Course Code	21CSS101J	Course Name	PROGRAMMING FOR PROBLEM SOLVING	Course Category	S	*Engineering Sciences*	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR): *The purpose of learning this course is to:*

CLR-1 :	Think and evolve with a logic to construct an algorithm and pseudocode that can be converted into a program
CLR-2 :	Utilize the appropriate operators and control statements to solve engineering problems
CLR-3 :	Store and retrieve data in a single and multidimensional array
CLR-4 :	Create custom designed functions to perform repetitive tasks in any application
CLR-5 :	Create basic Abstract Data Types with python
CLR-6 :	Create applications using suitable python library functions for solving datascience problems.

Learning

Program Learning Outcomes (PLO)

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1 Level of Thinking (Bloom)	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt. & Finance	12 Life Long Learning	13 PSO - 1	14 PSO - 2	15 PSO – 3
CLO-1 :	To solve problems through computer programming. Express the basic data types and variables in C	2	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-2 :	To use appropriate data types in simple data processing applications. To create programs using the concept of arrays.	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-3 :	To create string processing applications with single and multi-dimensional arrays.	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-4 :	To create user defined functions with required operations. To implement pointers in applications with dynamic memory requirements.	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-5 :	To create programs using the python data types, loops, control statements for problem solving	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-6 :	To implement the suitable python library based solutions for solving statistical problems in data science .	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-

Unit-1 Evolution of Programming & Languages - Problem solving through programming - Writing algorithms & Pseudo code - Single line and multiline comments - Introduction to C: Structure of the C program - Input and output statements. Variables and identifiers, Constants, Keywords - Values, Names, Scope, Binding, Storage Classes - Numeric Data types: integer, floating point
Non-Numeric Data types: char and string - L value and R value in expression, Increment and decrement operator - Comma, Arrow and Assignment operator, Bitwise and Size-of operator - Arithmetic, Relational and logical Operators - Condition Operators, Operator Precedence - Expressions with pre / post increment operator

Unit-2 Conditional Control -Statements :Simple if, if...else - Conditional Statements : else if and nested if - Conditional Statements : Switch case - Un-conditional Control Statements : break, continue, goto - Looping Control Statements:for, while, do..while - Looping Control Statements: nested for, nested while - Introduction to Arrays -One Dimensional (1D) Array Declaration and initialization - Accessing, Indexing and operations with 1D Arrays - Array Programs – 1D - Initializing and Accessing 2D Array, Array Programs – 2D - Pointer and address-of operators -Pointer Declaration and dereferencing, Void Pointers, Null pointers
Pointer based Array manipulation

Unit-3 String Basics - String Declaration and Initialization - String Functions: gets(), puts(), getchar(),putchar(), printf() - Built-inString Functions: atoi, strlen, strcat, strcmp -String Functions: sprint, sscanf, strrev, strcpy, strstr, strtok - Operations on Strings - Function prototype declaration, function definition - Actual and formal parameters - Function with and without Arguments - Function with and without return values - Call by Value, Call by Reference - Passing Array to Function - Passing Array elements to Function - Function Pointers

Unit-4 Python: Introduction to Python - Introduction to Google Colab - Basic Data Types: Integers, Floating Points, Boolean types - Working with String functions - Working with Input, Output functions - Python-Single and Multi line Comments/ Error Handling - Conditional & Looping Statements : If, for, while statements - Working with List structures - Working with Tuples data structures - Working with Sets - Working with Dictionaries - Introduction to Python Libraries - Introduction to Numpy - High Dimensional Arrays

Unit-5 Creating NumPy Array -Numpy Indexing - Numpy Array attributes - Slicing using Numpy - Descriptive Statistics in Numpy: Percentile - Variance in Numpy -Introduction to Pandas - Creating Series Objects, Data Frame Objects - Simple Operations with Data frames - Querying from Data Frames -Applying Functions to Data frames - Comparison between Numpy and Pandas - Speed Testing between Numpy and Pandas - Other Python Libraries
Lab Lab 1: Input, Output Statements, Variables Lab 2: Data types & Operators-I Lab 3: Data types & Operators-II Lab 4: Control Statements (Branching, Looping) Lab 5: Arrays Lab 6: Arrays with Pointers Lab 7: Strings Lab 8: Functions Lab 9 : Arrays and Functions Lab 10: Input, Output in Python Lab 11: Python data structures Lab 12: Arrays in Python Lab 13: Operations with Numpy Lab 14: Operations with Pandas Lab 15: case study: Data science with Numpy, Pandas

Learning Resources	Reference Books (C): 1. Programming in C, E.Balagurusamy,Mc Graw Hill, Eighth Edition.2019. [chapters 1 to 6 & 8 To 11] 2. Head First C: A Brain-Friendly Guide, By David Griffiths, Dawn Griffiths,Oreilly. [Chapters 2 to 4] 3. Let Us C, Fifth Edition, Yashavant P. Kanetkar,BPB publications.[Chapters 1 to 6, 8 to 9] 4. Problem Solving & Programming Concepts, Maureen Sprankle, Jim Hubbard, Prentice Hall, Ninth Edition. [Chapters 1 to 7] 5. https://www.tutorialspoint.com/cprogramming/index.htm 6. https://www.geeksforgeeks.org/c-programming-language/	Reference Books (Python): 7. Python Datascience Handbook, Oreilly,Jake VanderPlas, 2017.[Chapters 2 &3] 8. Python For Beginners, Timothy C.Needham,2019. [Chapters 1 to 4] 9. https://www.tutorialspoint.com/python/index.htm 10. https://www.w3schools.com/python/

	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) - By the Course Faculty				By The CoE	
		Formative CLA-I Average of unit test (50%)		**Life Long* Learning** CLA-II- Practice (10%)		**Summative** Final Examination (40% weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	**15%**	-	-	-	**15%**	-
Level 2	Understand	**20%**	-	-	**30%**	**20%**	-
Level 3	Apply	**35%**	-	-	**35%**	**35%**	-
Level 4	Analyze	**30%**	-	-	**35%**	**30%**	-
Level 5	Evaluate	-	-	-			-
Level 6	Create	-	-	-	-	-	-
	Total	100 %		100 %		100 %	

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sainarayanan Gopalakrishnan, HCL Technologies, sai.jgk@gmail.com	*1. Prof. Janakiram D, IIT Madras, djram@iitm.ac.in*	*1. Dr. E.Poovammal, SRMIST*
2. Dr. Sricharan Srinivasan, Wipro Technologies, sricharanms@gmail.com	*2. Dr. Rajeev Sukumaran, IIT Madras, rajeev@wmail.iitm.ac.in*	*2. Dr. B. Amutha, SRMIST*