ASANSOL GIRLS' COLLEGE

Department of Computer Application

Programme Specific Outcome (PSO) and Course Outcome (CO)

Programme Specific Outcome (PSO):

PSO1: Able to gain knowledge and skill set in applying core concepts

PSO2: Able to analyze current and future trends to solve problems

PSO3: Become competent for higher education, IT and ITES

PSO4: Develop societal responsibility

PSO5: Employability readiness in various sectors

Department of Computer Application, Asansol Girls' College

Discipline: Bachelor of Computer Application (Honours)

Semester	Course / Module	Module Specific Course Outcome
Semester – I	**Course: Introduction to Programming using C (BCAMJ101)**	
	UNIT I. Introduction to computers	CO-1. Evolution, Generation of Computers CO-2. Computers Hierarchy, Different components of computer (CPU, ALU, different types of memory etc.) CO-3. Number System – Binary, Hexadecimal, Octal, BCD System, Introduction to operating environment
	UNIT II. Introduction to Programming	CO-4. Program Concept, Characteristics of Programming, Stages in Program Development CO-5. Algorithms, Notations, Flowcharts, Types of Programming Methodologies CO-6. Introduction to C Programming - Basic Program Structure in C, Variables and Assignments, Input and Output CO-7. Selection and Repetition Statements
	UNIT III. Top-Down Design	CO-8. Predefined Functions, Programmer-defined Function, Local Variable CO-9. Recursion - Developing Recursive Definition of Simple Problems and their implementation.
	UNIT IV. Introduction to Array	CO-10. Declaration and Referring Arrays, Arrays in Memory, Initializing Arrays. Arrays in Functions CO-11. Multi-Dimensional Arrays, Searching in Array
	UNIT V. Pointers	CO-12. Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers CO-13. Call-By-Value and Call-By-Reference Parameters.
	UNIT VI. Structures	CO-14. Member Accessing, Pointers to Structures, Structures and Functions, Arrays of Structures, Unions
	UNIT VII. Strings	CO-15. Declaration and Initialization, Reading and Writing Strings, Arrays of Strings, String and Function, Strings and Structure, Standard String Library Functions.
	UNIT VIII. File Handling	CO-16. File opening modes, use of files for data input and output CO-17. Merging and copy files.
	Course: Financial Accounting (BCAMN101)	
	UNIT I. Basic idea of Book Keeping and Accounting	CO-18. Definition, Nature, Importance, Limitations, Difference between Book Keeping and Accounting CO-19. Accounting Principles: Generally Accepted Accounting Principles (GAAP) CO-20. Important Accounting Concepts: Proprietary, Entity, Fund, Money Measurement, Accounting Period, Going Concern, Duality, Realization and Accrual CO-21. Important Accounting Conventions: Disclosure, Materiality, Consistency, Comparability, Objectivity and Conservatism CO-22. Accounting Concept vs. Accounting Convention, Matching Concept, and Relation of Accounting Theory with Accounting Practice.
	UNIT II. Accounting Process	CO-23. Journal: Definition, Features, Classification, Journal Entry CO-24. Ledger: Definition, Classification, Ledger posting; Difference between Journal and Ledger
	UNIT III. Trial Balance	CO-25. Definition, Importance, Errors, and Preparation of trial balance.

Semester	Course / Module	Module Specific Course Outcome
	UNIT IV. Cash Book	CO-26. Definition, Features, Types of Cash Book and Preparation of cashbook under Single column method, Double column method, Triple column method and petty Cash Book
	UNIT V. Depreciation	CO-27. Concepts-Features-Causes-Different Methods of Depreciation on assets-Practical Problems on Straight line methods,
		CO-28. Diminishing balance methods depreciation and Sinking Fund method
	UNIT VI. Bad Debt Concepts	CO-29. Features-Difference between bad debt and doubtful debt-accounting treatment of bad debt and doubtful debt
	UNIT VII. Preparation of Financial Accounts	CO-30. Preparation of Financial Accounts of a profit-making trading Concern with additional information
	UNIT VII. Sectional and Self Balancing Ledgers	CO-31. Concept of Sectional Balancing, preparation of control accounts.
		CO-32. Self-Balancing Ledger: advantages; Recording process; preparation of Adjustment accounts.
	Course: Office Automation Software Lab (BCASE101)	
	UNIT I. Windows Basics	CO-33. Introduction of windows OS, navigating the Windows 10 user interface, Creating accounts in Windows, Opening apps and programs, working with files, using the Start button and Start menu,
		CO-34. Accessing and using the Action Center, Working with apps and programs on the taskbar
		CO-35. Customizing settings in Windows 10, including backgrounds, screensavers, and more, Using the Settings app and the Control Panel.
	UNIT II. MS Word and Google Docs	CO-36. Overview, creating, saving, opening, importing, exporting, and inserting files, formatting pages, paragraphs and sections, indents and outdents, creating lists and numbering.
		CO-37. Headings, styles, fonts and font size, editing, positioning, viewing texts, searching and replacing text, inserting page breaks, page numbers, bookmarks, symbols, and dates.
		CO-38. Using tabs and tables, header, footer, and printing,
	UNIT III. MS Excel and Google Sheets	CO-39. Worksheet overview, entering information, Worksheet creation, opening and saving workbook, formatting numbers and texts, protecting cells, producing charts, and printing operations
		CO-40. Application of Excel for obtaining statistical parameters, Mean, Median, Mode, average, co-relation, Regression
		CO-41. Data capturing using Google Forms.
	UNIT IV. MS Power Point or Google Slides	CO-42. Slide creation with PowerPoint, Presenting shows for corporate and commercial using PowerPoint.
	UNIT V. Graphics and Image Editing Software	CO-43. Overview of graphic design and image editing applications (e.g., Adobe Photoshop, GIMP),
		CO-44. Understanding basic image editing techniques (e.g., cropping, resizing, retouching), Creating and manipulating graphics forvarious purposes.
	UNIT VI. Web Browsing and Internet Applications	CO-45. Navigating web browsers and utilizing essential features, Understanding internet protocols and security considerations,
		CO-46. Exploring common internet applications (e.g., email clients, cloud storage, online collaboration tools).
	UNIT VII. File Compression and Archiving Software	CO-47. Introduction to file compression formats (e.g., ZIP, RAR), Compressing and decompressing files and folders, managing archived files and folders.

