	Program Outcomes (POs) BCA
PO1	Acquire Knowledge of mathematical foundations, computer application theory and algorithm principles in the design and modelling of computer based system.
PO2	Understand to design, analyze and develop solutions and evaluate system components/processes to meet specific need for various domains.
PO3	Create, select, adapt and apply appropriate technologies and tools to a wide range of computational activities while understanding their limitations.
PO4	Communicate effectively by being able to comprehend effective documentation and presentations.
PO5	Ability to engage in independent learning for continuous self- development as a computer application professional.

Programming in C

PAPER CODE: 101

Course Objectives

This course aims to introduce students to the fundamentals of programming and structured problem-solving using the C language. It covers essential concepts like algorithms, flowcharts, programming techniques, and debugging tools. Students will learn C syntax, control structures, arrays, strings, functions, pointers, structures, and preprocessor directives. The course emphasizes logic building, modular programming, and hands-on coding for developing efficient and maintainable programs.

Course outcomes

CO1a:	Understand the problem solving constructs and techniques through flowcharts
CO1b:	Understand various tokens and predefined functions of C language.
CO2:	Understand & apply control statements and arrays to solve problems for Computers.
CO3:	Create modular program using functions and utilize various storage class.
CO4:	Understand & apply pre-processor directives, structures, and union in solving problems.

CO/PO Matrix

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	1	1	-	3
CO1b	2	2	2	-	3
CO2	2	2	2	-	3
CO3	2	2	2	-	3
CO4	2	2	2	-	3

Computer Organization and Architecture

PAPER CODE: 102

Course Objectives: The course focus on structure and function of the computer system. Analyze and understand the Logic Gates, Boolean algebra, Combinational and sequential circuits, instruction sets. Addressing modes, Memory hierarchy, I/O systems DMA technique.

Course Outcomes: At the end of the course, students will be able to-

	PO1	PO2	PO3	PO4	PO5
CO1a-Understand the concepts of Logic Gates, map simplification, Different Digital Circuits.	2	2	1	1	3
CO 1b-Use of the data representation Techniques and codes.	2	2	2	1	3
CO2-Understand the concepts of computer organization.	2	2	2	-	3
CO3-Understand central processor organization.	2	2	2	-	3
CO4-Understanding the various types of Memories and I/O organization.	2	3	3	-	3

MATHEMATICS-I
DISCRETE MATHEMATICS
PAPER CODE: 103

Course Objectives: This course introduces foundational concepts in logic, set theory, relations, and functions essential for mathematical reasoning. It aims to develop understanding of Boolean algebra for logical circuit simplification and switching theory applications. Students will also explore fundamental graph theory concepts and algorithms for solving network-related problems.

Course Outcomes:

CO1a	Understand the key concept of propositions and quantifiers.
CO1b	Construct proofs of basic set-theoretic identities involving unions, intersections, and Cartesian products
CO2	Understand the concept of relation and function and its operations.
CO3	Evaluate Boolean algebra expressions and functions and simplify the Boolean expression representing switching circuit.
CO4	Demonstrate graph, path, cycles, complement of a graph, trees and its types

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	2	2	-	3
CO1b	3	2	2	-	3
CO2	3	2	3	-	3
CO3	3	2	3	-	3
CO4	3	2	2	-	3

ENGLISH AND COMMUNICATION SKILLS
PAPER CODE: 104

Course Objective : To enable students to learn general English grammar and its use in daily life.

Course Outcomes:

CO1a	Students will be able to acquire a wide vocabulary and understanding of basic functional grammar and knowledge for reading, writing and spoken language.
CO1b	Students will be able to develop creative and critical writing skills along with developing an interest and appreciation of literary texts.
CO2	To enable the learners to communicate effectively and appropriately in real life situations.
CO3	Students will be able to demonstrate the use of basic and advanced business writing skills and to produce clear and concise written business documents.
CO4	Students will be able to summarize and synthesize information into a coherent text and develop language competence, presentation and public speaking skills.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	-	3	1	2
CO1b	2	-	3	-	1
CO2	3	3	3	3	2
CO3	2	3	3	3	3
CO4	3	2	3	3	3

PRINCIPLES AND PRACTICES OF MANAGEMENT
PAPER CODE: BCA 105

Course Objectives: After the completion of this subject, the students will be able tointroduce the fundamental concepts of management.

CO1a	Understand the concepts and functions of Management.
CO1b	To articulate management agenda using tools and techniques of planning
CO2	Devise the organization structure and distill the organization function.
CO3	Developing skills in directing individuals and groups.
CO4	Analyze various control systems and their effectiveness in achieving organization goals.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	2	1	1	2
CO1b	1	3	2	1	2
CO2	1	2	3	2	1
CO3	1	1	2	3	2
CO4	2	1	2	2	3

Programming in C Lab

PAPER CODE: 106

Course Objectives:

This course aims to introduce students to the fundamentals of programming using the C language. It focuses on structured problem-solving techniques through flowcharts, algorithms, and modular approaches. Students will learn to develop efficient programs using C constructs such as operators, loops, arrays, strings, functions, pointers, structures, and file handling.

