

BCA

3.2 Programme Outcomes (POs):

PO1: Software development knowledge: Apply the knowledge of logics, programming, data structure, OOPS fundamentals, and a framework specialization to the solution of complex real world problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex real world problems reaching substantiated conclusions using first principles of mathematics, programming, and sciences.

PO3: Design/development of solutions: Design web based solutions for complex real world problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern frameworks/techniques/tools to automate the solution.

PO6: Contribution to the society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues.

PO7: Environment and sustainability: Understand the impact of the automated solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the programming practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex programming activities with the software engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the



software engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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BCA

3.3 Programme Specific Outcomes (PSO's)

PSO1: Students will be able to apply fundamental knowledge in problem solving and logical thinking skill.

PSO 2: Students will be able to design and develop software by imparting the knowledge of programming languages, web designing, networking and Software development cycle.

PSO 3: Students will be able to learn latest Technologies in IT and Communications system.



BCA COURSE OUTCOMES

S.No.	Course Code	Course Title	Course Outcomes
First Semester			
01	BCA-101	Digital Electronics	<p>CO1: To understand number system conversions, binary arithmetic, complements, and binary codes, while utilizing De-Morgan's Theorem and the Principle of Duality.</p> <p>CO2: Design efficient digital circuits using Boolean algebra, logic gates, and Karnaugh maps for optimized logic function implementation.</p> <p>CO3: Design and implement combinational circuits: adders, subtractors, comparators, encoders, decoders, multiplexers using MUX, ROM for efficient digital systems.</p> <p>CO4: To analyze and apply sequential circuits (SR, JK, T, D flip flops), shift registers, counters, and memory circuits (ROM, PROM, EPROM, dynamic RAM) in digital systems.</p> <p>Co5: Students will comprehend memory classification, organization, operations, and cell technologies, enabling effective memory design and utilization.</p>
02	BCA-102	Business Systems and Applications	<p>CO1: To understand information types, their relevance to management levels, and the essential qualities of effective information for business functions.</p> <p>CO2: Demonstrate proficiency in understanding and applying various SDLC models for effective system development and analysis.</p> <p>CO3: Apply CBIS tools for efficient office automation, informed decision-making and streamlined transaction processing in business environments.</p> <p>Co4: To develop a comprehensive understanding of ERP's evolution, benefits, implementation process, and post-implementation considerations in modern business systems.</p> <p>Co5: To understand how to use modern IT-based business systems, such as AI-driven information systems, to improve managerial decision-making and organizational performance.</p>
03	BCA-103	Introduction to programming	<p>CO1: To understand C programming fundamentals, including language characteristics, structure, flowcharts, algorithms, and pseudo code usage.</p> <p>CO2: To understand essentials of C programming, including control structures, constants, variables, operators, and operators& Apply operator precedence and associatively rules to evaluate complex expressions.</p> <p>CO3: To Understand input/output, branching, looping, arrays, and strings for programming.</p> <p>CO4: To Design and apply variables, functions, recursion, structures, unions, pointers, and pointer arithmetic in programming."</p> <p>CO5: To Design file operations, apply command-line args, and understand macros in 'C' programming.</p>
04	BM-101	Mathematics	<p>CO1: To understand set theory concepts to design Venn diagrams and perform set</p>

			<p>operations.</p> <p>CO2: to understand and apply operations with determinants, matrices, and their properties.</p> <p>CO3: to Understand and apply trigonometric functions, angles, and equations; design solutions using sum/difference of angles.</p> <p>CO4: Understand, apply, and design solutions for quadratic equations using factorization, completion of square, and formula.</p> <p>CO5: Apply differentiation techniques to analyze and differentiate various functions, including composite and implicit functions."</p>
05	BCA-104	PC Software and Computer fundamentals	<p>CO1: To understand computer evolution, components, OS functions, BIOS, and booting processes."</p> <p>CO2: To understand of input, output, and storage units, enabling design of diverse computer peripherals.</p> <p>CO3: To understand and analyse and design high/low-level languages, software types, hardware, and algorithm design through flowcharts."</p> <p>CO4: To understand PC booting, DOS and Windows internals, and differentiate internal/external commands.</p> <p>CO5: To understand and design of network topologies, devices, protocols, and connections for effective network design.</p>
06	ELGA-101	English and General Awareness	<p>CO-1: Demonstrate effective communication skills in written and spoken English, including grammar, vocabulary, and pronunciation, to convey ideas clearly and coherently.</p> <p>CO-2: Analyze and interpret a variety of written texts, such as articles, essays, and literary works, to extract relevant information and comprehend their meaning and context.</p> <p>CO-3: Develop critical thinking and analytical skills to evaluate and assess information from diverse sources, including newspapers, magazines, and online platforms, to enhance general awareness and understanding of current events and social issues.</p> <p>CO-4: Apply effective reading strategies to comprehend and interpret complex texts, including technical documents and academic literature, in order to gather information and conduct research on specific topics related to computer applications and technology.</p> <p>CO-5: Engage in effective oral communication and presentation skills, including public speaking and group discussions, to express ideas confidently and persuasively on topics related to computer science, current affairs, and general knowledge, while demonstrating awareness of ethical and cultural considerations.</p>

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2ND Semester			
01	BCA-201	Computer Architecture and System Software	<p>CO1: To understand computer architecture and its design principles.</p> <p>CO2: To understand core aspects of computer system and organization.</p> <p>CO3: To analyze working of computer processing units to confidently work with computer systems and their functions.</p> <p>CO4: To understand key principles in computer arithmetic and others to</p>

05	BCA-405	Computer Oriented Numerical Techniques	<p>Co1: Understanding and Learning of numerical methods for numerical analysis and General error formula.</p> <p>Co2: Understanding the implementation of numerical methods using a computer.</p> <p>Co3: Learning of tracing errors in Numerical methods and analyze and predict it.</p> <p>Co4: Discuss concepts of numerical methods used for different applications.</p> <p>Co5: skilled in using various techniques for numerical integration and solving first-order differential equations, which are valuable tools for addressing a wide range of mathematical problems.</p>
06	ELGA-202	English Language And General Awareness-IV	<p>Co1: To develop in them vital communication skills which are integral to their personal, social and professional interactions.</p> <p>Co2: The syllabus shall address the issues relating to the Language of communication.</p> <p>Co3: Students will become proficient in professional communication such as interviews, group discussions, office environments, important reading skills as well as writing skills such as report writing, note taking etc</p> <p>Co4: To help the students become the independent users of English language.</p>

S.No.	Course Code	Course Title	Course Outcomes
5th Semester			
01	BCA-501	Computer Networks	<p>CO1: To familiarize the student with the basic taxonomy and terminology of computer networks.</p> <p>CO2: Understanding of Error correction techniques and data transmission <i>techniques across the network</i>.</p> <p>CO3: A formal understanding of topologies and IEEE standards in computer networking.</p> <p>CO4: Understanding of various routing algorithms and its types in computer networking.</p> <p>CO5: Understanding of the protocols in the computer networking.</p>
02	BCA-502	Optimization Techniques	<p>CO1: Understanding the basic fundamentals of optimization techniques.</p> <p>CO2: Analyze characteristics of a general linear programming problem.</p> <p>CO3: To prepare the student for applying optimization techniques in problem solving.</p> <p>CO4: Solve Engineering Design and Manufacturing related optimization problem.</p> <p>CO5: Analyze characteristics of a general non-linear programming problem.</p>
03	BCA-503	.Net Frameworks	<p>CO1: Understand the concept of .Net Framework fundamentals.</p>

MCA

PROGRAM OUTCOMES

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PO 2 Problem Analysis: Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

PO 3 Design /Development of Solutions: Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PO 4 Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5 Modern Tool Usage: Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex activities, with an understanding of the limitations.