Semester	Course / Module	Module Specific Course Outcome	
	Course: Data Structures and Algorithms (BCAMJ201)		
	UNIT I. Basic concepts	CO-1.	Data, Data Structures, ADT, Algorithm Specification
		CO-2.	Introduction, Recursive algorithms, Data Abstraction,
		CO-3.	Performance analysis, Linear and Non Linear data structures.
	UNIT II. Singly Linked Lists	CO-4.	Operations, Concatenating, Circularly linked lists - Operations for Circularly linked lists,
		CO-5.	Doubly Linked Lists - Operations. Polynomial and sparse matrix representation using linked list.
	UNIT III. Stack	CO-6.	Definition and Operations, Array and Linked Implementations, Applications Valid Expression Checking (Parenthesis matching), Reversal of string,
		CO-7.	Infix to Postfix Conversion, Postfix Expression Evaluation, Recursion Implementation.
	UNIT IV. Queue	CO-8.	Definition and Operations, Array and Linked Implementations, Applications
		CO-9.	Circular Queues - Insertion and Deletion Operations
		CO-10.	Priority Queue-Definition and Implementation
		CO-11.	Dequeue (Double Ended Queue) – Introduction
	UNIT V. Searching Methods	CO-12.	Linear Search
Semester - II		CO-13.	Binary Search
	UNIT VI. Sorting Methods	CO-14.	Bubble, Insertion, Selection, Shell
		CO-15.	Using Divide-Conquer Approach (Quick and Merge sort)
		CO-16.	Comparison of Sorting Methods.
	UNIT VII. Trees	CO-17.	Representation of Trees, Binary tree, Properties of Binary Trees, Binary Tree Representations- Array and Linked Representations, Binary Tree Traversals
		CO-18.	Threaded Binary Trees, Binary Search tree - Creation, Insertion, Deletion and Search,
		CO-19.	AVL tree- Definition, Examples, Insertion and Rotations
		CO-20.	B tree, B+ tree
		CO-21.	Heap- Definition, Min heap, Max heap, Insertion and Deletion. Priority Queue using Heap
	UNIT VIII. Graphs	CO-22.	Graph ADT, Graph Representations, Graph Traversals and Searching,
	Course: Cost Accounting (BCAMN201)		
	UNIT I. Introduction to cost accounting	CO-23.	Meaning, scope, objectives and advantages of cost accounting
		CO-24.	Cost centre and Cost Unit, Difference between financial and cost accounting, Limitation of Cost accounting, Classifications of cost.
	UNIT II. Cost sheet	CO-25.	Elements of cost and cost sheet.
	UNIT III. Materials	CO-26.	Material/inventory control techniques. Accounting and control of purchases, storage and issue of materials. Inventory systems, EOQ,
		CO-27.	Various levels of stocks, Methods of pricing of materials issues — FIFO, LIFO, Simple Average method, weighted average method and base stock method.
	UNIT IV: Labour	CO-28.	Accounting and Control of labour cost. Time-keeping and time-booking. Concept of idle time, over time, labour turnover and fringe benefits.
		CO-29.	Methods of wage payment, Time Rate, Piece Rate, and Incentive schemes- Halsey, Rowan, Requisites of Good Wages Incentive Plan
	UNIT-V: Overheads	CO-30.	Classification, allocation, apportionment and absorption of overheads, Under- and over- absorption
		CO-31.	Causes and treatment of under- and over- absorption, Machine Hour Rate.

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	UNIT VI. Budgetary Control	CO-32.	Definition, features, importance, Classification Zero based Budgeting and Responsibility Accounting, Preparation of Cash Budget and Flexible Budget.
	UNIT VII. Marginal Costing	CO-33.	Concept of marginal cost and marginal costing; Assumptions, Cost-volume-profit analysis;
		CO-34.	Break-even analysis-using mathematical and graphical approaches, Profit-volume ratio, angle of incidence, margin of safety.
	UNIT VIII. Standard Costing	CO-35.	Standard Costing and Variance Analysis: Meaning of standard cost and standard costing; advantages, limitations and applications;
		CO-36.	Variance Analysis – Material Variances and Labour Variances.
	Course: Web Designing with HTML, CSS (BCASE201)		
	UNIT I. Introduction to Web Design	CO-37.	Understanding the role and importance of web design, Exploring the components of a web page, Overview of web design principles and best practices.
	UNIT II. Introduction to HTML	CO-38.	Understanding the structure and syntax of HTML, Working with HTML tags, attributes, and elements, Creating a basic web page using HTML.
	UNIT III. HTML Document Structure	CO-39.	Defining the document type and character encoding, Organizing content with headings, paragraphs, lists, and tables, Incorporating images, links, and multimedia elements.
	UNIT IV. HTML Forms and Input Validation	CO-40.	Creating forms for user input, Utilizing different form elements (e.g., text fields, checkboxes, and radio buttons), and Implementing form validation using HTML attributes.
	UNIT V. Introduction to CSS	CO-41.	Understanding the purpose and benefits of CSS, Working with CSS selectors, properties, and values, Applying CSS styles to HTML elements.
	UNIT VI. Styling Text and Typography	CO-42.	Formatting text using CSS properties (e.g., font-family, font-size and color), applying text effects (e.g., bold, italic, underline), Customizing typography using Google Fonts and other resources.
	UNIT VII. Box Model and Layouts	CO-43.	Understanding the box model concept, Controlling element dimensions, padding, margins, and borders, Creating different layout structures (e.g., fixed, fluid, responsive).
	UNIT VIII. CSS Flexbox and Grid	CO-44.	Introduction to CSS Flexbox for flexible page layouts, Utilizing CSS Grid for advanced grid-based layouts, Creating responsive designs with media queries.
	UNIT IX. Styling Links, Navigation, and Menus	CO-45.	Customizing link styles and states, Creating navigation menus using HTML lists and CSS
		CO-46.	Implementing dropdown menus and responsive navigation patterns.
	UNIT X. CSS Transitions and Animations	CO-47.	Creating smooth transitions between CSS states,
		CO-48.	Adding animations to elements using key frames and CSS properties
		CO-49.	Incorporating CSS animation libraries and frameworks.
Semester - III	**Course: Object Oriented Programming with C ++ (BCAC301)**		
	UNIT I. Basics	CO-1.	Introduction to Object Oriented Programming and its Basic Features
		CO-2.	Basic Components of C++, Characteristics of Object-Oriented Language, Structure of a C++ Program
		CO-3.	Flow Control Statements in C++
		CO-4.	Functions - Scope of Variables, Inline Functions, Recursive Functions, Pointers to Functions
		CO-5.	C++ Pointers, Arrays
		CO-6.	Dynamic Memory Allocation and De-Allocation

