DEPARTMENT OF COMPUTER SCIENCE

FACULTY OF SCIENCES,

JAMIA MILLIA ISLAMIA, NEW DELHI-11025

Credit distribution Structure for B.Sc. (Honors) Computer Science with Research

Year	SEM	Course Code	Title	L-T-P	Credits	Semester Credits
1	I	25-DCS-C-101	Algorithmic Problem Solving	3-0-0	3	8
		25-DCS-C-102	Programming with C	3-0-0	3	
		25-DCS-C-103	Lab-I (C)	0-0-4	2	
	II	25-DCS-C-151	Digital Logic and Computer Architecture	3-0-0	3	8
		25-DCS-C-152	Object-Oriented Programming with C++	3-0-0	3	
		25-DCS-C-153	Lab-II (C++)	0-0-4	2	
2	III	25-DCS-C-201	Operating Systems	3-0-0	3	8
		25-DCS-C-202	Data Structures	3-0-0	3	
		25-DCS-C-203	Lab-III (Linux & DS)	0-0-4	2	
	IV	25-DCS-C-251	Algorithm Design and Analysis	3-0-0	3	12+1
		25-DCS-C-252	Data Communication and Computer Networks	3-0-0	3	
		25-DCS-C-253	Programming with Java	3-0-0	3	
		25-DCS-C-254	Lab-IV (ADA)	0-0-4	2	
		25-DCS-C-255	Lab-V (Java)	0-0-4	2	
3	V	25-DCS-C-301	Database Management Systems	3-0-0	3	12+1
		25-DCS-C-302	Software Engineering	3-0-0	3	
		25-DCS-C-303	Programming with Python	3-0-0	3	
		25-DCS-C-304	Lab-VI (Python)	0-0-4	2	
		25-DCS-C-305	Lab-VII (MySQL/Oracle)	0-0-4	2	
	VI	25-DCS-C-351	Software Project Management	3-0-0	3	16
		25-DCS-C-352	Cloud Computing	3-0-0	3	
		25-DCS-C-353	Artificial Intelligence	3-0-0	3	
		25-DCS-C-354	Elective-I	3-0-0	3	
		25-DCS-C-355	Lab-VIII (CC)	0-0-4	2	
		25-DCS-C-356	Lab-IX (AI)	0-0-4	2	
4	VII	25-DCS-C-401	Information Security	3-0-0	3	16
		25-DCS-C-402	Machine Learning	3-0-0	3	
		25-DCS-C-403	Big Data Analytics	3-0-0	3	
		25-DCS-C-404	Elective-II	3-0-0	3	
		25-DCS-C-405	Lab-X (ML&BDA)	0-0-4	2	
		25-DCS-C-407	Minor Project	0-0-4	2	
	VIII(A/B)	25-DCS-C-451	Industrial/Research Project#	0-4-24/16	16/12	20/16
		25-DCS-C-452	Elective-III*	3-1-0	4	
				Total Credits (A/B)		**104/100**

#Projects are to be undertaken by the Department of Computer Science.

**Semester VIII Elective-III & Minor courses must not be previously taken by the candidate and to be completed in NPTEL/SWAYAM.*

ELECTIVES (3-0-0)

Elective-I	Elective-II
Business Intelligence	Cyber Security
Theory of Computation	Advanced DBMS
Advanced Algorithmics	J2EE Programming
Foundations of e-Business	Portal Development
Agile Methodology & DevOps	Modelling & Simulation
Software Testing & Quality Assurance	Data Analysis & Visualization
Any other course approved by BoS	

Approved by Board of Studies held on 06 -02-2025

DEPRTMENT OF COMPUTER SCIENCE

Faculty of Natural Sciences, Jamia Milla Islamia, New Delhi

B.Sc. (Honors) Computer Science with Research

Detailed Syllabi

25-DCS-C-101: **Algorithmic Problem Solving** (3-0-0) Credits: 3
1. **Fundamental of Problem Solving:** Introduction to problem-solving aspect, Algorithmic approach of problem solving, Problem-solving aspects, top-down design, implementation of algorithm, Flow chart, program verification, Top-down design, Implementation of algorithms, program verification, Efficiency of algorithms, Analysis of algorithms. Introduction to Flowchart, Exchanging the values of two variables, Counting, Summation of a set of numbers, Factorial computation, Reversing the digits of an integer. 2. **Factoring Methods:** Finding square root of a number, the smallest divisor of an integer, the greatest common divisor of two integers, Generating prime numbers, Raising a number to a large power, Computing the nth Fibonacci number etc 3. **Array Techniques:** Introduction to array, Array order reversal, Array counting, finding maximum number in a set, Removal of Duplicates from an ordered array, Partitioning of array, Finding Kth smallest element etc 4. **Merging, Sorting and Searching:** Two way merge, Selection sort, Quick Sort, Insertion sort, linear search, Binary search.
Text Books • How to Solve it By Computer by R. G. Dromey • Programming in C by E Balagurusamy, 5 ed

