Bachelor of Computer Application (BCA)

Program Outcomes

PO1: To understand the function of various hardware, software, and network components.

PO2: To develop the ability to analyze, design, and develop computer-based solutions for different application domains.

PO3: To be professionally competent in order to adapt to the fast-changing IT industry.

PO4: To be able to use Internet effectively and develop web-based and mobile applications for wider access.

PO5: To develop entrepreneurship skills and venture into start-ups for providing end-to-end solutions.

NB:

Students have to do the laboratory assignments mentioned under different subjects/papers. In order to make the subject more interesting and sync with the current trends in the subject, the course instructor will give additional assignments relevant to the subject, and students are also encouraged to do some experiments on their own.

COURSE OUTCOME

STREAM: BCA (SEMESTER - I)

CC I - Problem Solving using C Programming - 4Credits

Core I	Content	Objectives & Expected Outcomes
Unit I	Introduction: Introduction to Programming Language, Introduction to C Programming, Keywords & Identifiers, Constants, Variables, Input and Output Operations, Compilation and pre-processing, Data types: Different data types, Data types qualifier, modifiers, Memory representation, size and range, Operators: Operators (Arithmetic, Relational, Logical, Bitwise, Assignment & compound assignment, Increment & Decrement, Conditional), Operator types (unary, binary, ternary). Expressions, Order of expression (Precedence and associativity)	**Course Objectives:** 1. To learn the C programming language to solve different scientific and business problems 2. To learn how to design and write effectively codes using various programming constructs available in the C programming language **Course Outcomes:** Upon completion of this course, students will be able to: 1. Gain knowledge about different data types and operators in C language 2. Learn the use of various control structures and array 3. Learn the use of pointers, functions, and storage classes 4. Write programs using structures, union, and files
Unit II	• Decision Control structures & Loops: Decision Making and Branching statements (Simple IF, IF…ELSE, Nested IF… ELSE, ELSE … IF ladder), Selection control structure (Switch Statement). Looping statements (FOR, WHILE, DO…WHILE), break, continue and GOTO statements • Array: Concept of Array, Array Declaration, types of arrays (one and multiple dimension), Character Arrays and Strings, limitation of array.	
Unit III	• Pointers: Concept of Pointer (NULL pointer, wild pointer, dangling pointer, generic pointer), Pointer Expressions, Accessing the Address of a Variable, Declaring Pointer Variables, Initializations of Pointer Variable, accessing a Variable through its Pointer, Pointer arithmetic, Pointer representation of array, Array of Pointers, Accessing Sting using Pointer. • Function: Types of Function, Function Declaration, Function Definition, Function Call, Recursive Function, Dynamic Memory Management functions, String handling function (strlen, strcmp, strcpy, strncpy, strcat, strstr). • Storage class: Types (auto, register, static, extern), scope rules, declaration and definition.	
Unit IV	Structure and Union: Defining, Declaring, Accessing, Initialization Structure, nested structure, self-referential structure, bit-field, Arrays of Structures, Structures and Functions, structures and pointers, Unions, difference between structure and union, structure within union. File: File Management in C, Defining and Opening a File, File opening modes (read, write, append), Closing a File, File operations, Error handling during I/O Operations, sequential and random access files. Command line arguments.	

COURSE OUTCOME

STREAM: BCA (SEMESTER - I)

CC II - Introduction to Python Programming - 4Credits

Core II	Content	Objectives & Expected Outcomes
Unit I	• Introduction to Python, getting started with Python, Python Basics: Identifiers, Keywords, Python types, basic types, mutable and immutable types, Integer & float ranges, Variable type & assignment, Arithmetic Operators, Precedence & Associativity, Conversions, built-in functions, modules, container types, comments & indention, multi-lining. • Strings: Introduction, Accessing String elements, Properties, built-in functions, Methods, Conversions, Comparisons. Console I/O: I/O operations, formatted printing.	**Course Objectives:** 1. To gain a solid understanding of basic programming concepts of Python. 2. To understand and write programs using Python. 3. Apply Python programming skills to develop practical, real-world applications and projects.
Unit II	• Decision Control Instruction: Logical operators, Conditional Expressions, all () & any (), receiving input, pass statement. Repetition Control Instruction: types, usage of loops, break & continue, else block of a loop. • Lists, Sets, Tuples, Dictionaries: creating, accessing, and looping-in each type. Applying basic operations, using built-in functions and methods on each type, possible data structure / mathematical operations on each type. Comprehensions on List, Set, and dictionary.	**Course Outcomes:** Upon completion of this course, students will be able to learn: 1. Basics of Python construct. 2. Basics of decision making and looping, use of list, set, tuples and dictionary 3. Creation and use of functions 4. Object-oriented concepts, handling exceptions, operations on files
Unit III	Functions: built-in and user-defined functions, invoking functions, unpacking arguments. Recursive function, iteration vs recursion. Lambda functions, map, filter, reduce function. Modules and Packages: Main module, importing a module, packages, programs using modules and packages.	
Unit IV	• Classes & Objects: Programming paradigms, public and private members, declaring classes, creating objects, class variables, methods, operator overloading, containership, features and types of inheritance. • Exception Handling: Introduction, handling exception, user-defined exceptions, else block, finally block. File Input/Output: Opening a file, modes of opening a file, operations: reading, writing. Use of with keyword.	