PO 6 Professional Ethics: Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

PO 7 Life-long Learning: Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

PO 8 Project management and finance: Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 9 Communication Efficacy: Communicate effectively with the computing community, and with society, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand *clear instructions*.

PO 10 Societal and Environmental Concern: Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.



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PO 11 Individual and Team Work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

PO 12 Innovation and Entrepreneurship: Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large


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MCA

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO 1: Enable the students to design suitable data models, appropriate architectures and analytics techniques for efficient implementation of complex systems.

PSO 2: Enable the students to design and integrate systems for providing interactive solutions for IT industry, consultancy, Research and Development and allied areas applications.



Course Outcome of MCA

S. No.	Course-Code	Course Title	Course Outcomes
First Semester			
01	MCS-101	Database Management System	<p>CO-1: To understand differences between File and Database systems, explain structures, and differentiate Data Models for effective data representation.</p> <p>CO-2: Write SQL queries for a given context in relational database, design normalized databases, and demonstrate querying proficiency while adhering to relational</p> <p>CO-3: To demonstrate and to understanding of the record storage methods, design file operations for data management, and explain index structures' significance for efficient querying.</p> <p>CO-4: To describe Transaction Processing, design transactions with desirable properties, and explain Concurrency Control concepts for data consistency.</p> <p>CO-5: To discuss and apply Object-Oriented Database concepts, design models with complex data types, and explain distributed database concepts for modern data management.</p>
02	MCS-102	Accounting and Financial management	<p>CO-1: Understand the concept of management accounting</p> <p>CO-2: Analyses and interpret the financial statements.</p> <p>CO-3: Calculate various ratios from the financial statements.</p> <p>CO-4: Do cash flow analysis.</p> <p>CO-5: Manage working capital requirement estimations of the firm.</p>
03	MCS-103	Computer Architecture	<p>CO-1: To understand computer architecture and its design principles.</p> <p>CO-2: To analyze and understand the fundamental of computer organization.</p> <p>CO-3: To understand in brief about operational principles of the Central Processing Unit (CPU).</p> <p>CO-4: To understand about data input/output processes and data</p>



			<p>transfer mechanisms.</p> <p>CO-5: To understand the memory hierarchy concepts and their operational mechanisms.</p>
04	MCS-104	Discrete Mathematics	<p>CO-1: To understand logic principles, compound propositions, quantifiers, and arguments, and demonstrate their applications in forming normal forms and making valid deductions.</p> <p>CO-2: To analyze properties of relations, equivalence, and lattices, comprehend function composition, and design recursive functions to explore essential properties of lattices.</p> <p>CO-3: To grasp counting basics, combinations, and permutations, apply algebraic structures to analyze examples, and demonstrate to understanding of semi-groups, groups, and isomorphism.</p> <p>CO-4: Explore generating functions, solve recurrence relations by substitution and characteristic roots, and apply methods to find coefficients and solutions of inhomogeneous relations.</p> <p>CO-5: Demonstrate and to understanding of the graph representation, traverse using DFS and BFS, analyze spanning trees, and discuss isomorphism, multigraphs, Euler and Hamiltonian circuits, and chromatic numbers.</p>
05	MCS-105	Object Oriented Programming with C++	<p>CO-1: Demonstrate the use of various OOP concepts, compare paradigms, and apply basic UML notations for modeling.</p> <p>CO-2: Able to Apply & Analyze C++ variables, keywords, and data types. Apply stream I/O with overloaded operators and formatting techniques.</p> <p>CO-3: Able to understand and apply the concepts of classes, create objects, and control member access. Implement static members, const, and nested classes.</p> <p>CO-4: Apply the concepts of constructors, destructors, and their roles. Implement copy constructors, operator overloading, and type conversions.</p>

			<p>CO-5: Apply inheritance concepts in real live application, create derived classes, apply virtual functions, and to understand polymorphism's concepts and advantages.</p>
06	MCSL-106	Lab-Database Concepts	<ul style="list-style-type: none"> • Ability to design and implement a database schema for given problem. • Ability to formulate queries using SQL DML/DDI/DCL commands. • Apply the normalization techniques for development of application software to realistic problems.
07	MCSL-107	Lab-Object Oriented Programming with C++	-



S.No.	Course-Code	Course Title	Course Outcomes
2ND Semester			
01	MCS-201	.Net Framework and C# Programming	<p>CO-1: To understand the concepts of C# fundamentals, namespaces, and basic Windows Forms and Console app development in Visual Studio.</p> <p>CO-2: Grasp OOP concepts: encapsulation, inheritance, and polymorphism. Apply interfaces, clone able and comparable objects, and manage object lifetime.</p> <p>CO-3: Design classes with custom indexers, operator overloading, delegates, and events. Comprehend assemblies, threads, and App Domains in C#.</p> <p>CO-4: To understand serialization using IO streams, persistence, and remoting concepts for inter-process communication.</p> <p>CO-5: Apply ADO.Net for data control in Windows Forms, grasp data sources, data binding, and connected/disconnected scenarios.</p> <p>CO-6: To understand working of ASP.net architecture, develop web forms, and implement server controls for data connectivity.</p>
02	MCS-202	Web Technology	<p>CO-1: To understand Internet protocols, HTTP messages, and client-server communication. Demonstrate familiarity with XHTML and HTML elements.</p> <p>CO-2: Apply CSS for styling, comprehend cascading and inheritance. Implement text properties, box model, and layout techniques.</p> <p>CO-3: To understand JavaScript syntax, variables, functions, and objects. Apply debugging techniques and manipulate the Document Object Model (DOM).</p> <p>CO-4: To apply and design XML structure, namespaces, and data processing. Apply event-oriented parsing, XML transformation using XPATH and XSLT. Grasp JSP technology, its integration with Servlets, and the Model-View-Controller (MVC) paradigm.</p> <p>CO-5: To understand Java Web Services, describing services using WSDL, and data representation with XML Schema.</p>



03	MCS-203	Theory of Computation	<p>CO-1: To understand formal proof methods, inductive reasoning, and properties of Finite Automata (FA) including DFAs and NFAs.</p> <p>CO-2: Define and discuss the concept of formal grammar, formal language, regular expression and automata machine.</p> <p>CO-3: To understand Context-Free Grammars (CFG), parse trees, and Design Pushdown Automata and CFG.</p> <p>CO-4: Analyze normal forms for CFG, apply Pumping Lemma for Context-Free Languages, and comprehend Turing Machines and their programming techniques.</p> <p>CO-5: Grasp the concept of Recursively Enumerable (RE) languages and undecidability in relation to Turing Machines. To understand classes P and NP.</p>
04	MCS-204	Elective I A. Java Programming B. Python Programming	<p>A. CO-1: To understand and apply OOPs principles: Classes, Objects, Constructors, Inheritance, Polymorphism, Exception Handling, and File Manipulation.</p> <p>CO-2: To grasp package concepts, apply interfaces, and comprehend multithreading fundamentals in practical examples.</p> <p>CO-3: To design user interfaces using applets, GUI components like buttons, checkboxes, and radio buttons.</p> <p>CO-4: Design user interfaces using Container, Panel, Windows, Frame classes, and implement advanced GUI components.</p> <p>CO-5: To establish database connectivity JDBC fundamentals, , execute SQL statements, and work with Result Sets.</p>