Course Outcomes:

CO1a	Read understand and trace the execution of programs written in C language
CO1b	Write the C program for a given algorithm using control statements with input and output.
CO2	Write the modular program for given problem.
CO3	Write the program to solve problem using array, structure and pointers
CO4	Implement the solutions of real world problem.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	1	3	1	-	3
CO1b	1	3	2	-	3
CO2	1	3	2	-	3
CO3	1	3	2	-	3
CO4	1	3	2	-	3

MS Office (LAB)

PAPER CODE: 107

Course Objective: To equip learners with fundamental skills in MS Office tools—Word, Excel, and PowerPoint enabling efficient document creation, data analysis using formulas and functions, and professional presentation design.

Course outcomes
After the completion of course, students will be able to:

CO1a: Understand computer basics fundamentals to familiar with computer and its parts.
CO1b: Working with MS Word, various menus and formatting structures along with special features.
CO2: Hands on MS Excel spread sheet including various formatting techniques.
CO3: Working with MS Excel functions and formulas and statistical functions.
CO4: Hands on ms power point presentation slide with its features.

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	3	3	3	3
CO1b	3	2	2	3	2
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	2

Data Structure
PAPER CODE: BCA-201

Course Objective: To enable students with the knowledge and skills necessary to design implement and analyze efficient solutions to computational problems.

Course Outcomes:

CO1a	Understand the basic concepts of data structure & articulate linear data structure and permitted operations
CO1b	Understand and apply linked list data structure for solving problems
CO2	Articulate the tree data structures and permitted operations
CO3	Articulate the graph data structures and permitted operations
CO4	Implement Searching and Sorting algorithms & Understand the concepts of file organization techniques

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	1	1	1	2
CO1b	2	1	1	1	2
CO2	3	1	1	1	2
CO3	3	1	1	1	2
CO4	2	1	1	1	2

Database Management System
PAPER CODE: BCA 202

Course Objective : This course covers fundamentals of database architecture, database management system. Principles and methodologies of database design and techniques for database application development.

Course Outcomes:

CO1a	Understand the Database concepts, DBMS software and supported architecture.
CO1b	Understand to design and implement databases using concepts of data models
CO2	Understand and analyze databases using normalization concepts.
CO3	Apply SQL and relational algebra expressions to retrieve and manage database
CO4	Understand transaction processing and concurrency control concepts

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	1	1	-	1	2
CO1b	2	1	1	2	2
CO2	2	2	-	1	3
CO3	2	3	3	2	2
CO4	2	2	1	1	2

MATHEMATICS II
STATISTICAL METHODS
PAPER CODE: 203

Course Objectives: This course aims to introduce fundamental statistical concepts, data presentation techniques, and measures of central tendency and dispersion.It equips students with knowledge of probability theory, correlation, regression analysis, and probability distributions. Students will also learn hypothesis testing using statistical tools like t-test and z-test for informed decision-making.

Course Objective:

CO1a	To Understand the concept of statistics and analyze statistical data graphically using frequency distributions.
CO1b	To Analyze statistical data using measures of central tendency, dispersion, skewness and Kurtosis.
CO2	Understand the concept of basic terminology of probability and use of Normal distribution to find area under normal curve.
CO3	Apply the concept of correlation & Regression to analyze the underlying relationships between the variables.
CO4	Analyze statistical inference techniques (including statistical estimation and hypothesis testing) in business situations.

COPO Matrix:

CO/PO Matrix							
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**
CO1a	3	3	2	2	1	1	0
CO1b	3	3	2	1	1	1	0

CO2	3	2	-	-	1	1	1
CO3	3	2	2	2	2	1	0
CO4	2	2	2	2	2	1	1

Environmental science &Sustainability
PAPER CODE: BCA-204 (MDE)

Course Objective : Developing a strong understanding of ecological principles, environmental issue and sustainable solutions.

Course Outcomes:

CO1a	Comprehend the Fundamentals of Ecology and Environmental Science
CO1b	Understand and Appreciate Biodiversity and Its Protection
CO2	Apply Principles of Sustainable Development
CO3	Conduct Environmental Experiments and Analysis
CO4	Develop and Disseminate Environmental Conservation Messages

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	2	2	1	1
CO1b	1	1	2	2	1
CO2	2	3	2	2	3
CO3	2	2	1	2	3
CO4	1	2	2	1	2

Data Structure Lab
PAPER CODE: BCA-205

Course Objective : To make the students to learn to develop solutions of problems by implementing various data structures, searching and sorting algorithms

Course Outcomes:

CO1a	Implement and apply different linear data structure algorithms(stack, queues)
CO1b	Implement the various operations like insertion, deletion and traversing different linked list.
CO2	Demonstrate various operations like traversal, insertion, deletion on tree data structure.
CO3	Demonstrate various operations like traversal, insertion, deletion on graph data structure.
CO4	Implement various searching and sorting algorithms on different data structure.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	1	1	1	2
CO1b	2	1	1	1	2
CO2	3	1	1	1	2
CO3	3	1	1	1	2
CO4	2	1	1	1	2