COURSE OUTCOME

STREAM: BCA (SEMESTER - I)

SEC I - Principles of Management – 3 Credits

SEC I	Content	Objectives & Expected Outcomes
Unit I	• Nature of Management: Meaning, Definition, its nature purpose, importance & Functions, Management as Art, Science & Profession- Management as social System Concepts of management-Administration- Organization. Evolution of Management Thought: Contribution of F.W. Taylor, Henri Fayol, Elton Mayo, Chester Barhard & Peter Drucker to the management thought. Various approaches to management (i.e. Schools of management thought) Indian Management Thought.	**Course Objectives:** 1. To understand the basic principles of management 2. To provide an insight into different management functions and strategies **Course Outcomes:** Upon completion of this course, students will be able to learn: 1. Understand the evolution management and various school of thoughts 2. Learn different management functions and decision-making process 3. Know about different leadership styles and importance of co-ordination 4. Learn about the need for strategic management
Unit II	• Functions of Management (Part-I) Planning - Meaning - Need & Importance, types levels– advantages & limitations, Forecasting - Need & Techniques, Decision making - Types - Process of rational decision making & techniques of decision making. Organizing - Elements of organizing & processes: Types of organizations, Delegation of authority - Need, difficulties in delegation – Decentralization.	
Unit III	• Functions of Management (Part-II) Staffing - Meaning & Importance, Direction - Nature – Principles, Communication - Types & Importance, Motivation - Importance – theories, Leadership - Meaning - styles, qualities & functions of leaders. Controlling- Need, Nature, importance, Process & Techniques, Coordination - Need, Importance.	
Unit IV	• Strategic Management Definition, Classes of Decisions, Levels of Decision, Strategy, Role of different Strategist, Relevance of Strategic Management and its Benefits, Strategic Management in India.	

COURSE OUTCOME

STREAM: BCA (SEMESTER - I)

AEC I - Odia – 4 Credits

SEC I	Content	Objectives & Expected Outcomes
Unit I	(କ) ଶବ୍ଦର ସଂଜ୍ଞା, ଶୁଦ୍ଧ ଶବ୍ଦ ଓ ବର୍ଣ୍ଣାଶୁଦ୍ଧି (ଖ) ରୂଢ଼ିର ଅର୍ଥ ଓ ପ୍ରୟୋଗ ବିଧି	**Course Objectives:** ପରିଶୁଦ୍ଧ ଭାଷା ଓ ଲିଖନ ଧାରା
Unit II	ବାକ୍ୟ ଗଠନରୀତି ଓ ପ୍ରକାର ଭେଦ	
Unit III	ଅନୁଚ୍ଛେଦ ସଂକ୍ଷେପଣ, ଶୀର୍ଷକ ନିର୍ଦ୍ଧାରଣ ଓ ପ୍ରଶ୍ନୋତ୍ତର	**Course Outcomes:**
Unit IV	ନିର୍ଭୁଲ ଲିଖନ ପଦ୍ଧତି, ଟିପ୍ପନ ଲିଖନ, ଫିଚର୍, ପତ୍ର ଲିଖନ, ବିଜ୍ଞାପନ ପ୍ରସ୍ତୁତି	ଶବ୍ଦ ଗଠନରେ ଶୁଦ୍ଧତା ରୂଢ଼ିର ଅର୍ଥ ଅବଗତି ରୂଢ଼ିର ପ୍ରୟୋଗବିଧି ଶିକ୍ଷା ବାକ୍ୟର ଗଠନରୀତି ଶିକ୍ଷା ବିବିଧ ପ୍ରକାର ବାକ୍ୟ ସମ୍ପର୍କରେ ଧାରଣା ନିର୍ଭୁଲ ବାକ୍ୟଲିଖନ ବିଦ୍ୟା ବୃହତ୍ ଅନୁଚ୍ଛେଦକୁ ସଂକ୍ଷିପ୍ତ କରିବାର କୌଶଳ ବିଷୟଗତ ଶୀର୍ଷକ ନିର୍ଦ୍ଧାରଣ କଳା ଅନୁଚ୍ଛେଦରୁ ବିଭିନ୍ନ ପ୍ରଶ୍ନର ଉତ୍ତର ପ୍ରଦାନ ଟିପ୍ପନଲିଖନ ଜ୍ଞାନ ଫିଚର୍ ପ୍ରସ୍ତୁତି ନିର୍ଭୁଲ ପତ୍ରଲିଖନ ଓ ବିଜ୍ଞାପନ ପ୍ରସ୍ତୁତି କଳା

