	PROGRAM: BCA
	COURSE OUTCOMES
First Semester	
	Course Name: Computer Fundamental &Problem solving Techniques
COs	Description
C01	Describe the usage of computers and why computers are essential components in business and society.
C02	Understanding the concept of Computer memory and input/output devices of Computers and how it works and recognize the basic terminology used in computer programming.
CO3	Demonstrate the use of Operating system commands. Understand the basic concepts of computational thinking, including sequential logic, abstractions and problem-solving techniques.
CO4	Possess the ability to design and develop programs to solve basic computational problems, develop algorithms and flowcharts. Explain the working of important application software and their use to perform any engineering activity.
C05	Possess the ability to extend their knowledge towards learning behaviour on windows operating system and Hands on training on MS Office Automation.
Course Code: BCA-1002	Course Name: C Programming
COs	Description
<b>CO1</b>	Able to understand the basic knowledge of Computer fundamental and
	its application in computers.
C02	Able to write and execute simple C programs using control structuressuch as loops and conditional statements.
CO2 CO3	<ul> <li>Able to understand the basic knowledge of computer fundamental and its application in computers.</li> <li>Able to write and execute simple C programs using control structures such as loops and conditional statements.</li> <li>Able to design and develop various programming problems using C programming concepts.</li> </ul>
CO2 CO3 CO4	<ul> <li>Able to understand the basic knowledge of computer fundamental and its application in computers.</li> <li>Able to write and execute simple C programs using control structures such as loops and conditional statements.</li> <li>Able to design and develop various programming problems using C programming concepts.</li> <li>Able to Implement advance C programming concepts like function, pointer, structure and Union</li> </ul>
C02 C03 C04 C05	<ul> <li>Able to understand the basic knowledge of computer fundamental and its application in computers.</li> <li>Able to write and execute simple C programs using control structures such as loops and conditional statements.</li> <li>Able to design and develop various programming problems using C programming concepts.</li> <li>Able to Implement advance C programming concepts like function, pointer, structure and Union</li> <li>Able to understand the file handling using C Programming language.</li> </ul>
CO2 CO3 CO4 CO5 Course Code: BCA-1003	Able to understand the basic knowledge of computer randomental and its application in computers.         Able to write and execute simple C programs using control structures such as loops and conditional statements.         Able to design and develop various programming problems using C programming concepts.         Able to Implement advance C programming concepts like function, pointer, structure and Union         Able to understand the file handling using C Programming language.         Course Name: Principle of Management
CO2 CO3 CO4 CO5 Course Code: BCA-1003 COs	Able to understand the basic knowledge of computer randomental and its application in computers.         Able to write and execute simple C programs using control structures such as loops and conditional statements.         Able to design and develop various programming problems using C programming concepts.         Able to Implement advance C programming concepts like function, pointer, structure and Union         Able to understand the file handling using C Programming language.         Course Name: Principle of Management         Description
CO2 CO3 CO4 CO5 Course Code: BCA-1003 COs CO1	Able to understand the basic knowledge of computer randomization in the state of the state
C02 C03 C04 C05 Course Code: BCA-1003 COs C01 C02	Able to understand the basic knowledge of computer randomental and         its application in computers.         Able to write and execute simple C programs using control structures         such as loops and conditional statements.         Able to design and develop various programming problems using C         programming concepts.         Able to Implement advance C programming concepts like function,         pointer, structure and Union         Able to understand the file handling using C Programming language.         Course Name: Principle of Management         Description         Understand the concepts related to business.         Define Management and Demonstrate the roles, skills and Levels of management.
C02 C03 C04 C05 Course Code: BCA-1003 C0s C01 C02 C03	Able to understand the basic knowledge of computer fundamental and         its application in computers.         Able to write and execute simple C programs using control structures         such as loops and conditional statements.         Able to design and develop various programming problems using C         programming concepts.         Able to Implement advance C programming concepts like function,         pointer, structure and Union         Able to understand the file handling using C Programming language.         Course Name: Principle of Management         Description         Understand the concepts related to business.         Define Management and Demonstrate the roles, skills and Levels of management.         Describe major management theories, Business ethics and social responsibility in the context of management.
C02 C03 C04 C04 C05 Course Code: BCA-1003 C0s C01 C02 C02 C03 C04	Able to understand the basic knowledge of computer fundamental and its application in computers.         Able to write and execute simple C programs using control structures such as loops and conditional statements.         Able to design and develop various programming problems using C programming concepts.         Able to Implement advance C programming concepts like function, pointer, structure and Union         Able to understand the file handling using C Programming language.         Course Name: Principle of Management         Description         Understand the concepts related to business.         Define Management and Demonstrate the roles, skills and Levels of management.         Describe major management theories, Business ethics and social responsibility in the context of management.         To analyze and discuss planning, Organizing, controlling, decision making, motivation, leadership, Management of change
C02 C03 C04 C04 C05 Course Code: BCA-1003 C05 C01 C02 C03 C04 C04 C05	Able to understand the basic knowledge of computer fundamental and         its application in computers.         Able to write and execute simple C programs using control structures         such as loops and conditional statements.         Able to design and develop various programming problems using C         programming concepts.         Able to Implement advance C programming concepts like function,         pointer, structure and Union         Able to understand the file handling using C Programming language.         Course Name: Principle of Management         Description         Understand the concepts related to business.         Define Management and Demonstrate the roles, skills and Levels of management.         Describe major management theories, Business ethics and social responsibility in the context of management.         To analyze and discuss planning, Organizing, controlling, decision making, motivation, leadership, Management of change         Develop theoretical and critical thinking skills relevant to both academic and management practices.

