DEPARTMENT OF BCA, BELDA COLLEGE, BELDA 721424
PROGRAMME OUTCOME (PO), COURSE OUTCOME (CO) AND PROGRAMME
SPECIFIC OUTCOME (PSO) FOR END SEMESTER STUDENTS: UNDER
GRADUATE COURSE

Programme Name: BCA

PROGRAMME OUTCOMES(Session: 22-23)

At the end of the B.C.A. Programme, graduates will be able to

PO	Summary	Description
PO1	object oriented analyzing by unified modeling language	Ability to Implementation of the diagrams in Unified Modeling Language. Ability to Create and analyze activity and state diagrams; and Present the transition from business events to use cases. Student will gain an in-depth understanding of Unified Modeling Language (UML) class diagrams.
PO2	Develop knowledge of Image Processing and Pattern Recognition.	Ability to study the image fundamentals and mathematical transforms necessary for image processing. Ability to study image enhancement techniques. Ability to study image restoration procedures and image compression procedures.
PO3	Learning PHP/My SQL	Participants should be able to list the key components of PHP and MySQL functioning and explain why PHP is effective for web development after successfully completing the course. Students are able to learn how to use PHP and MySQL to convert a static website into a dynamic website that is powered by a database.
PO4	Knowledge enhancement about advanced OS.	Students can apply their knowledge of computing, mathematics, science, and engineering to the analysis of technological problems, as well as to the design and implementation of viable solutions to those problems. The ability to design and conduct experiments and computational simulations for the purpose of evaluating and comparing proposed solutions on the basis of empirical evidence. Learners possess the characteristics of lifelong learners; they are able to acquire and use new techniques, skills, and engineering and scientific tools for research and development in electrical engineering and computer science, as well as to develop new methods and make new discoveries.

PO5	Advance Networking	Students can differentiate between different LAN-based forwarding devices so that they can make thoughtful suggestions on how to build a network. They can write networking code that uses TCP and UDP in client-server applications and design and implement networking protocols as well as applications.
PO6	Data warehousing & Mining.	Ability to analyze data by simplifying it and extracting the characteristics of its various components through the use of statistical algorithms that look for patterns in data.
PO7	Advanced DBMS.	The candidate will gain knowledge of query optimization, parallel and distributed database systems, new database architectures, and query operators. The students are able to develop new methods in databases based on knowledge of existing techniques. -Ability to apply acquired knowledge to develop holistic solutions based on database systems/database techniques.
PO8	E – Commerce & ERP	After completing the subject, students should be able to understand the basic concepts and technologies used in the field of management information systems. Acquire knowledge of the different types of management information systems. Understanding the processes of developing and implementing information systems Gain knowledge of the ethical, social, and security issues of information systems.
PO9	Computer Graphics and Multimedia	The main objective of this module is to introduce to the students the concepts of computer graphics. It starts with an overview of interactive computer graphics, two dimensional system and mapping, then it presents the most important drawing algorithm, two-dimensional transformation; Clipping, filling and an introduction to 3-D graphics.
PO10	Project Management	Ability to understand management and computing principles with computing knowledge to manage projects in multidisciplinary environments.
PO11	Communication Efficacy	Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.
PO12	Individual & Team Work	Ability to work as a member or leader in diverse teams in a multidisciplinary environment.

PROGRAMME SPECIFIC OUTCOMES (PSO) :: BCA.

PSO1 (PO1+ PO3): Use of The tool supports Java and PHP, and has built-in support for round-trip-engineering. Knowledge also brings support for PHP code using a MySQL database. Understanding the basic concepts of **PHP** and its applications Demonstrate various MySQL database queries.

PSO2: To study the image fundamentals and mathematical transforms necessary for image processing. Knowledge of image enhancement techniques ability to study image restoration procedures and image compression procedures.

PSO 3: Students will obtain a set of training, including practical experience with the creation of a particular system on an operating system, at the conclusion of this course. Students will use scientific analysis to a research challenge. System development, encompassing system design, implementation, performance analysis, and assessment, will be the students' main area of study. creating an evaluation strategy to thoroughly test the system under development.

