

Syllabus of BSc [AI & DS / AI & ML / CS] First Year Subjects



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Dr. Madhavi
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Dr. Shripal
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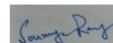
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Dr. Sounak
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Dr. Soumya
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SEMESTER – I

Course Information Sheet

Course Code : SC25101
 Course Title : Programming with C
 Pre-requisite(s) :
 Co-requisite(s) : C Programming Lab
 Credits : 3
 Class schedule/ week : L:3 T: 0 P: 0
 Class : B.Sc. (AI & DS / AI & ML / CS)
 Semester/Level : I/1
 Branch : AI & DS / AI & ML / CS

Course Objectives : This course enables the students to:

A.	Recall the fundamentals and syntax of C programming.
B.	Understand the use of variables, control structures, and data types in C.
C.	Apply C programming constructs to solve computational problems.
D.	Analyze real-world problems and develop corresponding C programs.
E.	Create modular programs using functions, structures, and file operations.

Course Outcomes : After the completion of this course, students will be able to:

CO1	Apply decision-making and loop constructs to solve basic problems.
CO2	Implement array operations to manipulate data efficiently.
CO3	Develop programs using user-defined and library functions.
CO4	Analyze and use pointers, structures, and unions effectively.
CO5	Design and implement file handling in C for data management

SYLLABUS

MODULE	No. Of Lectures (Hours)
Module-1: Introduction to C Programming Overview of C Language: History and evolution, significance of C in programming, structure of a C program. Constants, Variables, and Data Types: C tokens: Keywords, identifiers, constants, strings, operators, and symbols. Data types: Primary data types and user-defined data types. Variable declaration and initialization.	7
Module-2: Operators, Expressions, and Control Flow Operators and Expressions: Types of operators: Arithmetic, relational, logical, assignment, increment/decrement, bitwise, conditional, and special operators. Arithmetic expressions, operator precedence and associativity, type conversions in expressions. Decision Making and Branching: Control statements: if, if-else, else-if ladder, nested if, switch, goto. Loop control statements: break, continue. Looping Constructs: while, do-while, and for loops.	7



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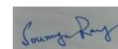
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Module-3: Arrays and Strings Arrays: Declaration and initialization of one-dimensional arrays. Two-dimensional and multi-dimensional arrays. Character Arrays and Strings: Declaring and initializing strings. Reading and writing strings: gets(), puts(). String manipulation functions and other string-related operations.	7
Module-4: Functions Function Basics: Definition, declaration, and function calls, Actual and Formal parameters, Nesting of functions, recursion, call by value and call by reference., Passing arrays and strings to functions.	7
Module-5: Structures, Unions and Pointers Structures and Unions: Defining structures, declaring and accessing structure variables. Arrays of structures and structures within arrays. Union: Definition and usage. Pointers: Concept of pointers, accessing addresses using pointers. Declaration of pointer variables and pointer expressions.	7

Text Books:

1. Balagurusamy E., "Programming in ANSI C", 8th Edition, TMH, 2019.
2. Gottfried B. S., "Programming with C", Schaum Series, McGraw Hill, 2005.
3. C How to Program, 9/E, deitel & deitel , Pearson Publication, 2022
4. Programming In C, Reema Thareja, OUP India

Reference Books:

1. Sprankle M., "Problem Solving and Programming Concepts", 7th Edition, Pearson Education, New Delhi, 2006.
2. Kanetkar Y., "Let us C", 19th Edition, BPB publication, New Delhi, 2022.

Gaps in the Syllabus (to meet Industry/ Profession requirements)

POs met through Gaps in the Syllabus:

Topics beyond the syllabus/ Advanced topics/ Design:

POs met through Topics beyond the syllabus/ Advanced topics/ Design

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

DIRECT ASSESSMENT

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50
Continuous Internal Assessment	
% Distribution	
First Quiz	10
Mid Semester Examination	25
Second Quiz/ Assignment/Seminar Presentation	10
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]
Semester End Examination	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]

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INDIRECT ASSESSMENT

Student Feedback on Faculty

Student Feedback on Course Outcome

Mapping between Course Outcomes and Program Outcomes

Course outcome	Program Outcomes (POs)												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3	1	3	1	1	1	2	2	1	2	2	3	2
CO2	3	3	3	1	3	1	1	1	1	2	2	2	2	2	2
CO3	3	3	3	3	3	1	2	2	2	1	1	2	2	3	2
CO4	3	3	3	1	3	1	1	1	1	1	1	2	2	3	2
CO5	3	3	3	3	3	1	1	1	1	1	1	2	2	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping between COs and Course Delivery (CD) methods

CD Code	Course Delivery Methods	Course Outcome	Course Delivery Method Used
CD1	Lecture by use of Boards/ LCD Projectors	CO1	CD1,CD8
CD2	Tutorials/Assignments	CO2	CD1,CD8,CD9
CD3	Seminars	CO3	CD1,CD2,CD5
CD4	Mini Projects/Projects	CO4	CD1,CD5,CD8, CD9
CD5	Laboratory Experiments/Teaching Aids	CO5	CD1,CD2,CD9
CD6	Industrial/ Guest Lectures		
CD7	Industrial Visits/ In-plant Training		
CD8	Self-learning such as use of PTEL Materials and Internets		
CD9	Simulation		