Database Management System Lab
PAPER CODE: BCA 206

Course Objective : To make the student to learn writing SQL queries.
Course Outcomes:

CO1	Design relational databases that meet specific application requirement.
CO2	Write the SQL statement for creating databases in RDBMS
CO3	Write SQL statements for insert, update, and delete data from databases
CO4	Write SQL statements for fetching desired data from databases

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	2	2	-	3
CO2	1	1	1	-	3
CO3	1	1	1	-	3
CO4	1	1	1	-	3

INTRODUCTION TO OPERATING SYSTEM
PAPER CODE: BCA 301

Course Objectives:

This course is designed to provide students with a strong foundation in the fundamentals of operating systems. It aims to develop an understanding of instruction execution, processor registers, and inter-component communication within a computer system. Students will learn how the operating system manages processes and memory, handles synchronization issues, and resolves deadlocks using various algorithms. The course also covers different memory management techniques implemented by modern operating systems.

Course Outcomes:

CO1a	To learn the fundamentals of OS, gain the knowledge on the basics of instruction execution, processor registers and how components of system communicate with each other.
CO1b	To learn the concept of process and how OS manages processors and memory.
CO2	To gain knowledge about the mechanisms of OS for synchronizing processes and understanding various problems of synchronization.
CO3	To learn the concept of deadlocks and various algorithms for handling deadlocks.
CO4	To understand various memory management techniques implemented by OS.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	-	2	2	-	2
CO1 b	2	3	2	-	3
CO2	2	3	3	-	2
CO3	2	2	2	-	3
CO4	2	2	3	-	3

Object Oriented Programming in C++

PAPER CODE: 302

Course Objective: To enable students to understand and apply object-oriented programming principles using C++ by exploring concepts such as classes, inheritance, polymorphism, file handling, and exception handling to build robust and modular software applications.

Course Outcomes

CO1a:	Understand basic constructs of C++ Programs and identify potential benefits of Object-oriented programming over other approaches.
CO1b:	Understanding and applying of object oriented programming concept of class, object and their storage to develop solutions of the problems.
CO2:	Understanding the concept of overloading the operator and functions and Applying the concept of Inheritance to solve the real-world problem
CO3:	Understanding the concept of Polymorphism and declaring Pointers and Arrays in Programs.
CO4:	Introduction to Files and Applying the concept of file and exception handing to store and retrieve data.

CO/PO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	3	2	-	3
CO1b	3	3	2	1	3
CO2	2	2	3	1	3
CO3	2	2	3	1	3
CO4	-	-	1	2	3

MATHEMATICS-III
LINEAR ALGEBRA
PAPER CODE: 303

Course Objectives: This course introduces fundamental concepts of matrices, determinants, and their algebraic properties. It focuses on solving systems of linear equations using analytical and numerical methods.
Students will learn about eigenvalues, eigenvectors, and apply matrix techniques in solving mathematical problems.

Course Objectives:

CO1a	To Understand the concept of Matrices and analyse the matrix operations.
CO1b	To Analyze matrices using determinants, inverse and ranks.
CO2	Learn to solve system of linear equations and application problems requiring them.
CO3	Analyze and Calculate Eigen values & Eigen vectors and practical problem of Cayley Hamilton Theorem.
CO4	To understand and learn various iterative techniques to solve simultaneous linear equations.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	1	2	-	2
CO1b	3	1	2	-	2

CO2	3	1	2	-	2
CO3	3	1	2	-	2
CO4	3	1	2	-	2

WEB TECHNOLOGIES
PAPER CODE: BCA 304

Course Objective : To introduce the web technologies concepts for developing web applications.
Course Outcomes:

CO1a	**Apply** knowledge of HTML and CSS to **construct and style basic web pages**.
CO1b	**Analyze** the functionalities of basic client-side scripting with JavaScript
CO2	**Understand** and **Write** the basic syntax and functionalities of PHP code
CO3	**Evaluate** different methods for handling form submissions in PHP (GET vs. POST), **the need for** and **implement user sessions and cookies**
CO4	**Create** a basic application that interacts with a MySQL database using PHP

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	1	1	1	2
CO1b	2	3	1	2	2
CO2	2	2	3	3	3
CO3	3	1	3	2	2
CO4	3	2	1	1	2

Object Oriented Programming in C++ Lab

PAPER CODE: BCA-306

Course Objective: To enable students to understand and apply the principles of C++ programming including operators, control structures, object-oriented concepts, function and operator overloading, inheritance, polymorphism, and file handling for solving real-world problems.

Course Outcomes:

CO1a	Apply basic programming constructs such as variables, operators, and input/output statements to solve simple arithmetic problems.
CO1b	Implement decision-making and loop control structures to design structured and interactive C++ programs.
CO2	Develop object-oriented programs using classes, objects, constructors, destructors, and access specifiers.
CO3	Demonstrate the concept of function overloading, inline functions, and default arguments for code flexibility and reuse.
CO4	Integrate object-oriented and functional programming features to write optimized and modular C++ code for real-life applications.