PSO 4: Students are able to distinguish between various LAN-based forwarding devices, enabling them to offer well-considered advice on how to design a network. They can design and implement networking protocols as well as applications, and they can develop networking code that employs TCP and UDP in client-server applications.

PSO 5: Students are able to learn the concepts of database technology and its evolutionary path, which has led to the need for data mining and its applications. Examine the types of data to be mined and present a general classification of tasks and primitives to integrate a data mining system. A student can apply preprocessing statistical methods to any given raw data set. Explore DWH and OLAP, and devise efficient and cost effective methods for maintaining DWHs.

PSO 6: The candidate will gain knowledge of query optimization, parallel and distributed database systems, new database architectures, and query operators. The students are able to develop new methods in databases based on knowledge of existing techniques. -Ability to apply acquired knowledge to develop holistic solutions based on database systems/database techniques.

PSO 7: Students should be able to comprehend the fundamental ideas and technology utilized in the field of management information systems after finishing the course. learn about the many categories of management information systems. Knowing the steps involved in creating and implementing information systems. Learn about the security, societal, and ethical challenges that surround information technologies.

PSO 8: This course's major goal is to present the fundamentals of computer graphics to the pupils. The most significant drawing method, two-dimensional transformation; clipping, filling, and an introduction to 3-D graphics are presented after providing an overview of interactive computer graphics, a two-dimensional system, and mapping.

PSO 9: Ability to understand management and computing principles with computing knowledge to manage projects in multidisciplinary environments. Students are able to learn lessons for developing projects and identifying areas for improvement. Problem solving knowledge by computer.

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Course Outcomes (CO) for End Semester Students:

CO 3201: (OBJECT ORIENTED ANALYSIS AND DESIGN)

To explain OOAD concepts and various UML diagrams. To select an appropriate design pattern. To illustrate domain models and conceptual classes. To compare and contrast various testing techniques. To gain an understanding of how to build projects using UML diagrams.

CO 3202(1): (Image Processing and Pattern Recognition)

The ability to understand and use fundamental image processing techniques using both theoretical and applied information, the capacity to recognise, formulate, and solve issues linked to object recognition in images. To get knowledge and skills needed to comprehend image processing techniques, as well as a first introduction to pattern recognition. At the end of this course, the student will be able to understand how digital images are treated and will acquire a basic knowledge of image processing.

CO 3202(2): (PHP/My SQL.)

Ability to write PHP scripts to handle HTML forms and to write regular expressions, including modifiers, operators, and metacharacters. The ability to create PHP programs that use various PHP library functions, and that manipulate files and directories.

CO 3202(3): (Advanced OS.)

To study, discover, and comprehend the fundamental ideas behind modern operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems). To gain an understanding of the features of the hardware and software that support these systems.

CO 3202(4): (Advance Networking)

Students successfully completing this course will demonstrate that they can differentiate between different LAN-based forwarding devices so that they can make thoughtful suggestions on how to build a network and write networking code that uses TCP and UDP in client-server applications. They can design and implement networking protocols and implement networking applications.

CO 3202(5): (Data warehousing & Data Mining)

Students will be able to understand warehouse architectures and tools for systematically organizing large databases and using their data to make strategic decisions by the end of this course, as well as the KDD process for finding interesting patterns in warehouses. Ability to remove redundancy and incomplete data from the dataset using data preprocessing methods. To characterize the kinds of patterns that can be discovered by association rule mining. To discover

interesting patterns from large amounts of data to analyze for predictions and classification and to develop a data mining application for data analysis using various tools.

CO 3202(6): Advanced DBMS

Students will get an idea to Design, develop and implement a mid-scale relational database for an application domain using a commercial-grade RDBMS. Students can Identify and resolve physical database design and implementation issues And can Use the persistence framework of a chosen language to perform Object Relational Mapping.

To get ideas about Research, analyze and hands-on experience with a number of contemporary information management systems. To get knowledge of Explore a research aspect of advanced databases.

CO 3202(7): E – Commerce & ERP

To specify the basic concepts of computing. To discuss the constituents of electronic commerce and to classify e-Commerce applications in business. To utilize networking and Internet basics. To apply the concept of EDI in a business environment. Justify the vital tools and services of the internet in the development of a virtual e-commerce site. To understand the business process, project management life cycle, and emerging trends of *ERP* and *effects of e-commerce*.