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Course Information Sheet

Course Code : SC25103
 Course Title : Structured and Object-Oriented Programming
 Pre-requisite(s) :
 Co-requisite(s) : Structured and Object-Oriented Programming Lab
 Credits: 3 L: 3 T: 0 P: 0
 Class schedule per week 03
 Class : B.Sc. (Computer Science)
 Semester / Level : I/1
 Branch : Computer Science

Course Objectives

This course enables the students to:

A.	Impart the basic constructs in structured and object-oriented paradigms.
B.	Learn about different problems and the approach to solve them.
C.	Gain proficiency with the concepts of structured and object oriented programming.
D.	Apply these concepts to solve real world problems.
E.	Help solving real world problems through appropriate programming paradigms.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Choose the loops and decision-making statements to solve the problem.
CO2	Implement different Operations on arrays.
CO3	Use functions to solve the given problem and understand structures and unions.
CO4	Recognize the application of modular programming approach.
CO5	Comprehend various elements of object-oriented programming paradigm, propose solutions through inheritance and polymorphism. Identify appropriate data structure for the given problem and device solution using generic programming techniques.

Syllabus

MODULE	No. of Lectures (Hours)
Module-1: Overview of C: History of C, Importance of C, Structure of C program, Sample of C programs. Constant, Variable and Data types, Tokens . Decision making and Branching: Decision making with if statement ,switch statement, The ?: Operator, The go-to statement. Decision making and Looping: The while statement, The do statement, The for statement, Nesting of loops, jumps in loops: break, continue.	7
Module 2: Arrays: One - dimensional arrays, Declaration and assign value of one – dimensional arrays, two dimensional arrays, Declaration and assign value of two – dimensional arrays, Multi – dimensional arrays. Character Arrays and String: Declaring and initializing string variables, reading string from terminal, Comparison of two strings, String handling functions.	7



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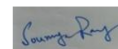
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MODULE	No. of Lectures (Hours)
Module 3: User defined functions: Definition of function, Function calls, Function declaration, Category of functions, Nesting of functions, Recursion, passing arrays to functions, Passing strings to functions. Structures: Defining a structure, declaring structure variables, Accessing structure members, Arrays of structures, Arrays within structures.	7
Module 4: Overview of Object-Oriented Programming: Features of OOP, Classes and Objects, Constructors and Destructors, Static data members, Static member functions and objects, Inline function, Function with default arguments, Friend function.	7
Module 5: Inheritance: Types of Inheritance, Single Inheritance, Multiple Inheritance, Multi-Level Inheritance, Hierarchical Inheritance, Multipath Inheritance, Inheritance and constructors, Polymorphism: Function overloading, operator overloading, Dynamic Polymorphism, Virtual functions, Pure virtual functions, Abstract classes	7

Text Books:

1. Kanetkar Y., "Let us C", 17th Edition, BPB publication, New Delhi, 2020.
2. Balagurusamy E., "Object-Oriented Programming with C++", 8th Edition, TMH, 2021.

Reference Books:

1. Balagurusamy E., "Programming in ANSI C", 9th Edition, TMH, 2020
2. Herbert Schildt, C++, The Complete Reference, Tata McGraw-Hill

Gaps in the Syllabus (to meet Industry/ Profession requirements)

POs met through Gaps in the Syllabus:

Topics beyond the syllabus/ Advanced topics/ Design:

POs met through Topics beyond the syllabus/ Advanced topics/ Design

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

DIRECT ASSESSMENT

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50
Continuous Internal Assessment	
% Distribution	
First Quiz	10
Mid Semester Examination	25
Second Quiz/ Assignment/Seminar Presentation	10
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]
Semester End Examination	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]

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INDIRECT ASSESSMENT

Student Feedback on Faculty
Student Feedback on Course Outcome

Mapping between Course Outcomes and Program Outcomes

Course outcomes	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3	1	3	1	1	1	1	2	1	2	2	3	2
CO2	3	3	3	1	3	1	1	1	1	1	2	2	2	2	2
CO3	3	3	3	3	3	1	2	2	1	1	1	2	2	3	2
CO4	3	3	3	1	3	1	1	1	2	1	1	2	2	3	2
CO5	3	3	3	3	3	1	1	1	1	1	1	2	2	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping between COs and Course Delivery (CD) methods

CD Code	Course Delivery Methods	Course Outcome	Course Delivery Method Used
CD1	Lecture by use of Boards/ LCD Projectors	CO1	CD1, CD7, CD8
CD2	Tutorials/Assignments	CO2	CD1, CD9
CD3	Seminars	CO3	CD1, CD2, CD3
CD4	Mini Projects/Projects	CO4	CD1, CD2
CD5	Laboratory Experiments/Teaching Aids	CO5	CD1, CD2
CD6	Industrial/ Guest Lectures		
CD7	Industrial Visits/ In-plant Training		
CD8	Self-learning such as use of PTEL Materials and Internets		
CD9	Simulation		

