Bachelor of Computer Applications (Data Science)
Semester–I

Course Code	Course Title	L	T	P	Credits
BCA-101A	Foundations of Computer Science (Pre-requisite: None)	3	0	0	3
		CIE	SEE		Total
		40	60		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-101A.1	Understand the basics of computers
BCA-101A.2	Explain input/output devices, hardware/software, and types of software.
BCA-101A.3	Evaluate different computer languages and the roles of compilers, interpreters, and linkers.
BCA-101A.4	Create a conceptual framework for understanding computer networks.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-101A.1	3	-	-	-	-	-	-	2
BCA-101A.2	3	-	-	-	-	-	-	2
BCA-101A.3	3	-	-	2	-	-	-	2
BCA-101A.4	3	2	2	-	-	-	2	2

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I — Contact Hours: 12

Basics of Computer, Software and Memory

Computer Fundamentals: Computer Evolution through Generations, Computer Characteristics, Computer Strengths and Limitations, Computer Classification, Computer System Components, Computer Applications in Various Fields.

Types of Software: System Software, Application Software, Utility Software, Shareware, Freeware, Firmware, Open Source Software.

Memory Systems: Bits, Bytes, Words, and Nibbles; Storage Locations and Addresses; Storage Capacity Measurement Units; Access Time; Memory Hierarchy. Primary Memory: RAM, ROM, PROM, EPROM. Secondary Memory: Storage Devices; Magnetic Tape, Hard Disk, Optical Disk, Flash Memory

UNIT-II — Contact Hours: 12

Input/ Output Devices and Operating System basics

I/O Devices: Desktop Computer I/O Ports, Device Controllers, Device Drivers. Input Devices: Types and Uses; Keyboard, Pointing Devices—Mouse, Touchpad, Trackball, Joystick, Magnetic Stripes, Scanner, Digital Camera, microphone. Output Devices: Speakers, Monitors, Printers—Types, Laser, Inkjet, Dot-Matrix, Plotters.

Introduction to Operating Systems: Definition, Functions, Features; Icons, Folders, Files; Start Button, Taskbar, Status Buttons, Shortcuts, Recycle Bin, Desktop, My Computer, My Documents, Windows Explorer, Control Panel.

UNIT-III — Contact Hours: 10

Internet and Electronic mail concepts

The Internet: Network and Internet Basics, History, Internet vs. Intranet vs. Extranet, How the Internet Works, Internet Connection Methods.

Electronic Mail: Overview, Pros and Cons, User IDs, Passwords, Email Addresses, Message Components, Composition, Mailer Features. Web Browsing: Browsers and Search Engines.

UNIT-IV **Contact Hours: 11**

Threats and Security fundamentals

Threats: Physical and Non-Physical Threats, Viruses, Worms, Trojans, Spyware, Keyloggers, Rootkits, Adware, Cookies, Phishing, Hacking, Cracking.

Computer Security Fundamentals: Confidentiality, Integrity, Authentication, Non-Repudiation, Security Mechanisms, Security Awareness, Security Policies, Anti-Virus Software and Firewalls, Backup and Recovery.

Text Books:

1. Sinha, P. K. & Sinha, Priti, *Computer Fundamentals*, BPB
2. Dromey, R.G., *How to Solve it By Computer*, PHI

Other References:

1. Balagurusamy E, *Computing Fundamentals and C Programming*, Tata McGraw Hill.
2. Norton, Peter, *Introduction to Computer*, McGraw-Hill

Course Code	Course Title	L	T	P	Credits
BCA-103A	Digital Logic Design (Pre-requisite: None)	3	0	0	3
		CIE	SEE		Total
		40	60		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-103A.1	Understand the fundamental principles of Number System.
BCA-103A.2	Optimize the logic functions using Boolean principles and K-map.
BCA-103A.3	Design the various combinational logic circuits and Sequential logic circuits using data path circuits.
BCA-103A.4	Analyze basic Computer Organization including Instruction cycle.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-103A.1	3	-	-	-	-	-	-	2
BCA-103A.2	3	-	2	-	-	-	-	2
BCA-103A.3	3	2	3	-	-	-	-	2
BCA-103A.4	3	3	3	-	-	-	-	2