Semester	Course / Module	Module Specific Course Outcome
	UNIT II. OOP Concept	CO-7. Differences Between Object Oriented and Procedure Oriented Programming
		CO-8. Abstraction, Overview of Object-Oriented Programming Principles, Encapsulation, C++ Classes, Objects, User Defined Types,
		CO-9. Constructors and Destructors, this Pointer, Friend Functions, Data Abstraction
	UNIT III. Polymorphism	CO-10. Static and Dynamic Bindings, Function Overloading
		CO-11. Operator Overloading, Type Conversion
	UNIT IV. Class Inheritance	CO-12. Base and Derived Classes, Base and Derived Class
		CO-13. Dynamic Binding through Virtual Functions, Pure Virtual Functions, Virtual Base Class, Abstract Classes, Virtual Destructors
	UNIT V. Stream Classes	CO-14. Stream Classes Hierarchy, Stream I/O, File Streams, Overloading the Extraction and Insertion Operators, Error Handling during File Operations, Formatted I/O
	UNIT VI. Exception Handling	CO-15. Benefits of Exception Handling, Throwing an Exception, the Try Block, Catching an Exception
		CO-16. Exception Objects, Exception Specifications, Re-throwing an Exception, Uncaught Exceptions
	UNIT VII. Templates	CO-17. Class Templates and Function Templates, simple generic classes and generic function, simple example programs.
		CO-18. Introduction to Standard Template Library (STL).
	Course: Computer Organization and Architecture (BCAC302)	
	UNIT I. Data Representation and Basic Computer Arithmetic	CO-19. Number systems, complements, fixed and floating point representation, character representation
		CO-20. Addition, subtraction, magnitude comparison, multiplication and division algorithms for integers
	UNIT II. Register Transfer and Micro operations	CO-21. Register Transfer Language, Register Transfer, Bus & Memory Transfer
		CO-22. Arithmetic Microoperations, Logic Microoperations, Shift Microoperation.
	UNIT III. Basic Computer Organization	CO-23. Instruction codes, Computer Registers, Computer Instructions, Timing & Control, Instruction Cycles, Memory Reference Instruction
		CO-24. Input - Output & Interrupts
		CO-25. Complete Computer Description & Design of Basic Computer
	UNIT IV. Processor and Control Unit	CO-26. Hardwired vs. Micro programmed Control Unit
		CO-27. General Register Organization, Stack Organization
		CO-28. Instruction Format, Data Transfer and Manipulation, Program Control, RISC, CISC
		CO-29. Pipelining: Pipelined data path and control
		CO-30. Handling Data hazards and Control hazards
		CO-31. Introduction to Parallelism
	UNIT V. Memory and I/O Systems	CO-32. Peripheral Devices, I/O Interface, Data Transfer Schemes, Program Control
		CO-33. Interrupt, DMA Transfer, I/O Processor
		CO-34. Memory Hierarchy, Processor vs. Memory Speed, High-Speed Memories, Cache Memory, Associative Memory, Interleave, Virtual Memory
		CO-35. Cache Mapping Techniques, Memory Management
	Course: Database Management System (BCAC303)	

Semester	Course / Module	Module Specific Course Outcome
	UNIT I. Basic Database Concepts	CO-36. Terminology, and Architecture CO-37. Types of Database Management Systems, Differences between Relational and other Database Models. CO-38. Data Modelling: Relations, Schemas, Constraints, Queries, and Updates CO-39. Conceptual vs. Physical Modelling CO-40. Entity Types, attributes, ER Diagrams
	UNIT II. SQL Data Definition	CO-41. Specifying Tables, Data Types, Constraints; Simple SELECT, INSERT, UPDATE, DELETE Statements CO-42. Complex SELECT Queries, including Joins and Nested Queries CO-43. Actions and Triggers, Views, Altering Schemas
	UNIT III. Relational Algebra	CO-44. Definition of Algebra; Relations as Sets; Operations: SELECT, PROJECT, JOIN, etc. CO-45. Normalization Theory and Functional Dependencies, 2NF, 3NF, BCNF, 4NF, 5NF
	UNIT IV. Indexing	CO-46. Files, Blocks, and Records, Hashing; RAID, Replication CO-47. Single-Level and Multi-Level Indexes, B-Trees and B+-Trees CO-48. Basics of Transactions, Concurrency and Recovery
	UNIT V. Database Programming	CO-49. Embedded SQL CO-50. Dynamic SQL, Avoiding Injection Attacks CO-51. Stored Procedures
	UNIT VI. BIG DATA	CO-52. Motivations; OLAP vs. OLTP; Batch Processing CO-53. Map Reduce and Hadoop; Spark
	Course: Mathematics –II (BCAGE301)	
	UNIT I. Differential Calculus	CO-54. Limit of a function and continuity. Fundamental properties of continuous functions (proofs not required); CO-55. Derivative and Differential-Geometric meaning, Rules of Differentiation. Successive differentiation. Rolle's theorem, Mean-Value theorems CO-56. Taylor's and Maclaurin's theorems with Cauchy's and Lagrange's forms of remainder; Taylor's series. CO-57. Functions of several variables. Partial Derivatives. Total Differential. CO-58. Euler's theorem on homogeneous functions of two variables. CO-59. Application of differential calculus (tangents, normals, curvature, asymptotes).
	UNIT II. Integral Calculus	CO-60. Rules of Integration of Indefinite Integrals, Solution of Definite Integrals and their elementary properties. Idea of improper integrals. CO-61. Application of integral calculus (evaluation of area, lengths of plane curves).
	UNIT III. Differential Equations	CO-62. Order, degree, solution and formation of a differential equation. ODE of first order and first degree CO-63. Exact equations, Integrating factors, Linear equations CO-64. Bernoulli's equations, Standard techniques of solving second order linear ordinary differential equations with constant coefficients CO-65. Cauchy's and Legendre's Linear Differential Equations with variable coefficients

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	UNIT IV. Sequence and Series	CO-66.	Bounded and unbounded sequences, Convergence or divergence of a sequence, Behaviour of monotone sequences,
		CO-67.	Algebra of convergent sequences, Cauchy sequence, Cauchy's general principle of convergence,
		CO-68.	Infinite series, it's convergence and sum, series with positive terms and standard tests of convergence (without proofs), Alternating Series
		CO-69.	Leibniz Test, Absolute convergence, Rearrangement of absolutely convergent series, Test of convergence of Abel and Dirichlet (without proofs).
	Course: Reasoning & Aptitude (BCASE301)		
	UNIT I. Quantitative Ability (Basic Mathematics)	CO-70.	Number Systems, LCM and HCF, Decimal Fractions
		CO-71.	Simplification, Square Roots and Cube Roots, Average
		CO-72.	Problems on Ages, Surds & Indices, Percentages, Problems on Numbers
	UNIT II. Quantitative Ability (Applied & Engineering Mathematics)	CO-73.	Logarithm, Permutation and Combinations
		CO-74.	Probability, Profit and Loss
		CO-75.	Simple and Compound Interest, Time, Speed and Distance
		CO-76.	Time & Work, Ratio and Proportion
		CO-77.	Area, Mixtures and Allegation.
	UNIT III. Data Interpretation	CO-78.	Data Interpretation, Tables, Column Graphs, Bar Graphs, Line Charts, Pie Chart, Venn Diagrams.
	UNIT IV. Logical Reasoning (Deductive Reasoning)	CO-79.	Analogy, Blood Relation, Directional Sense
		CO-80.	Number and Letter Series, Coding – Decoding, Calendars, Clocks
		CO-81.	Venn Diagrams, Seating Arrangement, Syllogism, Mathematical Operations.
Semester - IV	**Course: Core Java (BCAC401)**		
	UNIT I. Introduction to Java	CO-1.	Java Architecture and Features, Compiling and Executing a Java Program, Variables, Constants, Keywords, Data Types
		CO-2.	Operators (Arithmetic, Logical and Bitwise) and Expressions, Type Conversion and Type Casting
		CO-3.	Decision Making Constructs (Conditional Statements and Loops) and Nesting, Java Methods (Definition, Scope, Passing and Returning Arguments, Built-in Java Class Methods).
	UNIT II. Arrays, Strings and I/O	CO-4.	Creating and Using Arrays (One-Dimensional and Multi-Dimensional), Referencing Arrays Dynamically
		CO-5.	The Java String Class, Creating and Using String Objects, Manipulating Strings, String Immutability and Equality, Passing Strings to and from Methods, StringBuffer Class
		CO-6.	Simple I/O using System.out and Scanner Class, Byte and Character Streams, Reading and Writing from Console and Files.
	UNIT III. Object-Oriented Programming Overview	CO-7.	Principles of Object-Oriented Programming, Defining and Using Classes, Controlling Access to Class Members, Class Constructors
		CO-8.	Method Overloading, Class Variables and Methods, Objects as Parameters, Final Classes, Object Class, Garbage Collection
	UNIT IV. Inheritance, Interfaces, Packages, Enumerations, Autoboxing and Annotations	CO-9.	Inheritance (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes)
		CO-10.	Interfaces and Packages, Extending Interfaces and Packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io)
		CO-11.	Wrapper Classes, Enumerations, Autoboxing and Unboxing, Annotations.

