BIDAR UNIVERSITY BIDAR

BACHELOR OF COMPUTER APPLICATION (BCA)

SYLLABUS FOR UNDER GRADUATE

STATE EDUCATION POLICY-2024

WITH EFFECT FROM

THE ACADEMIC YEAR 2024-25

Submitted by

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Chairman, Board of Studies in Computer Science, Bidar University, Bidar

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Preamble

The Bachelor of Computer Applications program is designed to provide students with a comprehensive education in computer science and its applications, preparing them for successful careers in the rapidly growing IT industry. This program aims to equip students with a strong foundation in computer science fundamentals, programming skills, and practical knowledge of software development, data management, and mathematical foundations in first year.

The curriculum is structured to cover essential topics, including:

- Fundamentals of Computer: understanding the basics of computer systems, hardware, and software
- C Programming: mastering the basics of programming using the C language
- Digital Logic: understanding the principles of digital electronics and logic design
- Object-Oriented Programming: learning to design, implement, and analyze software systems using OOP concepts
- DBMS: understanding database concepts, design, and management
- Discrete Mathematics: building a strong foundation in mathematical concepts essential for computer science

Through this program, students will develop a solid understanding of computer science principles, programming skills, and practical expertise in software development, data management, and problem-solving. Graduates will be well-prepared to pursue careers in software development, data analysis, IT consulting, and more, or to pursue advanced studies in computer science and related fields."

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Curriculum Structure for B.C.A w. e. f 2024-25

Category	Course Code	Title of the Paper	Marks			Hour/ Week	Credits	Duration of Exams (Hrs.)
			IA	Semester End Exam (SEE)	Total			
SEMESTER I								
DSC01		**THEORY**						
	SEPBCAT01	Computer Fundamentals	20	80	100	4	4	3
	SEPBCAT02	C Programming	20	80	100	4	4	3
	SEPBCAT03	Digital Electronics	20	80	100	4	4	3
		PRACTICALS						
	SEPBCAP01	Computer Fundamentals Lab	10	40	50	4	2	3
	SEPBCAP02	C Programming Lab	10	40	50	4	2	3
	SEPBCAP03	Digital Electronics Lab	10	40	50	4	2	3
TOTAL HOURS/CREDIT					450	24	18	
SEMESTER II								
DSC02		**THEORY**						
	SEPBCAT04	Object Oriented Programming Using C++	20	80	100	4	4	3
	SEPBCAT05	Database Management System	20	80	100	4	4	3
	SEPBCAT06	Discrete Mathematics	20	80	100	4	4	3
		PRACTICALS						
	SEPBCAP04	C++ Lab	10	40	50	4	2	3
	SEPBCAP05	Database Management System Lab	10	40	50	4	2	3
	SEPBCAP06	Discrete Mathematics Lab	10	40	50	4	2	3
TOTAL HOURS/CREDIT					450	24	18	

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Year	I	Course Code : SEPBCAT01	Credits	4
Semester	I	Course Title : Computer Fundamentals	Hours	60

Course Pre-requisites, if any	NA	
Formative Assessment Marks : 20	Summative Assessment Marks : 80	Duration of SEE: 3 hrs.

Course Objectives	**After completing this course satisfactorily, a student will be able to:** • Understand the concept of input & output devices of Computer. • Learn the functional units and classify types of computers, how they process information and how individual computers interact with other computing systems and devices. • Understand and operating system and its working and solve common problems related to operating systems. • Apply the uses of basic word processing, spreadsheet and presentation Graphics software skills. • Study to use the Internet safely, legally and responsibly.

Unit No.	Course Content	Hours
UNIT I	**Introduction to Computers:** Introduction to Computers - Computer Definition, Characteristics of Computers, Evolution and History of Computers, Types of Computers, Basic Organization of a Digital Computer; Number Systems Different types, conversion from one number system to another; Computer Codes, BCD, Gray Code, ASCII and Unicode. Boolean Algebra - Boolean Operators with Truth Tables; Types of Software - System Software and Utility Software Computer Languages - Machine Level, Assembly Level & High Level Languages, Translator Programs - Assembler, Interpreter and Compiler; Planning a Computer Program - Algorithm, Flowchart and Pseudo code with Examples.	15
UNIT II	**Computer Hardware:** Classification of Digital Computer Systems: Microcomputers, Minicomputers, Mainframes, Super computers. Anatomy of Computer: Introduction, Functions & Components of a Computer, Central Processing Unit, Microprocessor, Storage units, Input and output Devices. How CPU and memory works. Program execution with illustrative examples.	10
UNIT III	**Operating System and Computer Networking:** Operating Systems: Introduction, Functions of an operating System, Classification of Operating Systems, System programs, Application programs, Utilities, The Unix Operating System, Basic Unix commands, Microkernel Based Operating System, Booting. Networking Fundamentals(PAN,LAN,WAN, MAN), Network Protocols(TCP/IP, HTTP, FTP) , Network Devices(Router, Switch, Hub).	12
UNIT IV	**Computer Applications-MS-Office:** MS WORD Text Basics, Text Formatting and saving file, Header & Footers, Shapes and Pictures, Working with bullets and numbered lists, Tables, Styles and Content, Mail Merge, Printing. **MS EXCEL-** Introduction to Excel, Formatting excel work book, Perform Calculations with Functions, Sort and Filter Data with Excel, Date and Time Functions, Text Functions, Create Effective Charts to Present Data Visually.	15