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I — Contact Hours: 12

Number System and Codes

Introduction, Binary Number System, Decimal Number System, Octal Number System, Hexa Decimal Number System and Conversion from one number system to another, Error Detecting and Correcting Codes: Parity Check Code, CRC and Hamming Code, BCD Number System:BCD Codes, Natural Binary Codes, Weighted Codes, Self complementing Codes,Excess-3 Codes and Cyclic Codes, Representation of sign number, Sign magnitude,1's and 2's Complement.

UNIT-II — Contact Hours: 12

Boolean Algebra and Logic Gates

Boolean Algebra Postulates, Boolean laws and theorems, Boolean expressions and functions, truth table, canonical representation (SOP, POS), simplification of Boolean function by Boolean algebra, K-Map (up to 4 variables), handling don't care conditions.

Digital Logic Gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, symbols, expressions and truth table, implementation- using NAND and NOR gates.

UNIT-III — Contact Hours: 10

Combinational and Sequential Circuit

Combinational Circuit-Introduction, half adder, full adder, half subtractor, full subtractor, multiplexer (2:1,4:1,8:1), demultiplexer (1:2,1:4,1:8), comparators (1 bit and 2 bit), multiplexer, demultiplexer, encoder, decoder, seven segment display, code convertor.

Sequential Circuit- Introduction, Flip Flops (SR, JK, D, T, Master Slave Flip Flop) and their applications, state diagram, state table, excitation table, state equations, characteristic table.

UNIT-IV **Contact Hours: 11**

Registers and Computer Organization

Register – Designing Registers-Serial in Serial Out Register (SISO), Serial in Parallel Out Register (SIPO), Parallel in Parallel Out Register (PIPO), Parallel in Serial Out Register (PISO), Shift Register.

Basic Computer Organization and Design - Instruction codes, Types of Instructions (Register reference, Memory reference, Input-Output reference), computer registers, addressing modes, instruction cycle.

Text Books:

1. M. Moris Mano (2006), *Computer System Architecture*, 3rd edition, Pearson/PHI, India.
2. Pratima Manhas and Shaveta Thakral, *Digital Electronics*, S.K. Kataria & sons, India
3. P. K. Sinha , *Computer Fundamentals*, 8th edition , BPB Publications, India

Other References:

1. William Stallings (2010), *Computer Organization and Architecture- designing for performance*, 8th edition, Prentice Hall, New Jersy.
2. Anrew S. Tanenbaum (2006), *Structured Computer Organization*, 5th edition, Pearson Education Inc,
3. John P. Hayes (1998), *Computer Architecture and Organization*, 3rd edition, Tata McGrawHill
4. Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), *Computer Organization*, 5th edition, McGraw Hill, New Delhi, India.

Course Code	Course Title	L	T	P	Credits
BCA-171A	Digital Logic Design Lab (Pre-requisite: Digital Logic fundamentals)	0	0	4	2
		CIE	SEE		Total
		50	50		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-171A.1	Understand the fundamental principles of Number System
BCA-171A.2	Optimize the logic functions using Boolean principles and K-map
BCA-171A.3	Design the various combinational logic circuits and Sequential logic circuits using data path circuits.
BCA-171A.4	Analyze basic Computer Organization including Instruction cycle.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-171A.1	3	-	-	-	-	-	-	2
BCA-171A.2	3	-	2	-	-	-	-	2
BCA-171A.3	3	2	3	-	-	-	-	2
BCA-171A.4	3	3	3	-	-	-	-	2