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	2	2	1	2
CO2	3	3	3	2	2
CO3	3	3	3	2	2
CO4	3	3	3	2	2
CO5	3	3	3	2	3

Indian Constitution
PAPERCODE: BCA 307

Course Objective : To make the students aware, history, structure and values of the Indian constitution.

Course outcomes :

After the completion of course, students will be able to:

CO1a:UnderstandthetruenatureofIndianFederalStructureandSalientfeaturesofIndianConstitution.
CO1b:ComprehendthestructureoffundamentalrightsguaranteedunderIndianConstitution
CO2:Criticallyappraisethecategoriesoffundamentalrightsandreasonablerestrictions
CO3:Appraisethenatureofdirectiveprinciplesofstatepolicyand FundamentalDuties
CO4:Comparethethree organsofgovernanceoftheState

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	2	3	-	2
CO1b	3	2	3	-	2
CO2	3	2	3	-	2
CO3	3	2	3	-	2
CO4	3	1	3	-	2

PROGRAMMING IN JAVA
PAPER CODE: BCA 401

Course Objective : To impart knowledge about basic JAVA language syntax and semantics to write JAVA programs.

Course Outcomes:

CO1a	Understanding the basics of java language, and utilize control structures to manage program flow.
CO1b	Design and implement Java classes, demonstrate inheritance and polymorphism, and utilize interfaces for modular design.
CO2	Organize Java code into packages, manipulate strings, and utilize Java collections to store and manipulate data efficiently
CO3	Implement robust error-handling with exception handling mechanisms and understand multithreading in Java.
CO4	Design and develop Graphical User Interfaces (GUIs) using AWT and Swing components, incorporating event-driven programming and layout management.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	2	2	-	-	1
CO1 b	2	2	3	-	-
CO2	1	3	3	-	3
CO3	2	3	3	-	2
CO4	2	3	3	-	3

Analysis and Design of Algorithm
PAPER CODE: BCA 402

Course Objectives:

1.To introduce the foundational concepts of algorithm analysis, including time and space complexity, and equip students with the ability to evaluate algorithm efficiency using asymptotic notations.

2.To develop the ability to design, implement, and analyze algorithms using standard techniques such as Divide and Conquer, Greedy Method, Dynamic Programming, Backtracking, and Branch and Bound.

Course Outcomes:

CO1a	Understand the fundamental concepts of Algorithm and Analysis of algorithms in terms of time and space complexity.
CO1b	Understand and analyze the divide and conquer technique of algorithm design.
CO2	Understand and analyze the Greedy method technique of algorithm design.
CO3	Understand and analyze the Dynamic Programming technique of algorithm design.
CO4	Understand and analyze the Backtracking and Branch and Bound technique of algorithm design.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	2	2	-	2	-
CO1 b	2	2	-	2	-

CO2	2	3	-	3	2
CO3	2	3	-	3	2
CO4	2	3	1	2	3

MATHEMATICS-IV
CALCULUS
PAPER CODE: 403

Course Objectives: This course aims to develop a strong understanding of functions, limits, continuity, and differentiability. It equips students with techniques of differentiation, integration, and series expansion for mathematical analysis.
Students will also learn to solve first-order differential equations relevant to real-world applications.

Course Outcomes:

CO1a	Understand concepts of limit, continuity and differentiability of a function.
CO1b	Learn the basic concept of differentiation and various theorem based on differentiation.
CO2	Understand the key concept of successive differentiation and apply them to solve various Problems.
CO3	Evaluate the integration of various types of function.
CO4	Learn the basic concept of differential equation and apply various methods to solve differential equation of first order and first degree.

CO-PO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	2	-	-	2
CO1b	3	2	-	-	1
CO2	3	2	-	-	1
CO3	3	2	-	-	1
CO4	3	2	-	-	2

Python Programming
PAPER CODE: BCA 404

Course Objective : To make the students familiar with the programming paradigms brought in by python programming language along with a focus on file handling and regular expressions.

Course Outcomes:

CO1a	Interpret the fundamental Python syntax and semantics
CO1b	Apply Control statements to control the flow of program in python.
CO2	Determine the methods to create and manipulate Python programs by utilizing thedata structures like lists, dictionaries, tuples ,and sets
CO3	Express proficiency in the handling of strings and functions
CO4	Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	1	1	1	2
CO1b	2	1	1	2	2

CO2	2	2	3	1	3
CO3	3	1	3	2	2
CO4	3	2	1	1	2

ENTREPRENEURSHIP DEVELOPMENT
PAPER CODE: 408

Course Objective : To introduced the concepts of entrepreneurship, business planning and the role of entrepreneurs in economic development.

Course Outcomes:

CO1a	Analyze the distinctions between entrepreneurs, entrepreneurs, and managers and their roles in entrepreneurship development
CO1b	**Evaluate** the necessity and objectives of EDPs and their impact on the Indian economy.
CO2	**Create** a funding strategy for a startup, incorporating various sources and government incentives.
CO3	**Evaluate** the roles of various institutions in supporting small business enterprises in India.
CO4	**Develop** a comprehensive business plan that leverages emerging technologies and professional networks.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	3	2	1	3
CO1b	1	3	2	1	3
CO2	2	3	3	2	3
CO3	2	3	2	1	3
CO4	3	3	3	3	3

Programming in Advance Java

PAPER CODE: BCA 501

Course Objective : This course is designed with intent to acquaint the students with tools and techniques for creating a dynamic web application.