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	MS POWERPOINT -Setting Up PowerPoint Environment, creating slides and applying themes, Animation and Slide Transition, Using slide Master, Slide show option, **Computer Application and Emerging Trends:** Basic concepts of Artificial Intelligence and Machine Learning, Basics of Cloud Computing and Big Data, Basic of Internet of Things(IOT) and Cyber Security.	
UNIT V	**Internet Basics and Computer Security:** Introduction, Features of Internet, Internet application, Services of Internet, Logical and physical addresses, Internet Service Providers, Domain Name System.Threats and Vulnerabilities, Security Measures (Firewall, Antivirus, Encryption), Best Practices for safe Computing.	8

Recommended Learning Resources

Text Books:

1. Pradeep K. Sinha and Preeti Sinha, "Computer Fundamentals (Sixth Edition)", BPB Publications.
2. David D. Riley and Kenny A. Hunt, "Computational Thinking for Modern Problem Solver", CRC Press.

Reference Books:

1. J. Glenn Brookshear and Dennis Brylow, "Computer Science: an Overview (12th Edition.)", Pearson.
2. R. G. Dromey, "How to Solve it by Computer", Pearson.

E-Resources:

1. Coursera- Computer Science 101 by Stanford University.
2. edX-Introduction to Computer Science by Harvard University.
3. Codecademy- Computer Science Course
4. FreeCodeCamp-Computer Science Curriculum.
5. GeeksforGeeks- Computer Science Portal.

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Year	I	Course Code : SEPBCAT02	Credits	4
Semester	I	Course Title : C Programming	Hours	60

Course Pre-requisites, if any	NA	
Formative Assessment Marks : 20	Summative Assessment Marks : 80	Duration of SEE : 3 hrs.

Course Objectives

After completing this course satisfactorily, a student will be able to:

- Understanding the concept of programming languages.
- Read, understand and trace the execution of programs written in C language.
- Write the C code for any complex and real-time problems.
- Write programs that perform operations on matrices using Arrays & Strings.
- Write programs using pointer concepts for efficient memory usage.
- Create user defined functions to strengthen the C Library.

Unit No.	Course Content	Hours
UNIT I	Introduction to C Programming: Importance of C, Basic structure of C Program, Creating and Executing C Program. C Programming Basic Concepts: Data types, Variables, Constants, C Tokens, Input and Output with C: Formatted I/O Functions, Unformatted I/O Functions.	15
UNIT II	Operators and Expressions, Control Structures-Decision Statements, Looping Statements, Unconditional Statements. Arrays: Definition of Array, Types of Array-Declaration, Initialization and Memory Representation.	10
UNIT III	String: Declaring and Initializing String Variables, String Handling Function-strlen, strcmp,strcpy,strcat, Character Handling function-to ASCII, to upper, tolower, isalpha, isnumeric. Function: Definition of function, Types of Function-Built in Function, User Defined Function-With and Without Parameters and return type	15
UNIT IV	Structures: Definition and Declaration of Structures, assigning and accessing the members of a structure, Unions: Definition and Declaration, accessing the members of a Union, Comparison of Structure and Union.	10
UNIT V	Pointers: Definition of Pointers, Declaration of Pointer Variable, call by value and call by reference. Files: Definition, Types of Files, Creating Text Files, Modes of opening a file, Formatted and Unformatted I/O Operations.	10

Recommended Learning Resources

Text Books:

1. E Balagurusamy, "Computer Concepts and Programming in C (UPTU)", McGraw Hill Education India.
2. Reema Thareja ,"Computer Fundamentals and Programming in C(Second Edition, 2017.) ", Oxford Higher Education,
3. Brian W. Kernighan and Dennis M. Ritchie ,"The 'C' Programming Language", Prentice Hall of Software Series.