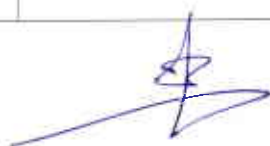
			<p>B CO-1: Understand the Python basics, including variables, expressions, operators, and introductory string operations</p> <p>CO-2: Learn advanced Python features, like string manipulation, lists, dictionaries, and exception handling.</p> <p>CO-3: Apply object-oriented concepts, including classes, inheritance, and handling exceptions.</p> <p>CO-4: Implement and manage data structures (stacks, queues, lists) and algorithms (sorting, searching and recursion).</p> <p>CO-5: Apply database concepts and use Python for data manipulation, retrieval, and management</p>
05	MCS-205	<p>Elective 2</p> <p>A. Data Communication and Networks B. Wireless Network and Mobile Computing</p>	<p>CO-1: To understand network applications, transmission methods, OSI model, and network protocol concepts.</p> <p>CO-2: Analyze data transmission types, media characteristics, and transmission impairments.</p> <p>CO-3: Evaluate data encoding techniques, modulation methods, error detection, and communication hardware.</p> <p>CO-4: Explain framing, media access protocols, CSMA/CD, token-based protocols, and asynchronous transfer mode.</p> <p>CO-5: Comprehend network layer functionality, addressing, routing, congestion control, and internetworking concepts.</p>



			<p>B. CO-1: To Understand the concept of systems thinking in the context of mobile and wireless systems.</p> <p>CO-2: To Explain mobile communication generations, Cellular Concept- reuse, Channel assignment strategies.</p> <p>CO-3: To understand and design MAC protocols for digital cellular systems such as GSM, MAC protocols for wireless LANs such as IEEE 802.11a,b,g.</p> <p>CO-4: Explain Radio specification, baseband specification, Link manager specifications.</p> <p>CO-5: To establish TCP over wireless networks, approach to improve transport layer performance. Security and Fraud detection in Mobile and wireless networks.</p>
06	MCSL-207	Lab-.Net Framework and C# Programming	



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3RD Semester			
01	MCS-301	Analysis and Design of algorithms	<p>CO-1: To understand data structures, analyze algorithms, determine time and space complexity, and order arithmetic.</p> <p>CO-2: Apply and analyze divide and conquer techniques in different algorithms.</p> <p>CO-3: Analysis algorithms using greedy approach for job sequencing, knapsack, merge patterns, optimal storage, and minimum spanning trees.</p> <p>CO-4: Create programs for finding spanning tree, shortest path using different design techniques.</p> <p>CO-5: Analyze graph traversal, apply algorithms like Dijkstra's, solve optimization problems, and comprehend advanced techniques including P, NP, and NP-complete problems.</p>
02	MCS-302	Software Project Management	<p>CO-1: To understand SPM fundamentals, create project plans, estimate resources using various methods, and make informed decisions.</p> <p>CO-2: To design project structures, construct WBS, manage project life cycle, apply scheduling techniques using PERT, CPM, and Gantt charts.</p> <p>CO-3: To monitor project dimensions, analyze earned value, implement software reviews, interpret performance indicators, and employ error tracking techniques.</p> <p>CO-4: To apply testing principles, design test plans and to understand software quality attributes, metrics, and implement SQA techniques.</p> <p>CO-5: To manage software configuration, handle change control, assess risks, perform cost-benefit analysis, and utilize project management tools effectively.</p>
03	MCS-303	Compiler Construction	<p>CO-1: To understand compiler phases, lexical analysis, and the role of the lexical analyzer in source code processing.</p>



			<p>B. CO-1: To understand OSI Security Architecture, encryption techniques, and modes of operation for data confidentiality.</p> <p>CO-2: Grasp key management, Elliptic Curve Cryptography, and applications of public key cryptography like RSA.</p> <p>CO-3: Analyze authentication, message authentication codes, hash functions, and security of hash functions and MACs.</p> <p>CO-4: Explore authentication applications, such as Kerberos, X.509, and security mechanisms for electronic mail, IP, and web.</p> <p>CO-5: Discuss intrusion detection, virus threats, countermeasures, and principles of designing firewalls and trusted systems.</p>
05	MCS-305	<p>Elective 4</p> <p>A. Computer Graphics B. ERP</p>	<p>A.CO-1: To understand the application areas of Computer Graphics, graphics systems components, and input/output devices.</p> <p>CO-2: Analyze algorithms for point, line, circle, and polygon rendering along with filling techniques.</p> <p>CO-3: Design and apply translation, scaling, rotation, reflection, and shear transformations using matrices.</p> <p>CO-4: Explain the viewing pipeline, perform coordinate transformations, and apply line and polygon clipping algorithms.</p> <p>CO-5: To demonstrate 3-D object representations, curves, and surfaces, and apply geometric transformations and illumination models.</p> <p>B CO-1: To understand Analyze the essentials of supply chain management in ERP.</p> <p>CO-2: Analyze the implementation of ERP in the context of business of the different organization.</p> <p>CO-3: Analyze and apply ERP for different business modules for the given problem.</p> <p>CO-4: Analyze the given case study of ERP marketing.</p> <p>CO-5: Analyze the design of ERP with future E-commerce and internet.</p>



BCA-MCA (INTEGRATED)

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06	ELGA-101	English and General Awareness	<p>CO-1: Demonstrate effective communication skills in written and spoken English, including grammar, vocabulary, and pronunciation, to convey ideas clearly and coherently.</p> <p>CO-2: Analyze and interpret a variety of written texts, such as articles, essays, and literary works, to extract relevant information and comprehend their meaning and context.</p> <p>CO-3: Develop critical thinking and analytical skills to evaluate and assess information from diverse sources, including newspapers, magazines, and online platforms, to enhance general awareness and understanding of current events and social issues.</p> <p>CO-4: Apply effective reading strategies to comprehend and interpret complex texts, including technical documents and academic literature, in order to gather information and conduct research on specific topics related to computer applications and technology.</p> <p>CO-5: Engage in effective oral communication and presentation skills, including public speaking and group discussions, to express ideas confidently and persuasively on topics related to computer science, current affairs, and general knowledge, while demonstrating awareness of ethical and cultural considerations.</p>



