privileges, SQL support Tools.

UNIT 4: PL/SQL: Introduction to PL/SQL, Advantages, Execution environment, SQL within PL/SQL, Cursor, Triggers, Oracle Engine, Transaction management, Locks, Concurrency Control, Error handling.

UNIT 5: Oracle Database Objects: Installation of Oracle package, Introduction to Procedure and Functions, Packages, Procedure and Functions Overloading, Triggers.

BCA 303N: COMPUTER NETWORKS   **Credit: 4+0**

Course Outcome	• Understand the basic of Computer Network.
	• Recognize the different internetworking devices at each layer of TCP/IP protocol.
	• Understand the various routing protocols.
	• Analyze the functionality of the various layers of data networks.
	• Employment opportunity in the field of data communication and networking.

UNIT 1: Data Communication Networks: Introduction to Data communications concepts: Digital and Analog, Parallel and Serial, Synchronous and Asynchronous, Simplex, Half duplex, Full duplex, Multiplexing and Spreading, Encoding and Decoding, Error detection and Recovery, Multiplexing, Network topologies, Modulation, OSI and TCP/IP references model.

UNIT 2: Communication Channels and Components: Wired transmissions: UTP, STP, Telephone lines, Coaxial cables, Baseband, Broadband, Optical fiber transmission; Microwave transmission: Infrared   transmission, Laser transmission, Radio transmission and Satellite transmission, VSAT; Network connecting devices, Switching.

UNIT 3: Data Link Layer: Design Issue: Services provided to the network layer, Framing, Error control, Flow control, HDLC, SDLC, Data link layer in the internet (SLIP, PPP). MAC sub layer: ALOHA, CSMA/CD, IEEE standards, FDMA, TDMA, CDMA. Frame Relay, ATM.

Unit 4: LAN and WAN Network: LAN topologies and protocols, Ethernet, Token Ring, FDDI, Wireless LANs; Virtual LANs, WAN: Network Layer (Addressing and Routing concepts); Routing Methods (Static and dynamic routing); Distance Vector Protocol, Link State protocol, Open Shortest Path First; Internet Protocol: Addressing & Routing; Internet Control Message Protocol, Address Resolution Protocol, Dynamic Host Control Protocol, Process-to-Process delivery in Transport Layer: UDP, TCP, STCP, Congestion control.

UNIT 5: Application Layer Protocols: Client/Server Model, Network File System (NFS), Remote Login: Telnet; File Transfer Protocol (FTP); E-mail system: Simple Mail Transfer Protocol (SMTP), Post Office Protocol (POP); World Wide Web (WWW), Domain Name System (DNS), Hyper Text Transfer Protocol (HTTP), Hyper Text Markup Language (HTML).

BCA 304N: Software Project Management   **Credit: 4+0**

Course Outcome	- Identify the different project contexts and suggest an appropriate management strategy. - Practice the role of professional ethics in successful software development. - Determine an appropriate project management approach through an evaluation of the business context and scope of the project. - Provide Jobs opportunity to handle Software projects .

UNIT 1: Introduction to Software Development Organization and Roles: The Management Spectrum: People, Process, Project, And Product. Organizational Structure: Hierarchical, Flat, Matrix, Networked, T-Form Organization Structures. Job Roles in Software Development. Factors influencing Project Management. Stakeholders, Project communications, Project Development Phases. Project Charter.

UNIT 2: Project Planning and Budgeting: Tasks in Project Planning, Work Breakdown Structure, Planning Methods, Development Lifecycle Models, Software Cost Estimation – Estimation Methods, Comparison of Methods, COCOMO (Constructive Cost Model). Budgeting, Capital Budgeting, Net present value (NPV). ROI (Rate Of Interest), Payback Models.

UNIT 3: Project Scheduling and Risk Management: Scheduling Techniques – PERT (Program Evaluation and Review Technique) , Gantt Chart, Critical Path. Automated Tools. Concept of Risk Management, Risk Management Activities, Risk Categories. Aids of Risk Identification, Risk Components, Risk Prioritization.

UNIT 4: Software Configuration Management: Baseline, Software Configuration Items (SCI). Software Configuration Management Process. Identification of Objects in the Software Configuration. Version Control, Change Control, Configuration Audit, Status Reporting, Goals of SCM.

UNIT 5: Project Closure and Software Quality Assurance: Goals of SQA,FTR (Formal Technical Review), Standards and Procedures, SQA activities, Software Qualities – Reliability, Maintainability, Transportability, Interoperability, Efficiency, Creating a SQA plan. Project Closure Analysis, Role of Closure Analysis, Closure Analysis Report.

BCA 305N: Lab Work: Java Programming, ORACLE and PL / SQL   **Credit: 0+4**

Course Outcome	- Students learn about the model of object oriented programming. - Implementation of classes and objects. - Be able computer programs to solve specified problems and to use the Java SDK environment to create, debug and run simple Java programs. - Be able to develop programs by making use of inheritance, method overloading and overriding, multithreading, exception handling and file handling.

