National Curriculum and Credit Framework (NCCF)

Syllabus

for

Bachelor of Computer Application

w.e.f. Academic Session 2023-24

KaziNazrul University
Asansol, Paschim Bardhaman
West Bengal 713340

Semester- I

MAJOR COURSE - 1

Course Name: Introduction to Programming using C

Course Code: BCAMJ101

Course Type: **Major (Theoretical & Practical)**	Course Details:**MJC-1**		L-T-P: **3–0–4**	
Credit: **5**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**15**	**20**	**35**

Course Content:

Theory

UNIT I. Introduction to computers, Evolution, Generation of Computers, Computers Hierarchy, Different components of computer (CPU, ALU, different types of memory etc.), Number System – Binary, Hexa, Octal, BCD System, Introduction to operating environment.

UNIT II. Introduction to Programming, Program Concept, Characteristics of Programming, Stages in Program Development, Algorithms, Notations, Flowcharts, Types of Programming Methodologies, Introduction to C Programming - Basic Program Structure in C, Variables and Assignments, Input and Output, Selection and Repetition Statements.

UNIT III. Top-Down Design, Predefined Functions, Programmer-defined Function, Local Variable, Recursion - Developing Recursive Definition of Simple Problems and their implementation.

UNIT IV. Introduction to Arrays, Declaration and Referring Arrays, Arrays in Memory, Initializing Arrays.Arrays in Functions, Multi-Dimensional Arrays, Searching in Array.

UNIT V. Pointers - Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Call-By-Value and Call-By-Reference Parameters.

UNIT VI. Structures - Member Accessing, Pointers to Structures, Structures and Functions, Arrays of Structures, Unions.

UNIT VII. Strings - Declaration and Initialization, Reading and Writing Strings, Arrays of Strings, String and Function, Strings and Structure, Standard String Library Functions.

UNIT VIII. File Handling – File opening modes, use of files for data input and output. merging and copy files.

Practical

UNIT I. Given the problem statement, students are required to formulate problem, develop flowchart/algorithm, write code, execute and test it. Students should be given assignments on following:

a) To learn elementary techniques involving arithmetic operators and mathematical expressions, appropriate use of selection (if, switch, conditional operators) and control structures.

b) Learn how to use functions and parameter passing in functions, writing recursive programs.

UNIT II. Students should be given assignments on following:

a) Write Programs to learn the use of strings and string handling operations.

b) Problems which can effectively demonstrate use of Arrays. Structures and Union.

c) Write programs using pointers and functions.

d) Write programs to use files for data input and output.

Internal (CA) Evaluation: Practical Note Book (15 marks), Two experiments (10 marks) – one from each unit, Viva-voce (5 marks)

ESE Evaluation: Two experiments (10 marks) – one from each unit, Viva-voce (10 marks)

References/ Suggested Readings:

1. Problem Solving and Program Design in C, J. R. Hanly and E. B. Koffman, Pearson.
2. C Programming, Karnighan&Ritchie, PHI
3. Programming through C, Richard Johnsonbaugh and Martin Kalin, Pearson Education
4. Programming in C, B.S. Gottfried, Sahaum Series.
5. Programming in ANSI C, E. Balaguruswami, TMH

MINOR COURSE - 1

Course Name: Financial Accounting
Course Code: BCAMN101

Course Type: **Minor (Theoretical)**	Course Details:**MNC-1**		L-T-P: **4–1–0**	
Credit: **5**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
			30		**70**

Course Content:

Theory

UNIT I: Basic idea of Book Keeping and Accounting: Definition, Nature, Importance, Limitations, Difference between Book Keeping and Accounting. Accounting Principles: Generally Accepted Accounting Principles (GAAP) - Important Accounting Concepts: Proprietary, Entity, Fund, Money Measurement, Accounting Period, Going Concern, Duality, Realization and Accrual; Important Accounting Conventions: Disclosure, Materiality, Consistency, Comparability, Objectivity and Conservatism; Accounting Concept vs. Accounting Convention, Matching Concept, Relation of Accounting Theory with Accounting Practice.

UNIT II: Accounting Process: Journal: Definition, Features, Classification, Journal Entry; ledger: Definition, Classification, Ledger posting; Difference between Journal and Ledger;

UNIT III: Trial Balance: Definition, Importance, Errors, and Preparation of trial balance.

UNIT IV: Cash Book: Definition, Features, Types of Cash Book and Preparation of cash book under Single column method,Double column method,Triple column method and petty Cash Book

UNIT V: Depreciation-Concepts-Features-Causes-Diferent Methods of Depreciation on assets-Practical Problems on Straight line methods, Diminishing balance methods depreciation and Sinking Fund method

UNIT VI: Bad Debt and Provision for bad debt- Concepts-Features-Diference between bad debt and doubtful debt-accounting treatment of bad debt and doubtful debt

UNIT VII: Preparation of Financial Accounts of a profit-making trading Concern with additional information

UNIT VIII: Sectional and Self Balancing Ledgers: Concept of Sectional Balancing, preparation of control accounts. Self-Balancing Ledger: advantages; Recording process; preparation of Adjustment accounts.