List of Experiments

No.	Experiment Detail
1.	Draw and realize Trainer Kit and its other components.
2.	Draw and study of different Digital IC's and its specification and Verification of the Truth Table of logic gates using TTL IC's.
3.	Evaluation of a given Boolean function using logic gates in both SOP and POS form.
4.	Design and Implement 4 bit Half Adder using 7483 IC.
5.	Design and Implement 4-bit Full Adder using 7483 IC.
6.	Design and Implement 4:1 Multiplexer using 4153 IC.
7.	Design and Implement 1:4 Demultiplexer using 74155 IC.
8.	Implementation and verification of 2 x 4 decoder using logic gates.
9.	Implementation and verification of 2 x 4 encoder using logic gates.
10.	Design and Implement 4x16 decoder with 3 x 8 decoder
11.	Construct 7 Segment Display Circuit using decoder or 7 Segment LED and test it.
12.	Draw the circuit diagram of a single bit comparator and test the output.
13.	Verification of state table of RS, JK, T and D flip flop using logic gates.
14.	Verify the operations of 4-bit shift register for different modes of operations.

Text Books:

1. M. Moris Mano (2006), *Computer System Architecture*, 3rd edition, Pearson/PHI, India.
2. Pratima Manhas and Shaveta Thakral, *Digital Electronics*, S.K. Kataria & sons, India

3. P. K. Sinha , *Computer Fundamentals*, 8th edition , BPB Publications, India

Other References:

1. William Stallings (2010), *Computer Organization and Architecture- designing for performance*, 8th edition, Prentice Hall, New Jersy.
2. Anrew S. Tanenbaum (2006), *Structured Computer Organization*, 5th edition, Pearson Education Inc,
3. John P. Hayes (1998), *Computer Architecture and Organization*, 3rd edition, Tata McGrawHill
4. Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), *Computer Organization*, 5th edition, McGraw Hill, New Delhi, India.

Course Code	Course Title	L	T	P	Credits
BCA-105A	Problem Solving through C (Pre-requisite: None)	3	0	0	3
		CIE	SEE		Total
		40	60		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-105A.1	Understand the basics of C program, data types and input/output statements
BCA-105A.2	Explain different types of operators, their hierarchies and control statements of C.
BCA-105A.3	Compile programs using arrays, strings and user defined functions.
BCA-105A.4	Apply advanced concepts like structures, union and pointers.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-105A.1	3	-	1	-	-	-	-	2
BCA-105A.2	3	-	2	-	-	-	-	3
BCA-105A.3	3	2	2	-	-	-	-	3
BCA-105A.4	3	2	3	2	-	-	-	3

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I — Contact Hours: 12

Fundamentals of C language

Overview of C: History, Importance, Structure of C Program, Character Set, Constants and Variables, Identifiers and Keywords, Data Types, Assignment Statement, Symbolic Constant.
Input/output: Formatted and unformatted I/O Functions-, Input Functions viz. scanf(), getch(), getche(), getchar(), gets(), sscanf(), output functions viz. printf(), putchar(), puts(), sprintf()

UNIT-II — Contact Hours: 10

Operators and Control Structures

Operators & Expression: Arithmetic, Relational, Logical, Bitwise, Unary, Assignment, Conditional Operators and Special Operators, Operator Hierarchy; Arithmetic Expressions, Evaluation of Arithmetic Expression, Type Casting and Conversion.
Control Structures: Decision making Statements- simple if, if else, nested if, else if ladder, switch and break statement, goto statement, Looping Statements: for, while, and do while loop, nested loops, jumps in loops..

UNIT-III — Contact Hours: 11

Arrays, Strings, and Functions

Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays -Declaration, Initialization and Memory representation, Advantages and disadvantages of arrays
Strings: Declaration and Initialization, String I/O, Array of Strings, String Manipulation Functions: String Length, Copy, Compare, Concatenate, Reverse etc.
Functions: Definition, Advantages, prototype, function call, function classification, passing arguments to a function: call by value; call by reference, recursive functions.