COURSE OUTCOME

STREAM: BCA (SEMESTER - I)

AECC I - ENVIRONMENTAL STUDIES & DISASTER MANAGEMENT – 3 Credits

AECC I	Content	Objectives & Expected Outcomes
Unit I	**Multidisciplinary nature of environmental studies** Definition, scope and importance Need for public awareness **Environmental Pollution** Definition • Cause, effects and control measures of:- • Air pollution • Water pollution • Soil pollution • Marine pollution • Noise pollution • Radiation pollution	**Course Objectives:** 1. Environmental awareness 2. Environmental issues 3. Environmental action 4. Understanding disasters 5. Disaster management
Unit II	**Natural Resources:** **Renewable and non-renewable resources:** Natural resources and associated problems. • Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. • Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. • Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies. • Food resources : World food problems, changes caused by agriculture and Overgrazing, effects of modern agriculture, fertilizer-pesticide problems, waterlogging, salinity, case studies. • Energy resources : Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. **Biodiversity:-** Introduction-Definition; Biogeographically classification of India • India as a mega diversity nation. Hot sports of biodiversity, Threats to biodiversity. Endangered and endemic species of India. Conservation of biodiversity. In Situ and Ex-so conservation of biodiversity	**Course Outcomes:** Upon completion of this course, students will be able to learn: 1. Developing a sense of concern and responsibility for the environment 2. Learning how to take action to protect and improve the environment 3. Learning how to apply knowledge to make informed decisions about the environment

Unit III	**Disaster Management** 1. **Disaster Management:** Types of disasters (natural and Man-made) and their causes and effect) 2. **Vulnerability Assessment and Risk analysis:** Vulnerability to various disasters (Flood, Cyclone, Earthquake, Heat waves, Desertification and Lighting) 3. **Institutional Framework:** Institutional arrangements for disaster management (National Disaster Management Authority (NDMA), State Disaster Management Authority (SDMA), Disaster Management Act, 2005, District Disaster Management Authority (DDMA), National Disaster Response Force(NDRF) and Odisha Disaster Rapid Action Force(ODRAF) 4. **Preparedness measures:** Disaster Management cycle, Early Warning System, Pre-Disaster and Post-Disaster Preparedness, strengthening of SDMA and DDMA, Community Preparedness for flood cyclone, heat waves, fire safety, lightening and snake biting. Stakeholders participation, Corporate Social Responsibility (CSR) 5. **Survival Skills:** Survival skills adopted during and after disaster (Flood, Fire, Earthquake, Cyclone and Lightening), Disaster Management Act-2005, Compensation and Insurance	
Unit IV	**Social Issues and the Environment** **A.** a) Environmental Ethics: Issues and possible solutions. b) Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies c) Environment Protection Act d) Air(Preservation Control of Pollution) Act e) Water(Preservation Control of Pollution) Act f) Wildlife Protection Act g) Forest Conservation Act h) Solid waste management Cause, effect and Control Measure of Urban and Industrial waste (Role of each individual in conservation of Natural resources and prevention of pollution) **B. Human Population and the Environment** **Population Ecology:** Individuals, species, population, community Human population growth, population control method Urbanisation and its effect on society	
Unit V	**Field work** • Visit to an area to document environmental assets: river/ forest/ flora/ fauna, etc. • Visit to a local polluted site- Urban/ Rural/ Industrial/ Agricultural • Study of common plants, insects, birds and basic	

	principles of identification. • Study of simple ecosystems-pond, river, Delhi Ridge ,etc.	