References/ Suggested Readings:

1. Accounting Theory, Hendriksen, E.S., Khosla Publishing House, Delhi.
2. Accounting Theory, Lal, J. Himalaya Publishing House, Mumbai.
3. Accounting Theory, Porwal, L.S., Tata McGraw - Hill Publishing Co. Ltd., New Delhi.
4. Accounting Theory and Management Accounting, Sinha, G., Vidyoday Library Pvt. Ltd.
5. Financial Accounting, Goyal, Bhushan Kumar and H.N. Tiwari, Taxmann.
6. Financial Accounting, Kumar, Alok, Singhal Publication.
7. Financial Accounting – Concepts and Applications, Lt Bhupinder, Cengage.
8. Financial Accounting: concept and Applications, Monga, J R, Mayur paper Backs, New Delhi.

MULTIDISCIPLINARY COURSE - 1

Course Name: Information and Media Literacy

Course Code: MDC119

Course Type: **MD** **(Theoretical)**	Course Details:**MD-1**		L-T-P: **3–0–0**	
Credit: **3**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
			15		35

Course Content:

Theory

UNIT I. Introduction to Information and Media Literacy: Definition and importance of information and media literacy. Interrelationships between data, information, knowledge, and wisdom; Understanding the role of information and media in society. Information source vs. Information resource; Information society; Exploring the impact of misinformation, disinformation and fake news.

UNIT II. Evaluating Information Sources: Concepts of primary, secondary and tertiary information sources; Parametrs for information authenticity andIdentifying credible sources of information. Assessing the reliability and validity of sources. Recognizing bias and evaluating multiple perspectives. Conducting effective research using library resources: library retrieval, use of large-scale textual search engines, electronic databases (bibliographic & full-text), AI-enabled search tools; Developing critical reading and note-taking skills.

UNIT III. Digital Literacy and Online Research: Developing effective search skills – search strategies, search techniques (Boolean, Relational and Positional search operators); Evaluating and selecting appropriate online resources. Citing and referencing sources accurately – use of open source reference management software. Evaluating and integrating information from various sources. Credibility, reliability, and bias in different types of sources (websites, articles, social media, etc.) Fact-checking and verification techniques.

UNIT IV. Privacy, Security, and Digital Citizenship: Understanding online privacy issues and protecting personal information. Recognizing digital threats and practicing safe online behavior. Promoting responsible digital citizenship and ethical online practices. Understanding the relationship between media, democracy, and civic participation. Promoting media literacy as a tool for active citizenship. Concept of research ethics and academic honour code.

UNIT V. Social Media, Information Sharing and Civic Engagement: Analyzing the impact of social media on information dissemination. Understanding the role of algorithms and filter bubbles. Engaging in responsible sharing and combating misinformation, disinformation and fake news.

References/ Suggested Readings:

1. Media Literacy in the Information Age: Current Perspectives" edited by Christina Spurgeon.
2. Media Literacy: A Reader" edited by David Buckingham
3. Information Literacy: Search Strategies, Tools & Resources for High School Students and College Freshmen" by Susanna Caroselli
4. Media Literacy Education in Action: Theoretical and Pedagogical Perspectives" edited by Belinha S. De Abreu and Paul Mihailidis
5. Information Literacy and Information Skills Instruction: Applying Research to Practice in the 21st Century School Library" by Nancy Pickering Thomas
6. Web Literacy for Educators" by Alan November
7. Information and Media Literacy: The Whole-Student Approach" by Dr. Belinha S. De Abreu

SKILL ENHANCEMENT COURSE - 1

Course Name: Office Automation Software Lab

Course Code: BCASE101

Course Type:SEC (Practical)	Course Details:**SEC-1**		L-T-P: **0–0–6**	
Credit: 3	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30		**20**	

Course Content:

Practical

UNIT I. Windows Basics: 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, Accessing and using the Action Center, Working with apps and programs on the taskbar, 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: Overview, creating, saving, opening, importing, exporting, and insertingfiles, formatting pages, paragraphs and sections, indents and outdents, creating lists andnumbering. Headings, styles, fonts and font size, editing, positioning, viewing texts,searching and replacing text, inserting page breaks, page numbers, bookmarks, symbols, anddates. Using tabs and tables, header, footer, and printing,

UNIT III. MS Excel and Google Sheets: Worksheet overview, entering information, worksheet creation, openingand saving workbook, formatting numbers and texts, protecting cells, producing charts, andprinting operations. Application of Excel for obtaining statistical parameters, Mean, Median,Mode, average, co-relation, Regression, Data capturing using Google Forms.

UNITIV. MS PowerPoint or Google Slides: Slide creation with PowerPoint, Presenting shows for corporate and commercial using PowerPoint.

UNIT V. Graphics and Image Editing Software: Overview of graphic design and image editing applications (e.g., Adobe Photoshop, GIMP), Understanding basic image editing techniques (e.g., cropping, resizing, retouching), Creating and manipulating graphics for various purposes.

UNIT VI. Web Browsing and Internet Applications: Navigating web browsers and utilizing essential features, Understanding internet protocols and security considerations, Exploring common internet applications (e.g., email clients, cloud storage, online collaboration tools).

UNIT VII. File Compression and Archiving Software: Introduction to file compression formats (e.g., ZIP, RAR), Compressing and decompressing files and folders, Managing archived files and folders.

Internal (CA) Evaluation: Practical Note Book (15 marks), One experiment (10 marks), Viva-voce (5 marks).