CO 3203 and 3294: (Computer Graphics and Multimedia; Computer Graphics and Multimedia Lab)

The learner is aware of the fundamental ideas and mathematical underpinnings of computer graphics. The student is familiar with the basic data structures and computer graphics algorithms. The student can use modeling software to create basic 2D scenes and can apply basic mathematics in the development of graphics applications. To develop programming skills in graphics concepts and multimedia. To teach students about graphics concepts and to help them develop, design, and implement two and three-dimensional graphical structures using the C programming language. To understand multimedia compression techniques and applications of multimedia.

CO 3295: (Project Industrial)

To help the students comprehend the fundamentals of project management for the purpose of project planning and execution.
To aid in their comprehension of methods for cost and time estimation in project management feasibility analysis.
To enable them to comprehend the fundamentals of data-driven or research-based design projects.

Develop their ability to evaluate, utilize, and appreciate modern project management technologies and processes.

CO 3296: Grand Viva

The sixth semester will have a grand-viva that will encompass the entire curriculum. This will put the student's knowledge and comprehension from their B.C.A. curriculum to the test. Thus, the main goal of this course is to get students ready for interviews in both the academic and industrial fields.

By this viva teachers can get an idea about the overall subjects of the course.

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OUTLINE SYLLABUS OF END SEMESTER UG (HONOURS) COURSES DEPARTMENT OF BCA

List of Course

BCA-3201: (OBJECT ORIENTED ANALYSIS AND DESIGN (Using UML))

UNIT-I: Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software DevelopmentLifecycle.

UNIT-II:Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Advanced Structural Modeling: Advanced classes, advanced relationships,Interfaces,TypesandRoles,Packages.

UNIT-III:Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams.

UNIT-IV:Basic Behavioral Modeling-I: Interactions, Interaction diagrams.

UNIT-V:Basic Behavioral Modeling-II: Use cases, Use case Diagrams, Activity Diagrams.

UNIT-VI:Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT-VII:Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

UNIT-VIII:Case Study:The Unified Library application

BCA-3202 (1) (IMAGE PROCESSING AND PATTERN RECOGNITION)

UNI-I: Digital image processing systems: Image acquisition, storage, processing, communication, display.

UNIT-II: Visual perception: Structure of human eye, image formation in the human eye, brightness, adaptation and discrimination.

UNIT -III: Image model: Uniform and non-uniform sampling, quantization.

UNIT-IV: Image transforms: Introduction to Fourier transform, DFT and two-dimensional DFT, some properties of DFT, separability, translation, periodicity, conjugate symmetry, rotation, scaling, average value, convolution theorem, correlation, FFt algorithms, inverse FFt, and filter implementation through FFT.

UNIT-V: Other transforms: Other separable image transforms and their algorithms UNIT-VI: Pattern Recognition: Classification, Clustering, recognition etc.

BCA-3202(2): PHP/MY SQL

1.	Introduction to Web Programming
2.	Installation of PHP/MySql and web server
3.	Introduction to PHP programming
4.	Writing PHP Programs
5.	Loops, Control Structure and Arrays
6.	PHP functions String functions , Array functions , Mathematical function , Graphics functions, File system function, Date and time function , Miscellaneous Functions ,
7.	Error handling
8.	Object Oriented Features of PHP
9.	File and Directory handling
10.	MySql database Configuration of MySql server , Starting MySql server , MySql tables ,Displaying MySql data , Adding and removing user access.
11.	Web Servers IIS web Server ,Apache web server