COs	Description
CO1	To participate in an online learning environment successfully.
CO2	To distinguish among various levels of organizational communication and communication barriers while developing an understanding of Communication as a process in an organization.
CO3	To draft effective business correspondence with brevity and clarity.
CO4	To stimulate their Critical thinking by designing and developing clean and lucid writing skills.
CO5	To demonstrate their verbal and non-verbal communication ability through presentations.
Course Code: BCA-1005	Course Name: Mathematics –I
COs	Description
CO1	Find out matrix representation of any data.
CO1 CO2	Find out matrix representation of any data.Apply the concepts of limit, continuity and differentiability in different science fields.
CO1 CO2 CO3	Find out matrix representation of any data.Apply the concepts of limit, continuity and differentiability in different science fields.Apply Taylors and Maclaurin's theorem to find the expansion of functions as infinite series.
CO1 CO2 CO3 CO4	Find out matrix representation of any data.Apply the concepts of limit, continuity and differentiability in different science fields.Apply Taylors and Maclaurin's theorem to find the expansion of functions as infinite series.Evaluate the integrals of complex functions and to find area, volume.
CO1 CO2 CO3 CO4 CO5	<ul> <li>Find out matrix representation of any data.</li> <li>Apply the concepts of limit, continuity and differentiability in different science fields.</li> <li>Apply Taylors and Maclaurin's theorem to find the expansion of functions as infinite series.</li> <li>Evaluate the integrals of complex functions and to find area, volume.</li> <li>Apply the concept of vector algebra, scalar triple product, vector triple product.</li> </ul>
CO1 CO2 CO3 CO4 CO5	Find out matrix representation of any data.         Apply the concepts of limit, continuity and differentiability in different science fields.         Apply Taylors and Maclaurin's theorem to find the expansion of functions as infinite series.         Evaluate the integrals of complex functions and to find area, volume.         Apply the concept of vector algebra, scalar triple product, vector triple product.         Second Semester
CO1 CO2 CO3 CO4 CO5 Course Code:BCA-2001	Find out matrix representation of any data.         Apply the concepts of limit, continuity and differentiability in different science fields.         Apply Taylors and Maclaurin's theorem to find the expansion of functions as infinite series.         Evaluate the integrals of complex functions and to find area, volume.         Apply the concept of vector algebra, scalar triple product, vector triple product.         Second Semester         Course Name: Object Oriented Programming Using C++

Course Couc.DCA-2001	Course Name. Object Oriented Programming Using C++
COs	Description
C01	Identify classes, objects, members of a class and relationships among them needed for a specific problem
CO2	Implement C++ application programs using OOP principles and proper program structuring.
C03	Demonstrate the concepts of polymorphism, inheritance using C++ programming.
CO4	Using Generic function Template function to build generic programs.
CO5	Using Files Streams and Exception Handling to handle streams and exceptions.
Course Code: BCA-2002	Course Name: Internet Technology and Web Design
COs	Description
CO1	Analyze a web page and identify its elements and attributes.
CO2	Create web pages using XHTML and Cascading Style Sheets
CO3	Build dynamic web pages using JavaScript (Client side programming)
CO4	Create XML documents and Schemas.
Course Code: BCA-2003	Course Name: Organization Behavior
COs	Description
CO 1	Describe conceptual inputs to manage behavior in organizations and assess the basic design elements of organizational structure and evaluate their impact on employees.

