Course Code: CSE 113	CIE Marks: 60
Course Title: Programming and Problem Solving	SEE Marks: 40
Credits: 3.0	

Course Content (from syllabus):

Introduction to Programming & Problem Solving: Starting concept of C Programming, History of C Programming, Importance of Programing & Problem Solving, Compilation vs. interpretation.; **Basic program structure and variables:** Sample program of C, Basic Structure of C program, Programming style, Executing a 'C' program, Character set, C token, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of variables, Assigning values to variables, Defining symbolic constant, Declaring a variable as constant.; **Operators and Expressions:** What are operators? Types of operators, Arithmetic operators, Relational operators, Logical operators, Inc. and Dec. operators, Conditional operators, Bitwise operators, Arithmetic Expressions, Evaluation of Expressions, Precedence and associativity of operators, Type casting.; **Input Output functions:** Reading a character, Writing a character, Formatted input, Formatted output.; **Control Structures:** Conditional statements (e.g., if/else, switch case), Nested conditional structures Standard/structures, programming practices for decision structures.; **Loop Structures:** Why should we use the loops? Loop control variables, Initialization, test and modifications (e.g. while, do-while & for loop), Nested loop structures, Standard/structures programming practice for loop structures.; **Array:**Use of Array, Advantage of using Array, One-dimensional Array, Declaration of 1-D array, Initialization of 1-D array, Two Dimensional array, Initialization of 2-D array, Multi- dimensional array.; **Introduction to function & Recursion:** Introduction to function, Need for user-defined function, A multi-function program, Elements of user defined function, Definition of function, Return values and their types, Function calls, Function Declaration, Category of function, No arguments and no return values, Arguments but no return values, Arguments with return values, No Arguments but return a values, Functions that return multiple values, Nesting of functions, Recursion, Passing arrays to functions, Passing strings to functions, The scope, visibility and lifetime of variables.; **Pointers:** Pointer Expressions, Pointer Increments and scale factor, Pointers and array, Array of pointers, Pointer as Function Arguments, Functions Returning pointers, Pointers to Functions, Pointers and structures. ; **String:** Introduction to String, Declaring and Initializing string variable, Reading string from terminal, Arithmetic operations and characters, Putting strings together, Comparison of two strings, String handling functions**; User defined data type:** Introduction to structure, Defining a structure, Declaring structure variables, Accessing structure members, Structure initialization Copying and Comparing structure variables, Operations on individual members, Arrays of structures, Structure and function**; File IO:** Create, read, write and update files, Copying a File, Character Input vs. Line Input, Dynamic Memory Allocation, Allocating a block of Memory: Malloc, Releasing the used space:Free; **C Preprocessor:** Preprocessor – why?, #include: how to make use of a header file, #define: simple and

parameterized macros, #undef directive, predefined preprocessor symbols, macro operators: # and ## , conditional compilation: #if and #ifdef directive

Course Description/Rational:

Regardless of the area of study, computer science is all about solving problems with computers. The problems that we want to solve can come from any real world problem or perhaps even from the abstract world. Computer programming is at the heart of computer science. It is the implementation portion of software development, application development and software engineering efforts, transforming ideas and theories into actual, working solutions.

Course Objective

The primary purpose of this course is to teach students the basics of pure programming and problem solving. This course provides students with a comprehensive study of the C programming language. The course emphasizes problem-solving and empirical skills through the process of designing, implementing, and executing C programs.

Course Learning Outcome (CLO): (at the end of the course, students will be able to do:)

CLO1	Show computing problems using programming concepts and learn the basic concept of ACM Problem solving techniques.
CLO2	Illustrate fundamental programming elements including: variables, use of data types and data structures, decision structures, loop structures, pointer, string, console, file IO, and functions.
CLO3	Construct the problem requirements, analyze the problem, design the algorithm to solve the problem and implement it with the help of a programming language.
CLO4	Simplify the knowledge of programming and problem solving in real file problems.

Content of the course:

SL	Course Content (as summary)	Hrs	CLO's
1	Introduction to Programming & Problem Solving	1.5	CLO1
2	Basic program structure and variables	1.5	CLO2
3	Operators and Expressions, Input Output functions	3	CLO1, CLO2
4	Control Structures, Loop Structures, Array	12	CLO1, CLO2
5	Introduction to function & Recursion, Pointers, String	12	CLO1, CLO2, CLO3

6	User defined data type, File IO	7.5	CLO1, CLO2, CLO4
7	C Preprocessor	1.5	CLO1, CLO2
8	Review Exercises	6	CLO1- CLO4

Mapping of Course Learning Outcomes to Program Learning Outcomes

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11	PLO-12
CLO-1	✔											
CLO-2		✔										
CLO-3			✔									
CLO-4				✔								

Mapping Course Learning Outcome (CLOs) with the Teaching-Learning and Assessment Strategy:

CLO's	Teaching Learning Strategy	Assessment Strategy	Corresponding PO number	Domain Level/Learning Taxonomy
CLO1	Define the different time complexity, errors in code and output by analyzing the code segment that is present	Class Test/Midterm/ Final (Direct Method)	PO1	L1
CLO2	Demonstrate different uses of fundamental programming terms in code.	Class Test/Midterm/ Final (Direct Method)	PO2	L2
CLO3	Apply programming skills to develop code of different provided problem scenarios.	Class Test/Midterm/ Final (Direct Method)	PO3	L3
CLO4	Examine various functions, structures and pointers to relate their uses in real life.	Class Test/Midterm/ Final (Direct Method)	PO4	L4

Course Delivery Plan/Lesson Delivery Plan:

Week/Lesson (hour)	Discussion Topic and Book Reference	Student Activities during Online and Onsite [course teacher will decide based on the type of the contents]	Mapping with CLO and PLO	Assessment Plan
Week-1 Lesson 1 & 2 [3 Hours]	Importance of Programing & Problem Solving, Sample program of C, Basic Structure of C program, Programming style, Executing a 'C' program [E-Balagurusamy Ch1]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1	Class Test, Assignment, Midterm
	Character set, C token, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of variables, Assigning values to variables, Defining symbolic constant, Declaring a variable as constant [E-Balagurusamy - Ch2]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO2	Class Test, Assignment, Midterm
Week-2 Lesson 3 & 4 [3 Hours]	Arithmetic operators, Relational operators, Logical operators, Inc. and Dec. operators, Conditional operators, Bitwise operators, Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic operators [E-Balagurusamy - Ch3]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2	Class Test, Assignment, Midterm
	Reading a character, Writing a character Formatted input, Formatted output [E-Balagurusamy - Ch4]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2	Class Test, Assignment, Midterm
Week-3 Lesson 5 & 6 [3 Hours]	Conditional statements (e.g., if/else, switch case). [E-Balagurusamy -Ch5]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2	Class Test, Assignment, Midterm
	Nested conditional structures Standard/structures, programming practices for decision structures.	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture	CLO1, CLO2	Class Test, Assignment, Midterm

		[E-Balagurusamy - Ch5]	video, Lecture note, Open discussion.		
Week-4 Lesson 7 & 8 [3 Hours]		(Class Test – 1, Assignment – 1)			
		Review and Exercises up to Nested Conditional Operators			None
Week-5 Lesson 8 & 9 [3 Hours]		Why should we use the loops?, Loop control variables, initialization, test and modifications (e.g. while, do-while & for loop) [E-Balagurusamy - Ch6]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2	Class Test, Assignment, Midterm
		Nested loop structures, Standard/structures programming practice for loop structures [E-Balagurusamy - Ch6]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2	Class Test, Assignment, Midterm
Week-6 Lesson 10 & 11 [3 Hours]		Use of Array, Advantage of using Array, One-dimensional Array, Declaration of 1-D array, Initialization of 1-D array [E- Balagurusamy - Ch7]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2	Class Test, Assignment, Midterm
		Two Dimensional array, Initialization of 2-D array , Multi- dimensional array [E- Balagurusamy - Ch7]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2	Class Test, Assignment, Final
Week-7 Lesson 12 [3 Hours]		Review and Exercises up to Array			None
Mid Term Exam					
Week-8 Lesson 13 & 14 [3 Hours]		Pointer Expressions, Pointer Increments and scale factor, Pointers and array, Array of pointers, Pointer as Function Arguments, Functions Returning pointers, Pointers to Functions, Pointers and structures [E-Balagurusamy - Ch11]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2	Class Test, Assignment, Final

	Pointer Expressions, Pointer Increments and scale factor, Pointers and array, Array of pointers, Pointer as Function Arguments, Functions Returning pointers, Pointers to Functions, Pointers and structures [E-Balagurusamy - Ch11]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2	Class Test, Assignment, Final
Week-9 Lesson 15 [3 Hours]	: (Class Test – 2, Assignment – 2)			
	Introduction to function, Need for user-defined function, A multi-function program, Elements of user defined function, Definition of function, Return values and their types, Function calls, Function Declaration, Category of function [E-Balagurusamy - Ch9]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2, CLO3	Class Test, Assignment, Final
Week-10 Lesson 16 [3 Hours]	No arguments and no return values, Arguments but no return values, Arguments with return values, No Arguments but return a values, Functions that return multiple values, Nesting of functions, Recursion, Passing arrays to functions, Passing strings to functions, The scope, visibility and lifetime of variables [E-Balagurusamy - Ch9]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2, CLO3	Class Test, Assignment, Final
Week-11 Lesson 17 [3 Hours]	Review and Exercises up to Array			None
Week-12 Lesson 18 & 19 [3 Hours]	Introduction to String, Declaring and Initializing string variable, Reading string from terminal [E-Balagurusamy - Ch8]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2	Class Test, Assignment, Final
	Arithmetic operations and characters, Putting strings together, Comparison of two strings, String handling functions [E-Balagurusamy - Ch8]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2	Class Test, Assignment, Final
Week-13	Introduction to structure, Defining a structure, Declaring structure variables, Accessing structure members, Structure initialization	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture	CLO1, CLO2, CLO4	Class Test, Assignment Final