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Course Information Sheet

Course Code : SC25105
 Course Title : Operating Systems
 Pre-requisite(s) :
 Co-requisite(s) :
 Credits : 3
 Class schedule/ week : L:3 T: 0 P: 0
 Class : B.Sc. (AI & DS / AI & ML / CS)
 Semester/Level : I/1
 Branch : AI & DS / AI & ML / CS

Course Objectives

This course enables the students to :

A.	Define core concepts and architecture of operating systems.
B.	Explain the components such as process, memory, and file systems.
C.	Analyze CPU scheduling and memory management strategies.
D.	Evaluate different OS mechanisms for process and file handling.
E.	Apply OS concepts to real-time computing environments

Course Outcomes

After the completion of this course, students will be able to:

CO1	Describe the functions and structures of an operating system.
CO2	Analyze process management and scheduling algorithms.
CO3	Examine deadlock conditions and recovery techniques.
CO4	Evaluate memory management schemes including paging and segmentation.
CO5	Illustrate file system concepts and implement basic file handling techniques

SYLLABUS

MODULE	No. Of Lectures (Hours)
Module-1: Overview of OS, Evolution and history of OS, Types of OS, Functions and services provided by OS, Process concept, Process states and process life cycle, Process Control Block, Context Switching.	7
Module-2: CPU scheduling algorithms: First come first served (FCFS), Shortest job first (SJF), Round robin (RR) and Priority-based scheduling, Multi-level Scheduling, Multi-Level Feedback queue, Multi Processing Scheduling.	7
Module-3: Introduction to memory hierarchy, Primary and secondary memory, Contiguous and non-contiguous memory allocation, Paging and Segmentation.	7
Module-4: Introduction to virtual memory, Demand Paging and Demand Segmentation, Page fault, Page Replacement Algorithms, Thrashing.	7
Module-5: File concept, File Attributes and Types, File access methods, File allocation methods, Directory Structures, File protection methods.	7



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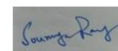
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Text Books:

1. Silberschatz A., Galvin P.B. & Gagne G., "Operating System Concepts", 10th Edition, Wiley India, 2018.

Reference Books:

1. D.M. Dhamdhare, Operating Systems: A concept Based Approach", Tata McGraw Hill 2nd Edition
2. Tanenbaum, "Operating Systems Design and Implementation", 3rd Edition., Prentice- Hall Inc., 2006

Gaps in the Syllabus (to meet Industry/ Profession requirements)

POs met through Gaps in the Syllabus:

Topics beyond the syllabus/ Advanced topics/ Design:

POs met through Topics beyond the syllabus/ Advanced topics/ Design

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure**DIRECT ASSESSMENT**

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50
Continuous Internal Assessment	
% Distribution	
First Quiz	10
Mid Semester Examination	25
Second Quiz/ Assignment/Seminar Presentation	10
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]
Semester End Examination	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]

INDIRECT ASSESSMENT

Student Feedback on Faculty

Student Feedback on Course Outcome

Mapping between Course Outcomes and Program Outcomes

Course outcome	Program Outcomes (PO)												Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3	2	1	1	2	2	3	3	3	2	1	1	2
CO2	3	1	1	1	1	3	1	1	3	1	1	1	1	3	1
CO3	2	3	3	1	2	1	2	2	2	3	3	1	2	1	2
CO4	1	1	3	3	1	1	1	1	1	1	3	3	1	1	1
CO5	3	3	3	1	2	1	1	2	3	3	3	1	2	1	1

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)



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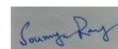
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Mapping between COs and Course Delivery (CD) methods

CD Code	Course Delivery Methods	Course Outcome	Course Delivery Method Used
CD1	Lecture by use of Boards/ LCD Projectors	CO1	CD1,CD8
CD2	Tutorials/Assignments	CO2	CD1,CD8,CD9
CD3	Seminars	CO3	CD1,CD2,CD5
CD4	Mini Projects/Projects	CO4	CD1,CD5,CD8, CD9
CD5	Laboratory Experiments/Teaching Aids	CO5	CD1,CD2,CD9
CD6	Industrial/ Guest Lectures		
CD7	Industrial Visits/ In-plant Training		
CD8	Self-learning such as use of PTEL Materials and Internets		
CD9	Simulation		



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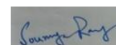
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Course Information Sheet

Course Code : SC25107
 Course Title : Fundamentals of Computing
 Pre-requisite(s) :
 Co-requisite(s) :
 Credits : 2
 Class schedule/ week : L:2 T: 0 P: 0
 Class : B.Sc. (AI & DS / AI & ML / CS)
 Semester/Level : I/1
 Branch : AI & DS / AI & ML / CS

Course Objectives :

This course enables the students to:

A.	Identify the components and types of computer systems.
B.	Explain the role of operating systems and programming languages.
C.	Perform conversions and apply logic using number systems and Boolean algebra.
D.	Analyze input/output devices and memory units.
E.	Understand basic networking and software lifecycle models.