ESE Evaluation: One experiment (10 marks), Viva-voce (10 marks).

References/ Suggested Readings:

1. Introduction to Computers with MS-Office, Leon, TMH
2. Learn Microsoft Office 2019, Linda Foulkes, HP.

Semester- II

MAJOR COURSE - 2

Course Name: Data Structures and Algorithms

Course Code: BCAMJ201

Course Type: **Major (Theoretical & Practical)**	Course Details:**MJC-2**		L-T-P: **3–0–4**	
Credit: **5**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**15**	**20**	**35**

Course Content:

Theory

UNIT I. Basic concepts- Data, Data Structures, ADT, Algorithm Specification-Introduction, Recursive algorithms, Data Abstraction, Performance analysis, Linear and Non Linear data structures.

UNIT II. Singly Linked Lists - Operations, Concatenating, Circularly linked lists - Operations for Circularly linked lists, Doubly Linked Lists - Operations. Polynomial and sparse matrix representation using linked list.

UNIT III. Stack- Definition and Operations, Array and Linked Implementations, Applications - Valid Expression Checking (Parenthesis matching), Reversal of string, Infix to Postfix Conversion, Postfix Expression Evaluation, Recursion Implementation.

UNIT IV. Queue - Definition and Operations, Array and Linked Implementations, Applications, Circular Queues - Insertion and Deletion Operations, Priority Queue- Definition and Implementation, Dequeue (Double Ended Queue) - Introduction.

UNIT V. Searching Methods – Linear and Binary.

UNIT VI. Sorting Methods – Bubble, Insertion, Selection, Shell, Using Divide-Conquer Approach (Quick and Merge sort), Comparison of Sorting Methods.

UNIT VII. Trees, Representation of Trees, Binary tree, Properties of Binary Trees, Binary Tree Representations- Array and Linked Representations, Binary Tree Traversals, Threaded Binary Trees, Binary Search tree - Creation, Insertion, Deletion and Search, AVL tree- Definition, Examples, Insertion and Rotations, B tree, B+ tree, Heap- Definition, Min heap, Max heap, Insertion and Deletion. Priority Queue using Heap.

UNIT VIII. Graphs, Graph ADT, Graph Representations, Graph Traversals and Searching,

Practical

Students are required to write and practically execute programs to solve problem using various data structures. The teacher can suitably device problems which help students experiment using the suitable data structures and operations. Some of the problems are indicated below.

1. Write program that uses functions to perform the following:
   a) Creation of list of elements where the size of the list, elements to be inserted and deleted are dynamically given as input.
   b) Implement the operations, insertion, deletion at a given position in the list and search for an element in the list
   c) To display the elements in forward / reverse order
2. Write recursive programs for Factorial, Fibonacci numbers, Towers of Hanoi etc.
3. Write a program to implement stack (using array and linked list). Write a program that demonstrates the application of stack operations (Eg: infix expression to postfix conversion, postfix evaluation).
4. Write programs to implement queue using array and linked list.
5. Write program that implements linear (using array and linked list) and binary search.
6. Write programs of a) Bubble sort b) Insertion Sort c) Selection Sort d) Quicksort etc.
7. Write a program to create a Binary Search Tree and insertion and deletion of node from the tree. Write recursive and non-recursive routines to traverse a binary tree in preorder, inorder and postorder.

Internal (CA) Evaluation: Practical Note Book (15 marks), Two experiments (10 marks), Viva-voce (5 marks)

ESE Evaluation: Two experiments (10 marks), Viva-voce (10 marks)

References/ Suggested Readings:

1. Fundamentals of Data structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson-Freed, Universities Press.
2. Data structures and Algorithm Analysis in C, 2nd edition, M. A. Weiss, Pearson.
3. Data structures,Lipschutz: Schaum's outline series, Tata McGraw-Hill
4. Data Structure through C in Depth, S.K. Srivastava and DeepaliSrivastava, B.P.B Publication.

MINOR COURSE - 2

Course Name: Cost Accounting
Course Code: BCAMN201

Course Type: **Minor (Theoretical)**	Course Details:**MNC-2**		L-T-P: **4–1–0**	
Credit: **5**	Full Marks: **100**	CA Marks		ESE Marks
		Practical	Theoretical	Practical	Theoretical
			30		**70**

Course Content:

Theory

UNIT I. Introduction Meaning, scope, objectives and advantages of cost accounting; Cost centre and Cost Unit, Difference between financial and cost accounting, Limitation of Cost accounting, Classifications of cost.

UNIT II: Elements of cost and cost sheet.

UNIT III. Materials: Material/inventory control techniques. Accounting and control of purchases, storage and issue of materials. Inventory systems, EOQ, 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: Accounting and Control of labour cost. Time-keeping and time-booking. Concept of idle time, over time, labour turnover and fringe benefits. Methods of wage payment, Time Rate, Piece Rate, and Incentive schemes- Halsey, Rowan, Requisites of Good Wages Incentive Plan;

UNIT-V: Overheads: Classification, allocation, apportionment and absorption of overheads, Under- and over- absorption; Causes and treatment of Under- and over- absorption, Machine Hour Rate.

UNIT VI. Budgetary Control: Definition, features, importance, Classification Zero based Budgeting and Responsibility Accounting, Preparation of Cash Budget and Flexible Budget.