COURSE OUTCOME

STREAM: BCA (SEMESTER - II)

CC III - Data Structures - 4Credits

Core III	Content	Objectives & Expected Outcomes
Unit I	• Introduction to Data Structures: Definition, Concepts, Classification of Data Structures. • Array: Introduction, One-Dimensional Array, Memory representation, Operations: Traversing, Searching, Insertion, Deletion, Merge. Two-Dimensional Array & Memory Representation, Multidimensional Array. Linear Search versus Binary Search, Sorting: Selection Sort, Bubble Sort.	**Course Objectives:** 1. To understand different ways of organizing data in computer's memory. 2. To learn different operations on data structures. 3. To explore different applications of data structures. **Course Outcomes:** Upon completion of this course, students will be able to : 1. Learn about data structures and the use of array 2. Create linked lists and perform insertion/deletion operations on them 3. Represent Stack and Queue in the memory and learn their applications 4. Learn the use of various non-linear data structures and their applications
Unit II	• Linked Lists: Definition, Single Linked List, Memory representation, Operations: Traversing, Searching, Insertion, Deletion and Merge. Double Linked List, Operations: Insertions, Deletion. • Circular, Double Circular Linked list, Operations: Traversing, Insertion. Applications of Linked List, Sparse Matrix and Polynomial representations.	
Unit III	• Stack: Definition, Representation: Array and Linked List representations, Operations: PUSH, POP, STATUS. Applications: Evaluation of Arithmetic Expressions: Notations, Infix to Postfix Conversion, Evaluation of Postfix expression. Recursion (Factorial and Fibonacci), Tower of Hanoi. • Queues: Definition, Representation: Array and Linked List representations, Operations: Enqueue, Dequeue. Structures of Queue: Circular, Deque and Priority Queue. Applications of Queue	
Unit IV	• Trees: Definition, Terminologies, Binary Tree: Properties, Representations (Linear and Linked List representations). Operations: Traversal (Inorder, Preorder, Postorder), Search. Introduction to Binary Search Tree, AVL tree, M-Way Search Tree. Applications of Trees. • Graph: Definition, Terminologies, Representations (Set, Linked List, Matrix), Operations: Traversal (BFS, DFS). Applications of Graphs.	

COURSE OUTCOME

STREAM: BCA (SEMESTER – II)

CC IV - Object Oriented Programming using C++ - 4Credits

Core IV	Content	Objectives & Expected Outcomes
Unit I	• Principles of Object-Oriented Programming: Object-Oriented Programming (OOP) Paradigm, Basic Concepts of OOP, Benefits of OOP, Characteristics of OOPS, Object Oriented Languages, Applications of OOP. • Introduction to C++, Difference between C & C++, Tokens, Data types, Operators, structure of C++ Program, C++ statements, Expressions and Control Structures. • Functions in C++: Argument passing in function, Inline Functions, Default Arguments, Const. Arguments, Friend function.	**Course Objectives:** 1. To know about the Object-Oriented Programming concepts. 2. To write object-oriented programs using C++ constructs **Course Outcomes:** Upon completion of this course, students will be able to : 1. Understand OOPs concepts as a programming style 2. Use class/objects in programs and functions of different types 3. Learn the concept of inheritance and overloading of functions and operators 4. Use files in C++
Unit II	• Classes and Objects: Defining Member Functions, Making an outside Function Inline, Nested Member Functions, Private Member Functions, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friend Functions. • Constructors & Destructors: Constructors, Parameterized Constructors, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Dynamic Constructors, Destructors.	
Unit III	• Inheritance: Basics of Inheritance, Type of Inheritance, Virtual Base Classes, Abstract Classes, Member Classes, Nesting of Classes. Polymorphism: Pointers, Pointers to Objects, this Pointer, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions, Function Overloading, Operator Overloading.	
Unit IV	• Managing Console I/O Operations: C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Formatted Console I/O Operations, Managing Output with Manipulators. • Files: Classes for File Stream Operations, Opening and Closing a File, Detecting endof-file, File Modes, File Pointers and their Manipulations, Sequential Input and Output Operations, Updating a File: Random Access, Error Handling during File Operations, Command-line Arguments.	