Course Outcomes:

After the completion of this course, students will be able to:

CO1	Recall fundamental concepts of hardware and software.
CO2	Explain operating system functions and programming paradigms.
CO3	Apply Boolean logic and number conversions.
CO4	Describe working of I/O devices and memory architecture.
CO5	Explain stages of software lifecycle and computer network basics

SYLLABUS

MODULE	No. Of Lectures (Hours)
Module-1: Introduction to Computers: Definition, Characteristics of Computers, Classification of Computers, Analog-Hybrid-general purpose digital Computers, Applications of Computers. Computer Software: Software: Definition, Relationship between Software and Hardware, Software Categories, System Software, Application Software, Utility programs. Input Devices & Output Devices.	5
Module-2: Category of different Programming Languages, Steps for Developing a computer program, supporting tools like Algorithm, Flowchart, Pseudo Code(P-Code) for designing a computer program, Generations of Programming Languages.	5



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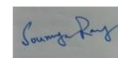
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Module-3: Number Systems and Logic Gates: Number Systems, Conversion between Number bases, Arithmetic System. Signed and Unsigned Numbers, Concept of Overflow, Binary Coding, Logic Gates, Boolean Algebra and Combination of Logic Gates.	5
Module-4: Computer Architecture: Central Processing Unit (CPU), Memory, Communication between various units of a Computer System, The Instruction Format, Instruction Set, Computer Memory: Primary Memory Hierarchy, Random Access Memory, Types of RAM, Read only memory (ROM), Types of ROM., Classification of Secondary Storage Devices, Magnetic Tape, Magnetic Disk, Optical Disk.	5
Module-5: The Software Engineering Discipline – Evolution and Impact, Programs vs. Software Products, Why Study Software Engineering? Software Life Cycles Models: Classical Waterfall Model, Prototyping Model, Spiral Model and Comparison of Different Life Cycle Models. Uses of Computer Networks, Needs and Advantages, Network Hardware devices.	5

Text Books:

1. ITL Education Solution Limited, R & D Wing, Introduction to Computer Science, Pearson Education.
2. Mano M., “Computer System Architecture”, Prentice Hall of India, New Delhi,

Reference Books:

1. Raja Raman V, Fundamentals of Computers, Second Edition, PHI, New Delhi.

Gaps in the Syllabus (to meet Industry/ Profession requirements)

POs met through Gaps in the Syllabus:

Topics beyond the syllabus/ Advanced topics/ Design:

POs met through Topics beyond the syllabus/ Advanced topics/ Design

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

DIRECT ASSESSMENT

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
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Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]
Semester End Examination	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]

INDIRECT ASSESSMENT

Student Feedback on Faculty

Student Feedback on Course Outcome

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Dr. Shripal Vijayvargiya

Mrs. Seema Sharma

Mr. Anurag Joshi

Dr. K.N. Mishra

Dr. Sounak Paul

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Mapping between Course Outcomes and Program Outcomes

Course outcome	Program Outcomes (POs)												Program Specific Outcomes		
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CO3	3	3	3	3	3	1	2	2	1	1	1	2	2	3	2
CO4	3	3	3	1	3	1	1	1	1	1	1	2	2	3	2
CO5	3	3	3	3	3	1	1	1	1	1	1	2	2	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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CD4	Mini Projects/Projects	CO4	CD1,CD5,CD8, CD9
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Course Information Sheet

Course Code : SC25109
 Course Title : Fundamentals of Mathematics
 Pre-requisite(s) :
 Co-requisite(s) :
 Credits : 3
 Class schedule/ week : L:3 T: 0 P: 0
 Class : B.Sc. (AI & DS / AI & ML / CS)
 Semester/Level : I/1
 Branch : AI & DS / AI & ML / CS

Course Objectives

This course enables the students to:

A.	Recall basic concepts in geometry and coordinate systems.
B.	Apply linear equations and matrices to solve algebraic problems.
C.	Understand sets, functions, and their properties.
D.	Differentiate functions and apply them in optimization.
E.	Integrate functions and compute areas under curves.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Understand geometric interpretation of linear equations.
CO2	Solve linear equations using matrix algebra.
CO3	Explain set operations and function properties.
CO4	Apply differentiation for real-world applications.
CO5	Integrate functions and apply to area calculations

SYLLABUS

MODULE	No. Of Lectures (Hours)
Module-1: Basics of Geometry : Cartesian system, coordinates, Point, Straight line and its different forms, Basics of Circle and Parabola. Plain and its equation. System of Linear equations in two variables and three variables and their solution along with geometrical interpretation.	7
Module-2: Introduction to Matrices and System of Linear Equations: Matrices, Algebra of Matrices (Addition, Subtraction, multiplication), Determinant and inverse of Matrices. Solving System of Linear using Matrices (Homogeneous/non-Homogenous), Gaussian Elimination method.	7
Module-3: Basics of Set and Function: Set, Venn diagram, Operations on Sets, Union, Intersection, complement, properties of set operations, Functions, one-one, onto, bijective function, identity function, composite of functions, inverse of function. Meaning of Continuous functions, polynomials and their roots.	7