S.No.	Course Code	Course Title	Course Outcomes
II Semester			
01	BCA-201	Computer Architecture and System Software	<p>CO1: Understand essential concepts in computer architecture and binary representation, enabling them to work confidently with low-level programming and system understanding.</p> <p>CO2: Develop strong foundation in core aspects of digital systems, facilitating their competence in related practical applications.</p> <p>CO3: Understand important concepts about computer processing units, which will help them confidently work with computer systems and their functions.</p> <p>CO4: Comprehend and apply essential concepts of key principles in computer arithmetic and others to confidently work with various aspects of computing.</p> <p>CO5: Develop overall understanding of how computer memory works, allowing them to confidently navigate and utilize different aspects of computer systems.</p>
02	BCA-202	Information System Analysis & Design	<p>CO1: Understand the life cycle of a systems development project.</p> <p>CO2: Introduction to various data flow and data normalization techniques.</p> <p>CO3: Understanding of I/O design and object-oriented system modelling.</p> <p>CO4: Introduction to various development methodologies of system design.</p> <p>CO5: Formal understanding of system software testing.</p>
03	BCA-203	Computer Programming	<p>CO1: Understanding of various code development and programming tools.</p> <p>CO2: Basic understanding of interfaces of various code development tools.</p> <p>CO3: Understanding of basic data types, constraints and scope of variables.</p> <p>CO4: Understanding of decision-making structures.</p> <p>CO5: Introduction to functions and concepts of argument passing.</p>
04	BM-201	Mathematics	<p>CO1: To study the concept of sequence and series and hence find sum of infinite terms, n terms with different methods.</p> <p>CO2: Understanding differentiation methods, notations and concepts.</p> <p>CO3: Formal understanding of integration concepts and techniques.</p> <p>CO4: Understanding of solving first order and first-degree differential equations.</p> <p>CO5: Formal understanding of 2D geometry concepts, methods and formulas.</p>
05	ELGA-102	ENGLISH AND GENERAL AWARENESS-II	<p>Co 1. Fluent English usage across diverse contexts and communication situations.</p> <p>Co 2. Effective idiomatic expression incorporation and contextually appropriate language utilization in communication.</p>



			<p>Co 3. Competent phrasal verb application within various communication and situational contexts.</p> <p>Co 4. Proficient employment of prefixes and suffixes in varied contexts.</p> <p>Co 5. Skillful emphasis creation through strategic and impactful phrasing techniques</p>
06	BMA-301	Management & Accounting	<p>CO1: A formal understanding of basic concept, importance & functions of Management Accounting.</p> <p>CO2: Understanding of conceptual framework of accounting.</p> <p>CO3: To understand the concepts of financial management and finance function in business.</p> <p>CO4: Understanding the conceptual framework of cost accounting.</p> <p>CO5: Basic understanding of budget control and its types..</p>



S.No.	Course Code	Course Title	Course Outcomes
III Semester			
01	BCA-301	Operating System	<p>CO1: Understands the basics of operating systems like kernel, shell, types and views of operating systems.</p> <p>CO2: Understand key mechanisms in design of operating systems modules.</p> <p>CO3: Acquire a clear grasp of computer system operations and challenges, enabling you to manage them effectively.</p> <p>CO4: Learn different memory management techniques and calculate efficiency of different memory management techniques.</p> <p>CO5: Recognize file system interface, protection and security mechanisms and gain expertise through case studies of Linux and Windows systems.</p>
02	BCA-302	Data Structure with C	<p>CO1: Understands the basic concept of data representation and structure.</p> <p>CO2: Learn to analyze and compare algorithms in terms of time and space.</p> <p>CO3: Understand basic data structures in working with arrays in various dimensions for enhanced problem-solving.</p> <p>CO4: To solve problems using data structures and write programs for these solutions.</p> <p>CO5: Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.</p>
03	BCA-303	Computer networks and Web Development	<p>CO1: Understand the fundamentals of data communication concepts.</p> <p>CO2: Understand network protocols and recognize common setups for data transfer.</p> <p>CO3: Design, analyse, and evaluate networks and services for homes, data centres, IoT /IoE, LANs and WANs.</p> <p>CO4: Analyze a web page and identify its elements and attributes.</p> <p>CO5: Gain a comprehensive understanding of internet security to prevent cyber problems and handle electronic payments securely.</p>
04	BM-301	Mathematics for Computing	<p>CO1: Ability to apply mathematical logic to solve problems.</p> <p>CO2: Able to formulate problems and solve recurrence relations.</p> <p>CO3: Ability to model and solve real world problems using graphs.</p> <p>CO4: Basic understanding and problem-solving using tress.</p> <p>CO5: Formal understanding of finite automata and its type.</p>
05	BCA-304	Electives A.Parallel and Distributed Computing B. Artificial Intelligence C. Network Security	<p>CO1: Understand the fundamental of parallel computing motivations, diverse computer architectures, and message passing methods using MPI and PVM.</p> <p>CO2: Well-equipped to assess performance metrics, analyze parallel programs, and address key considerations in parallel computing.</p> <p>CO3: To proficiently apply parallel programming methods.</p> <p>CO4: Effectively manage work schedules and balance loads and develop skills for tackling various computational challenges.</p>

			<p>CO5: Have practical knowledge of different problem-solving techniques to solve a variety of computational problems.</p> <p>CO1: Understand the fundamental concepts of artificial intelligence and grasp the differences understanding of their architectures.</p> <p>CO2: Gain knowledge about agents and their surroundings to change this knowledge into expert systems via specific instances.</p> <p>CO3: Have a solid grasp of knowledge representation and logic, particularly focusing on propositional logic.</p> <p>CO4: Apply different types of machine learning algorithms to solve the real-world problems.</p> <p>CO5: Integrate a trained machine learning model into an online software system.</p> <p>CO1: Introduction to the network security fundamentals and its types.</p> <p>CO2: Formal introduction to reconnaissance techniques and its tools.</p> <p>CO3: understanding of various kind of malware and viruses in network security system.</p> <p>CO4: Prevention from various kind of attacks and threats in network security.</p> <p>CO5: Formal understanding of social engineering and types</p>
06	ELGA-201	English Language And General Awareness-III	<p>CO-1: Demonstrate proficiency in English language skills, including effective communication, reading comprehension, and writing skills, through various written and spoken exercises.</p> <p>CO-2: Develop an understanding of general awareness topics, including current affairs, social issues, cultural diversity, and ethical considerations, to enhance critical thinking and global awareness.</p> <p>CO-3: Apply advanced grammar and vocabulary knowledge to effectively express ideas, opinions, and arguments in both spoken and written English.</p> <p>CO-4: Analyze and interpret authentic English texts, such as articles, essays, and literary works, to extract relevant information and demonstrate comprehension skills.</p> <p>CO-5: Engage in collaborative discussions, debates, and presentations on a wide range of topics, employing effective listening and speaking strategies, and respecting diverse perspectives within the English language context.</p>



S.No.	Course Code	Course Title	Course Outcomes
IV Semester			
01	BCA-401	Data Base Management System	<p>CO1: To understand various data processing systems and database management through this course.</p> <p>CO2: Develop a comprehensive conceptual data model for courses, including entities, attributes, relationships, and constraints.</p> <p>CO3: Design and optimize databases using relational model, normalization (1NF to BCNF), ensuring data integrity.</p> <p>CO4: To analyse SQL skills encompassing DDL, DML, functions, joins, and PL/SQL, fostering advanced database management expertise.</p> <p>CO5: Demonstrate expertise in transaction processing, concurrency control, and database security through practical implementation using advanced Oracle features</p>
02	BCA-402	Object Oriented Programming with C++	<p>CO1 Understand the fundamental programming concepts and methodologies which are essential to building good C/C++ programs.</p> <p>CO2 Analyze and design object-oriented models based on common construct of programming language and implement them language.</p> <p>CO3 Develop reusable and modular code using C++ classes, objects, and inheritance to achieve code reusability and maintainability.</p> <p>CO4 Implement and manage dynamic memory allocation and de-allocation in C++ programs to efficiently manage system resources.</p> <p>CO5 Utilize various advanced features of C++ such as templates, exceptions, and polymorphism to enhance the functionality and flexibility of software.</p>
03	BCA-403	Introduction to Software Engineering	<p>Co1: Understand the <u>planning</u> of a software engineering process life cycle, including the specification, design, implementation, and testing of software systems that meet specification, performance importance and quality requirements.</p> <p>Co2: Able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project</p> <p>Co3: Analyze and translate a specification into a design, requirement specification, functional requirements, non-functional requirements and then realize that design practically, using an appropriate software engineering methodology.</p> <p>Co4: Know how to develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice</p> <p>Co5: Able to use modern engineering tools necessary for software project management, time management and software reuse.</p>
04	BCA-404	Linux and Shell programming	<p>Co1: Learn History and various distributions of Linux.</p> <p>Co2: Learn and implement Linux system administration and installation and hardware configuration.</p> <p>Co3: Learn and implement TCP/IP on Linux, introduction to Kernel, introduction to Linux Shell.</p> <p>Co4: Create file systems and directories and operate those using programs.</p>