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Reference Books:

1. Ashok N. Kamthane," Programming with ANSI and TURBO C", Pearson Education.
2. Yashavant Kanetkar ," Let Us C", BPB Publication.

E-Resources:

1. Codecademy - C Programming Course
2. Coursera - C Programming Specialization by University of Colorado Boulder
3. edX - C Programming by Microsoft
4. FreeCodeCamp - C Programming Challenges
5. GeeksforGeeks - C Programming Portal
6. Tutorialspoint - C Programming Tutorial
7. (link unavailable) - C Programming Tutorial
8. OpenClassrooms - C Programming Course

E-books:

1. "The C Programming Language" by Brian Kernighan and Dennis Ritchie (PDF)
2. "Computer Fundamentals" by Peter Norton (PDF)
3. "C Programming: A Modern Approach" by K. N. King (PDF)

Online Communities:

1. Stack Overflow - C Programming Tag
2. Reddit - r/learnprogramming and r/C_Programming
3. GitHub - C Programming Repository

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Year	I	Course Code : SEPBCAT03	Credits	4
Semester	I	Course Title : Digital Electronics	Hours	60

Course Pre-requisites, if any	NA	
Formative Assessment Marks : 20	Summative Assessment Marks : 80	Duration of SEE : 3 hrs.

Course Objectives	After completing this course satisfactorily, a student will be able to: • Examine the structure of number systems and perform the conversion among different number systems. • Illustrate reduction of logical expressions using Boolean algebra, k-map and tabulation method and implement the functions using logic gates. • Design and analyses synchronous and asynchronous • Sequential circuits using flip-flops. • Implement combinational logic circuits using programmable logic devices. • Examine the structure of various number systems and its application in digital design. • Ability to identify basic requirements for a design application and propose a cost-effective solution.

Unit No.	Course Content	Hours
UNIT-I	**Digital computer and digital systems:** Binary number, number base conversion, Octal and hexadecimal number, Compliments, Binary codes, Binary storage and Registers. Binary logic and Integrated circuits.Definition of Boolean algebra, Basic theorems and properties of Boolean algebra, Boolean functions, Canonical and standard forms. Digital logic gates.	15
UNIT-II	**Simplification of Boolean function:** Two, Three and four variable maps, Sum of products and Products of sums simplifications. AND and NOR implementation, AND-OR-INVERT method, Determination and selection of prime, Implicates, Combinational circuit, design procedure, Adders, Substractor,	15
UNIT-III	**Adders:** Binary parallel adder, Decimal adder, Magnitude compactors, Decoders, Multiplexers, Read Only Memory, Programmable Logic Array (PLA), Sequential circuit. Flip-Flops-SR flip flop, JK flip flop, D flip flop, T flip flop.	10
UNIT-IV	**Registers: Registers**, Example of Random access memory, Inter registers transfer, Arithmetic logic and shift micro operations, Shift register: Serial Shift registers, parallel shift registers.	10
UNIT-V	**Counters:** Ripple Counter, Synchronous counters, timing sequence the memory unit, Fixed-point binary data, Overflow, Arithmetic shifts decimal data, Floating point data, on numeric data, Instruction coded, Design of simple counter.	10

Recommended Learning Resources

Reference Books:

1. M. Morris Mano , "Digital Logic and Computer Design", PHI Publication.
2. Floyd & Jain, "Digital Fundamentals 8th Edition", Pearson Education.

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E-Resources:
1. GeeksforGeeks- Digital Electronics and Logic Design. 2. Sparkfun-Digital Logic.

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Year	I	Course Code : SEPBCAP01	Credits	2
Semester	I	Course Title : Computer Fundamentals Lab	Hours	50

Course Pre-requisites, if any	Knowledge of MS-Office	
Formative Assessment Marks :10	Summative Assessment Marks : 40	Duration of SEE : 3 hrs.

PART-A :

1. Create a visiting card of your college using page size as follows Page Width=3.2 and Height=2.2.
2. Write a letter to the principal by using alignments, correct format in MS Word.
3. Generate interview call letters 10 different applicants using Mail Merge.
4. Create a Student information table in MS Word.
5. Create time table in MS Word.
6. Draw a flow chart to check equality of two numbers.
7. Create a suitable examination database and sum of marks (total) of each students and respective class secured by students in Excel.
8. Show the use Date and Time functions in Excel.
9. Demonstrate the use of text functions in Excel.
10. Plot a column chart for employee information in Excel.
11. Create a MS-Excel worksheet to illustrate Sorting on employee data.
12. Make a power point presentation on books you are studying.
13. Make a power point presentation by using animation
14. Prepare the presentation about advantage and disadvantage of Television and when the slide show starts from beginning, second slide will display after 30 seconds without clicking mouse and using keyboard.
15. Demonstrate the insertion of images in power point presentation.

