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| Course Code | 21CSS101J | Course Name | PROGRAMMING FOR PROBLEM SOLVING | Course Category | *S* | *Engineering Sciences* | L | T | P | C |
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| Pre-requisite  Courses | Nil | | Co-requisite  Courses | Nil | | Progressive  Courses | Nil |
| Course Offering Department | | Computer Science and Engineering | | | Data Book / Codes/Standards | Nil | |

*The purpose of learning this course is to:*

**Course Learning Rationale (CLR):**

**Learning**

**Program Learning Outcomes (PLO)**

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| |  |  | | --- | --- | | **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. | | | | 1 | 2 | 3 |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Level of Thinking (Bloom) | Expected Proficiency (%) | Expected Attainment (%) | Engineering Knowledge | Problem Analysis | Design & Development | Analysis, Design, Research | Modern Tool Usage | Society & Culture | Environment & Sustainability | Ethics | Individual & Team Work | Communication | Project Mgt. & Finance | Life Long Learning | PSO - 1 | PSO - 2 | PSO – 3 |
| Course Learning Outcomes (CLO): | | At the end of this course, learners will be able to: |
| 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* | *-* | *-* | *-* |

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| 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 |

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| 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/ |

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| Learning Assessment | | | | | | | | | | | |
|  | Bloom’s  Level of Thinking | Continuous Learning Assessment (60% weightage) | | | | | | | | Final Examination (40% weightage) | |
| CLA – 1 (15%) | | CLA – 2 (15%) | | CLA – 3 (20%) | | CLA – 4 (10%) | |
| Theory | Practice | Theory | Practice | Theory | Practice | Theory | Practice | Theory | Practice |
| Level 1 | Remember | *20%* | *20%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* |
| Understand |
| Level 2 | Apply | *20%* | *20%* | *20%* | *20%* | *20%* | *20%* | *20%* | *20%* | *20%* | *20%* |
| Analyze |
| Level 3 | Evaluate | *10%* | *10%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* |
| Create |
|  | Total | 100 % | | 100 % | | 100 % | | 100 % | | 100 % | |

# CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper as specified in regulation.,

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| Course Designers | | |
| Experts from Industry | Experts from Higher Technical Institutions | Internal Experts |
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