			Co5: Understand the processes background and fore ground by process and signals system calls, network configuration.based projects, showcasing effective communication and problem-solving skills.
05	BCA-405	Computer Oriented Numerical Techniques	<p>Co1: Understanding and Learning of numerical methods for numerical analysis and General error formula.</p> <p>Co2: Understanding the implementation of numerical methods using a computer.</p> <p>Co3: Learning of tracing errors in Numerical methods and analyze and predict it.</p> <p>Co4: Discuss concepts of numerical methods used for different applications.</p> <p>Co5: skilled in using various techniques for numerical integration and solving first-order differential equations, which are valuable tools for addressing a wide range of mathematical problems..</p>
06	ELGA-202	English Language And General Awareness-IV	<p>Co1: To develop in them vital communication skills which are integral to their personal, social and professional interactions.</p> <p>Co2: The syllabus shall address the issues relating to the Language of communication.</p> <p>Co3: Students will become proficient in professional communication such as interviews, group discussions, office environments, important reading skills as well as writing skills such as report writing, note taking etc</p> <p>Co4: To help the students become the independent users of English language..</p>



S.NO	COURSE CODE	COURSE TITLE	COURSE OUTCOMES
V SEMESTER			
01	BMI-501	Advanced Data Structure	<p>CO-1: Apply advanced data structure concepts to solve complex problems in computer science and related domains.</p> <p>CO-2: Analyze the efficiency and performance of various advanced data structures in terms of time and space complexity.</p> <p>CO-3: Design and implement efficient algorithms using advanced data structures for tasks such as searching, sorting, and graph traversal.</p> <p>CO-4: Evaluate and select appropriate data structures based on problem requirements, considering factors such as memory usage and runtime efficiency.</p> <p>CO-5: Develop software solutions that demonstrate a deep understanding of advanced data structure concepts and their practical applications in real-world scenarios.</p>
02	BCA-504	E-Business	<p>CO-1: Apply fundamental concepts and principles of e-business to analyze and evaluate online business models, strategies, and technologies.</p> <p>CO-2: Develop and implement effective e-commerce websites and digital marketing campaigns using appropriate tools and technologies.</p> <p>CO-3: Demonstrate an understanding of legal and ethical considerations in e-business, including privacy, security, and intellectual property rights.</p> <p>CO-4: Analyze and interpret data related to e-business performance and use it to make informed decisions for business growth and improvement.</p> <p>CO-5: Collaborate effectively in a team to design and present innovative e-business solutions, considering user experience, customer engagement, and competitive advantage.</p>
03	PGD-104	Information Security & Cyber Crime Handling	<p>CO-1: Identify and analyze potential cyber threats and vulnerabilities in information systems and networks.</p> <p>CO-2: Apply effective techniques to prevent unauthorized access, data breaches, and cyber-attacks in an organization.</p> <p>CO-3: Demonstrate proficiency in handling cybercrime incidents by employing appropriate forensic tools and methodologies.</p> <p>CO-4: Evaluate and implement information security policies, procedures, and best practices to ensure the confidentiality, integrity, and availability of data.</p> <p>CO-5: Assess and mitigate risks associated with emerging technologies and trends in information security and cybercrime.</p>
04	BCA-505	Multimedia System	<p>CO-1: Identify and explain the fundamental principles and components of multimedia systems.</p> <p>CO-2: Design and develop multimedia applications using various tools and technologies.</p> <p>CO-3: Apply multimedia authoring techniques to create interactive and engaging multimedia content.</p> <p>CO-4: Evaluate and analyze the impact of multimedia systems on society and industries.</p> <p>CO-5: Demonstrate effective communication and teamwork skills in the development of multimedia projects.</p>
05	ELGA-301	English Language And General Awareness-V	<p>CO-1: Demonstrate effective communication skills in English by expressing ideas clearly and coherently in both written and oral forms.</p> <p>CO-2: Develop a strong vocabulary and language proficiency in English to comprehend and interpret various texts, including academic, professional, and literary materials.</p> <p>CO-3: Acquire a comprehensive understanding of grammar rules and apply them accurately in speaking and writing, thereby enhancing overall language fluency and accuracy.</p> <p>CO-4: Develop critical thinking and analytical skills through reading and analyzing a wide range of texts, enabling students to engage in thoughtful discussions and express informed opinions on various topics.</p> <p>CO-5: Gain a broad knowledge of current affairs, general knowledge, and contemporary issues, fostering an awareness of the world and the ability to participate in discussions on diverse subjects with confidence and competence.</p>

S.No.	CourseCode	Course Title	Course Outcomes
VI Semester			
01	BMI-601	Advanced Software Engineering	<p>CO-1: Analyze and evaluate complex software systems to identify areas for improvement, incorporating advanced software engineering principles and techniques.</p> <p>CO-2: Design and develop scalable and reliable software solutions using advanced software engineering methodologies and tools, taking into consideration the diverse requirements of stakeholders.</p> <p>CO-3: Apply advanced software testing and quality assurance techniques to ensure the reliability, efficiency, and maintainability of software systems.</p> <p>CO-4: Employ project management practices and strategies in the context of advanced software engineering projects, effectively coordinating team efforts, managing resources, and delivering high-quality software products within specified timeframes.</p> <p>CO-5: Demonstrate proficiency in researching, critically analyzing, and applying emerging trends and technologies in the field of software engineering to solve complex problems and meet evolving industry demands.</p>
02	BCA-601	Data Warehousing and Mining	<p>CO-1: Analyze the principles and concepts of data warehousing and mining to design efficient and scalable data warehouse systems.</p> <p>CO-2: Apply various data mining techniques and algorithms to extract meaningful patterns and insights from large datasets stored in a data warehouse.</p> <p>CO-3: Evaluate the performance and effectiveness of data warehouse systems using appropriate evaluation metrics and measures.</p> <p>CO-4: Develop data integration and transformation strategies to ensure the consistency and quality of data stored in a data warehouse.</p> <p>CO-5: Design and implement data mining models and algorithms for predictive analytics and decision support in real-world applications using data warehousing techniques.</p>
03	BMI-602	Cloud Computing and Services	<p>CO-1: Analyze the fundamental concepts of cloud computing and services, including virtualization, storage, networking, and security, to demonstrate a comprehensive understanding of the subject.</p> <p>CO-2: Evaluate and compare various cloud computing models, such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), to select appropriate solutions for specific business requirements.</p> <p>CO-3: Design and implement cloud-based solutions using popular cloud platforms, such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform (GCP), to address real-world computing challenges.</p> <p>CO-4: Apply best practices and techniques for deploying, managing, and monitoring cloud-based applications, ensuring scalability, reliability, and cost-efficiency in the cloud environment.</p> <p>CO-5: Analyze and evaluate the security risks and challenges associated with cloud computing, and develop strategies to ensure data privacy, integrity, and compliance with regulatory requirements in cloud-based systems.</p>