Instructions:

1. A certified journal is mandatory for every student to appear for the practical examination.

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Year	I	Course Code : SEPBCAP02	Credits	2
Semester	I	Course Title : C Programming Lab	Hours	50

Course Pre-requisites, if any	Knowledge of C Programming Language	
Formative Assessment Marks : 10	Summative Assessment Marks : 40	Duration of SEE : 3 hrs.

PART-A

1. Write an algorithm, flow chart and a C Program to read the radius of a circle and find the area and circumference of the circle.
2. Write an algorithm, flow chart and a C Program to read three numbers and find the biggest of three.
3. Write an algorithm, flow chart and a C Program to check the given number is prime or not.
4. Write an algorithm, flow chart and a C Program to read a number, find the sum of the digits, reverse the number and check it for palindrome.
5. Write an algorithm, flow chart and a C Program to display the following by reading the number of rows as input,

   1
   121
   12321
   1234321
6. An electricity board charges the following rates for the use of electricity: for the first200 units 50 paisa per unit: for the next 100 units 90 paisa per unit: beyond 300 units Rs 1 per unit. All usersarechargedaminimumofRs.100asmetercharge.Ifthetotalamountismorethan Rs400, then an additional surcharge of 15% of total amount is charged. Write an algorithm, flow chart and a program to read the name of the user, number of units consumed and print out the charges.
7. Write an algorithm, flow chart and a C Program to find the roots of quadratic equation (demonstration of switch-case statement)
8. Write an algorithm, flow chart and a C program to read marks scored by n students and find the average of marks (Demonstration of single dimensional array)
9. Write an algorithm, flow chart and a C Program to remove Duplicate Elements in a single dimensional Array.
10. Write an algorithm, flow chart and a C Program to perform addition and subtraction of Matrices

PART-B

1. Write a C Program to find the length of a string without using built-in function.
2. Write a C Program to demonstrate string functions-strlen, strcmp,strcpy,strrevandstrcat.
3. Write a C Program to demonstrate pointers in C.
4. Write a C Program to read, display and to find the trace of a square matrix.
5. Write a C Program to read, display and multiply two m x n matrices using functions.
6. Write a C Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters.
7. Write a C Program to Reverse a String using Pointer.
8. Write a C Program to Swap Two Numbers using Pointers.
9. Write a C Program to demonstrate student structure to read & display records of n students.
10. Write a C Program to demonstrate the difference between structure & union.

Instructions:

1. A certified journal is mandatory for every student to appear for the practical examination.
2. The student has to execute a minimum of eight programs from each part to complete the lab course.

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Year	I	Course Code : SEPBCAP03	Credits	2
Semester	I	Course Title : Digital Electronics Lab	Hours	50
Course Pre-requisites, if any		Knowledge of Digital Electronics		
Formative Assessment Marks : 10		Summative Assessment Marks : 40	Duration of SEE : 3 hrs.	

PART-A

1. Convert the following decimal numbers to binary, octal and hexadecimal numbers showing the steps clearly.
   a) 135.36
   b) 444.44
   c) 1024.12
2. Convert the following binary numbers to decimal, octal, and hexadecimal.
   a) 111001101.101
   b) 101010101.11
   c) 1111.11
3. Perform the following conversion
   a) $[100101010111]_{BCD}=[\ ]_{\text{Excess 3 code}}$
   b) $[127]_8=[\ ]_2$
   c) $[-123]_{10}=[\ ]_{\text{2 in 2S' complement}}$
4. Reduce the following expressions using Boolean algebra.
   a) $XYZ[XY+\bar{Z}(YZ+XZ)]$
   b) $XZ(\bar{X}YZ+XY+Z)$
   c) $ABC(\bar{A}B+BBC)$
5. Express the following function in sums of minterm and product of maxterm.
   a) $F(X,Y,Z)=(\bar{X}+\bar{Y})(\bar{Y}+Z)$
   b) $F(A,B,C,D)=\bar{A}\bar{B}D+AB\bar{D}+\bar{C}D+AB\bar{C}$
6. Simplify the Boolean functions defined by $F(W,X,Y,Z)=\sum(1,3,7,11,15)+\sum d(0,2,5)$
7. Verify Demorgan's theorem for three variable using truth table.
8. Design a combinational circuit that converts a decimal digit from 8,4,-2,-1 code to BCD
9. Design a digital circuit which gives an output equal to 1' when valid BCD is applied to as an input otherwise output is 0.