BCA-3202(3): ADVANCED OS

UNIT-I: Introduction to Distributed Systems: Goals – Advantages of distributed systems over centralized systems – disadvantages of distributed systems, Hardware & Software Concepts, loosely coupled systems, network operating systems, Network file systems, design Issues – transparency – Flexibility – performance – scalability.
UNIT-II: Remote Procedure Calling: Introduction, Features of RPC, User package, Design issues, Classes of RPC system, Interface definition language, exception handling, delivery guarantees, implementation, interface processing, binding, Locating the binder, RPC in Unix system
UNIT-III: Synchronization in Distributed systems: Clock synchronization, Logical Clocks, Physical Clocks, Clock synchronization algorithms, Mutual exclusion, A centralized algorithms, Distributed algorithms, A token ring algorithms, comparison of the three algorithms, Election algorithms, The Bully algorithms, Ring algorithms, DeadLocks in distributed systems, Distributed deadlock detection.
UNIT-IV: Process and Processors in distributed systems: Threads, Introduction, Usage, Design issues for thread packages, An example for thread packages, System models, The workstation model, The processor pool model, The hybrid model , Processor allocation, Allocation models, Design issues, Implementation issues.
UNIT-V: Distributed File and Directory Services: Distributed file service requirements, File service components, Flat file service , Directory Service, Client module, Design issues, implementation techniques.
UNIT-VI: Distributed shared memory Introduction: Shared memory, Consistency models, Page based Distributed shared memory, Shared – variable Distributed shared memory, Object based Distributed Shared Memory.

BCA-3202(4): ADVANCE NETWORKING

UNIT I: Introduction: Protocols and standards, OSI model. TCP / IP protocol suite, addressing, versions, underlying technologies.

UNIT II: IP Addresses, Routing, ARP And RARP: Classful addressing, other issues, subnetting, supernetting,

 classless addressing, routing methods, delivery, table and modules, CIDR, ARP package, RARP. UNIT III: IP, ICMP, TGMP AND UDP: Datagram, fragmentation, options, checksum, IP package, ICMP,

messages, formats, error reporting, query, checksum, ICMP package, IGMP, messages, operation, encapsulation, IGMP package, UDP, datagram, checksum, operation, uses, UDP package.

UNIT IV: TCP, Unicast And Multicast Routing Protocols: Services, flow, congestion and error control, TCP package and operation, state transition diagram, unicast routing protocols, RIP, OSPF, BGP, multicast routing, trees, protocols, MOSPF, CBT,PIM

UNIT V: Application Layer, Sockets: Client server model, concurrency, processes, sockets, byte ordering, socket system calls, TCP and UDP client-server programs, BOOTP -DHCP, DNS, name space, resolution, types of records, concept, mode of operation, Rlogin

BCA-3202(5): PHP/MY SQL

UNIT-I: Introduction to DataMining: Motivation and importance, What is Data Mining, Relational Databases, DataWarehouses, Transactional Databases, Advanced Database Systems and AdvancedDatabase Applications, Data Mining Functionalities, Interestingness of a pattern Classification of Data Mining Systems, Major issues in Data Mining.
UNIT-II: Data   Warehouse   and   OLAP   Technology   for
        Data Mining What is a Data Warehouse? Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Development of Data Cube Technology, Data Warehousing to Data Mining.
UNIT-III:DataPreprocessing Why Preprocess the Data? Data Cleaning, Data Integration and Transformation Data Reduction, Discretization and Concept Hierarchy Generation.
UNIT-IV: Data Mining Primitives, Languages and system Architectures,Data Mining Primitives: What defines a Data Mining Task?, A Data Mining query language, Designing Graphical Use Interfaces Based on a Data Mining Query language, Architectures of Data Mining Systems.
UNIT-V: Concept Description: Characterization and comparison, What is Concept Description? Data Generalization and summarization-based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between different Classes, Mining Descriptive Statistical Measures inlarge Databases.

UNIT-VI: Mining Association rule in large Databases, Association Rule Mining, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

UNIT-VII: Classification and prediction,Concepts and Issues regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification,Classification by Back-propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods like k- Nearest Neighbor Classifiers, Case-Based Reasoning, Generic Algorithms, Rough Set Approach, Fuzzy Set Approaches, Prediction, Classifier Accuracy.

UNIT-VIII: Cluster Analysis what is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods.

BCA-3202(6) ADVANCED DATABASE MANAGEMENT SYSTEM

UNIT-I: Database Design: Multivalued dependencies, theory of normalization-4NF, 5NF, 6NF DKNF UNIT-II: ANSI SQL2: DDL, DML, constraints and assertions, views, database security. UNIT-III: Transaction processing, concurrency control, Recovery management. Transaction model properties, lock base protocols, Two-phase locking, Live – Lock, Time- Stamp Protocol. UNIT-IV: Brief introduction to distributed database, temporal database and object-oriented database. UNIT-V: Embedded SQL & Applications.