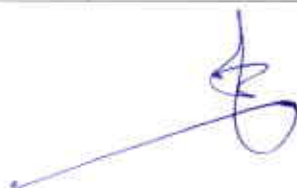
04	PGD-201	E-Governance and Web Technologies	<p>CO-1: Demonstrate a comprehensive understanding of e-governance principles and concepts, and the role of web technologies in transforming traditional government processes.</p> <p>CO-2: Apply web development frameworks, tools, and technologies to design and develop efficient and user-friendly e-governance solutions.</p> <p>CO-3: Analyze the challenges and opportunities associated with implementing e-governance initiatives, and propose effective strategies to address them using web technologies.</p> <p>CO-4: Evaluate the security and privacy concerns in e-governance systems and employ appropriate measures to safeguard sensitive information and ensure data integrity.</p> <p>CO-5: Demonstrate effective project management skills in planning, executing, and monitoring e-governance projects using web technologies, and effectively communicate project outcomes and recommendations.</p>
05	MCA-102	Mathematical Foundations for Computer Science	<p>CO-1: Apply mathematical concepts and principles to analyze and solve computational problems encountered in computer science.</p> <p>CO-2: Demonstrate proficiency in mathematical reasoning, logic, and proof techniques, and apply them to formalize and validate computer science concepts.</p> <p>CO-3: Utilize discrete mathematical structures, such as sets, relations, functions, graphs, and trees, to model and solve real-world computational problems.</p> <p>CO-4: Analyze and evaluate algorithms using mathematical techniques, including complexity analysis, recurrence relations, and asymptotic notation, to determine their efficiency and performance.</p> <p>CO-5: Apply mathematical principles to the design and analysis of data structures, including arrays, linked lists, stacks, queues, and trees, to efficiently store and manipulate data in computer programs.</p>
06	ELGA-401	English Language And General Awareness-VI	<p>CO-1: Demonstrate effective written and verbal communication skills in the English language.</p> <p>CO-2: Develop a broad understanding of general knowledge and current affairs through regular reading and engagement with news articles, journals, and other relevant sources.</p> <p>CO-3: Apply critical thinking skills to analyze and interpret complex texts and media, and express informed opinions on various socio-cultural, political, and economic issues.</p> <p>CO-4: Acquire a strong foundation in English grammar and vocabulary, enabling clear and concise expression of ideas in both written and spoken forms.</p> <p>CO-5: Display an awareness and appreciation of diverse literary genres, authors, and their contributions to the English language, fostering a deeper understanding of literature's impact on society.</p>



S.No.	Course Code	Course Title	Course Outcomes
VII Semester			
01	MCA-301	Analysis and Design of algorithms	<p>CO-1: To understand data structures, analyze algorithms, determine time and space complexity, and order arithmetic.</p> <p>CO-2: Apply and analyze divide and conquer techniques in different algorithms.</p> <p>CO-3: Analysis algorithms using greedy approach for job sequencing, knapsack, merge patterns, optimal storage, and minimum spanning trees.</p> <p>CO-4: Create programs for finding spanning tree, shortest path using different design techniques.</p> <p>CO-5: Analyze graph traversal, apply algorithms like Dijkstra's, solve optimization problems, and comprehend advanced techniques including P, NP, and NP-complete problems.</p>
02	MCA-302	Data Communication and Networks	<p>CO-1: To understand network applications, transmission methods, OSI model, and network protocol concepts.</p> <p>CO-2: Analyze data transmission types, media characteristics, and transmission impairments.</p> <p>CO-3: Evaluate data encoding techniques, modulation methods, error detection, and communication hardware.</p> <p>CO-4: Explain framing, media access protocols, CSMA/CD, token-based protocols, and asynchronous transfer mode.</p> <p>CO-5: Comprehend network layer functionality, addressing, routing, congestion control, and internetworking concepts.</p>
03	MCA-303	Operating System	<p>CO-1: Demonstrate knowledge and comprehension of fundamental concepts and principles related to operating systems, such as process management, memory management, file systems, and device management.</p> <p>CO-2: Apply critical thinking and problem-solving skills to analyze and resolve common issues and challenges encountered in operating systems, including process synchronization, deadlock handling, and memory allocation.</p> <p>CO-3: Design and implement efficient algorithms and data structures for various operating system components, such as process scheduling, file organization, and virtual memory management.</p> <p>CO-4: Evaluate the performance of different operating system functionalities and propose optimization techniques to enhance system efficiency, scalability, and reliability.</p> <p>CO-5: Communicate effectively, both orally and in writing, about operating system concepts, principles, and techniques, demonstrating the ability to present technical information clearly and concisely to diverse audiences.</p>



04	MCA-304	Operation Research	<p>CO-1: Apply mathematical modeling techniques to analyze and solve complex problems in the field of operations research.</p> <p>CO-2: Demonstrate proficiency in using optimization methods and algorithms to optimize decision-making processes in various operational scenarios.</p> <p>CO-3: Evaluate and interpret the results obtained from mathematical models and optimization techniques to make informed decisions and recommendations.</p> <p>CO-4: Apply linear programming and network analysis techniques to formulate and solve real-world problems in areas such as transportation, supply chain management, and project scheduling.</p> <p>CO-5: Utilize decision analysis methods to evaluate alternatives and make optimal decisions considering uncertainties and risk factors in operational settings.</p>
05	MCA-305	Java Programming (Core)	<p>CO-1: Apply fundamental concepts of Java programming to develop efficient and error-free code.</p> <p>CO-2: Design and implement object-oriented programs using Java, demonstrating proficiency in encapsulation, inheritance, and polymorphism.</p> <p>CO-3: Analyze and solve complex programming problems using Java's control structures, data types, and operators.</p> <p>CO-4: Develop graphical user interfaces (GUIs) using Java Swing and JavaFX, incorporating event handling and user interaction.</p> <p>CO-5: Utilize Java's input/output (I/O) mechanisms, exception handling, and file handling techniques to develop robust and reliable applications.</p>



			<p>CO-3: Evaluate and compare different wireless communication technologies and their suitability for specific mobile computing scenarios, considering factors such as range, data rate, power consumption, and mobility support.</p> <p>CO-4: Apply effective techniques for optimizing the performance and security of wireless networks and mobile computing systems, including techniques for reducing interference, improving signal quality, and implementing encryption and authentication mechanisms.</p> <p>CO-5: Demonstrate the ability to troubleshoot and diagnose common issues in wireless networks and mobile computing environments, employing appropriate tools and methodologies for network monitoring, debugging, and performance analysis.</p>
05	MCA-405	Computer Graphics	<p>CO-1: Apply principles of computer graphics to design and create visually appealing 2D and 3D graphics.</p> <p>CO-2: Implement algorithms and techniques for rendering, shading, and lighting in computer graphics applications.</p> <p>CO-3: Develop interactive computer graphics applications using modern graphics libraries and frameworks.</p> <p>CO-4: Analyze and evaluate the performance of computer graphics algorithms and optimize them for real-time rendering.</p> <p>CO-5: Demonstrate an understanding of the ethical and legal considerations related to computer graphics, including copyright and intellectual property issues.</p>