UNIT VII. Marginal Costing-concept of marginal cost and marginal costing; Assumptions, Cost-volume-profit analysis; Break-even analysis-using mathematical and graphical approaches, Profit-volume ratio, angle of incidence, margin of safety.

UNIT VIII: Standard Costing: Standard Costing and Variance Analysis: Meaning of standard cost and standard costing; advantages, limitations and applications; Variance Analysis – Material Variances and Labour Variances.

References/ Suggested Readings:

1. Cost Accounting-principles and practice, Arora, M.N., Vikas Publishing House, New Delhi.
2. Fundamentals of Cost Accounting, Jhamb, H. V., Ane Books Pvt Ltd, New Delhi.
3. Cost Accounting, Lal, Jawahar., and Srivastava, Seema, McGraw Hill Publishing Co., New Delhi.
4. Fundamentals of Cost Accounting, Singh, Surender, KitabMahal, Allahabad/New Delhi.
5. Management and Cost Accounting, Drury, Colin,Thomson Learning.
6. Cost Accounting: A Managerial Emphasis, Horngren, Charles T., George Foster and Srikant M. Dattar. Prentice Hall of India Ltd., New Delhi.
7. Cost Accounting: Principles and Methods, Jain, S.P., and Narang, K.L., Kalyani Publishers, Jalandhar.

SKILL ENHANCEMENT COURSE - 2

Course Name: Web Designing with HTML, CSS

Course Code: BCASE201

Course Type: SEC (Practical)	Course Details:**SEC-2**		L-T-P: **0–0–6**	
Credit: 3	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30		**20**	

Course Content:

Practical

Students are directed to do a minor project based on the contents of the course below (UNIT I to UNIT X) for internal and ESE evaluation.

UNIT I. Introduction to Web Design: 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 HTM: 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: 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: Creating forms for user input, Utilizing different form elements (e.g., text fields, checkboxes, radio buttons), Implementing form validation using HTML attributes.

UNIT V. Introduction to CSS: 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: Formatting text using CSS properties (e.g., font-family, font-size, color), Applying text effects (e.g., bold, italic, underline), Customizing typography using Google Fonts and other resources.

UNIT VII. Box Model and Layouts: 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: 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: Customizing link styles and states, Creating navigation menus using HTML lists and CSS, Implementing dropdown menus and responsive navigation patterns.

UNIT X. CSS Transitions and Animations: Creating smooth transitions between CSS states, Adding animations to elements using key frames and CSS properties, Incorporating CSS animation libraries and frameworks.

Internal (CA) Evaluation: Minor Project Report (15 marks), Demonstration of the minor project (10 marks), Viva-voce (5 marks).

ESE Evaluation: Presentation of the minor project (10 marks), Viva-voce (10 marks).

References/ Suggested Readings:

1. HTML & CSS: design and build websites, John Duckett, John Wiley & Sons, Inc.
2. Beginning Responsive Web Design with HTML5 and CSS3, Jonathan Fielding, Apress.

Semester- III

MAJOR COURSE - 3

Course Name: Object Oriented Programming with C ++

Course Code: BCAMJ301

Course Type: **Major (Theoretical & Practical)**	Course Details:**MJC-3**		L-T-P: **3–0–4**	
Credit: **5**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**15**	**20**	**35**

Course Content:

Theory

UNIT I: **Principles of Object Oriented Programming (OOP)**: Software Evaluation, A Look at Procedure Oriented Programming, OOP Paradigm, Basic Concepts of OOP, Benefits of OPP, Application of OOP.

UNIT II: Introduction to C++: What is C++, A simple C++ Program, More C++ statements, Structure of C++ Program. Tokens, Expression and controls Structures, Keywords, Identifiers and Constants, C++ data types, Variables: Declaration, Dynamic initialization of variables, Reference variables, Operators in C++ : Scope resolution operator, Member deferencing Operators, Memory Management Operators, Manipulators, Type cast operators, Expressions and Control Structures. Functions The main() function, Function Prototyping, Call by reference, Return by reference, Inline function.

UNIT III: Classes and Objects: Introduction, Specifying a Class, Defining member Functions, Nesting of Member functions, Private member functions, Memory Allocation for Objects, Static Data members, Static Member Functions, Arrays within a Class, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects.

UNIT IV: Pointers: Declaration and initializing, Manipulation of pointers, Pointers to objects, this pointers, Arrays of Pointers to Objects.

UNIT V. Constructors and Destructors: Constructors, Parameterized Constructors, Multiple Constructors in a class, Copy constructor, Destructors.

UNIT VI. Polymorphisms: Function Overloading, Operator overloading, Overloading Unary Operators, Overloading Binary Operators, Type Conversions.

UNIT VII: Inheritance: Introduction, Defining Derived Classes, Single inheritance, Multiple inheritance, Hierarchical inheritance, Multilevel inheritance, Hybrid inheritance, Virtual Base Classes, Constructor in Derived Classes, Pointers to Derived Classes, Static and dynamic binding, Virtual Functions, Pure Virtual Functions.

UNIT VIII: **I/O Operations and Files**: C++ Stream Classes, Unformatted I/O Operations, Formatted I/O operations, Classes for File Streams, Opening and Closing a File : open() and close() functions, Manipulators of File Pointers, Sequential Input and output Operations, Error handling in File Operations.

