



Maharaja Suhel Dev University

Azamgarh (U.P.) - 276128, India

SYLLABUS

Bachelor of Computer Applications (BCA)
4-Years Undergraduate Programme
(Effective from Session 2025-26 Onwards)

Board of Studies

Computer Science & Engineering

Maharaja Suhel Dev University
Azamgarh (U.P.) - 276128, India

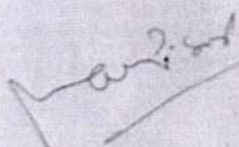
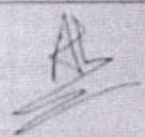
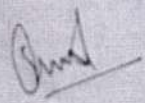
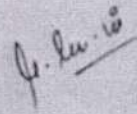
Bachelor in Computer Application (BCA)

Bachelor of Computer Application (BCA) under FYUP of NEP 2020 Semester - I

Course Code	Course title	credits	Evaluation Pattern		
			Int. Asst.	External	MM
BCA 101	IT Tools and Applications	4	25	75	100
BCA 102	Computer Organization	4	25	75	100
BCA 103(P)	PC Software Lab (P)	4	-	100	100
Z010101T	Co-curricular/Ability Enhancement Course (AEC)	2	-	100	100
	Vocational/ Skill Enhancement Course (SEC) - related to Main subject	3	60 (Skill test)	40 (Theory)	100
		17			

Semester - II

Course Code	Course title	credits	Evaluation Pattern		
			Int. Asst.	External	MM
BCA 201	Programming Principles and C Language	4	25	75	100
BCA 202	Concept of Artificial Intelligence	4	25	75	100
BCA 203	Minor (Discrete Mathematics)	6	25	75	100
BCA 204(P)	Programming in C Lab	4	-	100	100
Z020201	Co-curricular/Ability Enhancement Course (AEC)	2	-	100	100
	Vocational/ Skill Enhancement Course (SEC) - related to Main subject	3	60 (Skill test)	40 (Theory)	100
		23			

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Year 1 Semester: I

IT TOOLS & APPLICATIONS

Course Code: BCA 101

Unit-I: Introduction

The unit covers the definition of a PC and its components, along with the concepts of software, hardware, and firmware. It explains different types of software and distinguishes between a program and software.

Unit-II: MS-DOS

This unit introduces basic operating system concepts, including the Command-Line User Interface (CUI), files and directories, and system booting. It covers internal and external DOS commands, disk partitioning, and the limitations of DOS.

Unit-III: MS Windows

Students will learn the basics of multiprogramming and the Graphical User Interface (GUI). The unit explores file and folder management, login and logout procedures, and key Windows features such as My Documents, My Computer, My Network Places, Recycle Bin, Start Button, and Taskbar. Additional topics include date and time settings, and the use of built-in tools like Calculator, WordPad, and system utilities.

Unit-IV: MS Office

Word Processing

This section covers word processing fundamentals, including screen layout, document handling (opening, saving, and printing, including PDFs), and text formatting (character, paragraph, and document-level). It also includes inserting headers and footers, finding and replacing text, spell check, table manipulation (insertion, borders, shading), and mail merge for bulk document creation.

Spreadsheet

The spreadsheet module introduces basic concepts, screen elements, and operations such as opening, saving, and printing spreadsheets. It covers data entry, cell editing, sorting, filtering, row/column management, basic formulas and functions, and chart creation for data visualization.

Presentation

Students will learn presentation basics, including opening, saving, and printing slides/handouts. The unit covers slide enhancement using images, objects, and multimedia, formatting techniques, and slide show management with transitions and animations.

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Unit-V: Computer Communication and Internet

Internet Basics

This section provides an overview of the internet, its architecture, services, and communication methods, along with steps to configure internet access.

WWW and Web Browsers

Topics include web browsing software, browser configuration, search engine usage, and downloading/printing web pages.

Email and Online Communication

The unit explains email fundamentals, addressing, and configuration. It covers email client usage (Inbox, Outbox, sending emails), attaching documents, and forwarding messages.

Recommended Books:

- MS Office: Joan Lambert, Curtis Frye, *Microsoft Office Step by Step*, Pearson Education.
- Computer Concepts and Microsoft Office Dr. Anita Goel Pearson Education
- Computer Fundamentals with Office Automation Dr. P.K. Sinha, Priti Sinha BPB Publications

COMPUTER ORGANIZATION

Course Code: BCA 102

Unit – I: Number System

Introduction to number systems, Binary, Octal, and Hexadecimal number systems. Conversion methods from decimal to binary, octal, and hexadecimal. Representation of numbers in computers (signed, unsigned, floating-point). Overview of character encoding schemes (ASCII, Unicode).