S.No.	CourseCode	CourseTitle	CourseOutcomes
IX Semester			
01	MCA-501	Software Project Management	<p>CO-1: Analyze the fundamental principles and concepts of software project management to effectively plan, execute, and control software development projects.</p> <p>CO-2: Apply appropriate project management methodologies and techniques to ensure the successful delivery of software projects within defined constraints of time, cost, and quality.</p> <p>CO-3: Evaluate and select suitable software development life cycle models and project management tools to address the specific requirements and challenges of different software projects.</p> <p>CO-4: Develop strategies for effective team management, communication, and collaboration in software development projects, fostering a positive and productive work environment.</p> <p>CO-5: Assess and mitigate risks associated with software projects by employing risk management techniques, ensuring project success and minimizing potential disruptions.</p>
02	MCA-502	Compiler Construction	<p>CO-1: Apply principles of lexical analysis and parsing to design and implement a compiler for a given programming language.</p> <p>CO-2: Develop a comprehensive understanding of the different phases involved in the construction of a compiler, including lexical analysis, syntax analysis, semantic analysis, intermediate code generation, and code optimization.</p> <p>CO-3: Demonstrate proficiency in implementing various algorithms and data structures used in compiler construction, such as symbol tables, parsing tables, and abstract syntax trees.</p> <p>CO-4: Evaluate and debug a compiler by analyzing its intermediate code, identifying and resolving syntax and semantic errors, and optimizing code generation.</p> <p>CO-5: Design and implement a language-specific front end and back end for a compiler, utilizing appropriate tools and techniques, such as lexers, parsers, and code generators, to produce efficient and correct code.</p>
03	MCA-503	Cryptography and Network Security	<p>CO-1: Identify and analyze different cryptographic algorithms and protocols used in network security, demonstrating an understanding of their strengths and weaknesses.</p> <p>CO-2: Apply cryptographic techniques to secure data transmission and storage in computer networks, ensuring confidentiality, integrity, and authentication.</p> <p>CO-3: Evaluate the vulnerabilities and threats associated with network security, and design effective countermeasures to protect against attacks, including intrusion detection and prevention systems.</p> <p>CO-4: Demonstrate knowledge of key concepts and principles of public key infrastructure (PKI), digital signatures, and certificate authorities, and their role in ensuring secure communication.</p> <p>CO-5: Critically analyze legal, ethical, and privacy issues related to cryptography and network security, and propose solutions to mitigate potential risks and challenges in real-world scenarios.</p>

04	MCA-504	<p>Elective I</p> <p>A. Embedded System and Programming</p> <p>B. Web Services</p> <p>C. ERP</p>	<p>CO-1: Identify and analyze the fundamental concepts and principles of embedded systems, including hardware and software components.</p> <p>CO-2: Develop proficiency in programming languages and tools commonly used in embedded systems, such as C/C++ and assembly language, to design and implement embedded software.</p> <p>CO-3: Apply knowledge of microcontrollers, sensors, and actuators to design and develop embedded systems solutions that meet specific requirements and constraints.</p> <p>CO-4: Demonstrate the ability to integrate hardware and software components to create functional and efficient embedded systems, considering factors such as power consumption, memory management, and real-time responsiveness.</p> <p>CO-5: Evaluate and troubleshoot embedded systems by employing debugging techniques, testing methodologies, and analysis tools to ensure their proper functionality and reliability.</p> <p>CO-1: Identify and explain the key concepts and principles of web services, including their architecture, protocols, and standards.</p> <p>CO-2: Develop and implement web services using various technologies and platforms, such as SOAP and RESTful APIs.</p> <p>CO-3: Evaluate and compare different approaches for securing web services, including authentication, authorization, and encryption techniques.</p> <p>CO-4: Design and integrate web services with existing systems, ensuring interoperability and scalability.</p> <p>CO-5: Analyze and troubleshoot common issues and challenges related to web services, and propose effective solutions for their resolution.</p> <p>CO-1: Analyze and evaluate the fundamental concepts and principles of Enterprise Resource Planning (ERP) systems, including their architecture, components, and functionalities.</p> <p>CO-2: Apply ERP software tools and techniques to effectively manage various business processes, such as finance, supply chain, manufacturing, and human resources, within an organization.</p> <p>CO-3: Design and develop customized ERP solutions that align with the specific requirements and goals of an organization, taking into consideration factors such as scalability, security, and integration with existing systems.</p> <p>CO-4: Demonstrate proficiency in configuring and administering ERP systems, including user management, data migration, system maintenance, and troubleshooting, to ensure smooth operations and optimal performance.</p> <p>CO-5: Assess the impact of ERP implementations on organizations, considering factors such as change management, organizational culture, and business process reengineering, and propose strategies for successful ERP adoption and utilization.</p>
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PGDCA

3.2 Programme Outcomes (POs):

PO1: Software development knowledge: Apply the knowledge of logics, programming, data structure, OOPS fundamentals, and a framework specialization to the solution of complex real world problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex real world problems reaching substantiated conclusions using first principles of mathematics, programming, and sciences.

PO3: Design/development of solutions: Design web based solutions for complex real world problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern frameworks/techniques/tools to automate the solution.

PO6: Contribution to the society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues.

PO7: Environment and sustainability: Understand the impact of the automated solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the programming practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex programming activities with the software engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the



software engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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PGDCA

3.3 Programme Specific Outcomes (PSO's)

PSO1: Students will be able to apply fundamental knowledge in problem solving and logical thinking skill.

PSO 2: Students will be able to design and develop software by imparting the knowledge of programming languages, web designing, networking and Software development cycle.

PSO 3: Students will be able to learn latest Technologies in IT and Communications system.



COURSE OUTCOMES (PGDCA)

S.No.	Course Code	Course Title	Course Outcomes
First Semester			
01	PGD-101	Operating System	<p>CO-1: Analyze the fundamental concepts of operating systems, including process management, memory management, file systems, and input/output operations.</p> <p>CO-2: Evaluate different types of operating systems and their architectural designs, such as batch processing systems, time-sharing systems, and distributed systems.</p> <p>CO-3: Apply problem-solving skills to design and implement basic operating system functionalities, including process scheduling algorithms, memory allocation strategies, and file management techniques.</p> <p>CO-4: Demonstrate an understanding of inter-process communication mechanisms and synchronization techniques in operating systems, including semaphores, monitors, and message passing.</p> <p>CO-5: Evaluate the impact of operating system design decisions on system performance, security, and reliability, and propose appropriate strategies to optimize system efficiency and mitigate potential risks.</p>
02	PGD-102	Computer Fundamentals and Information System	<p>CO-1: Analyze the basic components and functionalities of computer systems and explain their significance in the context of information systems.</p> <p>CO-2: Apply fundamental concepts of computer organization and architecture to understand the internal structure of computers and their impact on system performance.</p> <p>CO-3: Evaluate different types of software and operating systems, and demonstrate proficiency in their installation, configuration, and troubleshooting.</p> <p>CO-4: Utilize the principles of data organization and storage to effectively manage and retrieve information using database management systems.</p> <p>CO-5: Identify and assess various types of computer networks and their components, and employ networking protocols and technologies to establish secure and reliable communication systems.</p>
03	PGD-103	Introduction to C Programming	<p>CO-1: Demonstrate proficiency in the fundamental concepts of C programming, including variables, data types, operators, control structures, and functions.</p> <p>CO-2: Apply problem-solving skills to design and implement efficient C programs that solve real-world computational problems.</p> <p>CO-3: Analyze and debug C code effectively, utilizing appropriate debugging techniques and tools to identify and rectify errors in programs.</p> <p>CO-4: Develop modular and well-structured C programs by utilizing appropriate programming techniques, such as modularization, encapsulation, and code reuse.</p> <p>CO-5: Demonstrate an understanding of memory management in C programming, including dynamic memory allocation and deallocation, and utilize it effectively to optimize program performance.</p>
04	PGD-104	Mathematical Foundation for Computer Science	<p>CO-1: Apply fundamental mathematical concepts and principles to analyze and solve problems in computer science, including sets, logic, functions, relations, and combinatorics.</p> <p>CO-2: Utilize mathematical techniques such as algebra, calculus, and discrete mathematics to model and solve problems in computer science, such</p>