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10. Design a combinational circuit that accepts 3 bit number and generates an output number equal to square of an input number

11. Design a full adder logic circuit and implement the same using only NAND gates.

12. Draw the block diagram of 4 bit bidirectional shift register with parallel load.

13. Design and implement a full subtractor using 4:1 multiplexer.

14. Verify the following logic gates.

    a) AND gate

    b) OR gate

    c) Not gate.

15. Verify the following logic gates.

    a) NAND gate.

    b) NOR gate.

Instructions:

1. A certified journal is mandatory for every student to appear for the practical examination.

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Year	I	Course Code : SEPBCAT04	Credits	4
Semester	II	Course Title : Object Oriented Programming Using C++	Hours	60

Course Pre-requisites, if any	NA	
Formative Assessment Marks : 20	Summative Assessment Marks : 80	Duration of SEE : 3 hrs.

Course Objectives	**After completing this course satisfactorily, a student will be able to:** • Describe OOP's concepts. • Use functions and pointers in your C++ program. • Understand tokens, expressions and control structures. • Explain arrays and strings and create programs using them. • Describe and use constructors and destructors.

Unit No.	Course Content	Hours
UNIT-I	**Object Oriented Programming Paradigm:** Basic Concepts of Object Oriented Programming, Structure of C++ Program, I/O Functions, Tokens-Keywords , Identifiers, Variables, constants, Operators and Expressions, Control Structures-Decision making & Branching, Decision making & looping, Jumps statements.	10
UNIT-II	**Classes and Objects:** Class Definition and Access Specifies -Private, Public, protected, Creating objects ,accessing members of class ,Passing Objects as Arguments, Returning Objects from Functions, Arrays of Objects, Arrays as Member Data, Static Member Data, Static Member Functions, Friend Functions, Friend Class, this Pointer, Nesting of member Functions ,Constructors and Destructors: Constructors and their Characteristics, Types of Constructors- Default Constructor, Parameterized Constructor, Copy Constructor, Dynamic Constructor, Destructor and its Characteristics, Operator Overloading- syntax of operator overloading function, overloading Unary operators, overloading Binary operators.	15
UNIT-III	**Inheritance:** Types of Inheritance ,Virtual Base Class, Pointer to objects, Pointer to derived Classes and Virtual functions and Abstract class, Constructors and destructors in derived classes ,Constructors and destructors in Multiple inheritance, Private Inheritance, Protected Inheritance, Public Inheritance.	10
UNIT-IV	**File Handling:** Built-in Classes for file I/O operations, types of data files(text files and binary files),Opening and Closing a file, Detecting End of File, Text Files, Character I/O-put(),get() Member Functions, String I/O-The < < operator and the getline() Member Function, Random accessing of a Binary file (seekg(), seekp(), tellp() Member Functions), Error Handling During File I/O operations-fail(), bad(), good(), command Line Arguments. String Handling: String class and its Constructors, Member Function of String class.	10

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UNIT-V	**Exception Handling:** Exception Handling Mechanism, Throwing in one Function and catching in the other, single try block, Multiple Catch Blocks, Catching all exceptions in a single catch block, Re-throwing an exception, Specification of an exception. Templates: Class Templates, Class Templates with Multiple Parameters, Function Templates, and Function Templates with Multiple Parameters, Member Function Templates, and overloading Template functions.	15

Recommended Learning Resources

Reference Books:

1. M.T. Somashekara, "Object Oriented Programming with C++ (2nd Edition)", PHI.
2. E Balagurusamy, "Object Oriented Programming with C++", McGraw Hill Publications.
3. Herbert Schildt, "C++:The Complete Reference", Tata McGraw Hill Publication.