Unit – II: Logic Gates & Boolean Algebra

Boolean algebra fundamentals (laws, theorems). Minterms and maxterms, simplification of Boolean functions using algebraic methods and Karnaugh Maps (K-Maps). Combinational circuits: Half adder, Full adder, Decoder, Encoder, Multiplexer, Demultiplexer. Sequential circuits: Binary counters, Flip-Flops (SR, D, JK, T).

Unit – III: Memory Organization

Primary memory: RAM (SRAM, DRAM), ROM (PROM, EPROM, EEPROM). Secondary/Auxiliary memory (magnetic disks, optical disks). Memory hierarchy (registers, cache, main memory, secondary storage). Associative memory, Virtual memory concepts, Cache memory (mapping techniques). Memory management hardware (MMU, paging, segmentation).

Unit – IV: Input-Output Organization

Peripheral devices and I/O interfaces. I/O commands (control, status, data transfer). Modes of data transfer (programmed I/O, interrupt-driven I/O, DMA). Asynchronous data transfer (strobe control, handshaking). Direct Memory Access (DMA) and I/O Processors (IOP).

Unit – V: Processor Organization

Instruction formats (zero-address, one-address, two-address, three-address). CPU architectures: Single Accumulator, General Register, and Stack-based organizations. Addressing modes (immediate, direct, indirect, indexed, relative). Data transfer and manipulation instructions.

Recommended Books:

1. Primary Textbooks:

- M. Morris Mano, *Computer System Architecture*, 3rd Edition, Pearson Education.
- William Stallings, *Computer Organization and Architecture*, 11th Edition, Pearson Education.

2. Additional References:

- Carl Hamacher et al., *Computer Organization and Embedded Systems*, 6th Edition, McGraw Hill.

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- **David A. Patterson & John L. Hennessy**, *Computer Organization and Design (RISC-V Edition)*, Morgan Kaufmann.
 - **Andrew S. Tanenbaum**, *Structured Computer Organization*, 6th Edition, Pearson.
 - **Ramesh Gaonkar**, *Microprocessor Architecture, Programming, and Applications*, Penram International.
3. **For Practical Logic Design:**
- **M. Morris Mano**, *Digital Design*, 5th Edition, Pearson (covers K-Maps, adders, counters in detail).

Year 1 Semester: II

PROGRAMMING PRINCIPLES AND C LANGUAGE

Course Code: BCA 201

Unit – I: Introduction to C Programming

This unit covers the fundamental concepts of programming including algorithms and flowcharts. It introduces programming languages with a focus on the history and evolution of C language. The basic structure of a C program is explained along with the process of compiling and executing C programs. The unit also covers data types including constants, variables, identifiers, keywords, and tokens. Detailed explanation is provided about variable declaration and initialization. The operator section includes arithmetic, relational, logical, assignment, increment/decrement, conditional (ternary), and bitwise operators, along with arithmetic expressions and precedence rules.

Unit – II: Control Structures & Arrays

This section explains various control structures in C programming. Branching constructs include if, if-else, nested if, else-if ladder, switch-case, and goto statements. Looping constructs cover while, do-while, and for loops, along with break and continue statements. The array section defines array declaration and initialization for one-dimensional, two-dimensional and multidimensional arrays, including passing arrays to functions. String handling includes string declaration, initialization, input/output operations and commonly used string handling functions like strlen(), strcpy(), strcat() etc.

Unit – III: Functions & Pointers

The function section differentiates between library and user-defined functions, covering function definition, calling, return values and types. It explains functions with no arguments and no return value, functions with arguments but no return value, and recursive functions. The pointer section details address accessing, pointer declaration and initialization, pointer expressions, and the relationship between pointers and arrays, functions, structures, as well as pointer-to-pointer concepts. Function nesting and arrays as function arguments are also covered.

Unit – IV: Structures & Unions

This unit explains structure definition, member value assignment, and structure initialization. It covers advanced concepts like arrays of structures, nested structures, and sizeof operator for structures. The union section provides definition and differentiation from structures, highlighting memory allocation differences and practical applications of unions in C programming.

Unit – V: File Handling & Dynamic Memory Allocation

File handling includes file definition, opening/closing files, input/output operations, error handling techniques, and random-access file operations. The dynamic memory allocation section explains memory management functions like malloc(), calloc(), free(), and realloc(), covering their syntax, usage, and practical implementation scenarios.