BCA-3203 COMPUTER GRAPHICS AND MULTIMEDIA

UNIT-I: Development of Computer Graphics: Basic graphics system and standards, Raster scan and random scan, graphics; Continual refresh and storages display, display processors and character generator, Colour display techniques, Frame buffer and bit operations, concepts in raster graphics.

UNIT-II: Points, Line and Curves; Scan Conversion; Line drawing algorithms; circle and ellipse generation; Polygon filling; Conic-section generation, Ant-aliasing.

UNIT-III: Two-dimensional viewing: Basic transformations; Coordinate systems; Windowing and Clipping; Segments; Interactive picture-construction techniques; interactive input-output device.

UNIT-IV: Three-dimensional Concepts: 3-D representation and transformations; 3-D viewing; Algorithm for 3-D volumes, spline curves and surface; Fractals; Quadtree and oct-tree data structures; Hidden line and surface rendering, and animation.

UNIT-V: An Introduction – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases.

UNIT-VI: Compression & Decompression – Data & File Format standards – Multimedia I/O technologies - Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval Technologies.

BCA-3294 GRAPHICS AND MULTIMEDIA LAB

1. Point plotting, line & regular figure algorithms
2. Raster scan line & circle drawing algorithms
3. Clipping & Windowing algorithms for points, lines & polygons
4. 2-D / 3-D transformations
5. Simple fractals representation , Demonstrate the properties of the Bezier curves.
6. Filling algorithms , Clip line segments against windows
7. Web document creation using Dreamweaver.
8. Creating Animation using Flash.

BCA-3295 PROJECT:(INDUSTRIAL)

Project Based on latest SOFTWARE and guided by faculty members of the respective college. FOR External project guide at least one Internal guide is required for each project. One faculty member can not guide more than eight(8) projects. Individual projects are prefered. In case of group projects **not** more than **four students** participate.

BCA-3296 Grand Viva

Grand Viva will be conducted in presence of an external examiner and will be based on all the subjects throughout the course.

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MAPPING OF CO, PO, PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO 3201	√		√									√								
CO 3202(1)		√											√							
CO 3202(2)			√									√								
CO 3202(3)				√										√						
CO 3202(4)					√										√					
CO 3202(5)						√										√				
CO 3202(6)							√										√			

CO 3202(7)							√									√		
CO 3203, 3294								√									√	
CO3295									√										√
CO3296										√									√

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JUSTIFICATION MATRIX OF CO WITH PO & PSO (High: 3, Medium: 2, Low: 1)

Course Outcome	Mapping	Correlation	Justification
CO3201	PO1	MEDIUM	Students acquired sufficient knowledge to explain OOAD concepts and various UML diagrams.
	PO3	HIGH	To select an appropriate design pattern. To illustrate domain models and conceptual classes. To compare and contrast various testing techniques.
	PSO1	HIGH	Build your knowledge of UML diagrams.
CO3202(1)	PO2	HIGH	Students learn about fundamental image processing techniques using both theoretical and applied information, developing the capacity to recognize, formulate, and solve issues linked to object recognition in images.

	PSO1	HIGH	At the end of this course, the student will be able to understand how digital images are treated and will acquire a basic knowledge of image processing.
CO3202(2)	PO3	HIGH	To write PHP scripts to handle HTML forms and to write regular expressions, including modifiers, operators, and metacharacters.
	PSO1	HIGH	The ability to create PHP programs.
CO3202(3)	PO4	HIGH	Study, discover, and comprehend the fundamental ideas behind modern operating systems
	PSO3	HIGH	To gain an understanding of the features of the hardware and software that supports these systems.
CO3202(4)	PO5	HIGH	To differentiate between different LAN-based forwarding devices so

 that they can make thoughtful suggestions on how to build a network. |
| | PSO4 | HIGH | Write networking code that uses TCP and UDP in client-server applications. |

CO3202(5)	PO6	HIGH	Understand warehouse architectures and tools for systematically organizing large databases.
	PSO5	HIGH	Discover interesting patterns from large amounts of data to analyze for predictions and classification and to develop a data mining application for data analysis using various tools.
CO3202(6)	PO7	HIGH	Students acquire knowledge about designing, developing, and implementing a mid-scale relational database for an application domain using a commercial-grade RDBMS.
	PSO6	HIGH	The students are able to develop new methods in databases based on knowledge of existing techniques.
CO3202(7)	PO8	HIGH	Understanding the processes of developing and implementing information systems Gain knowledge of the ethical, social, and security issues of information systems.