UNIT-IV **Contact Hours: 12**

User defined data types, pointers and storage class concepts

User defined data types: Structures Definition, Advantages of Structure, declaring structure variables, accessing structure members, Structure members initialization, Array of Structures; Unions - Union definition; difference between Structure and Union.

Pointers in C: Definition, Advantages, Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays, Pointers and Character Strings.

Storage classes in C: Auto, Static, Register, Extern

Text Books:

1. Balagurusamy, E., *Programming in ANSI C*, Tata McGraw-Hill
2. Yashwant Kanetkar, *Let us C*, BPB
3. Brian W. Kernighan, Dennis Ritchie, *The C Programming Language*, Pearson

Other References:

1. Gottfried, Byron S., *Programming with C*, Tata McGraw Hill
2. Rajaraman, V., *Computer Programming in C*, PHI
3. Jeri R. Hanly & Elliot P. Koffman, *Problem Solving and Program Design in C*, Addison Wesley

Course Code	Course Title	L	T	P	Credits
BCA-173A	**Problem Solving through C Lab** (Pre-requisite: C Programming)	0	0	4	2
		CIE	**SEE**		**Total**
		50	50		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-173A.1	Understand the basics of C program, data types and input/output statements.
BCA-173A.2	Explain different types of operators, their hierarchies and control statements of C.
BCA-173A.3	Compile programs using arrays, strings and user defined functions.
BCA-173A.4	Apply advanced concepts like structures, union and pointers.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-173A.1	3	-	1	-	-	-	-	2
BCA-173A.2	3	-	2	-	-	-	-	3
BCA-173A.3	3	2	2	-	-	-	-	3
BCA-173A.4	3	2	3	2	-	-	-	3

List of Experiments

No.	Experiment Detail
1.	An engineer designing circular rides in an amusement park needs to calculate the area and circumference of each ride. Develop a C program that reads radius as input, computes the area and circumference and outputs the results to ensure efficient design.
2.	Develop a C program that implements nested if to find the largest of three numbers.
3.	Develop a C program to read the percentage of marks and display appropriate grades to demonstrate the use of the else-if ladder.
4.	Develop a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
5.	Design a C program to find the roots of a quadratic equation.
6.	Design a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
7.	Design a C program to read a number, find the sum of the digits, reverse the number and check it for palindrome.
8.	A teacher uses a C program to read marks scored by n students. The program stores marks in a single-dimensional array and calculates the average marks of a class.
9.	Implement a C program that finds both the largest and smallest number in a list of integers.
10.	Implement a C program that sorts elements of an array in ascending order.
11.	Create a C program to perform addition and subtraction of matrices.
12.	Create a C program to perform multiplication of two matrices
13.	Create a C program to demonstrate string library functions
14.	Create a C program to find the length of a string and to copy string without using built-in function.

15.	Create a C program to read, display and add two m x n matrices using functions.
16.	Create a C program that use both recursive and non-recursive functions to find factorial of a given number.
17.	Create a C program that use both recursive and non-recursive functions to generate first n terms of Fibonacci series.
18.	A school administrator uses a C program to manage student records. The program utilizes a student structure to read and display records of n students, ensuring organized and efficient data handling.
19.	Create a C program to swap two numbers using pointers to demonstrate call by reference method for passing arguments in function.
20.	A linguistics researcher uses a C program to analyze text data. The program employs pointers to count vowels and consonants in a given string, ensuring accurate linguistic analysis and data processing.

Text Books:

1. Balagurusamy, E., *Programming in ANSI C*, Tata McGraw-Hill
2. Yashwant Kanetkar, *Let us C*, BPB
3. Brian W. Kernighan, Dennis Ritchie, *The C Programming Language*, Pearson

Other References:

1. Gottfried, Byron S., *Programming with C*, Tata McGraw Hill
2. Rajaraman, V., *Computer Programming in C*, PHI
3. Jeri R. Hanly & Elliot P. Koffman, *Problem Solving and Program Design in C*, Addison Wesley