25-DCS-C-102: **Programming with C** (3-0-0) Credits: 3
1. **C Fundamentals:** Introduction to C Language; The C Character set; Identifiers and Keywords; Data types, constants, variables and basic structure of C programming; Declarations;Operators and Expressions: Arithmetic, Unary, Relational and Logical, Assignment, The Conditional operator, Comma operator; Library functions: Common Input Output functions, Statements and Symbolic Constants, Preprocessor Directives. 2. **Control Statements and Functions:** Decision-making structures like if-else, nested if else, if-else ladder, and switch; looping structures*: for, while and do-while, nested loops*; flow control structures: break and continue statements, goto statement; Function Declaration (Function Prototypes) and Function definition; Function arguments (dummy, formal and actual), Local and Global Variables, Function call – call by value and call by reference, Returning multiple values from a function, passing arguments to a function by value; Recursion and Recursive functions; Storage class and Scope of variables: automatic, external, static and register 3. **Arrays and Pointers:** Defining an array, Processing an array, passing arrays to functions,multi-dimensional arrays, Arrays and Strings, String manipulation functions, Passing arrays to function; Pointers declarations, referencing and dereferencing; pointer arithmetic; passing pointers to functions; pointers and one-dimensional arrays, Dynamic memory allocation; pointers and Multidimensional Arrays; Arrays of Pointers 4. **Structure, Union, Enumeration, and Files:** Structure declaration and initialization; accessing structure members; structure assignment;array of structures; arrays within structures; nested structures; passing structures as functions; enumerated data types (*enum*); unions and the difference between structures and unions; Introduction to files; Opening and closing a Data file; Creating a Data file; Processing a Data file; error handling during file I/O; and Command Line Arguments

Text Books

- Programming With C by Byron Gottfried, Schaum's Outlines, TMH
- Programming in C by E Balagurusamy, 5th edition
- Let Us C by YashwantKanetkar, 19th edition

25-DCS-C-103: **Lab-I (C)** (0-0-4) Credits: 2

1. Write a program that produces exactly the following output:
   Jamia!Jamia!Jamia\n
   "Jamia!Jamia!\"
   Jamia!%
2. Write a program to check whether an input alphabet is a vowel or a consonant.
3. Write a program that converts a given number of seconds into hours, minutes, and seconds, providi clean and readable output.
4. Write a program to design a simple calculator with basic operations like +, −, $*$, and / and then p the result according to a given operator using a switch statement.
5. Write a program to determine whether a given year is a leap year or not.
6. Write a program to convert a decimal number to a binary number.
7. Write a program to convert a binary number to a decimal number.
8. Write a program to convert a hexadecimal number to a decimal number.
9. Write a program to convert a decimal number to a hexadecimal number.
10. Write a program that reads in three numbers and finds the maximum and next maximum.
11. Write a program that requests the user to enter an alphabet. Use nested loop to produce a pyramid pat like this: (Sample output when user enters D)

    A
    ABA
    ABCBA
    ABCDCBA
12. Write a program to print a series of prime numbers up to the given number.
13. Write a recursive function to find the GCD of two numbers. The two numbers should be supplied a argument from the function main.
14. Write a C program using recursion to print the Fibonacci series for a given input.
15. Write a program to add, subtract and multiply two matrices. Use separate functions for addit subtraction and multiplication.
16. Write a program to swap two numbers using pointers.
17. Write a program to check whether two strings are anagrams. (Process the strings using pointer)
18. Write a program to separate odd and even elements in an array into two separate arrays and print them
19. Write a C program that uses an array of structures to store and display the name, roll number, and m for three subjects for five students, then calculates and presents their total marks and average percenta
20. Write a C program to write a string to a file and then read the content back and display it on the screen.