E-Resources:

1. Codecademy's C++ Course: Covers OOP concepts like classes, objects, inheritance, and polymorphism.
2. Coursera - University of Colorado's "C++ for C Programmers" course: Covers OOP fundamentals and C++ specifics.
3. edX - Microsoft's "C++ Essentials" course: Covers OOP basics, including classes, objects, and inheritance.
4. GeeksforGeeks: Offers tutorials, examples, and practice problems on OOP concepts in C++.
5. (link unavailable) Provides tutorials, reference materials, and examples on OOP in C++.
6. Tutorialspoint's C++ Tutorial: Covers OOP concepts, including classes, objects, inheritance, and polymorphism.
7. C++ OOP Tutorial by FreeCodeCamp: A comprehensive tutorial covering OOP basics and C++ specifics.
8. OOP in C++ by LearnProgramming (YouTube): Video tutorials covering OOP concepts and implementation in C++.
9. C++ Documentation by (link unavailable) A comprehensive resource for learning C++ OOP concepts and syntax.
10. "The C++ Programming Language" by Bjarne Stroustrup (PDF): The definitive book on C++ by its creator, covering OOP concepts in-depth.

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Year	I	Course Code : SEPBCAT05	Credits	4
Semester	II	Course Title : Database Management System	Hours	60

Course Pre-requisites, if any	NA	
Formative Assessment Marks : 20	Summative Assessment Marks : 80	Duration of SEE: 3 hrs.

Course Objectives	**After completing this course satisfactorily, a student will be able to:** • Describe the fundamental elements of relational database management systems. • Explain the basic concepts of relational data model, entity- relationship model, relational database design, relational algebra and SQL. • Design ER-models to represent simple database application scenarios. • Design the ER-model to relational tables, populate relational. • Construct the database design by normalization, Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing.

Unit No.	Course Content	Hours
UNIT-I	Database Concepts; Database, Database Management System(DBMS), Characteristics of database approach, Advantages and Disadvantages of using the DBMS, DBMS users, Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces.	10
UNIT-II	The Entity Relationship Model: Entities, Attribute, Relationships, Connectivity and Cardinality, Weak Entities, Composite Entities, Entity Super Types and Subtypes, E-R Diagrams, Naming Conventions and Design Issues, Specialization and Generalization.	15
UNIT-III	Relational Model: Concepts, Constraints and Relational Database Schemas, Update Operations, Relational Algebra Operations, Relational Calculus, Relational Database Design using ER to relational Mapping.	12
UNIT-IV	Relational Query Languages: SQL Data Definition and Data Types, Specifying Constraints, Queries in SQL, DDL, DCL, DML, TCL.	10
UNIT-V	Relational Database Design: Functional Dependencies, Normal Forms- First, Second, Third , Boyce-Codd Normal Forms, Fourth Normal Form Backup and Recovery: Database backups, Importance of Backups, Causes of Failures, Database Recovery, Recovery Facilities, Recovery Techniques	13

Recommended Learning Resources

Reference Books:

1. Ramez Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems(7th Edition)", Pearson.
2. Bipin C. Desai ,"An Introduction to Database Systems", Galgotia Publications.
3. C. J. Date ,"An Introduction to Database Systems", Pearson.

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E-Resources:

Websites:

1. Tutorials Point: DBMS Tutorial - Comprehensive tutorials, examples, and quizzes.
2. GeeksforGeeks: DBMS - Tutorials, examples, and practice problems.
3. W3Schools: SQL Tutorial - Learn SQL basics and advanced concepts.
4. DatabaseStar: DBMS Tutorial - Tutorials, examples, and quizzes.
5. Studytonight: DBMS Tutorial - Comprehensive tutorials and examples.

Online Courses:

1. Coursera - University of Colorado's "Database Management Systems" course.
2. edX - Microsoft's "Database Management Systems" course.
3. Udemy - "Database Management Systems" course.
4. DataCamp - "Introduction to Database Management" course.

E-books:

1. "Database System Concepts" by Abraham Silberschatz (PDF).
2. "Database Management Systems" by Raghu Ramakrishnan (PDF).
3. "Fundamentals of Database Systems" by Ramez Elmasri (PDF).

YouTube Channels:

1. Database Management System by Neso Academy.
2. DBMS Tutorial by FreeCodeCamp.
3. Database Management System by Telusko.

Practice Platforms:

1. LeetCode - Database problems.
2. HackerRank - Database challenges.
3. SQL Fiddle - Practice SQL queries.

Blogs:

1. Database Journal.
2. DBMS Blog.
3. Database Trends and Applications.

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Year	I	Course Code : SEPBCAT06	Credits	4
Semester	II	Course Title : Discrete Mathematics	Hours	60

Course Pre-requisites, if any	NA	
Formative Assessment Marks : 20	Summative Assessment Marks : 80	Duration of SEE: 3 hrs.

Course Objectives	**After completing this course satisfactorily, a student will be able to:** • Ability to apply mathematical logic to solve problems. • Understand sets, relations, functions. • Able to use logical notations to define and reason about fundamental mathematical concepts. • Able to formulate problems and solve recurrence relations. • Able to model and solve real world problems using Graphs and trees.