	PSO7	HIGH	Knowing the steps involved in creating and implementing information systems. Learn about the security, societal, and ethical challenges that surround information technologies.
CO3203,3294	PO9	HIGH	To get knowledge about two dimensional system and mapping, then it presents the most important drawing algorithm, two-dimensional transformation; Clipping, filling and an introduction to 3-D graphics.
	PSO8	HIGH	To acquire knowledge about most significant drawing method, two-dimensional transformation; clipping, filling, and an introduction to 3-D graphics are presented after providing an overview of interactive computer graphics, a two-dimensional system, and mapping.
CO3295	PO10	HIGH	Understanding management and computing principles with computing knowledge to manage projects in multidisciplinary environments.

	PSO9	HIGH	Students are able to learn lessons for developing projects and identifying areas for improvement. Problem solving knowledge by computer.
CO3296	PO11	HIGH	Students are able to learn lessons for developing projects and identifying areas for improvement. Problem solving knowledge by computer. Increase Communicate efficiently with the computing community as well as society by being able to comprehend effective documentation and presentations.
	PSO9	MEDIUM	Ability to understand management and computing principles with computing knowledge to manage projects in multidisciplinary environments.

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ARTICULATION MATRIX OF CO WITH PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO 3201	2		3									3								
CO 3202(1)		3											3							
CO 3202(2)			3									3								
CO 3202(3)				3										3						
CO 3202(4)					3										3					
CO 3202(5)						3										3				
CO 3202(6)							3										3			

CO 3202(7)							3										3		
CO 3203, 3294								3										3	
CO3295									3											3
CO3296										3										2
Target	2	3	3	3	3	3	3	3	3	3 3	3	3	3	3	3	3	3	3	2.5

BACHELOR OF COMPUTER APPLICATION

THREE YEAR UNDERGRADUATE PROGRAMME

(UNDER CBCS)

(w.e.f. academic year 2022-23)

PROGRAMME OUTCOMES(Session: 22-23)

At the end of the B.C.A. Programme, graduates will be able to acquire the knowledge of following:

PO	Summary	Description
PO1	Develop knowledge of Computer Fundamentals.	Computer fundamental, hardware, software, memory, Basic Operating system.
PO2	Develop knowledge of C Programming language.	Develop a C program
PO3	Basic Mathematics	Knowledge about abstract algebra.
PO4	Communicative English	Produce words with right pronunciation, Develop vocabulary and improve the accuracy in grammar, Develop the confidence to speak in public.
PO5	Digital Logic Design	Discuss and have a working knowledge of Boolean algebra and its application to combinational logic circuits. Manipulate and design basic combinational operators (and, or, not, etc) and sequential circuits.
PO6	Data Structure	To provide the knowledge of basic data structures and their implementations. To understand importance of data structures in context of writing efficient programs.
PO7	Business Accounting	Upon successful completion of the course, a student will be able to: Describe the conceptual framework for financial reporting. Explain elements of primary financial statements and the statement of comprehensive income. Explain the composition of cash and the recognition and valuation of accounts receivable.

PO8	Environmental Science	Students will understand key concepts in the life and physical sciences and will apply them to environmental issues.
PO9	OOPs using C++	The learning objectives of this course are: To understand how C++ improves C with object-oriented features. To learn how to write inline functions for efficiency and performance.
PO10	Operating System	Know basic components of an operating system. Comprehend how an operating system virtualizes CPU and memory. Discuss various scheduling and swapping policies.
P11	Discrete Mathematics	To develop understanding of Logic Sets and Functions. To use mathematical reasoning techniques including induction and recursion • To understand and apply counting techniques to the representation and characterization of relational concepts.
PO12	Entrepreneurship Development	Entrepreneurship and Innovation minors will be able to sell themselves and their ideas. Entrepreneurship and Innovation minors will be able to find problems worth solving. Entrepreneurship and Innovation minors will be able to mobilize people and resources. Entrepreneurship and Innovation minors will be able to create value.
PO13	Web Designing	Understanding and applying Web Networking basics including TCP/IP, HTTP(S), URLs, and DNS. These are important for configuring websites and servers, but also in the debugging of web applications. Understanding the role and functions of Web servers and server frameworks.
PO14	Computer Networking	Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