Course outcomes

CO1a: To know the concept of Java Programming.
CO1b: To understand how to use programming in day to day applications.
CO2: To develop programming logic.
CO3: Working with ms excel functions and formulas and statistical functions.
CO4: Hands on ms power point presentation slide with its features.

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	3	3	3	3
CO1b	3	2	2	3	2
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	2

Software Engineering
PAPER CODE: 502

Course Objectives: The course objectives of Software Engineering Program are to produce graduates who, within three years after graduation, they are able to:-

1. Be employed in industry, government, or entrepreneurial endeavors to demonstrate professional advancement through significant technical achievements and expanded leadership responsibility.
2. Demonstrate the ability to work effectively as a team member and/or leader in an ever changing professional environment.
3. Progress through advanced degree or certificate programs in computing, science, engineering, business, and other professionally related fields.

Course Outcomes: On successful completion of this course, the students will be able to:-

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1a: Able to apply SE Life cycle models, Planning, analysis, design, construction and deployment.	2	3	3	3	2
CO1b: Working in one or more application domains.	2	2	2	3	3
CO2:Work individually and in team develop and Deploy the quality software.	3	3	2	3	3
CO3: Apply correct theories, models and software techniques.	2	3	3	3	3
CO4: Software Metrics, tools and techniques for SE practice.	3	3	2	3	3

ORACLE
PAPER CODE: BCA 503

Course Objective : To enhance the knowledge and understanding of database analysis and design.
Course Outcomes:

CO1a	Understand the concepts of Oracle RDBMS Architecture and Role of DBA to solve the real-world problem of Data and Storage.
CO1b	Understand and apply the concept Database creation and manipulation of Data to communicate.
CO2	Apply the concept of joining the tables to visualize data and provide controlled access to the data.
CO3	Understand and apply the PL SQL block to perform data base Communication.
CO4	Understand and apply the concept of compiled statement using function, Procedure and Exception handing to make the database solution more robust.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	1	1	1	2
CO1b	2	3	1	2	2
CO2	2	2	3	3	3
CO3	3	1	3	2	2
CO4	3	2	1	1	2

Programming in Advance Java LAB

PAPER CODE: BCA 504

Course Objective : To make hands on various java programs.

Course outcomes

CO1a: To know the concept of Java Programming.
CO1b: To understand how to use programming in day to day applications.
CO2: To develop programming logic.
CO3: Working with ms excel functions and formulas and statistical functions.
CO4: Hands on ms power point presentation slide with its features.

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	3	3	3	3
CO1b	3	2	2	3	2
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	2

Oracle Lab
PAPER CODE: BCA - 505

Course Objectives: Equipping students with the practical skills to design develop and manage databases using Oracle technoloies.

CO1a	Understand the concept of Oracle Architecture and role of DBA
CO1b	Understand and implement SQL Query to perform DDL, DML and DCL command
CO2	Apply basic concepts Single and Multiple row function using SQL Query
CO3	Develop SQL query to implement pattern matching and joins
CO4	Develop PL/SQL block to create Stored Procedure, Function and Trigger.

PO-CO-PSO Matrix:

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	3	2	2	2
CO1b	2	2	2	2	3
CO2	2	3	2	3	2
CO3	2	3	2	3	2
CO4	2	3	3	3	3

Computer Networks
PAPER CODE: BCA-601

Course Objective : To build and understanding of the fundamental concepts of computer networking.

Course Outcomes:

CO1a	Define and understand basic working of computer network and its components
CO1b	Understand the various Network Devices and Transmission Impairments
CO2	Understand the basic concept of OSI and TCP reference model and TCP/IP Protocols
CO3	Define Multiplexing, Multiple Access Protocols and understand the concept of Routing.
CO4	Identify and adapt the basic concept of IEEE standards protocols and network Security Concepts for communications.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	-	1	1	2	2
CO1b	2	3	1	2	2
CO2	2	3	2	3	3
CO3	2	2	2	3	2
CO4	2	2	3	3	3

Computer Graphics and Multimedia
PAPER CODE: BCA – 602

Course Objective: To enable students to understand fundamental concepts of computer graphics, geometric transformations, clipping techniques, and multimedia systems, and to apply drawing algorithms and graphical operations for designing and implementing interactive graphic applications.

Course Outcomes:

CO1a	Understand the working of different display devices and input devices.
CO1b	Implement line drawing, circle drawing and area fill algorithm.
CO2	Implement different clipping algorithm.
CO3	Understand and apply 2D geometric Transformation.
CO4	Describe the concept of multimedia.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	1	2	1	1	2
CO1b	3	2	2	2	1
CO2	3	2	2	1	1
CO3	2	2	1	1	1
CO4	1	1	1	2	2

Software Testing
PAPER CODE: BCA 603

Course Objectives:

This course aims to provide students with a comprehensive understanding of the fundamental concepts and techniques of software testing. It covers planning and execution of test projects, test case design, defect management, and reporting. Students will explore advanced topics such as object-oriented and component-based testing, along with integration, regression, and system testing strategies. The course also emphasizes practical approaches to test automation and equips learners with the skills to analyze and address real-world software testing challenges.