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Vijayvargiya



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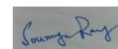
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Module-4: Differentiation: Functions (algebraic, trigonometric, geometrical, logarithmic, exponential) and their differentiation, rules of differentiation, sum rule, product rule, quotient rule and chain rule, Maxima minima of function with geometrical interpretation.	7
Module-5: Integration: Integration of functions, anti-derivative, Rules of integration, integration by substitution and integration by parts, Definite integration and Area under the Curve.	7

Text Books:

1. R.D. Sharma, “Mathematics for XI and XII Volume 1 and 2”, Dhanpat Rai Publication.
2. B.S. Garewal, “Higher Engineering Mathematics”, Khanna Publication.

Reference Books:

1. Thomas, G.B and Finney, R.L. , “Calculus and Analytic Geometry”, Pearson.

Gaps in the Syllabus (to meet Industry/ Profession requirements)

POs met through Gaps in the Syllabus:

Topics beyond the syllabus/ Advanced topics/ Design:

POs met through Topics beyond the syllabus/ Advanced topics/ Design

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

DIRECT ASSESSMENT

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50
Continuous Internal Assessment	
% Distribution	
First Quiz	10
Mid Semester Examination	25
Second Quiz/ Assignment/Seminar Presentation	10
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]
Semester End Examination	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]

INDIRECT ASSESSMENT

Student Feedback on Faculty

Student Feedback on Course Outcome

Mapping between Course Outcomes and Program Outcomes

Course outcomes	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	1	3	1	1	1	2	2	2	1	3	2	2	2
CO2	2	2	1	3	1	1	1	2	2	2	1	3	2	2	2
CO3	2	2	1	2	1	1	1	2	2	2	1	3	2	2	2
CO4	2	2	1	2	1	1	1	2	2	2	1	3	1	1	1
CO5	2	2	1	1	1	1	1	2	2	2	1	3	1	1	1

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Dr. Soumya Ray

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping between COs and Course Delivery (CD) methods

CD Code	Course Delivery Methods	Course Outcome	Course Delivery Method Used
CD1	Lecture by use of Boards/ LCD Projectors	CO1	CD1,CD8
CD2	Tutorials/Assignments	CO2	CD1,CD8,CD9
CD3	Seminars	CO3	CD1,CD2,CD5
CD4	Mini Projects/Projects	CO4	CD1,CD5,CD8, CD9
CD5	Laboratory Experiments/Teaching Aids	CO5	CD1,CD2,CD9
CD6	Industrial/ Guest Lectures		
CD7	Industrial Visits/ In-plant Training		
CD8	Self-learning such as use of PTEL Materials and Internets		
CD9	Simulation		

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Course Information Sheet

Course Code : SC25111
 Course Title : Calculus
 Pre-requisite(s) :
 Co-requisite(s) :
 Credits : 3
 Class schedule/ week : L:3 T: 0 P: 0
 Class : B.Sc.(Computer Science)
 Semester/Level : I/1
 Branch : Computer Science

Course Objectives

This course enables the students to:

A.	Understand some basics of calculus
B.	Provide the basic understandings of partial derivative, total derivative and integration for the multiple variable functions and their applications in the Engineering and Sciences.
C.	Impart the knowledge of mathematical modeling for practical problems in Research and Development.
D.	Prepare the students background for the advance level of understanding of the use of mathematics in the different engineering disciplines.
E.	Enable the students to implement the basic differentiation and integration into the applied field of Engineering and Sciences.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Understand and apply the fundamental concepts of single-variable calculus including Rolle's Theorem, Lagrange's Mean Value Theorem, and methods to determine maxima, minima, and points of inflection.
CO2	Solve and interpret ordinary differential equations (first-order, first-degree, and second-degree) and apply them in modeling real-world problems .
CO3	Perform and analyze multivariable calculus operations including partial differentiation, Taylor/Maclaurin expansions, and determine extrema of functions with two or more variables.
CO4	Apply vector calculus concepts such as gradient, divergence, curl, and directional derivatives to solve problems in scalar and vector fields.
CO5	Evaluate multiple integrals and apply vector integration theorems (Green's, Stokes's, and Gauss's Divergence Theorem) to compute physical quantities and solve field-related problems.