UNIT IX. Exception Handling: Benefits of Exception Handling, Throwing an Exception, the Try Block, Catching an Exception, Exception Objects, Exception Specifications, Rethrowing an Exception, Uncaught Exceptions.

UNIT X. Templates: Class Templates and Function Templates, simple generic classes and generic function, simple example programs. Introduction to Standard Template Library (STL).

Practical

Students are required to understand the object-oriented concepts using C++. They are required to practice the concepts learnt in the theory. Some of the programs to be implemented are listed as follows:

1. Number of vowels and number of characters in a string.
2. Write a function called zeros maller() that is passed with two introduce arguments by reference and set the smaller of the number to zero. Write a main() program to access this function.
3. Demonstration of Class, Constructors, destructors, input and output functions, Objects
4. Demonstration of array of object.
5. Demonstration of friend functions.
6. Demonstration of operator overloading.
7. Demonstration of inheritance.
8. Using this pointer to return a value (return by reference).
9. Demonstration of virtual function.
10. Demonstration of static function.
11. Accessing a particular record in a student's file.
12. Demonstration of exception handling.
13. Demonstration of class template and function template

Internal (CA) Evaluation: Practical Note Book (15 marks), Two experiments (10 marks), Viva-voce (5 marks).

ESE Evaluation: Two experiments (10 marks), Viva-voce (10 marks)

References/ Suggested Readings:

1. E.Balagurusamy, Object Oriented Programming through C++, TMH.
2. Lafore Robert, Object Oriented Programming in Turbo C++, Galgotia Publications.
3. Herbert Schildt, C++: The Complete Reference, McGraw Hill.
4. B. Stroutstrup, The C++ Programming Language, 3rd Edition, Pearson Education.
5. Ashok N Kamthane, Programming in C++, Pearson.

MAJOR COURSE - 4

Course Name: Digital Logic and Computer Organization

Course Code: BCAMJ302

Course Type: **Major (Theoretical & Practical)**	Course Details:**MJC-4**		L-T-P: **3–0–4**	
Credit: **5**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**15**	**20**	**35**

Course Content:

Theory

Unit I: Introduction to Computer-Definition of Computer System; Evolution of Computer – a brief history; Classification of computer; Generation of Computers.

Unit II: Computer System Architecture – Definition of Hardware; Basic units of Computer System; CPU – Control Unit, ALU; System Buses, Memory module – Primary Memory, Secondary Memory, Cache Memory, Virtual Memory – definition, classification, features and functions; measuring unit of memory – Bit, Byte, KB, MB, GB; Input Devices – Keyboard, Mouse, Scanner, Output Devices – Monitor, Printer.

Unit III: Introduction to Number System – Positional number systems; Binary, Octal, Hexadecimal and Decimal number systems; conversion of a number in one system to the other; Representation of signed numbers- signed magnitude, one's complement, 2's complement representation techniques, Merits of 2's complement representation scheme; Various binary codes- BCD, excess -3, Gray code; Binary arithmetic- addition, subtraction, multiplication and division of unsigned binary numbers.

Unit IV: Introduction to Software – Definition of Software; Classification of Software; Introduction to Operating System – Definition of OS; Application Softwares, Functions of OS, basic concept of different type of OS- batch processing OS, Multitasking OS, Multi-user OS, Network OS.

Unit V: Logic gates: Basic logic operations- logical sum(or), logical product (AND), complementation (not), Anti coincidence (EX-OR)and coincidence (EX-NOR) operations: Truth tables of Basic gates; Boolean Variables and Expressions; Demorgan's theorem; Universal gates- NAND and NOR; Boolean expressions Simplification- Algebraic technique, Karnaugh map technique, 3 variable and 4 variable Karnaugh map.

Unit VI: Combinational Circuits: Half adder, full adder, binary magnitude comparator, adder/subtractor circuits, multiplexer and demultiplexer circuits, BCD adder/subtractor; ALU; parity generators, code converters, priority encoders, PLAs.

Unit VII: Sequential circuits: flip- flops, - RS, clocked RS, D, JK, T flip-flops,: Race condition, Master Slave JK: Registers, Universal Shift Registers; Counters- Binary, decade; modulo-r divider; Practical IC's; Sequential Machine design.

Unit VIII: Basic Computer Organization and Design: Overview of computer architecture; Von Neumann architecture and its components; CPU, memory, input/output units; Instruction cycle, fetch-decode-execute; Data transfer and control signals

Unit IX: Processor Design and Control Unit: Basic structure of the CPU; Processor design: Control unit, Arithmetic and Logic Unit (ALU); Control unit design: Hardwired vs. Microprogrammed; Instruction set architecture (ISA); RISC vs. CISC processors; Pipelining concepts: Basic, instruction-level parallelism.

Practical

Unit I: Study on the characteristic of AND, OR, NAND, NOR, EX-OR, EX-NOR gates.

Unit II: Design of different combinational circuit such as half adder/subtractor, full adder/subtractor, decoder/encoder, priority encoder, multiplexer, demultiplexer, magnitude comparator etc.

Unit III: Study on the characteristic of different flip-flops-JK, RS, T, D etc.

Unit IV: Design and implementation of different sequential circuit such as shift register, counter-decimal, ripple etc.