Course Outcomes:

CO1a	Understand the fundamental concepts of software testing
CO1b	To learn how to plan a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report
CO2	Understand advanced software testing topics, such as object -oriented software testing methods, and component -based software testing issues, challenges, and solutions
CO3	Understand how to effectively use insights to software testing issues and solutions in software unit test; integration, regression, and system testing.
CO4	To be proficient in analyzing and understand software test automation problems and solutions

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	2	2	3	-	3
CO1 b	2	2	3	-	3
CO2	2	2	3	-	3
CO3	2	2	3	-	3
CO4	2	2	3	-	3

Introduction To AI and ML
PAPER CODE: BCA 604

Course Objectives:

1. To introduce students to the foundational principles of Artificial Intelligence and problem-solving through search algorithms, enabling them to understand AI systems and apply classical search techniques to real-world problems.
2. To provide conceptual and practical understanding of core Machine Learning algorithms, including linear and logistic regression, along with techniques for model evaluation, feature selection, and regularization.
3. To develop the ability to explore and apply basic neural network architectures, enhancing students' capacity for independent learning and implementation of AI models using modern learning algorithms and optimization techniques.

Course Outcomes:

CO1a	Explain the fundamental concepts of Artificial Intelligence (AI)
CO1b	Apply problem-solving techniques using search algorithms.
CO2	Develop and implement basic Machine Learning models.
CO3	Understand and develop logistic regression and linear regression based models
CO4	Demonstrate independent learning skills by exploring Neural Networks in AI

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	1	1	1	2
CO1b	2	1	1	2	2
CO2	2	2	3	1	3
CO3	3	1	3	2	2
CO4	3	2	1	1	2

GENERATIVE AI
PAPER CODE: BCA 606

Course Objectives:

The objective of this course is to introduce students to the fundamentals of Generative Artificial Intelligence and equip them with practical knowledge of AI tools used for generating text, images, videos, audio, and code. The course aims to develop students' proficiency in using text-based AI tools like ChatGPT and Bard for content creation and chatbot development; image and video generation tools such as DALL·E, Midjourney, and Synthesia; and audio tools like Eleven Labs, Murf AI, and AIVA for voiceovers and music.

Course Outcomes:

CO1a	Understand the fundamentals of Generative AI and explore various AI tools used for text, image, video, audio, and code generation.
CO1b	Apply and evaluate text-based AI tools (e.g., Chat GPT, Bard, Jasper AI) for content creation, chatbot development, and summarization.
CO2	Analyze and utilize AI-powered tools like DALL·E, Mid journey, and Synthesia for creating images, animations, and deep fake videos.
CO3	Develop and Demonstrate AI-based audio tools such as Eleven Labs, Murf AI, and AIVA to generate synthetic voiceovers, music, and sound effects.
CO4	Develop and automate software solutions using AI-powered coding assistants like GitHub Copilot, Tabnine, and Google AutoML.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	1	2	2	-	2
CO1 b	2	3	2	-	3
CO2	2	3	3	-	2
CO3	3	2	3	1	2
CO4	2	2	3	2	3

Computer Graphics and Multimedia Lab

PAPER CODE: BCA-606

Course Objective: To enable students to implement basic computer graphics algorithms for drawing, filling, 2D transformations, clipping, and mapping using Python/C/C++ programming.

Course Outcomes:

CO1a	***Understand*** **the fundamentals of graphics programming and implement basic drawing algorithms such as point plotting, DDA, and Bresenham's line algorithm.**
CO1b	***Apply*** **circle drawing and region filling algorithms like Midpoint Circle, Flood Fill, and Boundary Fill to render 2D shapes**
CO2	***Implement*** **two-dimensional geometric transformations including translation, scaling, rotation, reflection, and shearing using matrix operations.**
CO3	***Analyse*** **and implement line clipping using Cohen–Sutherland algorithm for viewport boundary constraints.**
CO4	***Demonstrate*** **the concept of window-to-viewport transformation for displaying objects in different viewing contexts.**

CO-PO-PSO Matrix:

CO/PO Matrix							
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**
CO1a	**3**	**2**	**3**	**1**	**1**	**3**	**2**
CO1b	**3**	**3**	**3**	**1**	**1**	**3**	**3**
CO2	**3**	**3**	**3**	**1**	**2**	**3**	**3**
CO3	**2**	**3**	**3**	**1**	**1**	**3**	**3**
CO4	**2**	**3**	**3**	**1**	**2**	**3**	**3**

DATA MINING
PAPER CODE: 701

Course Objectives

- To provide students with the fundamentals and essentials of Data Mining.
- To provide students a sound foundation of Data Mining so that they are able to start using and adopting Data Mining services and tools in their real life scenarios.
- To enable students exploring some important Data Mining driven commercial applications.
- To expose the students to frontier areas of Data Mining, while providing sufficient foundations to enable further study and research.