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	UNIT V. Exception Handling, Threading	CO-12. Exception Types, Uncaught Exceptions, Built-in Exceptions, Creating Your Own Exceptions CO-13. The Thread Class and Runnable Interface, Creating Single and Multiple Threads, Thread Prioritization, Synchronization and Communication, Suspending and Resuming Threads
	Course: Computer Networks (BCAC402)	
	UNIT I. Introduction to Computer Networks and Networking Elements	CO-14. Network Definition, Network Topologies, Network Classifications, Network Protocol, Layered Network Architecture CO-15. Overview of OSI Reference Model CO-16. Overview of TCP/IP Protocol Suite, Hub, Switch (Managed and Unmanaged), Routers.
	UNIT II. Data Communication Fundamentals and Techniques	CO-17. Analog and Digital Signal, Data-Rate Limits, Digital to Digital Line Encoding Schemes, Pulse Code Modulation CO-18. Parallel and Serial Transmission, Digital to Analog Modulation - Multiplexing Techniques- FDM, TDM CO-19. Transmission Media, Transmission mode.
	UNIT III. Networks Switching Techniques and Access Mechanisms	CO-20. Circuit Switching, Packet Switching- Connectionless Datagram Switching, Connection Oriented Virtual Circuit Switching CO-21. Dial-Up Modems, Digital Subscriber Line, Cable TV for Data Transfer.
	UNIT IV. Data Link Layer Functions and Protocol	CO-22. Error Detection and Error Correction Techniques, Data-Link Control- Framing and Flow Control, CO-23. Error Recovery Protocols-Stop and Wait ARQ, Go-Back-N ARQ, Point to Point Protocol on Internet.
	UNIT V. Multiple Access Protocol and Network Layer	CO-24. CSMA/CD Protocols, Ethernet LANS; Connecting LAN and Back-Bone Networks- Repeaters, Hubs, Switches, Bridges, Router and Gateways, CO-25. Networks Layer Functions and Protocols, Routing, Routing Algorithms, Network Layer Protocol of Internet - IP Protocol, Internet Control Protocols.
	UNIT VI. Transport Layer and Application Layer Functions and Protocols	CO-26. Transport Services- Error and Flow Control, Connection Establishment and Release- Three Way Handshake CO-27. Overview of Application Layer Protocol, Overview of DNS Protocol; Overview of WWW & HTTP Protocol.
	Course: Web and Internet Technology (BCAC403)	
	UNIT I. Introduction to Internet	CO-28. Evolution of Internet, concept of Intranet and Internet, Applications of Internet, Types of Connectivity such as dial – up, leased, VSAT. etc. CO-29. Internet Server and Clients module in various Operating Systems, TCP/IP, Introduction to RFC, Addressing in Internet – IP and Domains, major features of IP, IP datagram, major IP services, IP source routing, value of the transport layer CO-30. TCP, major features of TCP, passive and active operation, Internet Service Providers.
	UNIT II. E-mail and List-servers	CO-31. E-mail Networks, E-mail protocols(X.400, SMTP, UUCP), Format of an E- mail message , Description of E-mail Headers, E- mail contents and encoding, E-mail routing CO-32. List servers, E-mail clients, POP-3, IMAP-4.
	UNIT III. File Transfer Protocol	CO-33. Introduction to FTP, public domain Software, Types of FTP Servers, FTP clients, Common Commands.
	UNIT IV. Telnet	CO-34. Telnet protocol, Server daemon, Telnet clients, Terminal emulation, Usenet and Internet Relay Chat CO-35. Introduction to World Wide Web: Evolution of WWW, Basics Features, WWW Browsers, WWW servers, HTTP & URL's

Semester	Course / Module	Module Specific Course Outcome	
	UNIT V. WWW Browsers	CO-36.	Basic features, Bookmarks, history. Progress indicators, Personalization of Browsers, Printing displayed pages and forms, Saving Web pages
		CO-37.	Netscape Communicators, Internet Explorer, Search and Downloads.
	UNIT VI. Web Publishing	CO-38.	Technology Overview, Web site planning, where to host your Web site, Multiple sites on one server, Maintaining a Web site, Publishing tools.
	UNIT VII. Search Engines	CO-39.	Technology overview, Popular Search Engines, How to register a Web site on search engines.
	UNIT VIII. Internet Security	CO-40.	Overview of Internet Security threats, Firewalls, Malware and its type, Introduction to AAA.
	Course: Web and Internet Technology (LAB)		
	UNIT I. HTML	CO-41.	Introduction to HTML and HTML5, HTML Tags, Formatting and Fonts, Commenting Code, Anchors, Backgrounds, Images, Hyperlinks, Lists, Tables, Frames, HTML Forms.
	UNIT II. CSS	CO-42.	The need for CSS, Introduction to CSS, Basic syntax and structure, Inline Styles, Embedding Style Sheets, Linking External Style, Backgrounds, Manipulating Text, Margins and Padding, Positioning using CSS.
	UNIT III. JavaScript	CO-43.	Syntax, Variables, Values, Data Types, Data Types, Expressions and Operators, Control structures, Error handling, Throwing errors, Numbers, Strings, Arrays.
	UNIT IV. PHP	CO-44.	Introduction to PHP, Server side scripting, Role of web server software, PHP comments, variables, echo and print, PHP operators, data types , Branching statements, Loops,
		CO-45.	Arrays, PHP functions, PHP form, Passing information between pages, $_GET, $_POST, $_REQUEST
		CO-46.	String functions, include and require, session and cookie management, Error handling in PHP, Object Oriented Programming using PHP.
	UNIT V. PHP with MYSQL	CO-47.	Introduction to MySQL, data-types, SQL commands-CREATE, UPDATE, INSERT, DELETE, SELECT
		CO-48.	PHP functions for MySQL connectivity and operation- mysql_connect, mysql_select_db, mysql_query
		CO-49.	Updation and deletion of data using PHP, Displaying data from MySQL in webpage.
	Course: Mathematics –III (BCAGE401)		