CA (Internal) Evaluation: Laboratory Note Book (15 marks), Two Experiments (10 marks) Viva-voce (5 marks).

ESE Evaluation: Two Experiments (10 marks), Viva-voce (10 marks).

References/ Suggested Readings:

1. M. Morris Mano, Digital Logic, Pearson.
2. D.P. Leach, A.P. Malvino and G. Saha, Digital Principles and Applications, McGraw-Hill.
3. Modern Digital Electronics: R.P. Jain, Tata McGraw Hill.

MINOR COURSE - 3

Course Name: Introduction to Algebra and Trigonometry
Course Code: BCAMN301

Course Type: **Minor (Theoretical)**	Course Details:**MNC-3**		L-T-P: **4–1–0**	
Credit: **5**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		-	30	-	70

Course Content:

Theory

Unit I. Set: Sets and their representations,Finite and Infinite sets,Empty set. Power set. Equal sets. Subsets.Properties of Complement Sets.Venn diagrams. Difference of sets.Complement of a set.Universal set. Subsets of a set of real numbers especially intervals (with notations).Union and Intersection of sets and Practical Problems based on sets.

Relations and Functions: Defination,Types of relations: reflexive, symmetric, transitive and equivalence relations. Injective,surjective and bijective functions.

Unit II. Complex Number: Conjugate of a complex number, modulus of a complex Number, geometrical representation of complex number, De Moivre's theorem, nth roots of a complex number.

UNIT III. Permutations & Combinations: Fundamental Principle of counting. Factorial n. (n!) Permutations and combinations, derivation of formulae and their connections, simple applications.

UNIT IV. Matrices: Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operations on matrices: Addition and multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).

Unit V. Determinants: Determinant of a square matrix (up to 3 x 3 matrices), minors, co-factors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix,Cramer's rule.

Unit VI. Modern algebra: Introduction to Group, Ring, Field, integral domain with simple examples.

Theory of equations: Polynomials, Division algorithm, Fundamental theorem of classical algebra (Proof not required),Descartes rule of sign and their application, Relation between roots and coefficients; symmetric function of roots, Transformation of polynomial equation, Cardon's solution of cubic equation

Unit VII. Sequence and series: Arithmetic Progression (A.P.), Arithmetic Mean (A.M.), Geometric Progression (G.P.), Geometric Mean (G.M,) relation between A.M. & G.M., Arithmetic-Geometric Progression Series (AGP series), infinite G.P. and its sum.

Unit VIII. Vector Algebra: Scalars & vectors, vector addition, linear combination of vectors, condition of colinearity of three points, scalar and vector products, scalar triple product and vector triple product.

Unit IX. Trigonometry Basics: Positive and negative angles, Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity $\sin^2 x + \cos^2 x = 1$, for all x.

Unit X. Signs of Trigonometric Functions: Signs of trigonometric functions**,** domain, range and sketch their graphs.

Unit XI. Trigonometry Expressions: Expressing $\sin(x \pm y)$ and $\cos(x \pm y)$ in terms of $\sin x$, $\cos x$, $\sin y$ and cos y, Deducing identities like the following: $\tan(x \pm y)$, $\cot(x \pm y)$, sin x+sin y, cos x+cos y,sin x- sin y, cos x-cos y. Identities related to sin2x, cos2x, tan2x, sin3x, cos3x and tan3x.

References/ Suggested Readings:

1. J. G. Chakravorty & P. R. Ghosh, Advanced Higher Algebra, U. N. Dhur and Sons Private Limited, 2019.
2. J. G. Chakravorty & P. R. Ghosh, Vector Analysis: Vector Algebra & Vector Calculus, U. N. Dhur and Sons Private Limited, 1967.
3. M. K. Sen, Shamik Ghosh & Parthasarathi Mukhopadhyay, Topics in Abstract Algebra, Universities Press, 2022.
4. Gilbert Strang; Introduction to Linear Algebra (5th Edition); Wellesley-Cambridge Press, 2019.
5. K. Hoffman, R. Kunze, Linear algebra, Prentice Hall India Learning Pvt. Ltd., 2015.
6. W.S. Burnside and A.W. Panton, Theory of equations, Dublin University Press Series, S. Chand and Company Pvt. Ltd., 1986.
7. H.S. Hall, S.R. Knight, Elementary Trigonometry, G. K. Publications.

Semester- IV

MAJOR COURSE - 5

Course Name: Operating System

Course Code: BCAMJ401

Course Type: **Major (Theoretical & Practical)**	Course Details:**MJC-5**		L-T-P: **3–0–4**	
Credit: **5**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**15**	**20**	**35**

Course Content:

Theory

UNIT I. Introduction to Operating System: What is Operating System? History and Evolution of OS, Basic OS functions, Resource Abstraction, Types of Operating Systems– Multiprogramming Systems, Batch Systems, Time Sharing Systems; Operating Systems for Personal Computers, Workstations and Hand-held Devices, Process Control & Real time Systems.

UNIT II. Operating System Organization and Process Characterization: Processor and User Modes, Kernels, System Calls and System Programs, System View of the Process and Resources, Process Abstraction, Process Hierarchy, Threads, Threading Issues, Thread Libraries; Process Scheduling, Non-Pre-emptive and Preemptive Scheduling Algorithms.