Unit No.	Course Content	Hours
UNIT-I	**Set Theory :** Set Notation and Description, Subset, Basic set operations, Venn Diagram, Laws of set theory, Partitions of sets, min sets. Relations: Graphics of relations, Operations of relations, Properties of relations, Composition of relation, Closer operation on relation, Equivalence relation. Functions: Types of Functions, Composition of Functions.	15
UNIT-II	**Propositional Logic:** Mathematical logic introduction, Statement connectives –Negation, conjunction, disjunction, Statement formulas and Truth table--conditional and bi-conditional statements-tautology contradiction. Quantifiers, Arguments. Mathematical Induction: The principle of mathematical induction and its applications.	10
UNIT-III	**Graph Theory:** Graphs and Graph models, Graph terminology and Special types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest path Problems, Planar Graphs, Graph coloring.	10
UNIT-IV	**Counting:** Basics of counting, pigeonhole principle, permutation and combination, Binomial coefficient and combination, generating permutation and combination. Advanced counting Techniques: Applications of Recurrence relations, solving linear recurrence, Relations, divide and conquer algorithm and recurrence relation, Generating functions, inclusions-exclusion, Applications of inclusions-exclusion.	15
UNIT-V	**Boolean Proposition:** Lattices and Algebraic Structure; Duality, Distributive and complemented Lattices, Boolean lattices and Boolean Algebra. Boolean Functions and Expressions: Propositional Calculus, Design and implementation of Digital Networks, Switching circuits.	10

Recommended Learning Resources

Reference Books:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Mc. Graw Hill Education.
2. V. Krishnamurthy, "Combinatorics: Theory and Applications", East-West Press.
3. Kolman, Busby, Ross," Discrete Mathematical Structures", Prentice Hall International

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E-Resources:

1. Coursera:
   - Courses like "Discrete Mathematics" by UC San Diego offer structured content and assignments.
2. edX:
   - Similar to Coursera, edX offers courses from institutions like MIT and Harvard. Khan
3. Academy:
   - Provides free video lectures and exercises on various topics, including foundational concepts in discrete mathematics.
4. MIT OpenCourseWare:
   - Offers free course materials, including lecture notes, assignments, and exams for courses like "Mathematics for Computer Science."

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Year	I	Course Code : SEPBCAP04	Credits	2
Semester	II	Course Title : C++ Programming Lab	Hours	50
Course Pre-requisites, if any		Knowledge of C++ Programming.		
Formative Assessment Marks : 10		Summative Assessment Marks : 40	Duration of SEE: 3 hrs.	

PART - A:

1. Write a C++ Program to perform arithmetic operations.
2. Write C++ Program to read and print N numbers using arrays
3. Write C++ Program to find factorial of a given number.
4. Write C++ Program to add two numbers using function with arguments
5. Write C++ Program to display two numbers using class.
6. Write C++ Program to display student information using class.
7. Write C++ Program to find sum and average of three numbers using member function with arguments.
8. Write C++ Program to print student information using parameterized constructor.
9. Write C++ Program to display 5 employee information using array of objects.
10. Write C++ Program to implement destructor.

PART - B:

1. Write C++ Program to print student information using Single Inheritance.
2. Write C++ Program to demonstrate multiple inheritances.
3. Write C++ Program to demonstrate hybrid inheritance.
4. Write C++ Program to demonstrate example of this pointer.
5. Write C++ Program to demonstrate simple try and catch block.
6. Write C++ Program to demonstrate use of multiple catch blocks.
7. Write C++ Program to implement file handling.
8. Write C++ Program to demonstrate example of class template.
9. Write C++ Program to demonstrate example of function template.
10. Write C++ Program to demonstrate example of exceptional handling.

Instructions:

1. A certified journal is mandatory for every student to appear for the practical examination.
2. The student has to execute a minimum of eight programs from each part to complete the lab course.

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Year	I	Course Code : SEPBCAP05	Credits	4
Semester	II	Course Title: Database Management System Lab	Hours	50

Course Pre-requisites, if any	NA	
Formative Assessment Marks : 10	Summative Assessment Marks: 40	Duration of SEE : 3 hrs.