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	UNIT I. Probability and Statistics	CO-50. Random experiments. Simple and compound events. Event space. Classical and frequency definitions of probability and their drawbacks.
		CO-51. Axioms of Probability. Statistical regularity. Multiplication rule of probabilities. Bayes' theorem.
		CO-52. Independent events. Independent random experiments. Independent trials. Bernoulli trials and binomial law. Poisson trials. Random variables
		CO-53. Probability distribution. Distribution function. Discrete and continuous distributions. Binomial, Poisson, and Normal distribution.
		CO-54. Collection and presentation of data: Frequency distribution. Measures of central tendency. Measures of dispersion.
		CO-55. Bivariate Frequency Distributions (scatter Diagram, Correlation coefficient and its properties, regression lines, correlation index and correlation ratio, rank correlation).
		CO-56. Random sampling: Expectations and standard error of sampling mean. Expectation and standard error of sampling proportions.
	UNIT II. Numerical Methods and Algorithms	CO-57. Error: Introduction, types of error - relative, absolute, percentage, round-off.
		CO-58. Solution of Algebraic and Transcendental Equations: Bisection, Newton-Raphson, Regula-Falsi and Secant method.
		CO-59. Interpolation and approximation: Newton's forward interpolation and Newton's backward interpolation, Lagrange's interpolation.
		CO-60. Evaluation of Integrals: Trapezoidal and Simpson's 1/3 rules.
		CO-61. Solution of System of linear equations: Gaussian elimination, Gauss Seidel method.
		CO-62. Solution of Ordinary different equations: Euler's, Taylor's series, Runge-Kutta (order-2 and 4).
Course: Value and Ethics of Profession (BCASE401)	
	UNIT I. Introduction to Ethical Theories	CO-63. Consequentiality and Non-consequentiality theories, Hedonism, Utilitarianism, Virtue Ethics, Ethical Relativism, Ethical Naturalism
	UNIT II. Ethics and Morality	CO-64. Ethics and Morals, Ethics in Indian Tradition, Building character in workplace,
		CO-65. Moral and Ethical Judgement: Cannons of ethics, Ethics of duty, Ethics of responsibility
	UNIT III. Ethics and Environment	CO-66. Rapid technological growth and depletion of resources, Sources of energy, Energy crisis, Reports of Club of Rome, Environmental degradation, Environmental Regulations, Environmental Ethics, Eco- friendly technologies,
		CO-67. Sustainable Development, Important and recent national and international conventions on environment,
		CO-68. Appropriate Technology Movement of Schumacher: Later developments.
	UNIT IV. Technology and Developing Nations	CO-69. Technology transfer Problems of technology transfer, Stages of technology transfer, Problems of technology transfer, Technology Impact Assessment
		CO-70. Problems of man machine interaction, Impact of Assembly line, Automation, Corporate Social Responsibility.
	UNIT V. Ethics of Profession	CO-71. Attributes of a profession, Science, Technology and Engineering as Knowledge and as Social and Professional Activities
		CO-72. Engineering profession: Ethical issues in engineering practice, Conflicts between business demands and professional ideals
		CO-73. Social and ethical responsibilities of Technologists, Codes of professional ethics, Whistle blowing and beyond. Case studies.

Semester	Course / Module	Module Specific Course Outcome
	UNIT VI. Profession and Human Values	CO-74. Value Crisis in contemporary society CO-75. Nature of values: Value Spectrum of a 'good' life, Psychological values: Integrated personality; mental health, Societal values: The modern search for a 'good' society, justice, democracy, secularism, rule of law CO-76. Values in Indian Constitution, Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity.
Semester – V	**Course: Software Engineering (BCAC501)**	
	UNIT I. Software Development Approaches	CO-1. Introduction; Evolving Role of Software; Software Characteristics; Software Applications CO-2. Software Design Processes: Introduction CO-3. What is meant by Software Engineering? Definitions of Software Engineering CO-4. The Serial or Linear Sequential Development Model CO-5. Iterative Development Model; The incremental Development Model
	UNIT II. Software Design Principles	CO-6. Introduction, System Models: Data-flow Models, Semantic Data Models, Object Models, Inheritance Models, Object Aggregation, Service Usage Models, Data Dictionaries CO-7. Software Design: The Design Process, Design Methods, Design description, Design Strategies, Design Quality CO-8. Architectural Design: System Structuring, The Repository Model, The Client–Server Model, The Abstract Machine Model, Control Models, Modular Decomposition, Domain-Specific Architectures.
	UNIT III. Object Oriented Design	CO-9. Introduction; Object Oriented Design: Objects, Object Classes & Inheritance, Inheritance, Object Identification, An Object - Oriented Design Example, Object Aggregation, Service Usage CO-10. Object Interface Design: Design Evolution, Function Oriented Design, Data–Flow Design CO-11. Structural Decomposition: Detailed Design.
	UNIT IV. An Assessment of Process Life-Cycle Models	CO-12. Introduction; Overview of the Assessment of Process; The Dimension of Time; The Need for a Business Model in Software Engineering CO-13. Classic Invalid Assumptions: First Assumption: Internal or External Drivers CO-14. Second Assumption: Software or Business Processes CO-15. Third Assumption: Processes or Projects CO-16. Fourth Assumption: Process Centered or Architecture Centered; Implications of the New Business Mode CO-17. Role of the Problem - Solving Process in this Approach: Data, Problem Definition, Tools and Capabilities CO-18. Redefining the Software Engineering Process: Round-Trip Problem-Solving Approach, Activities, Goals, Interdisciplinary Resources, Time.
	UNIT V. Software Reliability	CO-19. Introduction; Software Reliability Metrics CO-20. Programming for Reliability: Fault Avoidance, Fault Tolerance, Software Reuse.
	UNIT VI. Software Testing Techniques	CO-21. Introduction; Software Testing Fundamental; Testing Principles; White Box Testing; Control Structure Testing; Black Box Testing CO-22. Boundary Value Analysis; Testing GUIs; Testing Documentation and Help Facilities CO-23. Software Testing Strategies: Introduction; Organizing for Software 40 Testing; Software Testing Strategy, Unit Testing: Unit Test Considerations, Top-Down Integration, Bottom-Up Integration.