UNIT III. Process Management: Deadlock, Deadlock Characterization, Necessary and Sufficient Conditions for Deadlock, Deadlock Handling Approaches: Deadlock Prevention, Deadlock Avoidance and Deadlock Detection and Recovery.

UNIT IV. Inter Process Communication and Synchronization: Concurrent and Dependent Processes, Critical Section, Semaphores, Methods for Inter-process Communication; Process Synchronization, Classical Process Synchronization Problems: Producer-Consumer, Reader-Writer.

UNIT V. Memory Management: Physical and Virtual Address Space; Memory Allocation Strategies– Fixed and -Variable Partitions, Paging, Segmentation, Virtual Memory; Page Replacement Algorithms.

UNIT VI. File and I/O Management, Disk Scheduling, OS security: Directory Structure, File Operations, File Allocation Methods, Device Management, Pipes, Buffer, Shared Memory, Disk Scheduling (FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK), Security Policy Mechanism, Protection, Authentication and Internal Access Authorization.

UNIT VII. Android Operating System: Introduction to Android Operating System, Android Development Framework, Android Application Architecture, Android Process Management and File System.

Practical

UNIT I. Students are required to write and practically execute programs to solve following problems using C programming language.

1. WRITE A PROGRAM (using fork() and/or exec() commands) where parent and child execute: a) same program, same code. b) same program, different code. c) before terminating, the parent waits for the child to finish its task.
2. WRITE A PROGRAM to report behavior of Linux kernel including kernel version, CPU type and model. (CPU information)
3. WRITE A PROGRAM to report behavior of Linux kernel including information on configured memory, amount of free and used memory. (memory information)
4. WRITE A PROGRAM to print file details including owner access permissions, file access time, where file name is given as argument.
5. WRITE A PROGRAM to copy files using system calls.
6. Write programs to implement scheduling algorithms (FCFS, Round Robin, SJF, SRJF)
7. Write program to implement non-preemptive priority based scheduling algorithm.
8. Write program to implement preemptive priority based scheduling algorithm.
9. Write program to calculate sum of n numbers using thread library.
10. Write a program to implement first-fit, best-fit and worst-fit allocation strategies.

UNIT II. UNIX and Shell Scripts
1. External and internal commands of UNIX
2. What is shell and various type of shell, Various editors present in unix/linux
3. Different modes of operation in vi editor
4. What is shell script, Writing and executing the shell script
5. Shell variable (user defined and system variables)
6. System calls, Using system calls
7. Pipes and Filters
8. Decision making in Shell Scripts (If else, switch), Loops in shell
9. Functions
10. Utility programs (cut, paste, join, tr, uniq utilities), Pattern matching utility (grep).

Internal (CA) Evaluation: Practical Note Book (15 marks), Two experiments (10 marks) – one from each unit, Viva-voce (5 marks).

ESE Evaluation: Two experiments (10 marks) – one from each unit, Viva-voce (10 marks).

References/ Suggested Readings:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. Sumitabha, Das, Unix Concepts and Applications, Tata McGraw-Hill Education.

4. Nemeth Synder and Hein, Linux Administration Handbook, Pearson Education, 2nd Edition ,2010.
5. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Unix Network Programming, The sockets Networking API, Vol. 1, 3rd Edition, 2014.
6. Yashavant Kanetkar , UNIX Shell Programming, BPB Publication.
7. Kernighan and Pike, The Unix Programming Environment, Prentice-Hall.

MAJOR COURSE - 6

Course Name: Database Management System
Course Code: BCAMJ402

Course Type: **Major (Theoretical & Practical)**	Course Details:**MJC-6**		L-T-P: **3–0–4**	
Credit: **5**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**15**	**20**	**35**

Course Content:

Theory

Unit I. Introduction: Basic Concept, Drawbacks of File Management; Advantages of DBMS; Layered Architecture of Database, Data Independence; Data Models; Schemas and Instances; Database Languages; Database Users, DBA; Data Dictionary; Functional Components of a DBMS.

Unit II. ER Model: Entity, Attributes and Relationship; Structural Constraints; Keys (candidate, super, foreign, primary); Weak & strong Entity Set; ER Diagram; Specialization and Generalization; Constraints of Specialization and Generalization; Aggregation.

Unit III. Relational Model: Basic Concepts of Relational Model; Relational Algebra, introduction to Tuple Relational Calculus.

Unit IV. SQL: DDL, DCL, DML commands, aggregate functions, create a database table, create relationships between database tables, modify and manage tables, queries, create view.

Unit V. Integrity Constraints: Domain Constraints, Referential Integrity.

Unit VI. Relational Database Design: Problems of Un-Normalized Database; Functional Dependencies, Derivation Rules, Closure of FD Set, Membership of a Dependency, Canonical Cover; Decomposition to 1NF, 2NF, 3NF or BCNF Using FDs; Lossless Join Decomposition & Dependency Preservation.

Unit VII. Transaction Processing: ACID properties, concurrency control

Practical

Students are required to practice the concepts learnt in the theory by designing and querying a database for a chosen organization (Like Library, Transport etc). The teacher may devise appropriate weekly lab assignments to help students practice the designing , querying a database in the context of example database. Some indicative list of experiments is given below.

Experiment 1: E-R Model Analyze the organization and identify the entities , attributes and relationships in it. . Identify the primary keys for all the entities. Identify the other keys like candidate keys, partial keys, if any.