CO 2	Evaluate individual human behavior in the workplace as influenced by personality, values, perceptions, and motivation.
CO 3	Analyze the behavior of individuals and groups in organizations in terms of the key factors that influence organizational behavior.
CO 4	Examine the cause of stress and analyze the effect of stress on individual,
	group and organization level.
CO 5	Examine the causes, outcomes and the different ways of managing
	individual, interpersonal and Group behavior in the context of
	Organizational set up.
Course Code: BCA-2004	Course Name: Financial Accounting & Management
COs	Description
CO 1	Prepare consolidated financial statements using international accounting standards.
CO 2	Manage the financial operations including revenues, expenses, assets, liabilities and capital and calculate the various ratios through financial statements and its impact on the short and long term position of the firm.
CO 3	Determine the long term sources of finance to fulfill the long term finance needs of organization.
CO 4	Demonstrate the applicability of the concept of Financial Management to understand Capitalization and Capital Structure, break-even point, fixed and variable costs and all the costs incurred in conducting the business.
CO 5	Evaluate and determine the organization's motives for holding cash, Cash budget, Managing Inventory and Receivables.
Course Code: BCA-2005	<b>Course Name: Mathematics II</b>
COs	Description
CO2	Ability to learn the basic concepts about relations, functions
CO3	To draw different diagrams like Lattice, Hasse diagrams.
CO4	Identify the application of partial differentiation and apply for evaluating maxima, minima
CO5	Illustrate the working methods of multiple integral and apply for finding area, volume
	Third Semester
Course Code: BCA-3001	Course Name: Python Programming
COs	Description
CO 1	Understand the structure, syntax, and semantics of the Python language.
CO 2	Solve real world problems by applying the Python Data Structures, Objects, Functions and Modules.
CO 3	Apply the fundamental principles of Object Oriented Programming.
CO 4	Apply the basics of data science using advanced Python libraries.
CO 5	Build practical applications in Python.

Course Code: BCA-3002	Course Name: Data Structure Using C & C++
COs	Description
<b>CO 1</b>	Understand the structure, syntax, and semantics of the Python language.

CO 2	Solve real world problems by applying the Python Data Structures, Objects, Functions and Modules.
CO 3	Apply the fundamental principles of Object Oriented Programming.
CO 4	Apply the basics of data science using advanced Python libraries.
CO 5	Build practical applications in Python.
Course Code: BCA-3003	Course Name: Operating System
COs	Description
CO1	Understand the basics of operating systems like kernel, shell, types and views of operating systems.
CO2	Describe the various CPU scheduling algorithms and remove deadlocks.
CO3	Explain various memory management techniques and concept of thrashing
CO4	Use disk management and disk scheduling algorithms for better utilization of external memory.
CO5	Recognize file system interface, protection and security mechanisms.
CO6	Explain the various features of distributed OS like Unix, Linux, windows etc
Course Code: BCA-3004	Course Name: Digital Electronics & Computer Organization
COs	Description
C01	An ability to understand theory of Digital Design and Computer Organization to provide an insight of how basic computer components are specified.
CO2	An ability to understand the functions of various hardware components and their building blocks
C03	An ability to understand and appreciate Boolean algebraic expressions to digital design
CO4	An in depth understanding of sequential! Combinational circuits
CO5	An in depth understanding of realization of different combinational/sequential circuits
Course Code: BCA-3005	<b>Course Name: Elements of Statistics</b>
COs	Description
C01	Organize, manage and present data.
CO2	Analyze statistical data graphically using frequency distributions and cumulative frequency distributions.
C03	Analyze statistical data using measures of central tendency, dispersion and location.
CO4	Use the basic probability rules, including additive and multiplicative laws, using the terms, independent and mutually exclusive events.
CO5	Translate real-world problems into probability models.
	Fourth Semester
Course Code: BCA-4001	Course Name: Computer Graphics & Animation
COs	Description
C01	Understand the basics of computer graphics, different graphics systems and applications of computer graphics.