Semester	Course / Module	Module Specific Course Outcome
	Course: Minor Project and Entrepreneurship (BCAC502)	
	UNIT I. Project Management Concepts	CO-24. Concept and Characteristics of a Project, Types of Projects, Project Management (Need, Knowledge Areas, Project Manager, Project Management Triangle, Project Scope and Scope Creep, Importance of Project Management).
	UNIT II. Project Management Life Cycle	CO-25. Project Management Life Cycle Phases, Project Management Process (Project Process, Process Group, Process Interactions, Customization, Process Group and Knowledge Area Matrix)
	UNIT III. Project Planning	CO-26. Planning Need, Importance of Planning, Planning Process, Work Breakdown Structure and Organization Breakdown Structure, CO-27. Roles, Responsibility and Team Work, Feasibility Studies.
	UNIT IV. Project Evaluation	CO-28. Investment Analysis of Projects (Time Value of Money, Interest Rates, Compounding/Discounting, Payback Period, Average Rate of Return, Net Present Value, Profitability Index, Internal Rate of Return), Sources of Finance.
	UNIT V. Project Scheduling	CO-29. Importance of Project Scheduling, Scheduling Techniques (Gantt chart and Line of Balance, Network Analysis – CPM/PERT, Slack and Float).
	UNIT VI. Project Cost Control	CO-30. Direct and Indirect Cost, Normal Cost and Crash Cost CO-31. Time– Cost Trade-off Analysis - Optimum Project Duration, Resource Allocation and Levelling.
	UNIT VII. Legal and Quality Aspects of Project Management	CO-32. Project Contract (Types of Contract, Sub-Contracting, Tenders, Payment to Contractors), Project Audit.
	UNIT VIII. IT in Projects	CO-33. Overview of types of Software for Projects, Major Features of Project Management Software like MS Project, Criterion for Software Selection.
	UNIT IX. Entrepreneurship	CO-34. Meaning & Concept of Entrepreneurship, Conditions needed for Entrepreneurship (Social Factors, Economic Factors, Psychological Factors, Legal Factors, Education & Technical Knowhow, Financial Assistance) CO-35. Qualities of a Prospective Entrepreneur.
	UNIT X. Entrepreneurial Motivation	CO-36. McClelland's N-Ach Theory (Need for Affiliation, Need for Power, Need for Achievement) CO-37. Self–Analysis, Personal Efficacy, Culture & Values, Risk-taking Behaviour, Technology Backup.
	UNIT XI. Introduction forms of business organization	CO-38. Various forms of business organization (sole proprietorship, partnership, corporations, Limited Liability company), mission, vision and strategy formulation.
	UNIT XII. Entrepreneurial Skills	CO-39. Creativity, Problem Solving, Decision Making, Communication, Leadership Quality.
	Course: Introduction to Cyber Security (BCADSE501)	
	UNIT I. Introduction to Cyber Security	CO-40. Cybersecurity objectives, Cybersecurity roles, Differences between Information Security & Cyber security CO-41. Confidentiality, integrity, & availability, Authentication & non-repudiation, Types of attack.
	UNIT II. Cryptography Concepts & Techniques	CO-42. Introduction, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption, Symmetric & Asymmetric key Cryptography, Key Range & Key Size.
	UNIT III. Symmetric Key Algorithm	CO-43. Introduction, Algorithm types & Modes, Overview of Symmetric Key Cryptography, DES(Data Encryption Standard) algorithm, IDEA(International Data Encryption Algorithm) algorithm, RC5 (Rivest Cipher 5) algorithm.

Semester	Course / Module	Module Specific Course Outcome
	UNIT IV. Asymmetric Key Algorithm, Digital Signature and RSA	CO-44. Introduction, Overview of Asymmetric key Cryptography, RSA algorithm, NP-hard, Symmetric & Asymmetric key Cryptography together CO-45. Digital Signature, Basic concepts of Message Digest and Hash Function.
	UNIT V. Firewall	CO-46. Introduction, Types of firewall, Firewall Configurations, DMZ Network.
	UNIT VI. Future Implications & Evolving Technologies	CO-47. New & emerging IT & IS technologies, Mobile security issues, risks, & vulnerabilities, Cloud concepts around data & collaboration.
	UNIT VII. Electronic Mail Security	CO-48. Basics of mail security, Pretty Good Privacy, S/MIME.
	Course: Data Science (BCADSE502)	
	UNIT I. Introduction to data science	CO-49. Introduction to data science, exploratory data analysis, linear regression and regularization, Model selection and evaluation.
	UNIT II. Classification	CO-50. KNN, decision trees, SVM; Ensemble methods: random forests, Naïve Bayes and logistic regression.
	UNIT III. Feature engineering and selection, Clustering	CO-51. k-means, hierarchical clustering, Dimensionality reduction: PCA and SVD
	UNIT IV. Text mining and information retrieval	CO-52. Text mining and information retrieval, Network Analysis, Recommender systems.
	Course: Intelligent Systems (BCADSE503)	
	UNIT I. Introduction	CO-53. What is AI? Importance of AI, Objectives. Applications of AI in Natural Language Processing CO-54. Speech Understanding, Computer Vision, Planning, etc. CO-55. Introduction to LISP: Study of features and its application.
	UNIT II. Knowledge and AI Problem solving concepts	CO-56. Its representation, Organisation – Manipulation and Acquisition.
	UNIT III. Predicate Calculus in AI	CO-57. First Order Predicate Logic & its use in Knowledge Representation – Resolution Principal. Use of Resolution in reasoning and Question answering. CO-58. Production Systems and Search Strategies – Production System and its variants – Heuristic Search Methods.
	UNIT IV. Uncertainty Management	CO-59. Fuzzy Logic, Bayesian inferencing, certainty factor Structured Representation of Knowledge – Semantic networks, Frames, Conceptual Dependency & Scripts.
	UNIT V. Learning	CO-60. Learning automation, learning by induction, Neural Networks, Genetic Algorithms.
	UNIT VI. Expert Systems	CO-61. Rule Based System Architecture, Non-production System Architecture CO-62. Knowledge Acquisition Methods, Explanation Methods, Expert System Shells.
	Course: Microprocessor and Assembly Language Programming (BCADSE504)	
	UNIT I. Microprocessor	CO-63. Functional units of Microprocessor, General and Special purpose register: AC, PC, SP, DR, DAR, MAR, Flags, B-C, D-E, H-L pairs, PSW.
	UNIT II. 8 bit microprocessor architecture	CO-64. 8 bit microprocessor architecture; 8085 pin description.
	UNIT III. Programming model of 8085	CO-65. Programming model of 8085, addressing modes of 8085; Instruction set of 8085; Assembly language program for 8085.