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Recommended Books:

1. **Ashok Kamthane**, *Programming in C*, Pearson Education
2. **Brian W. Kernighan & Dennis M. Ritchie**, *The C Programming Language*, 2nd Edition, Pearson Education
3. **Gottfried**, *Programming in C*, McGraw Hill
4. **Yashavant Kanetkar**, *Let Us C*, BPB Publications
5. **E. Balagurusamy**, *ANSI C Programming*, 3rd Edition, McGraw Hill

ARTIFICIAL INTELLIGENCE

Course Code: BCA 202

Unit-I: Introduction to Artificial Intelligence

This unit provides a comprehensive introduction to Artificial Intelligence, covering its foundational concepts and historical development. It explores the various applications of AI across different industries and domains. The unit also critically examines both the advantages and disadvantages of artificial intelligence implementations, providing students with a balanced understanding of the technology's potential and limitations in real-world scenarios.

Unit-II: Machine Learning Fundamentals

This section introduces machine learning as a core component of artificial intelligence. It covers supervised and unsupervised learning paradigms, explaining their differences and use cases. The unit details decision trees as a fundamental machine learning technique and explores statistical learning models. A special focus is given to learning with complete data through Naive Bayes models. The unit concludes with an introduction to deep learning, discussing its applications across various fields and the significant challenges associated with deep learning implementations.

Unit-III: Pattern Recognition Systems

This unit focuses on pattern recognition as a key AI capability. It begins with fundamental concepts and design principles of pattern recognition systems. The section covers statistical pattern recognition methods in detail, including various classification techniques. Specific algorithms examined include the Nearest Neighbor (NN) Rule and Bayes Classifier. The unit also explores unsupervised learning through K-means clustering algorithms, providing students with practical knowledge of how these techniques are applied in real-world pattern recognition tasks.

Recommended Books:

1. **Reema Thareja**, *Artificial Intelligence: Beyond Classical*, Pearson Education
2. **Stuart Russell and Peter Norvig**, *Artificial Intelligence: A Modern Approach*, Pearson Education
3. **Elaine Rich and Kevin Knight**, *Artificial Intelligence*, Tata McGraw Hill
4. **Tom Mitchell**, *Machine Learning*, McGraw Hill
5. **Christopher Bishop**, *Pattern Recognition and Machine Learning*, Springer

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Year 1 Semester: II

DISCRETE MATHEMATICS

Course Code: BCA 203

Unit – I: Set, Relation, and Function

This unit begins with fundamental concepts of sets, including subsets, set operations, power sets, and Cartesian products. It explores relations through composition of relations and various types of relations such as equivalence and partial orders. The function section covers mathematical functions with emphasis on exponential and logarithmic functions. The algebraic structures portion introduces groups, subgroups (finite, infinite, and cyclic), permutation groups, and homomorphisms (isomorphism, automorphism, endomorphism). It concludes with advanced algebraic concepts including cosets, fields, subfields, and rings.

Unit – II: Mathematical Logic

This section covers propositional logic through logical statements, notations, and connectives. It examines normal forms (DNF and CNF) and the theory of inference for statement calculus. The unit extends to predicate calculus, introducing quantifiers and their applications in logical reasoning.

Unit – III: Basic Concepts of Graph Theory

This unit introduces foundational graph theory concepts: pseudographs, multigraphs, simple graphs, bipartite graphs, and complete bipartite graphs. It proves the Handshaking Lemma and analyzes subgraphs and graph operations. The section details walks, paths, circuits, and their properties, concluding with practical applications like the Shortest Path Problem.

Unit – IV: Eulerian and Hamiltonian Graphs

This section distinguishes unicursal and Eulerian graphs, including randomly Eulerian graphs, with Fleury's Algorithm for Eulerian trails. It solves the Chinese Postman Problem and analyzes Hamiltonian graphs through necessary/sufficient conditions. The unit concludes with the Traveling Salesman Problem as a real-world application.

Unit – V: Trees and Network Flow

The trees portion defines tree properties, distance metrics (radius, diameter), and spanning trees with Cayley's counting formula. It compares Kruskal's and Prim's algorithms for minimal spanning trees and examines graph connectivity. The network flow section introduces flows, cuts, max-flow min-cut theory, and augmenting paths. It details Ford-Fulkerson and Edmonds-Karp algorithms, concluding with Menger's theorems on connectivity.

Recommended Books:

1. C.L. Liu, *Elements of Discrete Mathematics*, McGraw Hill
2. S. Pal, *Graph Theory and Its Applications*, Umesh Publications
3. Kenneth Rosen, *Discrete Mathematics and Its Applications*, McGraw Hill
4. Narsingh Deo, *Graph Theory with Applications to Engineering and Computer Science*, Prentice Hall
5. Douglas West, *Introduction to Graph Theory*, Pearson