CO2	Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
CO3	Use of geometric transformations on graphics objects and their application in composite form.
CO4	Extract scene with different clipping methods and its transformation to graphics display device.
CO5	Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.
CO6	Render projected objects to naturalize the scene in 2D view and use of illumination models for this.
Course Code: BCA-4002	Course Name: Database Management System
COs	Description
CO1	Describe DBMS architecture, physical and logical database designs, database modeling, relational, hierarchical and network models.
CO2	Identify basic database storage structures and access techniques such as file organizations, indexing methods including B-tree, and hashing.
CO3	Learn and apply Structured query language (SQL) for database definition and database manipulation.
CO4	Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
CO5	Understand various transaction processing, concurrency control mechanisms and database protection mechanisms.
Course Code: BCA-4003	Course Name: Software Engineering
COs	Description
COs CO1	Description           How to apply the software engineering lifecycle by demonstrating competence in
COs CO1	Description           How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.           An ability to work in one or more significant application domains
COs CO1 CO2	Description           How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.           An ability to work in one or more significant application domains.
COs CO1 CO2 CO3	DescriptionHow to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.An ability to work in one or more significant application domains.Work as an individual and as part of a multidisciplinary team to develop and deliver quality software
COs CO1 CO2 CO3 CO4	DescriptionHow to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.An ability to work in one or more significant application domains.Work as an individual and as part of a multidisciplinary team to develop and deliver quality softwareDemonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.
COs CO1 CO2 CO3 CO4 CO5	DescriptionHow to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.An ability to work in one or more significant application domains.Work as an individual and as part of a multidisciplinary team to develop and deliver quality softwareDemonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.Demonstrate an ability to use the techniques and tools necessary for engineering practice
COs CO1 CO2 CO3 CO4 CO5 CO6	DescriptionHow to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.An ability to work in one or more significant application domains.Work as an individual and as part of a multidisciplinary team to develop and deliver quality softwareDemonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.Demonstrate an ability to use the techniques and tools necessary for engineering practiceAn ability to identify, formulates, and solves complex engineering problems by applying principles of engineering, science, and mathematics.
COs CO1 CO2 CO3 CO4 CO5 CO6 BCA-4004	DescriptionHow to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.An ability to work in one or more significant application domains.Work as an individual and as part of a multidisciplinary team to develop and deliver quality softwareDemonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.Demonstrate an ability to use the techniques and tools necessary for engineering practiceAn ability to identify, formulates, and solves complex engineering problems by applying principles of engineering, science, and mathematics.Course Name: Optimization Techniques
COs CO1 CO2 CO3 CO4 CO5 CO6 BCA-4004 COs	DescriptionHow to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.An ability to work in one or more significant application domains.Work as an individual and as part of a multidisciplinary team to develop and deliver quality softwareDemonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.Demonstrate an ability to use the techniques and tools necessary for engineering practiceAn ability to identify, formulates, and solves complex engineering problems by applying principles of engineering, science, and mathematics.Course Name: Optimization Techniques Description
COs CO1 CO2 CO3 CO4 CO4 CO5 CO6 BCA-4004 COs CO1	DescriptionHow to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.An ability to work in one or more significant application domains.Work as an individual and as part of a multidisciplinary team to develop and deliver quality softwareDemonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.Demonstrate an ability to use the techniques and tools necessary for engineering practiceAn ability to identify, formulates, and solves complex engineering problems by applying principles of engineering, science, and mathematics.Course Name: Optimization Techniques DescriptionUnderstand the basic concepts of linear programming, duality and methods for solving linear programming problem.
COs CO1 CO2 CO3 CO4 CO4 CO5 CO6 BCA-4004 COs CO1 CO2	DescriptionHow to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.An ability to work in one or more significant application domains.Work as an individual and as part of a multidisciplinary team to develop and deliver quality softwareDemonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.Demonstrate an ability to use the techniques and tools necessary for engineering practiceAn ability to identify, formulates, and solves complex engineering problems by applying principles of engineering, science, and mathematics.Course Name: Optimization Techniques DescriptionUnderstand the basic concepts of linear programming, duality and methods for solving linear programming problem.Understand the mathematical formulation of transportation and assignment problems and solution
COs CO1 CO2 CO3 CO4 CO4 CO5 CO6 BCA-4004 COs CO1 CO2 CO3	DescriptionHow to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.An ability to work in one or more significant application domains.Work as an individual and as part of a multidisciplinary team to develop and deliver quality softwareDemonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.Demonstrate an ability to use the techniques and tools necessary for engineering practiceAn ability to identify, formulates, and solves complex engineering problems by applying principles of engineering, science, and mathematics.Course Name: Optimization Techniques DescriptionUnderstand the basic concepts of linear programming, duality and methods for solving linear programming problem.Understand the mathematical formulation of transportation and assignment problems and solutionSolve simple games using various techniques.