PO15	Computer Architecture & Microprocessor	Design better programs, including system software such as compilers, operating systems, and device drivers. Optimize program behavior. Assess and solve basic binary math operations using the microprocessor and explain the microprocessor's and Microcontroller's internal architecture and its operation within the area of manufacturing and performance.
PO16	Database Management System	At the end of the course, the students will be able to: • Understand the basic concepts and the applications of database systems. Master the basics of SQL and construct queries using SQL. Understand the relational database design principles.
PO17	Information Security	The main objectives of Information Security are typically related to ensuring confidentiality, integrity, and availability of company information.
PO18	Python programming	The course teaches you the essential concepts of Python programming, and gives you an in-depth knowledge in data analytics, machine learning, data visualization, web scraping, and natural language processing. You will master the essential concepts of data types, tuples, lists, dicts, basic operators, and functions.
PO19	Artificial Intelligence	Design and develop symbiotic human–AI systems that balance the information processing power of computational systems with human intelligence and decision making. Explain the benefits, limitations, and tradeoffs of designing engaging and ethical conversational user interactions, including those supported by chatbots, smart speakers, and other AI-driven, voice-based technologies.
PO20	Theory of Computer Science	Understand the basic properties of formal languages and grammars. differentiate regular, context-free and recursively enumerable languages
PO21	Java Programming	To learn how to implement object-oriented designs with Java. To identify Java language components and how they work together in applications. To design and program stand-alone Java applications. To learn how to design a graphical user interface (GUI) with Java Swing.

PO22	Cyber Security and Law	Make Learner Conversant With The Social And Intellectual Property Issues Emerging From 'Cyberspace. Explore The Legal And Policy Developments In Various Countries To Regulate Cyberspace.
PO23	Computer Graphics	The main objective of the course is to introduce students with fundamental concepts and theory of computer graphics.
PO24	Software Engineering and Project Management	The course aims is to develop a broad understanding of the discipline of software engineering and management of software systems
PO25	Image Processing & Pattern recognition	Summarize the various techniques involved in pattern recognition. Categorize the various pattern recognition techniques into supervised and unsupervised. Illustrate the artificial neural network based pattern recognition. Discuss the applications of pattern recognition in various applications
PO26	Project	In a specialization domain of his / her choice, student manager will be able to choose an appropriate topic

Course outcome:

CO1: Fundamentals of computer: Our Computer fundamentals tutorial includes all topics of Computer fundamentals such as input devices, output devices, memory, CPU, motherboard, computer network, virus, software, hardware etc.

CO2: C programming: identify, analyze, develop, implement, verify and document the requirements for a computing environment. Contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools.
Implement and maintain secure computing environments.

CO3: Students will be able to perform computations involving divisibility of integers. Students will be asked to identify ring-theoretic and group-theoretic properties and identify these properties in familiar rings and groups.

CO4: communicative English: The course imparts in-depth knowledge on the history of English Language, language acquisition, composition, reading, grammar and language development. This course is specially designed to learn the different aspects of the English language to develop reading and writing skills and English vocabulary.

CO5: Digital electronics: Identify, analyze, and evaluate categorical logic. Identify, analyze, and evaluate propositional logic. Identify and examine formal and informal fallacies. Apply principles of logic to practical problem solving and decision-making.

CO6: Data Structures: Ability to devise novel solutions to small scale programming challenges involving data structures and recursion. Understanding of basic algorithmic complexity. Ability to perform simple inductive proofs and proofs by contradiction and reason about program correctness and invariants.

CO7: Business Accounting: Upon successful completion of the course, a student will be able to: Outline the process and methods of financial decision-making. Identify appropriate financial theory and analytical techniques to solve various corporate financial problems.