COURSE OUTCOME

STREAM: BCA (SEMESTER – III)

CC V - Data Base Management System - 4Credits

Core V	Content	Objectives & Expected Outcomes
Unit I	Introduction to Database and Database Users, Database System Concepts and Architecture: data Models, schema, and instances, Conceptual Modeling and Database Design, Entity Relationship (ER) Model: Entity Types, Entity Sets, Attributes, Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, ER Naming Conventions. Enhanced Entity-Relationship (EER) Model.	**Course Objectives:** 1. To understand the database concepts for efficient storage and retrieval of data. 2. To learn about database design and transaction processing **Course Outcomes:** Upon completion of this course, students will be able to : 1. Build data models using entity relationship concepts 2.Design databases by systematically applying the normalization process 3. Create relational database tables and perform various operations using SQL 4. Learn issues relating to database transactions and approaches to deal with them
Unit II	Relational data Model and SQL: Relational Model Concepts, Basic SQLs, SQL Data Definition and Data types, Constraints in SQL, Retrieval Queries in SQL, INSERT, DELETE, UPDATE Statements in SQL, Relational Algebra and Relational Calculus: Unary Relational Operations: SELECT and PROJECT, Binary Relation: JOIN and DIVISION.	
Unit III	Database Design Theory and Normalization: Functional Dependencies, Normal Forms based on Primary Keys, Second and third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.	
Unit IV	Transaction Processing Concepts: Transaction and System Concepts, Properties of Transactions, Recoverability, Serializability, Concurrency Control Techniques, Locking techniques for Concurrency Control, Concurrency Control based on Time-Stamp Ordering.	

COURSE OUTCOME

STREAM: BCA (SEMESTER - III)

CC VI - Computer Organization & Architecture - 4Credits

Core VI	Content	Objectives & Expected Outcomes
Unit I	• Introduction to Computer Organization and Architecture: Basic concepts, Computer evolution and performance, Basic Structure of Computers: Functional Units, Operational Concepts, Bus Structures. Machine Instructions and Programs, Instruction formats, Addressing modes. Overview of Instruction set architecture. • Number systems and their Conversions, Data representation, Arithmetic Operations: Integer-Arithmetic, Floating-point arithmetic.	**Course Objectives:** 1. To understand the basic components of a digital computer and their working 2. To understand data representation techniques and used of various logic gates 3. To gain knowledge about processor and various memory devices **Course Outcomes:** Upon completion of this course, students will be able to : 1. Learn basic computer organization and design 2. Design various combinational circuits 3. Understand the functioning of central processing unit and memory organization 4. Understand the use of various input/output organization and parallel processing
Unit II	• Boolean Algebra, Basic Logic Functions, Electronic Logic Gates, Synthesis of Logic Functions, Minimization of Logic Expressions, Minimization using Karnaugh Maps. • Combinational circuits: Adders, Subtractors, Multiplexers and Demultiplexers, Sequential circuits: Characteristics, Flip-Flops (SR, JK, D, T)	
Unit III	• Memory Organization: Instruction execution cycle, Memory hierarchy: RAM, ROM, Cache memory, Addressing modes and memory addressing techniques. • Processor Organization: CPU organization, Arithmetic logic unit (ALU), Control unit, Instruction pipeline, RISC vs. CISC Architectures.	
Unit IV	• Input/Output Organization: I/O interface and devices, Interrupts and DMA (Direct Memory Access). Storage: Disk storage systems, RAID (Redundant Array of Independent Disks). • Parallel Processing: Multiple Processor Organization, Symmetric Multiprocessors, Cache Coherence and MESI Protocol, Multithreading and Chip Multiprocessors, Non-Uniform Memory Access (NUMA). Multicore Computers.	

COURSE OUTCOME

STREAM: BCA (SEMESTER - III)

CC VII - Operating Systems - 4Credits

<table>
<tr><th>Core VII</th><th>Content</th><th>Objectives & Expected Outcomes</th></tr>
<tr><td>Unit I</td><td>• Introduction to Operating System, Computer System Architecture, System Structures: Operating system services, User and Operating-System Interface, system calls, system programs, Operating system design and implementation, Operating system structure, Batch processing, multi-programming, time-sharing and real-time systems</td><td rowspan="4">Course Objectives:
1. To understand Operating system structure and services.
2. To understand the concepts of Process, memory, storage, and I/O management.
3. To explore different applications of data structures.