SYLLABUS

MODULE	No. Of Lectures (Hours)
Module-1: Calculus of Single Variable: Lagrange's Mean Value Theorem, Rolle's Theorem, Increasing and decreasing Functions, Maxima and Minima: single derivative test, double derivative test, the point of inflection. Integration, Differential Equation of the First Order and First Degree, Differential equation of first order and second degree. Applications of the differential equations: Motion, Heat transfer, LR Circuit, LCR Circuit.	7



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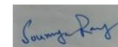
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Module-2: Multiple Variable Differentiation: Partial Differentiation, Euler's theorem, Taylor's Expansion, Maclaurin's Expansion, Maxima and Minima of the multi-variate functions, the point of inflection.	7
Module 3:Vector Differentiation: Scalar and Vector Valued Functions, Directional Derivative, Gradient of a Function, Divergence of a Function, Curl of a Function, Scalar and Vector Potentials. Simple problems	7
Module 4:Multiple Integration: Double Integration, Triple Integration, Change of Coordinate system of Integration, Change of Order of Integration, Green's Theorem, Stokes's theorem, Gauss' Divergence theorem.	7
Module 5:Partial Differential Equation: Creating the Partial Differential Equations, Partial Differential Equation of First Order, Partial Differential Equation of Second order, Applications of Partial Differential Equations, Heat Transfer, Wave Equations.	7

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 2020, 44th Edition, Khanna Publishers.

Reference Books:

1. George B. Thomas, D. Weir, and J. Hass, Thomas Calculus, 2014, 13th Edition, Pearson.
2. John Bird, Higher Engineering Mathematics, 2017, 6th Edition, Elsevier Limited.
3. James Stewart, Calculus: Early Transcendental, 2017, 8th Edition, Cengage Learning.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 2015, 10th Edition, Wiley India.

Gaps in the Syllabus (to meet Industry/ Profession requirements)

POs met through Gaps in the Syllabus:

Topics beyond the syllabus/ Advanced topics/ Design:

POs met through Topics beyond the syllabus/ Advanced topics/ Design

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

DIRECT ASSESSMENT

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50
Continuous Internal Assessment	% Distribution
First Quiz	10
Mid Semester Examination	25
Second Quiz/ Assignment/Seminar Presentation	10
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]
Semester End Examination	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]

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INDIRECT ASSESSMENT

Student Feedback on Faculty
Student Feedback on Course Outcome

Mapping between Course Outcomes and Program Outcomes

Course outcomes	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	2	3	3	2	2	2	1	1	1	2	1	3	2
CO2	3	3	1	3	2	1	3	1	1	1	2	2	2	3	1
CO3	3	3	3	2	3	1	2	3	1	1	2	1	2	2	3
CO4	3	2	3	3	1	1	1	1	1	2	1	1	2	3	2
CO5	2	3	3	2	3	3	1	2	2	1	1	2	2	1	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping between COs and Course Delivery (CD) methods

CD Code	Course Delivery Methods	Course Outcome	Course Delivery Method Used
CD1	Lecture by use of Boards/ LCD Projectors	CO1	CD1, CD7, CD8
CD2	Tutorials/Assignments	CO2	CD1, CD9
CD3	Seminars	CO3	CD1, CD2, CD3
CD4	Mini Projects/Projects	CO4	CD1, CD2
CD5	Laboratory Experiments/Teaching Aids	CO5	CD1, CD2
CD6	Industrial/ Guest Lectures		
CD7	Industrial Visits/ In-plant Training		
CD8	Self-learning such as use of PTEL Materials and Internets		
CD9	Simulation		

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Course Information Sheet

Course Code : SC25121
 Course Title : Quantitative Skills
 Pre-requisite(s) :
 Co-requisite(s) :
 Credits : 3
 Class schedule/ week : L:2 T: 0 P: 2
 Class : B.Sc. (Computer Science)
 Semester/Level : I/1
 Branch : Computer Science

Course Objectives

This course enables the students to:

A.	Enhance the logical reasoning skills of the students and help them improve problem-solving abilities
B.	Acquire skills required to solve quantitative aptitude problems
C.	Boost the verbal ability of the students for academic and professional purposes
D.	Enable the students to apply the reasoning skills in arithmetic problem solving
E.	Enable the students to apply the basic arithmetic concepts to solve real world problem.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Exhibit sound knowledge to solve problems of Quantitative Aptitude
CO2	Demonstrate ability to solve problems of Logical Reasoning
CO3	Display the ability to tackle questions of Verbal Ability
CO4	Solve the arithmetic problems with quantitative technique.
CO5	Enhance the logical reasoning skills for problem solving

SYLLABUS

MODULE	No. Of Lectures (Hours)
Module 1: Logical Reasoning: Word group categorization questions Puzzle type class involving students grouping words into right group orders of logical sense, image ordering, pattern recognition, Cryptarithmic	7
Module 2: Ratio and Proportion: Ratio - Proportion - Variation - Simple equations - Problems on Ages - Up Streams and Down Streams, Distance-Time, Speed variation.	7
Module 3: Percentages, Simple and Compound Interest: Percentages as Fractions and Decimals - Percentage Increase/ Decrease - Simple Interest - Compound Interest - Relation Between Simple and Compound Interest	7



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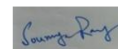
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Module 4: Number System: Number system- Power cycle - Remainder cycle - Factors, Multiples - HCF and LCM	7
Module 5: Combinatorics: Introduction to permutations and combinations. Relation between permutations and combinations, circular permutations, word problems in permutations and combinations.	7