Course Code: BCA-4005	Course Name: Mathematics-III
COs	Description
CO1	Find out nth roots of complex numbers
CO2	Apply the concepts of vector calculus
CO3	Find out Directional Derivatives, Divergence and Curl
CO4	Find out Fourier series of periodic functions
CO5	To solve various differential equations and to apply these analytical methods in different engineering applications

## **Fifth Semester**

Course Code: BCA-5001	Course Name: Knowledge Management
COs	Description
CO 1	Introduce students business intelligence and importance and technologies involved in decision support system.
CO 2	Characterize expert systems, OLAP & OLTP. Introduction and use of data warehouse and data marts in knowledge management system.
CO 3	Apply appropriate tool for data mining and knowledge discovery form databases.
CO 4	Describe key components of KM solutions: infrastructure, mechanisms and technologies, systems and processes. Clear understanding of importance of intellectual capital in gaining a competitive advantage of organization
Course Code: BCA-5002	Course Name: Java Programming and Dynamic Webpage Design
COs	Description
CO1	Use the syntax and sementics of Java programming language and basic concepts of OOPs.
CO2	Develop reusable Programs using the concept of Inheritance
CO3	Apply the concepts of Multithreading.
CO4	Design event driven GUI.
CO5	Identify categories of program, systems software and application organize and work with file and folder.
Course Code: BCA-5003	Course Name: Computer Network
COs	Description
CO1	Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission
CO2	Apply channel allocation, framing, error and flow control techniques.
CO3	Describe the functions of Network Layer i.e. Logical addressing, subnetting & Routing Mechanism.
CO4	Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.
CO5	Explain the functions offered by session and presentation layer and their Implementation.
CO6	Explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN.
Course Code: BCA-5004	Course Name: Numerical Methods

COs	Description
CO1	Apply Numerical Methods to find solution of Algebraic and transcendental equation
CO2	Apply Various Interpolation techniques to interpolate the complicated functions for given data into much simpler once like polynomial
CO3	Evaluate numerically differentiation and integration of a tabular function if analytical methods are not given
CO4	Solve system of linear equations in large size with the help of different iterative methods
CO5	Solve the ordinary differential equations using different numerical methods

## Sixth Semester

Course Code: BCA-6001	Course Name: Information & Cyber Security
COs	Description
CO1	Introduce the cyber world and cyber law in general. To explain about the Information Technology Act 2000
CO2	Enhance the understanding of problems arising out of online transactions and provoke them to find solutions.
CO3	Introduce the students to various cyber laws and standards.
CO4	Introduce the students to various wireless networks and security.
C05	To explain about the various facets of cyber crimes and ethical hacking.
Course Code: BCA-6002	Course Name: Internet Of Things
COs	Description
CO 1	Understand the concept of IoT and its significance in the current technological landscape.
CO 2	Familiarize with the hardware and software components that comprise an IoT system.
CO 3	Get acquainted with various hardware platforms as Raspberry pi, NetArduino etc.
CO 4	Explore different communication protocols and networking technologies used in IoT
CO 5	Develop skills in programming with Ardunio to create and manage IoT applications.
CO 6	Learn about emerging trends and applications of IoT in various industries and fields.
Course Code: BCA-6003	Course Name: E-Commerce
COs	Description
CO1	Use the Plate-form of E Commerce
CO2	Use the porter's Value chain Model
CO3	Apply the concept of E Commerce
CO4	Design and develop of E Commerce
CO5	Identify the categories of program, system software applications file and folder

Course Code: BCA-6004	Course Name: Data Science and Machine Learning
COs	Description
C01	Introduction to Data Science, Evolution of Data Science, Application of Data Science
CO2	Gain knowledge of data collection and pre-processing of data.
CO3	Develop an in-depth understanding of popular methods like regression, Skewness and Kurtosis, Introduction to Machines learning from data, Supervised and Unsupervised learning
CO4	Learn optimization formulations to minimize errors and build accurate models.
CO5	Understanding the basic concepts and principles of neural networks: Students should be able to describe the structure and functioning of neural networks