Course Outcomes:
Upon completion of this course, students will be able to :
1. Understand various services offered by an OS as a resource manager
2. Understand the concept of a process and various CPU scheduling techniques
3. Learn the concepts on effective memory management and virtual memory
4. Learn various approaches to disk scheduling & file management techniques</td></tr>
<tr><td>Unit II</td><td>• Process Management: Process Concept, Operations on processes, Process scheduling, Interprocess Communication, Threads, Multithreading Models. CPU Scheduling algorithms: Scheduling Criteria, FCFS, SJF, Priority, Round Robin, Multilevel Queue, Multilevel Feedback Queue. Deadlocks: Deadlock detection, deadlock prevention, and deadlock avoidance fundamentals.</td></tr>
<tr><td>Unit III</td><td>• Memory Management Strategies: Swapping, Contiguous Memory Allocation, Segmentation, Paging, Virtual Memory Management: Concepts, Demand Paging, Page Replacement techniques: FIFO, LRU, Optimal, Thrashing.</td></tr>
<tr><td>Unit IV</td><td>• Storage Management: Overview of Mass-Storage Structure, Disk Scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK, RAID technology.
• File System concept, Access Methods, Directory and Disk Structure, File System systems, File, Sharing and File Protection.</td></tr>
</table>

COURSE OUTCOME

STREAM: BCA (SEMESTER – IV)

CC VIII - Computer Graphics- 4Credits

Core VIII	Content	Objectives & Expected Outcomes
Unit I	• Computer Graphics: A Survey of Computer graphics, Overview of Graphics System: Video Display Devices, Raster-Scan Systems, Input Devices, Hard-Copy Devices, Graphics Software.	**Course Objectives:** 1. To understand basic concepts of computer graphics. 2. To learn techniques for creating basic graphical structures 3. To learn different transformation techniques **Course Outcomes:** Upon completion of this course, students will be able to : 1. Know the use of different graphics systems 2. Learn different algorithms to draw geometrical figures 3. Learn various geometric transformation techniques 4. Learn techniques for clipping
Unit II	• Graphics Output Primitives: Point and Lines, Algorithms for line, circle & ellipse generation, Filled-Area Primitives. Attributes of Graphics Primitives: Point, line, curve attributes, fill area attributes, Fill methods for areas with irregular boundaries.	
Unit III	• Geometric Transformations (both 2-D & 3-D): Basic Geometric Transformations, Transformation Matrix, Types of transformation in 2-D and 3-D Graphics: Scaling, Reflection, shear transformation, rotation, translation. 2-D, 3-D transformation using homogeneous coordinates.	
Unit IV	• Two-Dimensional Viewing: Introduction to viewing and clipping, viewing transformation in 2-D, viewing pipeline, Clipping Window, Clipping Algorithms: Point clipping, Line clipping and Polygon clipping.	

COURSE OUTCOME

STREAM: BCA (SEMESTER – IV)

CC IX - Web Development with PHP - 4Credits

Core IX	Content	Objectives & Expected Outcomes
Unit I	• Introduction to Server Side Technologies, Web Servers, Understanding the concepts of JSON, AJAX: Introduction, Creating Internet Applications using AJAX. XML: Introduction, Features, Fundamentals, Document Type Definition, XML Schema.	**Course Objectives:** 1. To understand the essentials of Server-side programming 2. To understand web development using PHP **Course Outcomes:** Upon completion of this course, students will be able to : 1. Learn the basics of JSON, XML and AJAX 2. Learn the programming concepts of PHP 3. Learn the server-side programming using PHP 4. Learn the mechanisms of connecting Database using PHP & use AJAX with PHP
Unit II	• PHP: Features, Programming fundamentals: Print/echo statement, Data Types, Variables, Constants, Strings, Arrays, Operators. Control Structures: Conditional, Looping & Jump Statements. Functions: String, Date-Time, Mathematical and User-defined functions. Embedding PHP in HTML, Reading Form data of a Web Page.	
Unit III	• Introduction to PHP with Database: Connecting to Database, Selecting a Database, Adding Table and Altering a Table in a Database. Inserting Data, Modifying Data in a Table, Retrieving Data from a table and displaying in HTML.	
Unit IV	• State Management in PHP: Introduction, Cookies, Session. Authentication in PHP: Creating a User, Adding authorized users, Displaying the User. Using AJAX: AJAX with PHP, AJAX with Database.	

COURSE OUTCOME

STREAM: BCA (SEMESTER – V)