Course Objectives	After completing this course satisfactorily, a student will be able to: • Ability to design and implement a database schema for given problem. • Apply the normalization techniques for development of application software to realistic problems. • Ability to formulate queries using SQL DDL/DML/DCL/TCL commands. • Ability to normalize the database & understand the internal data structure

1. Implementation of DDL commands of SQL with suitable examples.
   - Create table
   - Alter table
   - Drop Table
2. Implementation of DML commands of SQL with suitable examples.
   - Insert
   - Update
   - Delete
3. Implementation of different types of function with suitable examples.
   - Number function
   - Aggregate Function
   - Character Function
   - Conversion Function
   - Date Function
4. Implementation of different types of operators in SQL.
   - Arithmetic Operators
   - Logical Operators
   - Comparison Operator
5. Implementation of different types of Set operators in SQL.
6. Implementation of different types of Joins.
   - Inner Join
   - Outer Join
   - Natural Join etc.
7. Study and Implementation of
   - Group By & having clause
   - Order by clause
   - Indexing
8. Study & Implementation of
   - Sub queries
   - Views
9. Study & Implementation of different types of constraints.
10. Study & Implementation of Rollback, Commit, Savepoint.

Instructions:

1. A certified journal is mandatory for every student to appear for the practical examination.

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Year	I	Course Code : SEPBCAP06	Credits	2
Semester	II	Course Title : Discrete Mathematics Lab	Hours	50
Course Pre-requisites, if any		Knowledge of C++ Programming		
Formative Assessment Marks : 10		Summative Assessment Marks : 40	Duration of SEE: 3 hrs.	

Implement the following programs in C++

1. Write a program to find factorial of given number using recursion.
2. Write a program to Fibonacci sequence using recursion.
3. Write a program to find GCD of two numbers.
4. Write a program on union operation on sets.
5. Write a program on intersection operation on sets.
6. Write a program on symmetric difference of sets.
7. Write a program on AND gate.
8. Write a program on OR gate.
9. Write a program on NOT gate.
10. Write a program to display the truth table of AND, OR and NOT gate.
11. Write a program to demonstrate logical operators.
12. Write a program to generate truth table for A*B+C using for loop.

Instructions:

1. A certified journal is mandatory for every student to appear for the practical examination.

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Theory Examination Question Paper Pattern for Major Subjects of B. Sc. / BCA

Time: 3 Hours **Max Marks: 80**

Instructions to Candidates:

1. All Sections are Compulsory.
2. Draw neat and labeled diagrams wherever necessary.

	Section-A	
Answer ALL the following Questions.		**10x2=20**
Q1	a	Question to be asked from Unit-I
	b	Question to be asked from Unit-I
	c	Question to be asked from Unit-II
	d	Question to be asked from Unit-II
	e	Question to be asked from Unit-III
	f	Question to be asked from Unit-III
	g	Question to be asked from Unit-IV
	h	Question to be asked from Unit-IV
	i	Question to be asked from Unit-V
	j	Question to be asked from Unit-V
	Section-B	
Answer any SIX of the following Questions.		**6x5=30**
Q2		Question to be asked from Unit-I
Q3		Question to be asked from Unit-I
Q4		Question to be asked from Unit-II
Q5		Question to be asked from Unit-II
Q6		Question to be asked from Unit-III
Q7		Question to be asked from Unit-III
Q8		Question to be asked from Unit-IV
Q9		Question to be asked from Unit-V
	Section-C	
Answer any THREE of the following Questions.		**3x10=30**
Q10		Question to be asked from Unit-I
Q11		Question to be asked from Unit-II
Q12		Question to be asked from Unit-III
Q13		Question to be asked from Unit-IV
Q14		Question to be asked from Unit-V

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Instructions:

Continuous Internal Assessment for Practical	
Assessment Type	**Marks**
Test1 on PART A	10
Test2 on PART B	10
Maximum Marks to be awarded	10

Instructions:

1. A Certified Journal is mandatory for appearing the examination.
2. Students shall be given two programming assignments taking in to consideration of duration of the time allotted to students for writing, typing and executing the programs.
3. Award maximum 10 marks based on the average of two practical CIA.

Note: Guidelines given by the university from time-to-time shall be followed for I. A.

Semester End Examination (SEE) Scheme of Evaluation for Lab Examination

Assessment Criteria	**Marks**
Writing of 2 Programs(Each from Part A & Part B)	15
Execution (Includes program code modification and execution result)	15
Journal	05
Viva-Voice	05
Total	**40**

Instructions:

CIA(Continuous Internal Assessment) for Theory	
Assessment Type	Marks
1. Test 1 2. Assignment	15 05
1. Test 2 2. Seminar	15 05
Maximum Marks to be awarded	**20**

Award maximum 20 marks based on the average of two theories CIA.

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