Course Outcomes

Upon successful completion of this course, students will be able to –

CO1a: Explain the core concepts of the Data Mining paradigm.
CO1b: Analyze this paradigm,Techniques in Data Mining.
CO2: Data Mining technologies, Deployment Models etc.
CO3: Understand Data visualization,Full and partial uses cases.
CO4: Analyze various Data Mining techniques and apply them to solve problems.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	1	1	2	1	2
CO1 b	2	2	2	-	3
CO2	2	2	3	1	3
CO3	2	2	3	-	3
CO4	2	3	3	1	2

Research Methodology

PAPER CODE: 702

Course Objectives:

1.To familiarize students with the fundamental principles, types, and processes of research, including formulation of research problems, development of hypotheses, and review of literature with academic integrity.

2.To equip students with the ability to design and implement a research framework, including data collection, measurement, and analysis using digital tools and programming platforms such as Excel, SPSS, R, and Python.

3.To develop critical skills in academic writing and research communication, enabling students to conduct literature reviews, apply proper referencing styles, and write structured research papers in line with ethical standards.

Course outcomes
After the completion of course, students will be able to:

CO1a: Understand the concept, types & process of Research.
CO1b: Develop Review of literature and hypothesis.
CO2: Design the blueprint of research.
CO3: Demonstrate the ability to use various digital tools and programming platforms for data collection, organization, and visualization.
CO4: Develop the ability to evaluate existing research literature and effectively write structured research papers.

CO/PO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	3	2	-	3
CO1b	3	3	2	1	3
CO2	2	2	3	1	3
CO3	2	2	3	1	3
CO4	3	2	1	2	3

Data Science using Python
PAPER CODE: BCA - 703

Course Objectives: To equip students with the skills and knowledge necessary to perform data analysis, build machine learning models using python.

CO1a	Understand the concept of Python and its use in Data Science
CO1b	Understand and implement Basics control flow and string manipulation of Python
CO2	Apply basic concepts Python collections
CO3	Understand and apply basics OOP's concepts and use of numpy and pandas library of Python
CO4	Develop visualization using matplotib library of Python.

PO-CO-PSO Matrix:

PO-CO-PSO Matrix							
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**
CO1a	2	3	2	3	2	3	2
CO1b	2	2	2	2	3	3	3
CO2	2	2	2	3	2	2	2
CO3	2	3	2	2	2	2	3
CO4	2	3	3	3	3	2	3

CYBER SECURITY & LAW
PAPER CODE: BCA-704

Course Outcomes: Understanding cyber security concepts, measures and responding to security incidents.

CO1a	Identify and resolve security issues in networks and computer systems to secure any public or private organization.
CO1b	Understand the concept of Cyberspace and Regulation of cyberspace.
CO2	Apply the branches of law, jurisdictional boundaries, and cybersecurity law enforcement.
CO3	Analyze the concept and impact of E-commerce on business models and strategy.
CO4	Recommend a legal defence against data breaches or cybercrime civil or criminal proceedings.

CO/PO MATRIX

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	3	2	2	2
CO1b	2	3	1	2	3
CO2	2	1	1	3	2
CO3	2	2	2	3	3
CO4	2	1	2	3	2

Data Science using Python Lab
PAPER CODE: BCA –706

Course Objectives: To equip students with practical skills in applying python for data related task.

CO1a	Understand and implement the core concept of Python
CO1b	Explore and Implement the control flow and string manipulation in Python.
CO2	Explore the various uses of Python collection.
CO3	Understand and apply basics OOP's concepts and use of numpy and pandas library of Python
CO4	Creating, Evaluating and analyzing the data through Numpy, Pandas and Matplotlib

PO-CO-PSO Matrix:

Course Outcomes	PO1	PO2	PO3	PO4	PO5
CO1a	2	3	2	2	2
CO1b	2	2	2	2	3
CO2	2	3	2	3	2
CO3	2	3	2	3	2
CO4	2	3	3	3	3

Data Mining Lab Using Weka

PAPER CODE: BCA – 707

Course Objective : To equip students with practical skills and theoretical understanding in the field of data mining using weka tool.

Course Outcomes:

CO1a	CO1: Use different features of WEKA tool
CO1b	pre-process the data for mining
CO2	determine association rules
CO3	model various classifiers.
CO4	examine clusters from the available data

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	1	2	2	-	2
CO1 b	2	3	2	-	3
CO2	2	3	3	-	2

CO3	3	3	3	1	3
CO4	2	2	3	3	3

MOBILE APPLICATION DEVELOPMENT
PAPER CODE: BCA 801

Course Objectives:
This course aims to equip students with a solid understanding of Android architecture and the ability to develop basic to advanced Android applications. Students will learn to design user interfaces using Android UI components, manage activity lifecycles, and apply various data persistence techniques including shared preferences, file handling, and SQLite. The course also focuses on building and managing Android services, implementing multithreading, handling network operations, and utilizing broadcast receivers. Additionally, students will gain hands-on experience with location-based services, animations, media, sensors, and the app publishing process on the Google Play Store.