Text Books:

1. Aggarwal R.S. (2017). *Quantitative Aptitude for Competitive Examinations* 3rd (Ed.). New Delhi: S. Chand Publishing.

Reference Books:

1. SMART. (2018). *Place Mentor* 1st (Ed.). Chennai: Oxford University Press.

Gaps in the Syllabus (to meet Industry/ Profession requirements)

POs met through Gaps in the Syllabus:

Topics beyond the syllabus/ Advanced topics/ Design:

POs met through Topics beyond the syllabus/ Advanced topics/ Design

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

DIRECT ASSESSMENT

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50
Continuous Internal Assessment	
% Distribution	
First Quiz	10
Mid Semester Examination	25
Second Quiz/ Assignment/Seminar Presentation	10
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]
Semester End Examination	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]

INDIRECT ASSESSMENT

Student Feedback on Faculty

Student Feedback on Course Outcome

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Mapping between Course Outcomes and Program Outcomes

Course outcome	Program Outcomes (POs)												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	3	2	3	3	2	2	2	1	1	2	2	1	3	2
CO2	3	3	1	3	2	1	3	1	1	1	1	2	2	3	1
CO3	3	2	3	2	3	2	2	3	1	1	2	1	2	2	3
CO4	3	1	3	2	1	1	2	2	2	2	1	1	2	3	2
CO5	2	2	3	1	3	3	1	2	2	1	1	2	2	1	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping between COs and Course Delivery (CD) methods

CD Code	Course Delivery Methods	Course Outcome	Course Delivery Method Used
CD1	Lecture by use of Boards/ LCD Projectors	CO1	CD1, CD7, CD8
CD2	Tutorials/Assignments	CO2	CD1, CD9
CD3	Seminars	CO3	CD1, CD2, CD3
CD4	Mini Projects/Projects	CO4	CD1, CD2
CD5	Laboratory Experiments/Teaching Aids	CO5	CD1, CD2
CD6	Industrial/ Guest Lectures		
CD7	Industrial Visits/ In-plant Training		
CD8	Self-learning such as use of PTEL Materials and Internets		
CD9	Simulation		

Course Information Sheet



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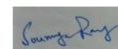
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Course Code : SC25131
 Course Title : Design Thinking
 Pre-requisite(s) :
 Co-requisite(s) :
 Credits : 2
 Class schedule/ week : L:2 T: 0 P: 0
 Class : B.Sc. (AI & DS / AI & ML / CS)
 Semester/Level : I/1
 Branch : AI & DS / AI & ML / CS

Course Objectives

This course enables the students to:

A.	Understand design thinking principles and mindset.
B.	Apply empathy techniques for user-centric problem analysis.
C.	Generate and ideate creative solutions using design frameworks.
D.	Build and iterate prototypes using user feedback.
E.	Integrate data and stakeholder insights for design evaluation

Course Outcomes

After the completion of this course, students will be able to:

CO1	Empathize: Apply empathy techniques to understand user needs and define human-centered problems.
CO2	Define: Formulate clear problem statements and “How Might We” questions from user research.
CO3	Ideate: Generate a wide variety of creative solutions using ideation techniques.
CO4	Prototype & Test: Build and test low-fidelity prototypes and iterate based on feedback.
CO5	Integrate Data: Integrate basic data insights and stakeholder feedback in the design process.

SYLLABUS

MODULE	No. Of Lectures (Hours)
Module-1: Introduction to Design Thinking: Evolution of Design Thinking—history and key schools, The Design Thinking Mindset—empathy, experimentation, bias to action, Human-Centered Design vs. Traditional Problem Solving, Framing Wicked Problems, Overview of the Five-Stage Process (Empathize, Define, Ideate, Prototype, Test), Case Studies: Design Thinking in Tech & Healthcare	5
Module-2: Empathize & Define: User Research Methods—interviews, observation, contextual inquiry, Empathy Mapping & Journey Mapping, Synthesizing Qualitative Data—clustering and affinity diagrams, Crafting Point-of-View (POV) Statements, Defining Problem Statements & “How Might We” Questions, Aligning Business Goals with User Needs. Decision Making and Branching: Control statements: if, if-else, else-if ladder, nested if, switch, goto. Loop control statements: break, continue. Looping Constructs: while, do-while, and for loops.	5
Module-3: Ideation Techniques –Brainstorming Best Practices & Rules, Alternative Ideation Methods: SCAMPER, Crazy 8’s, Mind Mapping, Co-creation Workshops & Stakeholder Involvement, Selecting & Prioritizing Ideas—Impact/Effort Matrix, Storyboarding Solutions, Integrating Quantitative Insights into Ideation	5