Lesson 20 & 21 [3 Hours]	[E-Balagurusamy - Ch10]	video, Lecture note, Open discussion.		
	Copying and Comparing structure variables, Operations on individual members, Arrays of structures, Structure and function [E-Balagurusamy - Ch10]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2, CLO4	Class Test, Assignment Final
Week-14 Lesson 22 [3 Hours]	(Class Test-3, Assignment – ORAL)			
	Create, read, write and update files, Copying a File, Character Input vs. Line Input [E-Balagurusamy - Ch12]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2	Class Test, Assignment, Final
Week-15 Lesson 23 & 24 [3 Hours]	Dynamic Memory Allocation, Allocating a block of Memory: Malloc, Releasing the used space:Free [E-Balagurusamy - Ch13]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2	Class Test, Assignment, Final
	Preprocessor – why?, include: how to make use of a header file, define: simple and parameterized macros, undef directive, predefined preprocessor symbols, macro - operators: and , conditional compilation: if and ifdef directives [E-Balagurusamy - Ch14]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2	Class Test, Assignment, Final
Week-16 Lesson 25 & 26 [3 Hours]	File Management using C/C++ [E-Balagurusamy - Ch14]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CLO1, CLO2	Class Test, Assignment, Final
	Review Exercise			None
Final Exam				

Assessment Pattern:

Assessment Task	CO's					Mark (Total=100)
	CO1	**CO2**	**CO3**	**CO4**	**CO5**	
Attendance	--	--	--	--	--	7

Class Test (CT1, CT2, CT3)	--	--	--	--	--	15
Assignment	--	--	--	--	--	5
Presentation	--	--	--	--	--	8
Midterm Examination	5	10	10	0	--	25
Semester Final Examination	0	10	10	20	--	40
Total Mark	5	20	20	20	--	100

CIE – Breakup (Theory) [60 marks]

Bloom's Criteria	Attendance (7)	Class Test (15)	Assignment (5)	Presentation (8)	Midterm Exam (25)
Remember					
Understand		05	01	02	05
Apply		10	04	04	15
Analyze				02	05
Evaluate					
Create					

SEE – Semester End Examination [40 marks] {Theory}

Bloom's Criteria	Score for the Test
Remember	
Understand	05
Apply	25

Analyze	10
Evaluate	
Create	

Learning Materials:

Textbook/Recommended Readings:
1. Programming in ANSI C- E Balagurusamy.
2. The C programming language. Prentice Hall, 1988, by Dennis Ritchie

Reference Books/Supplementary Readings:

1. Programming in C by Stephen G. Kochan
2. Let Us C , 7/e by Yashavant Kanetkar.
3. Teach Yourself C 3rd Edition: Herbert Schildt
4. C: The Complete Reference : Herbert Schildt
5. How to solve it using Computer: R.G. Dromey, Prentice Hall, 1985
6. C Programming- A Modern Approach, 2nd Edition, W W Norton, 2008
7. C: How to Program, 6/E Paul Deitel Harvey M. Deitel, Deitel & Associates, Inc

Other Readings:

Program Outcomes and Assessment

Program Outcomes (POs) are narrower statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills and attitudes that students acquire while progressing through the program. The program must demonstrate that by the time of graduation, students have attained a certain set of knowledge, skills and behavioral traits to some acceptable minimum level. The BAETE specifically requires that students acquire the following graduate attributes.

[PO1] Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

[PO2] Problem analysis: Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences.

[PO3] Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns.

[PO4] Investigation: Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

[PO5] Modern tool usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

[PO6] The engineer and society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

[PO7] Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.

[PO8] Ethics: Apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering practice.

[PO9] Individual work and teamwork: Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.

[PO10] Communication: Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.

[PO11] Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as a member or a leader of a team to manage projects in multidisciplinary environments.

[PO12] Life-long learning: Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

5. **Additional Support for Students**

   i. **Student Portal:** **http://studentportal.diu.edu.bd/**

   ii. **Academic Guidelines** **https://daffodilvarsity.edu.bd/article/academic-guidelines**

   iii. **Rules and Regulations of DIU**

   https://daffodilvarsity.edu.bd/article/rules-and-regulation

   iv. **Career Development Center:** **https://cdc.daffodilvarsity.edu.bd/**

   v. **For general queries: http://daffodilvarsity.edu.bd/**