Semester	Course / Module	Module Specific Course Outcome	
	UNIT IV. Memory interfacing	CO-66.	Memory interfacing; I/O interfacing; Peripheral ICs; I/O memory Interfacing Chips
		CO-67.	Bus structure of microprocessor based systems, bus arbitration;
		CO-68.	Interrupt handling and DMA operation.
		CO-69.	Basic idea about microprogramming.
	UNIT V. Case Study	CO-70.	Intel 8085 microprocessor.
	UNIT VI. Advanced Microprocessors	CO-71.	Functional description of 8086 microprocessor, software model of 8068/8088; Data addressing modes of 8086
		CO-72.	80x86 family of microprocessor. Comparison of different microprocessors; microprocessors of other families.
	Course: Multimedia System Design (BCADSE505)		
	UNIT I. Multimedia	CO-73.	Introduction to multimedia, components, uses of multimedia, multimedia applications, virtual reality.
		CO-74.	Text: Fonts & Faces, Using Text in Multimedia, Font Editing & Design Tools, Hypermedia & Hypertext.
	UNIT II. Images	CO-75.	Still Images – bitmaps, vector drawing, 3D drawing & rendering, natural light & colors, computerized colors, color palettes, image file formats.
	UNIT III. Sound	CO-76.	Digital Audio, MIDI Audio, MIDI vs. Digital Audio, Audio File Formats.
	UNIT IV. Video	CO-77.	How video works, analog video, digital video, video file formats, video shooting and editing.
	UNIT V. Animation	CO-78.	Principle of animations, animation techniques, animation file formats. Internet and Multimedia: www and HTML, multimedia on the web – web servers, web browsers.
	UNIT VI. Making Multimedia	CO-79.	Stages of a multimedia project, Requirements to make good multimedia.
	UNIT VII. Multimedia Hardware	CO-80.	Macintosh and Windows production Platforms, Hardware peripherals - Connections, Memory and storage devices, Multimedia software and authoring tools.
Semester - VI	**Course: Programming in Python (BCAC601)**		
	UNIT I. Introduction	CO-1.	The Python Language, the Python Standard Library and Extension Modules, Python Implementation, Python Development and Versions, Installation from Source Code and Binaries, the Python Interpreter.
	UNIT II. Core Python Language and Built	CO-2.	Data Type, Variable, Expression and Operators, Numeric Operations, Sequence Operations, Dictionary Operations, The print statement, Conditional Statements, Looping, Control flow Statements.
	UNIT III. String Manipulation	CO-3.	Introduction, Traversing a string, string operators, string slices, string functions and methods.
	UNIT IV. Lists and Tuple	CO-4.	Introduction to List and Tuple, Accessing List and Tuple, Operations, working with List and Tuple, Function and Methods.
	UNIT V. Dictionaries	CO-5.	Working with dictionaries, key-value pairs, properties, dictionary functions and methods.
	UNIT VI. Functions	CO-6.	Defining a function, calling a function, Types of functions, Built-in functions (Library Functions), Function Arguments, Anonymous functions.
		CO-7.	Module: Importing Module, Math Module, Random Module, Package, Composition and the Distribution Utility.
	UNIT VII. Object Oriented Programming Concept	CO-8.	Class and Object, Attribute, Inheritance, Overloading and Overriding, Data Hiding, Meta classes.

Semester	Course / Module	Module Specific Course Outcome	
	UNIT VIII. Exception handling	CO-9.	Meaning of exception, various keywords to handle exceptions such try, catch, except, else, finally, raise.
	UNIT IX. Regular Expressions	CO-10.	Concept of regular expression, various types of regular expressions, using match function.
	UNIT X. Graphical User Interface	CO-11.	GUI Programming in Python (using Tkinter/ wxPython/Qt): GUI concept, Advantages of GUI, and Introduction to GUI library
		CO-12.	Layout management, events and bindings, fonts, colours, drawing on canvas (line, oval, rectangle, etc.)
		CO-13.	Widgets such as: frame, label, button, check button, entry, list box, message, radio button, text, spin box etc.
	Course: Major Project (BCAC602)		
	Project Development and Reporting	CO-14.	Preparing project report under an Industry /Organization only using the tools learned in the BCA LOCF curriculum for the session 2021-2024, abiding by the Kazi Nazrul University project template.
	Course: Computer Graphics (BCADSE601)		
	UNIT I. Computer Graphics Basics	CO-15.	Basic elements of Computer graphics, Cathode Ray Tube, Raster Scan, Application of Computer Graphics. Architecture of Raster and Random scan display devices, input/output devices.
	UNIT II. Output Primitives	CO-16.	Points and Lines, Line Generation Algorithm (DDA Algorithm, Bresenham's Line Generation, Mid-Point Algorithm), Line Function,
		CO-17.	Circle-Generating Algorithms (Bresenham's Algorithm and Midpoint Circle Algorithm), Properties of Circles, Ellipse-Generating Algorithms, Midpoint Ellipse Algorithm, Properties of Ellipses.
		CO-18.	Filled-Area Primitives, Scan-Line Polygon Fill Algorithm Inside-Outside Tests, Scan-Line Fill of Curved Boundary, Areas Boundary-Fill Algorithm, Flood-Fill Algorithm, Fill-Area Functions.
	UNIT III. Two-Dimensional Geometric Transformations	CO-19.	Basic Transformations Translation Rotation Scaling, Matrix Representations and Homogeneous Coordinates,
		CO-20.	Composite Transformations, General Pivot-Point Rotation ,General Fixed-Point Scaling, General Scaling Directions, Concatenation Properties, General Composite Transformations and Computational Efficiency,
		CO-21.	Other Transformations – Reflection, Shear, Transformations Between Coordinate Systems.
	UNIT IV. Two-Dimensional Viewing	CO-22.	Viewing Coordinate Reference Frame, Window-to-viewport Coordinate Transformation
		CO-23.	Clipping Operations, Point Clipping, Line Clipping(Cohen-Sutherland Line Clippings, Cyrus-Beck Line Clipping Algorithm), Polygon Clipping (Sutherland Hodgman Algorithm),Text Clipping, Curve Clipping, Exterior Clipping.
	UNIT V. Three-Dimensional Geometric and Modelling Transformations	CO-24.	Translation, Rotation, Coordinate-Axes Rotations General Three-Dimensional Rotations, Scaling, Reflections, Shears, Composite Transformations, Three-Dimensional Transformation Functions, Modelling and Coordinate Transformations.
	Course: Theory of Computation (BCADSE602)		
	UNIT I. Introduction	CO-25.	Synchronous & Asynchronous Sequential Circuit, Storage Element, Mealy and Moore Machines, Design Technique of State Machine.
	UNIT II. Finite State Model	CO-26.	Synchronous Sequential Machine; State Successor in Sequential Machine; Capabilities and Limitations of FSM; State Equivalence and Machine Minimization.

Semester	Course / Module	Module Specific Course Outcome	
	UNIT III. Theory Of Automata	CO-27.	Definition of Automation; Description of Finite Automation;
		CO-28.	Transition System; Properties of Transition Function; NDFA, DFA, Conversion from NDFA to DFA, Minimization Of States (Equivalence Partition)
		CO-29.	Conversion From Moore to Mealy machine and Vice Versa.
	UNIT IV. Formal Languages	CO-30.	Basic Definition of Grammar and Languages; Examples; Chomsky Classification of Languages; Languages and their Relations; Operation on Languages; Language and Automata.
	UNIT V. Regular Set And Regular Grammar	CO-31.	Regular Expression; Finite Automata and Regular Expression; Regular Grammars and Regular Languages
		CO-32.	Pumping Lemma for Regular Sets, Application of Pumping Lemma, Closure Properties of Regular Languages.
	UNIT VI. Context-Free Languages	CO-33.	Basics of CFL; Sentential Forms; Derivation Trees; Ambiguity in CFG; Simplification of CFG; CNF And GNF;
	UNIT VII. Pushdown Automata	CO-34.	Basic Definition; Language Acceptance by PDA; Deterministic PDA.
	UNIT VIII. Turing Machine	CO-35.	Turing Machine Model; Representation of Turing Machine; Language Acceptability by TM; Design of TM; Nondeterministic TM.
		CO-36.	
	Course: Cloud Computing (BCADSE603)		
	UNIT I. Introduction to cloud computing	CO-37.	Definition, characteristics, components, Cloud service provider, the role of networks in Cloud computing
		CO-38.	Cloud deployment models private, public & hybrid, Cloud service models, multitenancy, Cloud economics and benefits
		CO-39.	Cloud computing platforms - IaaS: Amazon EC2, PaaS: Google App Engine, Microsoft Azure, SaaS.
	UNIT II. Virtualization	CO-40.	Virtualization concepts , Server virtualization, Storage virtualization, Storage services, Network virtualization, Service virtualization
		CO-41.	Virtualization management, Virtualization technologies and architectures, virtual machine, Measurement and profiling of virtualized applications.
		CO-42.	Hypervisors: KVM, Xen, VMware hypervisors and their features.
	UNIT III. Data in cloud computing	CO-43.	Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo
		CO-44.	MapReduce and extensions: Parallel computing, the map-Reduce model, Parallel efficiency of MapReduce, Relational operations using Map-Reduce, Enterprise batch processing using MapReduce.
	UNIT IV. Cloud security	CO-45.	Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud
		CO-46.	Cloud computing security architecture: General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro - architectures;
		CO-47.	Identity Management and Access control, Autonomic security, Security challenges: Virtualization security management - virtual threats, VM Security Recommendations
		CO-48.	VM - Specific Security techniques, Secure Execution Environments and Communications in cloud.