Text Books

- Programming With C by Byron Gottfried, Schaum's Outlines, TMH
- Programming in C by E Balagurusamy, 5th edition
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DEPRTMENT OF COMPUTER SCIENCE

Faculty of Natural Sciences, Jamia Milla Islamia, New Delhi

25-DCS-C-151: **Digital Logic and Computer Architecture** (3-0-0) Credits: 3

1. **Data Representation:** Number Systems - Binary, Octal, Decimal, and Hexa-Decimal; Base Conversions; Binary Arithmetic; Complements: (r-1)'s Complement, r's Complement, Subtraction using Complements; Integer Representation, Floating-point Representation; Binary Codes for Decimal Digits: BCD Code, Excess-3 Code, 84-2-1 Code, 2421 Code, Error Detection Code; Character Representation - ASCII, EBCDIC.
2. **Boolean Algebra, and Logic Gates:** Boolean Algebra, Huntington's Postulate, Switching Algebra, Basic Theorems and Properties of Boolean Algebra; Boolean Functions: Basic Definition, Literals, Minimization of Boolean Functions by Algebraic Manipulation, Complement of a Boolean Function; canon 1 Cal and Standard Forms: Minterms and Maxterms, Conversion Between Canonical and Standard Forms of a Boolean Function; Boolean Function Simplification using k-Map; Digital Logic Gates: Basic Gates - AND, OR, NOT; Universal Gates - NAND, NOR; Other Gates - XOR, XNOR, AND-OR-INVERT, and OR-AND-INVERT.
3. **Combinational Logic Circuit:** Overview of Combinational Logic Circuit; Design of Some Standard Combinational Circuits: Half Adder, Full Adder, Half Subtractor, Full Subtractor, Code Conversion; Binary Adder, BCD Adder, Decoders, Encoder, Multiplexers, De-multiplexer.
4. **Sequential Logic Circuit:** Overview of Sequential Logic Circuits, Flip-Flops, Categories of Flip-Flop - RS, JK, T, and D Flip Flops, Registers and Counters. Introduction to Computer Architecture, Addressing mode, pipeline, One address, two address, three address instruction format.

Text Books

- Mano, M. M. Digital logic and computer design. Pearson Education India.
- Harris, S. L., & Harris, D. Digital design and computer architecture. Morgan Kaufmann.

25-DCS-C-152: **Object-Oriented Programming with C++** (3-0-0) Credits: 3

1. **Introduction to OOP and C++:** Concepts of procedure-oriented and structured programming; OOP paradigm; basic concepts of OOP, its benefits and application; Introduction to C++, applications, simple programs, program structure, IDE of Turbo C++; tokens, expressions, and control structures; dynamic initialization of variables, operators, scope resolution operator, type casting.
2. **Classes, Objects, Constructors and Destructors:** C structures, specifying a class, defining member functions, making an outside function inline and nesting of member functions, private member functions, arrays within a class, static data members and member functions, arrays of objects, objects as function arguments, returning objects as function arguments, friendly functions; constructors, parameterized constructors, destructors.
3. **Operator Overloading and Inheritance:** Defining operator overloading, overloading unary and binary operators, rules for overloading operators; defining derived classes, types of inheritance, single, multilevel, multiple, hierarchical and hybrid inheritance, virtual bases classes, this pointer, virtual functions, pure virtual functions.
4. **Working with Files:** Classes for file stream operators, opening and closing a file, file pointers and their manipulations, sequential input and output operations, and error handling during file operations.

Text Books

- E. Balagrurusamy, Object Oriented Programming with C++, TMH.
- Deitel and Deitel, C++ How to program, PHI.
- Herbert Schildt, The Complete Reference C++, TMH

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25-DCS-C-153: **Lab-II (C++)** (0-0-4) Credits: 2
1. Implementation of simple classes like Rectangle, Circle, Sphere, Triangle, etc.
2. Implementation of some complex classes like Matrix, Complex Number, Vector] Decimal, etc.
3. Implementation of Matrix, Complex number, Vector, etc. classes with function overloading and constructor functions.
4. Implementation of some classes with operator over loadings.
5. Implementation of some classes like Square Matrix, Box, etc. with the help of inheritance.
6. Implementation of generic classes like Stack, Queue, etc.
7. Implementation of some simple classes with function overriding.
8. Implementation of some classes with «and » operator overloading.
9. Problems based on simple file handling.
10. Creation of student information system or inventory control system (construction of classes, implementing inheritance, overloaded functions, storing records to a file, fetching file records).
Text Books • E. Balagrurusamy, Object Oriented Programming with C++, TMH. • Deitel and Deitel, C++ How to program, PHI. • Herbert Schildt, The Complete Reference C++, TMH