			<p>as algorithm analysis, optimization, and data structures.</p> <p>CO-3: Develop proficiency in formal mathematical reasoning and proof techniques, including induction, contradiction, and mathematical induction, to establish the validity of statements and theorems in computer science.</p> <p>CO-4: Demonstrate a solid understanding of mathematical structures and their applications in computer science, such as graphs, trees, automata, and formal languages, to design and analyze algorithms and computational systems.</p> <p>CO-5: Apply mathematical knowledge and skills to critically analyze and evaluate advanced topics in computer science, such as cryptography, complexity theory, and computational logic, and make informed decisions in solving complex computational problems.</p>
05	PGD-105	Digital Electronics and its Applications	<p>CO-1: Analyze and interpret the fundamental concepts of digital electronics, including Boolean algebra, logic gates, and combinational and sequential circuits.</p> <p>CO-2: Design and implement digital circuits using various tools and techniques, such as logic gates, multiplexers, decoders, and flip-flops.</p> <p>CO-3: Evaluate the performance of digital systems by applying appropriate testing and troubleshooting methods, including simulation and diagnostic tools.</p> <p>CO-4: Apply knowledge of digital electronics to solve real-world problems and develop practical solutions in areas such as data communication, computer architecture, and control systems.</p> <p>CO-5: Demonstrate an understanding of emerging trends and applications of digital electronics, such as embedded systems, microprocessors, and digital signal processing, and their impact on various industries and technological advancements.</p>
06	PGDL-106	Lab- Computer Fundamentals and Information System	<p>CO-1: Analyze the fundamental concepts and components of computer systems and information systems, including hardware, software, and networks, to develop a comprehensive understanding of their functionality and interdependencies.</p> <p>CO-2: Apply problem-solving techniques and critical thinking skills to identify, diagnose, and resolve common hardware and software issues encountered in computer systems, ensuring efficient and effective operation.</p> <p>CO-3: Design, implement, and manage basic computer networks, including local area networks (LANs) and wide area networks (WANs), to facilitate efficient data communication and resource sharing within an organization.</p> <p>CO-4: Utilize various software applications, including operating systems, word processing, spreadsheets, and databases, to perform basic tasks such as creating, formatting, and managing files and documents, fostering productivity and organization.</p> <p>CO-5: Understand the ethical and legal considerations related to computer and information systems, including issues of privacy, security, and intellectual property, and apply appropriate measures to ensure compliance and protect sensitive information.</p>
07	PGDL-107	Lab - Introduction to C Programming	<p>CO-1: Apply fundamental concepts of the C programming language to develop simple programs.</p> <p>CO-2: Analyze and solve basic programming problems using C language constructs and control flow statements.</p> <p>CO-3: Design and implement efficient algorithms using appropriate data structures in C programming.</p> <p>CO-4: Debug and troubleshoot C programs using effective testing and debugging techniques.</p> <p>CO-5: Demonstrate effective teamwork and communication skills while collaborating on programming projects in a laboratory setting.</p>

S.No.	CourseCode	CourseTitle	CourseOutcomes
2 nd Semester			
01	PGD-201	Database Management System	<p>CO-1: Demonstrate proficiency in designing and implementing efficient and secure database systems.</p> <p>CO-2: Apply advanced querying techniques to retrieve, manipulate, and analyze data stored in a database.</p> <p>CO-3: Evaluate and optimize the performance of a database system through indexing, normalization, and other optimization techniques.</p> <p>CO-4: Utilize appropriate data modeling techniques to design logical and physical database schemas for a given set of requirements.</p> <p>CO-5: Apply principles of concurrency control and transaction management to ensure data integrity and consistency in a multi-user database environment.</p>
02	PGD-202	Information System Analysis & Design	<p>CO-1: Identify and analyze information system requirements.</p> <p>CO-2: Develop effective system designs for various organizational needs.</p> <p>CO-3: Apply appropriate methodologies and tools for system analysis and design.</p> <p>CO-4: Evaluate the feasibility and potential risks associated with proposed system solutions.</p> <p>CO-5: Communicate and present system analysis and design concepts effectively to stakeholders.</p>
03	PGD-203	Data Structure Algorithms	<p>CO-1: Apply fundamental data structures and algorithms to solve complex computational problems.</p> <p>CO-2: Design and implement efficient algorithms for sorting, searching, and manipulating data.</p> <p>CO-3: Analyze the time and space complexity of algorithms and evaluate their performance.</p> <p>CO-4: Implement advanced data structures such as graphs, trees, and heaps to solve real-world problems.</p> <p>CO-5: Develop and optimize algorithms for various computational tasks, including dynamic programming, greedy algorithms, and divide-and-conquer strategies.</p>
04	PGD-204	Management and Accounting	<p>CO-1: Evaluate the role of management in organizations and its impact on achieving organizational goals and objectives.</p> <p>CO-2: Analyze and apply accounting principles and techniques to record, classify, and interpret financial data for decision-making purposes.</p> <p>CO-3: Assess the significance of cost management techniques in optimizing resource allocation and improving organizational performance.</p> <p>CO-4: Demonstrate proficiency in using management and accounting software tools to perform financial analysis, budgeting, and forecasting tasks.</p> <p>CO-5: Apply ethical principles and professional standards in management and accounting practices, ensuring compliance with relevant regulations and promoting transparency and accountability in financial reporting.</p>
05	PGDL-205	Lab- Database Management System	<p>CO-1: Apply the principles and concepts of database management systems to design and implement efficient and reliable databases.</p> <p>CO-2: Analyze and evaluate the performance of different database management systems in terms of storage, retrieval, and query processing.</p> <p>CO-3: Design and develop effective database schemas using appropriate data modeling techniques and normalization principles.</p> <p>CO-4: Implement advanced database operations, such as indexing.</p>

			<p>transaction management, concurrency control, and data integrity enforcement.</p> <p>CO-5: Demonstrate proficiency in using SQL (Structured Query Language) to retrieve, manipulate, and update data stored in relational databases.</p>
06	PGDI.-206	Lab- Data Structure Algorithms	<p>CO-1: Demonstrate proficiency in implementing various data structures and algorithms using programming languages such as C++ or Java.</p> <p>CO-2: <i>Analyze the efficiency and performance of different data structures and algorithms, considering their time and space complexities.</i></p> <p>CO-3: Design and develop efficient algorithms for solving a wide range of computational problems, considering factors such as input size and resource utilization.</p> <p>CO-4: Apply various data structures and algorithms to effectively solve real-world problems, demonstrating an understanding of their applications and limitations.</p> <p>CO-5: Evaluate and compare different data structures and algorithms based on their strengths, weaknesses, and suitability for specific problem domains, enabling informed decision-making in algorithmic design and implementation</p>
07	PGD-207	project	