CO8: Environmental studies: With a focus on environmental justice, students develop critical-thinking skills, analyze real-world problems, and understand the power of narrative to create sustainable solutions for local and global communities.

CO9: OOPS using C++: The course is designed for to providing knowledge of C++. Students will be able to develop logics which will help them to create programs, applications.

CO10: OS: Operating System: This course will introduce the core concepts of operating systems, such as processes and threads, scheduling, synchronization, memory management, file systems, input and output device management and security. The goal of the programming assignments is to give students some exposure to operating system code.

CO11: Discrete mathematics: The aim of the discrete mathematics is the study of mathematical structures that are fundamentally discrete rather than continuous.

CO12: Entrepreneurship Development: Students increase their awareness and deliberately practice the skills and disciplines necessary to increase confidence and agency; foster self-efficacy and self-advocacy; improve communication and problem-solving skills, manage strong impulses and feelings; and identify personal purpose.

CO13: WEB design: Understanding and applying Web Networking basics including TCP/IP, HTTP(S), URLs, and DNS. These are important for configuring websites and servers, but also in the debugging of web applications. Understanding the role and functions of Web servers and server frameworks.

CO14: Computer Networking: As a student in Computer Networking (BSCN) you will gain valuable skills in computer networks (switching, routing), system and network administration, computer and network security, operating systems, web programming, databases, and project management.

CO15: Computer Architecture & Microprocessor: Predict the challenges of realizing different kinds of parallelism (such as instruction, data, thread, core level) and leverage them for performance advancement. Apply the concept of memory hierarchy for efficient memory design and virtual memory to overcome the memory wall.

CO16: DBMS: Upon successful completion, the students will be able to define program-data independence, data models for database systems, database schema and database instances. He/she will able to recall Relational Algebra concepts, and use it to translate queries to Relational Algebra, identify Structure Query Language statements used in creation and manipulation of database, identify the methodology of conceptual modeling through Entity Relationship model, identify the methodology of logical model and also identify the methodology of physical model. He/she will be able to describe the differences between OODBMS, ORDBMS and RDBMS and describe the practical implications of each approach. Student will also be able to analyze and design a real database application and develop and evaluate a real database application using a database management system.

CO17: information security: After the completion of the course, the students will be able to develop basic understanding of security, cryptography, system attacks and defences against them.

CO18: Python has become a staple in data science, allowing data analysts and other professionals to use the language to conduct complex statistical calculations, create data visualisations, build machine learning algorithms, manipulate and analyse data, and complete other data-related tasks.

CO19: Artificial Intelligence: Understand a wide variety of learning algorithms. Understand how to evaluate models generated from data. Apply the algorithms to a real problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

Co20: **Automata**- At successful completion of the course, students should: Demonstrate advanced knowledge of formal computation and its relationship to languages. Distinguish different computing languages and classify their respective types.

CO21: **Java**: To learn how to implement object-oriented designs with Java. To identify Java language components and how they work together in applications. To design and program stand-alone Java applications. To learn how to design a graphical user interface (GUI) with Java Swing.

CO22: Cyber security and law: Cyber law is of paramount importance in our digital age as it safeguards digital assets, prevents cybercrimes, regulates online activities, protects e-commerce and consumer rights, fosters international cooperation, upholds intellectual property rights, ensures data privacy, and provides legal remedies.

CC 23: T: Computer Graphics: *The student* understands the core concepts and mathematical foundations of computer graphics, knows fundamental computer graphics algorithms and data structures.

CC24: Software Engineering and Project Management: Be able to demonstrate an understanding of advanced knowledge of the practice of software engineering, from vision to analysis, design, validation and deployment. Be able to tackle complex engineering problems and tasks, using contemporary engineering principles, methodologies and tools.

CO25: Image Process: Evaluate current technologies and issues that are specific to image processing systems. Analyze different motion compensation techniques. Integrate concepts of various image processing algorithms.

CO26: Project: Learning outcomes are specific statements of what students will be able to do when they successfully complete a learning experience (whether it's a project, course or program). They are always written in a student-centered, measurable fashion that is concise, meaningful, and achievable.

MAPPING OF CO, PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PO16	PO17	PO18	PO19	PO20	PO21	PO22	PO23	PO24	PO25	PO26
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