CC X - Computer Network - 4Credits

Core X	Content	Objectives & Expected Outcomes
Unit I	• Introduction to Data Communications and Network Models: Protocols and Standards, Layers in OSI Models, Analog and Digital Signals, Network Topology, Transmission Modes, Transmission Impairment, Data Rate Limits, Performance, Digital Transmission, Network Devices & Drivers: Router, Modem, Repeater, Hub, Switch, Bridge (fundamental concepts only).	**Course Objectives:** 1. To understand data communication and network concepts. 2. To learn about different communication standards 3. To understand different network protocols **Course Outcomes:** Upon completion of this course, students will be able to : 1. Understand concepts on data communication and the use of communication devices 2. Learn about analog and digital signals and basic components of data communication 3. Learn about errors during data communication & access control mechanisms 4. Learn various network protocols and network security issues
Unit II	• Signal Conversion: Digital-to-Digital Conversion, Analog-to-Digital Conversion, Digital-to analog Conversion, Analog-to-analog Conversion. Switching Techniques: Packet Switching, Circuit Switching, Datagram Networks, Virtual-Circuit Networks, and Structure of a Switch.	
Unit III	• Error Detection and Correction: Parity Check, Checksum, CRC, Error correction technique (Hamming code), Data Link Control: Framing, Flow and Error Control, Noiseless Channels, Noisy channels, (Stop and Wait ARQ, Sliding Window Protocol, Go Back N, Selective Repeat) Point-to-Point Protocol. Access Control: TDM, CSMA/CD, and Channelization (FDMA, TDMA, and CDMA).	
Unit IV	• Network Layer: Logical Addressing, IPv4 Addresses, IPv6 Addresses, Subnet, Subnet masking, Virtual-Circuit Networks: Frame Relay and ATM, Transport Layer: Process Process Delivery: UDP, TCP. Application layers: DNS, SMTP, POP, FTP, HTTP, Basics of WiFi (Fundamental concepts only), and Network Security: Authentication, Basics of Public Key and Private Key Cryptography, Digital Signatures and Certificates (Fundamental concepts only).	

COURSE OUTCOME

STREAM: BCA (SEMESTER – V)

CC XI - Software Engineering - 4Credits

Core XI	Content	Objectives & Expected Outcomes
Unit I	• Introduction: Evolution of Software to an Engineering Discipline, Software Development Projects, Exploratory Style of Software Development, Emergence of Software Engineering, Changes in Software Development Practices, Computer Systems Engineering. Software Lifecycle Models: Waterfall Model and its Extensions, Rapid Application Development (RAD), Agile Development Models, Spiral Model.	**Course Objectives:** 1. To understand importance of Software engineering. 2. To understand different software development models 3. To understand various issues involved in a software development project **Course Outcomes:** Upon completion of this course, students will be able to : 1. Understand various software development lifecycle models 2. Know the complexities involved in software development projects & how to deal with them 3. Understand the software design process starting from requirement analysis 4. Learn about software documentation, software testing and maintenance
Unit II	• Software Project Management: Software Project Management Complexities, Responsibilities of a Software Project Manager, Project Planning, Metrics for Project Size Estimation, Project Estimation Techniques, Empirical Estimation Techniques, COCOMO, Halstead's Software Science, Staffing Level Estimation, Scheduling, Organization and Team Structures, Staffing, Risk Management, Software Configuration Management.	
Unit III	• Requirement Analysis and Specification: Requirements Gathering and Analysis, Software Requirement Specifications, Formal System Specification Axiomatic Specification, Algebraic Specification, Executable Specification and 4GL. • Software Design: Design Process, Characterize a Good Software Design, Cohesion and Coupling, Layered Arrangements of Modules, Approaches to Software Design (Function Oriented & Object-Oriented).	
Unit IV	• Coding and Testing: Coding: Code Review, Software Documentation, Testing, Unit Testing, Black Box and White Box Testing, Debugging, Program Analysis Tools, Integration Testing, System Testing, Software Maintenance.	

COURSE OUTCOME

STREAM: BCA (SEMESTER – V)

CC XII - Introduction to Artificial Intelligence- 4Credits

Core XII	Content	Objectives & Expected Outcomes
Unit I	• Introduction to AI, Scope of AI, Characteristics of AI problems, Turing test, Concept of Intelligent agents, Approaches to AI problem-solving, State space search, production system, Uninformed search: Breadth-First, Depth-First, Iterative deepening, bidirectional and beam search.	**Course Objectives:** 1. To learn the basic concepts of AI. 2. To understand AI problem-solving approaches **Course Outcomes:** Upon completion of this course, students will be able to : 1. Understand state space search as an approach to AI problem solving 2. Understand various Knowledge Representation techniques 3. Learn the complexity involved in NLP & role of learning in AI problem-solving 4. Understand the importance of Expert systems and the use of AI programming languages.
Unit II	• Informed/Heuristic search: Generate-and-Test, Hill climbing, Best-first search, A* algorithm, Problem reduction, AO* , Constraint satisfaction, Solution of CSP using search, Means-End analysis.	
Unit III	• Knowledge Representation: Propositional logic and Predicate logic along with their resolution principles, Unification algorithm, forward and backward chaining and conflict resolution, Semantic nets, Frames, Conceptual dependencies, Scripts. • Reasoning under uncertainty: Bayesian Belief networks, Dempster Shafer theory	
Unit IV	• Natural language processing: Introduction, Levels of knowledge in language understanding, , Phases of Natural language understanding, top-down and bottom-up parsing, transition networks. • Expert Systems: Introduction, Architecture, Expert system development cycle, Examples of ES: Mycin and Dendral.	