Experiment 2: Concept design with E-R Model Relate the entities appropriately. Apply cardinalities for each relationship. Identify strong entities and weak entities (if any).

Experiment 3: Relational Model Represent all the entities (Strong, Weak) in tabular fashion. Represent relation ships in a tabular fashion.

Experiment 4: Normalization Apply the First, Second and Third Normalization levels on the database designed for the organization

Experiment 5: Practicing DDL commands,Creating databases, How to create tables, altering the database, dropping tables and databases if not required. Try truncate, rename commands etc.

Experiment 6: Practicing DML commands on the Database created for the example organization DML commands are used to for managing data within schema objects. Some examples: ● SELECT - retrieve data from the a database ● INSERT - insert data into a table ● UPDATE - updates existing data within a table ● DELETE - deletes all records from a table, the space for the records remain

Experiment 7: Querying practice queries (along with sub queries) involving ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.

 Experiment 8: Querying (continued…) Practice queries using Aggregate functions (COUNT, SUM, AVG, and MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.

Internal (CA) Evaluation: Practical Note Book (15 marks), Two experiments (10 marks), Viva-voce (5 marks)

ESE Evaluation: Two experiments (10 marks), Viva-voce (10 marks)

References/ Suggested Readings:

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education,2010.
2. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education, 2013.
5. Ullman, Principles of Database Systems, Galgotia Publications.

MINOR COURSE - 4

Course Name: Introduction to Calculus and Differential Equation

Course Code: BCAMN401

Course Type: **Minor (Theoretical)**	Course Details:**MNC-4**		L-T-P: **4–1–0**	
Credit: **5**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		-	30	-	70

Course Content:

Theory

Unit I. Differential Calculus: Limit of a function and continuity. Fundamental properties of continuous functions (proofs not required).
Derivative: Differentiation of powers of x, Differentiation of exp and log x, differentiation of trigonometric functions, Rules for finding derivatives, Different types of differentiation, logarithmic differentiation, differentiation by substitution, differentiation of implicit functions, differentiation from parametric equation. Differentiation from first principles.Second order derivatives.
Successive differentiation. Leibnitz's theorem.
Rolle's theorem, Mean-Value theorems—Lagrange's and Cauchy's.
Partial Derivatives.Euler's theorem on homogeneous functions of two variables.
Application of derivatives:Maxima-Minima, Determining Increasing and Decreasing Functions.

Unit II. Integral Calculus: Integration of standard Functions, rules of Integration, More formulas in integration, Definite integrals and their elementary properties. Area of a simple curves using definite integral.

Unit III. Differential equations: First order differential equations, practical approach to Differential equations, first order and first degree differential equations, separation of variable, homogeneous equations. Linear equations, Bernoulli's equation, Exact Differential Equations, Integrating factors. Oblique and orthogonal trajectories, equations of first order but not first degree, Clairaut's form, Wronskian: its properties and applications, Linear homogeneous and non-homogeneous equations of higher order with constant coefficients, method of variation of parameters.

References/ Suggested Readings:

1. Das and Mukherjee, Differential Calculus, Dhar and Sons. Pvt. Ltd.
2. Das and Mukherjee, Integral Calculus and Differential Equations, Dhar and Sons. Pvt. Ltd.
3. Chakravorty and Ghosh, Differential Equations, Dhar and Sons. Pvt. Ltd.

SKILL ENHANCEMENT COURSE - 3

Course Name: Reasoning and Aptitude

Course Code: BCASE401

Course Type: SEC (Theoretical)	Course Details: **SEC-3**		L-T-P: 3–0–0	
Credit: 3	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		-	**15**	-	**35**

Course Content:

Theory

UNIT I. Quantitative Ability (Basic Mathematics): Number Systems, LCM and HCF, Decimal Fractions, Simplification, Square Roots and Cube Roots, Average, Problems on Ages, Surds & Indices, Percentages, Problems on Numbers.

UNIT II. Quantitative Ability (Applied & Engineering Mathematics), Logarithm, Permutation and Combinations, Probability, Profit and Loss, Simple and Compound Interest, Time, Speed and Distance, Time & Work, Ratio and Proportion, Area, Mixtures and Allegation.

UNIT III. Data Interpretation, Data Interpretation, Tables, Column Graphs, Bar Graphs, Line Charts, Pie Chart, Venn Diagrams.

UNIT IV. Logical Reasoning (Deductive Reasoning), Analogy, Blood Relation, Directional Sense, Number and Letter Series, Coding – Decoding, Calendars, Clocks, Venn Diagrams, Seating Arrangement, Syllogism, Mathematical Operations.

References/ Suggested Readings:
1. R S Agarwal, A Modern Approach To Verbal & Non Verbal Reasoning, S Chand Publishing.
2. R S Agarwal, Quantitative aptitude for Competitive examination, S Chand Publishing.
3. Abhijit Guha, Quantitative Aptitude by Competitive Examinations. McGraw Hill Education.
4. B.S. Sijwalii and Indu Sijwali, A New Approach to REASONING Verbal & Non-Verbal, Arihant Publications.

Internal (CA) Evaluation: To be decided by the college/institution.

ESE Evaluation: 35 MCQs to be answered from 40 MCQs given.