1. Write a program in Java for illustrating, overloading, over riding and various forms of inheritance.

2. Write programs to create packages and multiple threads in Java.

3. Write programs in Java for event handling Mouse and Keyboard events.

4. Using Layout Manager create different applications.

5. Write programs in Java to create and manipulate Text Area, Canvas, Scroll Bars, Frames and Menus using swing/AWT.

6. Using Java creates Applets.

7. Use Java Language for Client Server Interaction with stream socket connections.

8. Write a program in java to read data from disk file.

9. Write PL/SQL blocks to accept a year and check whether it is a leap year

10. Creating tables using PL/SQL

11. Table updating using PL/SQL .

12. Cursor implementation using PL/SQL

13. Procedure implementation using PL/SQL

14. Trigger implementation using PL/SQL.

Sixth Semester

BCA 306N: Advance Networks and Network Security   **Credit: 4+0**

Course Outcome	- Understand the Basic concepts of Network Security - Understand various Internet Security Protocols - Understand issues in Network Security as well as security threats and ways to counter against these threats. - Study of network devices like repeaters, bridges, gateways etc. - Knowledge about firewalls, and cryptography algorithms. - Develops ability to get employment in the emerging area of network security.

UNIT 1: Internetworking: Internetworking Basics, Internetworking Models, Cisco Three Hierarchical Model: Core Layer, Distribution Layer & Access Layer. Bridging / Switching: Switching Services, Spanning Tree Protocols, LAN Switch types- Cut Through, Fragment Free, Store-and-forward; Configuration of Switches, Virtual LANs, Routing and Configuration of VLAN.

UNIT 2: Cisco Basics, IOS & Basics Network Management: Flow Control and Describe the Three Basic Method Used in Networking. Routing Protocols and Configuration; Access List, Operation and Membership in router. Congestion Problem, Elements, Boot Sequence in router, Registers configurations, Cisco IOS Commands, Backup. Upgrade and Restore Cisco IOS image, Configuration of router.

UNIT 3: Information Security Fundamental: Background, Importance, National & International Scenario. Identification and Authentication, Confidentiality, Privacy integrity, Non-repudiation, Availability. Security & Prevention, Detection & Recovery, e-Commerce security. Security Threats: Weaknesses, Buffer overflow, Brute force, Protocol, Cross site, Spoofing, Denial of Service attacks.

UNIT 4: System & Network Security: Security consideration in OS, Backup, Internet Protocols and Security; SSL/TLS, IPSec, Application Security, Web security, Secure e-mails, Access control - Physical and Logical.

UNIT 5: Tools & Technologies: Firewalls, IDS, Antivirus, Log Analysis, Cryptography: Key Management, Hashing; Security Infrastructure: PKI, VPN, Network Scanners, Digital Forensics, Security Audits, Asset Classification and Risk Analysis, Audit Trails, Reporting; Security Management: Security Policies, Procedures and International Standards.

BCA 307N: Web Development Tools and Techniques   **Credit: 4+0**

Course Outcome	- Knowledge about scripting languages such as HTML, CSS, XML, JavaScript, PHP. - Build dynamic web pages using JavaScript and VB Script (client side programming). - Learn to build interactive web applications. - Design web pages using PHP - Create XML documents and understand XML Schema. - Provides employment opportunity ine the emerging area of web development.

UNIT 1: Introduction to Web Technology: Introduction to web, protocols governing the web, web development strategies, Web applications, web project, web team.

UNIT 2: Web Page Designing: HTML: list, table, images, frames, forms, CSS; XML: DTD, XML schemes, presenting and using XML

UNIT 3: Scripting: Java script: Introduction, documents, forms, statements, functions, objects; event and event handling; introduction to AJAX, VB Script

UNIT 4: Server Site Programming: Introduction to active server pages (ASP),ASP.NET, java server pages (JSP), JSP application design, tomcat server, JSP objects, declaring variables, and methods, debugging, sharing data between JSP pages, Session, Application: data base action , development of java beans in JSP, introduction to COM/DCOM.

UNIT 5: PHP (Hypertext Preprocessor): Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form ,mail, file upload, session, error, exception, filter, PHP-ODBC.

BCA 308N: Project Work: **Credit: 0+12**

Course Outcome	- Demonstrate skill and knowledge of technological tools and techniques specific to build useful real time projects. - Build running project and using any client as well as server side scripting language and make use of any database for backend storage of data. - Students learn to meet the requirements of current Industry requirements in the field of Information Technology.

Comprehensive Viva Voce: Viva of Full syllabus studied under BCA course and Project Work.

Format of Project Report

*   Title Cover

*   Certificate from organization about your stay (Project Duration) at that place and

        about submission of work done under external guide at the place of training.

*   Certificate from your guide about the submission of work done under his/her

        guidance, Internal Supervisor,

*   Table of Contents, abstract of the project (abstract of actual work done).

*   A brief overview of the organization (regarding function area, location, division in which you are working, turnover)

*   Profile of problems assigned.

*   Study of existing system, if any.

*   System requirements

> Product Definition

*   Problem Statement

*   Function to be provided

*   Processing Environment: H/W, S/W.

*   Solution Strategy

*   Acceptance Criteria

>   Feasibility Analysis

>   Project Plan

*   Team Structure

      *   Development Schedule (Gantt chart)

      *   Programming Languages and Development Tools

*   System Requirement Specifications

>   Developing/ Operating / Maintenance Environments.

> External Interface And Data Flows

      *   User display and report format, user command summary

      *   High-level DFD and data dictionary

*   Functional and performance specifications

*   Design

>   Detailed DFD's and structure diagrams

>   Data structures database and file specifications

>   Pseudo code.

•   Test Plan

>   Functional, Performance, Stress tests etc.

•   Implementation / Conversion Plan

»   Project Legacy

>   Current status of project

>   Remaining areas of concern

>   Technical and managerial lessons learnt

>   Future recommendations

»   Bibliography

•   Source Code (if available)

Note: - The above is meant to serve as a guideline for preparation of your project report. You may add to modify or omit some of the above-mentioned points depending upon their relevance to your project. You may also consult your internal supervisor for the same.