Course Outcomes:

CO1a	Understanding Android architecture, and developing basic Android applications and demonstrate proficiency in setting up Android development environments,
CO1b	Design and implement user interfaces using various Android UI components and understand the lifecycle of Android activities.
CO2	Apply different data persistence techniques in Android applications, including shared preferences, file handling, SQLite database management, and content providers.
CO3	Develop skills in creating and managing Android services, implementing multithreading for background tasks, and integrating network operations using HTTP and Broadcast Receivers.
CO4	Demonstrate advanced skills in implementing location-based services, animations, media handling, sensor programming, and understanding the process of publishing Android apps to Google Play Store.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	1	2	2	-	2
CO1 b	2	3	2	-	3
CO2	2	3	3	-	2
CO3	3	3	3	1	3
CO4	2	2	3	3	3

Cloud Computing
PAPER CODE: 802

Course Objectives

- To provide students with the fundamentals and essentials of Cloud Computing.
- To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
- To enable students exploring some important cloud computing driven commercial systems and applications.
- To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

Course Outcomes

Upon successful completion of this course, students will be able to –
CO1a: Explain the core concepts of the cloud computing paradigm.
CO1b: Analyze this paradigm, networks in Cloud computing, service model.
CO2: Cloud Computing Architecture, Deployment Models and cloud security.
CO3: Understand cloud virtualization, Full virtualization, partial virtualization and cloud economics.
CO4: Analyze various cloud programming models and apply them to solve problems on the cloud.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	1	1	2	1	2
CO1 b	2	2	2	-	3
CO2	2	2	3	1	3
CO3	2	2	3	-	3
CO4	2	3	3	1	2

Mobile Application Development Lab

PAPER CODE: BCA – 803

Course Objectives:

This course is designed to enable students to develop basic Android applications and proficiently set up Android development environments. It focuses on designing user interfaces using Android UI components and understanding the activity lifecycle. Students will implement various data persistence techniques, including shared preferences, file handling, SQLite, and content providers. The course also covers creating and managing Android services, multithreading, network communication via HTTP, and Broadcast Receivers. Additionally, learners will explore location-based services, animations, media and sensor integration, and the process of publishing apps on the Google Play Store.

Course Outcomes:

CO1a	Developing basic Android applications and demonstrate proficiency in setting up Android development environments.
CO1b	Design and implement user interfaces using various Android UI components and understand the lifecycle of Android activities.
CO2	Implement different data persistence techniques in Android applications, including shared preferences, file handling, SQLite database management, and content providers.
CO3	Develop programs in creating and managing Android services, implementing multithreading for background tasks, and integrating network operations using HTTP and Broadcast Receivers.

CO4	Implementing location-based services, animations, media handling, sensor programming, and understanding the process of publishing Android apps to Google Play Store.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	1	2	2	-	2
CO1 b	2	3	2	-	3
CO2	2	3	3	-	2
CO3	3	3	3	1	3
CO4	2	2	3	3	3

R PROGRAMMING
PAPERCODE:BCA-804

Course Objective: To enable students to perform data analysis, visualization, and statistical modeling using R programming, including data manipulation, advanced graphics, and machine learning techniques.

Course Outcomes:

CO1a	Understand the basic concepts of R programming, including its syntax, data types, and structures.
CO1b	Implement data manipulation and transformation techniques using base R and dplyr for data preprocessing.
CO2	Develop advanced data visualizations using base R, ggplot2, and interactive tools like plotly and shiny.
CO3	Apply statistical methods such as hypothesis testing, correlation, regression, and ANOVA using R.
CO4	Utilize R programming for advanced data analysis tasks such as machine learning, time series forecasting, and automation.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	5	2	1	1	4
CO1b	2	5	4	1	2
CO2	1	2	5	4	2
CO3	5	4	2	1	2
CO4	2	5	4	1	5

R Programming Lab

PAPER CODE: 805

Course Outcomes:

CO1a	Read understand and trace the execution of programs written in R language
CO1b	Write the R program for a given algorithm using control statements with input and output.
CO2	Write the modular program for given problem.
CO3	Write the program to solve problem using different packages
CO4	Implement the solutions of real world problem.

COPO Matrix:

CO/PO/PSO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	3	2	1	1
CO1b	3	3	3	1	1
CO2	2	3	3	1	2
CO3	3	3	3	2	2
CO4	3	2	3	2	3

BCA - 807

LANGUAGE PART I

FRENCH CREDIT:

Course Objective

This paper is to make students understand the basics of French languages and its importance on today's time.

Course Outcome (CO) and CO-PO Matrix:

	The subject will enable/help student to/in-	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1A	Comprehend the simple sentences into French to English	0	0	0	0	0
CO1B	Understand about the conjugation of sentences	0	0	1	0	0
CO2	Quoting the French vocabulary and accents	0	0	0	0	0
CO3	Selecting the parts of speech and types of sentences	0	0	0	0	1