Semester	Course / Module	Module Specific Course Outcome	
	UNIT V. Issues in cloud computing	CO-49.	Implementing real time application over cloud platform, Issues in Inter-cloud environments, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud
		CO-50.	Quality of Service (QoS) monitoring in a Cloud computing environment, Cloud Middleware, Mobile Cloud Computing, Inter Cloud issues.
		CO-51.	A grid of clouds, Sky computing, load balancing, resource optimization, resource dynamic reconfiguration, Monitoring in Cloud.
	Course: Digital Marketing (BCADSE604)		
	UNIT I. Introduction to Digital Marketing	CO-52.	Difference between Traditional Marketing and Digital Marketing, Benefits of using Digital Media, Inbound and Outbound Marketing
		CO-53.	Online marketing POEM: (Paid, Owned, and Earned Media), Components of Online Marketing (Email, Forum, Social network, Banner, Blog)
		CO-54.	Impact of Online Marketing, Basics of Affiliate Marketing, Viral Marketing, Influencer Marketing, Referral Marketing.
		CO-55.	Email Marketing: Email newsletters, Digests, Dedicated Emails, Lead Nurturing, Sponsorship Emails and Transactional Emails, Drawbacks of Email Marketing
		CO-56.	Social Media Marketing (SMM): Different types of Social Media Marketing like Facebook, LinkedIn, Twitter, Video, Instagram etc.
	UNIT II. Search Engine Optimisation (SEO)	CO-57.	About SEO, Need of an SEO friendly website, Importance of Internet and Search Engines; Role of Keywords in SEO
		CO-58.	On-Page Optimization (Onsite): Basics of Website Designing/Development
		CO-59.	HTML Basics for SEO; Onsite Optimization Basics; Website Structure and Navigation Menu Optimization; SEO Content Writing. Keywords Research and Analysis (e.g. SWOT analysis of website, finding appropriate keywords)
		CO-60.	Off Page Optimization: Introduction; Local marketing of websites depending on locations; Promoting Subsequent pages of the website. Introduction to organic SEO vs. non-organic SEO
		CO-61.	Social Media Optimization Techniques and Page Rank Technology.
	UNIT III. Content Marketing Strategy	CO-62.	Goals and concepts, Strategic building blocks, Content creation & channel distribution, Tools of the trade, Advantages and challenges
		CO-63.	Keywords Research and Analysis: Introduction to Keyword Research; Business Analysis; Types of Keywords; Keywords Analysis Tools.
		CO-64.	Web Presence: How to increase online presence and drive more traffic for a website, Search result visibility in search engines for chosen keyword and phrases, Using e-mail marketing to drive traffic for a website
		CO-65.	Posting social media content for lead generation, Tools to create and manage content, Use of Blogging as content strategy.
		CO-66.	Creating content: Writing and posting content on the web and in social networks, blog and video
		CO-67.	Create, manage and implement a content marketing strategy; Monitoring and recording results to improve content marketing campaigns, Successful content marketing strategies and case studies.

Semester	Course / Module	Module Specific Course Outcome
	UNIT IV. Online Advertising, Mobile Marketing and Web analytics	CO-68. Introduction to Online Advertising and its advantages, Paid versus Organic, Pay Per Click (PPC) Model. Basic concepts Cost per Click (CPC), CPM, CTR, CR etc. CO-69. About Mobile Marketing, Objectives of Mobile Advertising, Creating a Mobile Marketing Strategy, Introduction to SMS Marketing. CO-70. About Web Analytics Topk of Wch, Anastics (Onsite, off-site), Importance of Web Analytics.
	Course: Soft Computing (BCADSE605)	
	UNIT I. Introduction	CO-71. Introduction to soft computing; introduction to fuzzy sets and fuzzy logic systems; introduction to biological and artificial neural network; introduction to Genetic Algorithm.
	UNIT II. Fuzzy sets and Fuzzy logic systems	CO-72. Classical Sets and Fuzzy Sets and Fuzzy relations: Operations on Classical sets, properties of classical sets, Fuzzy set operations, properties of fuzzy sets, cardinality, operations, and properties of fuzzy relations CO-73. Membership functions: Features of membership functions, standard forms and boundaries, different fuzzification methods. Fuzzy to Crisp conversions: Lambda Cuts for fuzzy sets, fuzzy Relations, De-fuzzification methods CO-74. Classical Logic and Fuzzy Logic: Classical predicate logic, Fuzzy Logic, Approximate reasoning and Fuzzy Implication Fuzzy Rule based Systems: Linguistic Hedges, Fuzzy Rule based system – Aggregation of fuzzy Rules, Fuzzy Inference System, Mamdani Fuzzy Models – Sugeno Fuzzy Models. CO-75. Applications of Fuzzy Logic: How Fuzzy Logic is applied in Home Appliances, General Fuzzy Logic controllers, Basic Medical Diagnostic systems and Weather forecasting.
	UNIT III. Introduction to Neural Networks	CO-76. Advent of Modern Neuroscience, Classical AI and Neural Networks, Biological Neurons and Artificial neural network; model of artificial neuron. CO-77. Neural Network models: Perceptron, single layer network; Back-propagation and multi layer networks. CO-78. Competitive learning networks: Kohonen self organizing networks, Hopfield Networks. CO-79. Applications of Neural Networks: Pattern Recognition and classification.
	UNIT IV. Genetic Algorithms	CO-80. Simple GA, crossover and mutation, Multi-objective Genetic Algorithm (MOGA). CO-81. Applications of Genetic Algorithm: genetic algorithms in search and optimization, GA based clustering Algorithm, Image processing and pattern Recognition.
	UNIT V. Other Soft Computing techniques	CO-82. Basic concept of Simulated Annealing and Particle Swarm Optimization (PSO).