COURSE OUTCOME

STREAM: BCA (SEMESTER – V)

CC XIII - Programming in Java- 4Credits

Core XIII	Content	Objectives & Expected Outcomes
Unit I	• Introduction to Java: Java History, Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords (super, this, final, abstract, static, extends, implements, interface) , Data Types, Wrapper class, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods). Input through keyboard using Command line Argument, the Scanner class, BufferedReader class.	**Course Objectives:** 1. To learn Java for writing object-oriented programs 2. To understand the use of different Java programming constructs 3. To learn exception handling in Java and use of threads. **Course Outcomes:** Upon completion of this course, students will be able to : 1. Learn the basics of Java programming 2. Create classes/objects and implement different forms of inheritance 3. Use arrays and files in Java 4. Learn about exception handling
Unit II	• Object-Oriented Programming Overview: Principles of Object-Oriented Programming, Defining & Using Classes, Class Variables & Methods, Objects, Object reference, Objects as parameters, final classes, Garbage Collection. Constructor- types of constructors, this keyword, super keyword. Method overloading and Constructor overloading. Aggregation vs Inheritance, Inheritance: extends vs implements, types of Inheritance, Interface, Up-Casting, Down-Casting, Auto-Boxing, Enumerations, Polymorphism, Method Overriding and restrictions. Package: Pre-defined packages and Custom packages.	
Unit III	• Arrays: Creating & Using Arrays (1D, 2D, 3D and Jagged Array), Array of Object, Referencing Arrays Dynamically. Strings and I/O: Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability& Equality, Passing Strings To & From Methods, StringBuffer Classes and StringBuilder Classes. IO package: Understanding StreamsFile class and its methods, Creating, Reading, Writing using classes: Byte and Character streams, FileOutputStream, FileInputStream, File Writer, File Reader, InputStream Reader, Print Stream, Print Writer. Compressing and Uncompressing File.	
Unit IV	• Exception Handling, Threading, Networking and Database Connectivity: Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multithreading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.	

COURSE OUTCOME

STREAM: BCA (SEMESTER – VI)

CC XIV - Algorithm Design Techniques - 6Credits

Core XIV	Content	Objectives & Expected Outcomes
Unit I	• Algorithm specification: Pseudo code, Asymptomatic Analysis, Space complexity and time complexity, Analysis and design of Insertion sort algorithm, Divide and Conquer paradigm, Recurrence relations, Solving Recurrences: Substitution methods, Recursion tree method, and Master method.	**Course Objectives:** 1. To understand the importance of algorithm design. 2. To learn ways to analyze algorithms 3. To learn about adoption of different algorithmic styles for solving problems **Course Outcomes:** Upon completion of this course, students will be able to : 1. Learn approaches to algorithm analysis & design 2. Learn different searching and sorting techniques 3. Learn greedy techniques for problem-solving 4. Learn graph-based techniques for practical problem-solving
Unit II	• Searching and Sorting: Analysis of Linear Search, Binary Search, Merge Sort and Quick Sort, Heap Sort. Hashing: Hash functions, Hash table, Collision resolution: Chaining and Open Addressing (Linear probing, Quadratic probing, Double hashing).	
Unit III	• Greedy Technique: General Method, Applications: Fractional Knapsack Problem, Job Sequencing with Deadlines, Huffman Codes. Dynamic Programming: General Method, Applications: Matrix Chain Multiplication, longest common subsequence, 0/1 Knapsack.	
Unit IV	• Graph Algorithms, Topological sort, Minimum Spanning Trees: Prim's and Kruskal's algorithm, Single-source shortest paths: Bellman-Ford algorithm, Dijkstra's algorithm.	

COURSE OUTCOME

STREAM: BCA (SEMESTER – VI)

CC XV - Project Work-I - 6Credits

Core XV	Content	Objectives & Expected Outcomes
POJECT WORK	A student has to do a Project work under the guidance of a faculty member. After completing the project, the student has to submit a project report which has to be evaluated by an external examiner.	**Course Objectives:** **Course Outcomes:**