Title	**Programming Fundamentals Lab**		
Code	**CC-112L**		
Credit Hours	1 (0,3)		
Category	Computing Core		
Prerequisite	None		
Co-Requisite	None		
Follow-up	CC-211: Object Oriented Programming, DI-322: Web Technologies, EI-338: Enterprise Systems, DI-327: Information Technology Infrastructure		
Course Introduction	This course provides fundamental concepts of programming to freshmen. The course is prerequisite to many other courses; therefore, students are strongly advised to cover all contents and try to achieve CLOs to the maximum possible level.		
Course Learning Outcomes (CLOs)	At the end of the lab, the students will be able to:	**BT**	**PLO**
	CLO1: Understand basic problem-solving steps and logic constructs.	C2 (Understand)	1,2
	CLO2: Apply basic programing concepts.	C3 (Apply)	3,4
	CLO3: Design and implement algorithms to solve real world problems.	C3 (Solve)	3,4,5
Syllabus	**Implementation and Practice of the concepts studied in "CC-112 Programming Fundamentals"** **Introduction to Problem Solving, Algorithms, Programming, and C Language:** Problem Solving, a brief review of Von-Neumann Architecture., The C Programming Language, Pseudo-code, Concept of Variable, Data types in Pseudo-code, The C Standard Library and Open Source, Input/Output, Arithmetic expressions, Assignment statement, Operator precedence, Concept of Integer division, Flowchart and its notations, Typical C Program Development Environment, Role of Compiler and Linker, Test Driving C Application. **Introduction to C Programming:** A Simple C Program: Printing Text, Adding Two Integer, Memory Concepts, Arithmetic in C, Operators. Decision Making: Equality and Relational Operators. **Structured Program Development:** The **if**, **if…else**, **while** Nested Control Statements. **Program Control: for**, **switch**, **do…while**, **break, continue**, Logical Operators. **Functions:** Modularizing Program in C, Math Library Functions, Function Definitions and Prototypes, Function-Call Stack and Stack Frames, Stack rolling and unrolling, Headers, Passing Arguments by Value and by Reference, Random Number Generation, Scope Rules, Recursion, Recursion vs Iteration. **Arrays:** Defining Arrays, Character Arrays, Static and Automatic Local Arrays, Passing Arrays to Function, Sorting and Searching Arrays, Multidimensional and Variable Length Arrays. **Pointers:** Pointer Definitions and Initialization, Pointer Operators, Passing Arguments to Function by Reference, Using the **const** and **sizeof** Operator, Pointer Expressions and Arithmetic, Pointers and Arrays, Array of Pointers, Function Pointers. **Characters and Strings:** Strings and Characters, Character Handling Library, String Functions, Library Functions. **Formatted Input/Output:** Streams**,** Formatted Output with **printf,** Formatted Input with **scanf**. **Structures:** Defining Structures, Accessing Structure Member, Structures and Functions, typedef, Unions. **Bit Manipulation and Enumeration:** Bitwise Operators, Bit Fields, Enumeration Constants. **File Processing:** Files and Streams, Creating, Reading and Writing data to a Sequential and a Random-Access File. **Preprocessor: #include**, **#define**, Conditional Compilation, **#error** and **#pragma**, **#** and **##** Operators, Predefined Symbolic Constants, Assertions. **Other Topics:** Variable Length Argument List, Using Command Line Arguments, Compiling Multiple-Source-File Programs, Program Termination with **exit** and **atexit**, Suffixes for Integer and Floating-Point Literals, Signal Handling, Dynamic Memory Allocation **calloc** and **realloc**, **goto**. **Advance Topics:** Self-Referential Structures, Linked Lists. Efficiency of Algorithms, Selection and Insertion Sort.		
Suggested Instructional/ Reading Material	1. Paul Deitel, Harvey Deitel, C How To Program, 9th Edition, Pearson, 2022. 2. Tony Gaddis, Starting out with Programming Logic and Design, 5th Edition, Pearson, 2018. 3. The C Programming Language, 2nd Edition by Brian W. Kernighan, Dennis M. Ritchie 4. Object Oriented Programming in C++ by Robert Lafore 5. Problem Solving and Program Design in C++, 7th Edition by Jeri R. Hanly & Elliot B. Koffman		