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Module-4: Prototyping Strategies –Fidelity Spectrum: From Paper to Digital Prototypes, Rapid Prototyping Tools & Techniques, Storyboards & Role-Playing as Prototype Methods, Lean Experimentation & Build-Measure-Learn, Incorporating Data Feedback Loops, Ethical Considerations in Prototyping	5
Module-5: Testing, Iteration & Implementation –Planning & Conducting Usability Tests, Analyzing Feedback & Defining Metrics of Success, Iteration Strategies & Pivot vs. Persevere Decisions, Scaling Solutions & Handoff to Development, Measuring Impact & Continuous Improvement, Final Project Presentations & Reflection.	5

Text Books:

1. Idris Mootee, Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School, 2013, Wiley
2. Kristina Niedderer, Stephen Clune, Geke Ludden, Design Thinking for Student Projects: A Framework for Innovation and Entrepreneurship, 2021. Routledge
3. Michael Lewrick, Patrick Link, Larry Leifer, The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems, 2018 Wiley

Reference Books:

1. Ben Shneiderman, Human-Centered AI, 2022, Oxford University Press
2. Jake Knapp (Google Ventures), Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days, 2016, Simon & Schuster
3. Dan Saffer, Designing for Interaction: Creating Smart Applications and Clever Devices, 2020 (4th Ed.), New Riders
4. Stickdorn, Hormess, Lawrence, Schneider, This is Service Design Doing: Applying Service Design Thinking in the Real World, 2018, O'Reilly

Gaps in the Syllabus (to meet Industry/ Profession requirements)

POs met through Gaps in the Syllabus:

Topics beyond the syllabus/ Advanced topics/ Design:

POs met through Topics beyond the syllabus/ Advanced topics/ Design

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

DIRECT ASSESSMENT

Assessment Tool	% Contribution during CO Assessment				
Continuous Internal Assessment	50				
Semester End Examination	50				
Continuous Internal Assessment					
% Distribution					
First Quiz	10				
Mid Semester Examination	25				
Second Quiz/ Assignment/Seminar Presentation	10				
Teacher's Assessment	5				

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]
Semester End Examination	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]

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INDIRECT ASSESSMENT

Student Feedback on Faculty

Student Feedback on Course Outcome

Mapping between Course Outcomes and Program Outcomes

Course outcome	Program Outcomes (POs)												Program Specific Outcomes		
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CO2	3	3	2	1	1	1	1	2	2	2	1	2	2	3	2
CO3	2	3	3	1	2	2	1	1	2	2	1	2	3	3	2
CO4	2	3	3	2	3	2	1	1	3	3	2	2	3	3	2
CO5	2	2	3	3	3	2	2	2	2	3	2	3	3	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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CD4	Mini Projects/Projects	CO4	CD1,CD5,CD8, CD9
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CD6	Industrial/ Guest Lectures		
CD7	Industrial Visits/ In-plant Training		
CD8	Self-learning such as use of PTEL Materials and Internets		
CD9	Simulation		

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Course Information Sheet

Course Code : SC25102
Course Title : C Programming Lab
Pre-requisite(s) :
Co-requisite(s) :
Credits : 1.5
Class schedule/ week : L: 0 T: 0 P: 3
Class : B.Sc. (AI & DS / AI & ML / CS)
Semester/Level : I/1
Branch : AI & DS / AI & ML / CS

Course Objectives

This course enables the students to:

A.	Understand the basics of coding using C language.
B.	Apply fundamental programming techniques to solve problems.
C.	Develop programs for algorithm-based logic.
D.	Analyze program errors and debugging approaches.
E.	Create structured C programs using modular design.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Formulate simple algorithms for arithmetic/logical problems.
CO2	Convert algorithms into syntactically correct C programs.
CO3	Test and debug logical and syntax errors in C.
CO4	Apply C programming for numerical methods like integration.
CO5	Construct modular programs using functions and structures

SYLLABUS

Module-1: Basics of C Programming

Objective: To familiarize students with basic syntax, data types, variables, and program structure.

Lab Exercises:

1. Write a C program to demonstrate the use of variables and constants.
2. Write a C program to use different data types and print their sizes.
3. Write a C program to take input of various data types and display them.
4. Write a program to demonstrate the use of different types of C tokens (identifiers, keywords, constants, etc.)

Module-2: Operators, Expressions, and Control Flow

Objective: To understand operators, expressions, decision-making, and loops in C.

Lab Exercises:

1. Write a C program to demonstrate all arithmetic and logical operators.
2. Write a program to evaluate an expression and display the result (with proper operator precedence).
3. Write a C program to find the largest of three numbers using if-else.
4. Write a C program to print the grade of a student using switch-case.
5. Write a program to illustrate the use of for, while, and do-while loops.

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6. Write a program to demonstrate break, continue, and goto statements within loops.
7. WAP to find whether a given year is a leap year or not. Modify it to generate a list of leap years between two-year limits given by user
8. Using Ternary / Conditional operator find the greatest among 3 numbers.

Module-3: Arrays and Strings

Objective: To learn declaration, initialization, and manipulation of arrays and strings.

Lab Exercises:

1. Write a C program to find the sum and average of elements in an array.
2. Write a program to search an element in an array and print its position.
3. Write a C program to perform matrix addition or multiplication using 2D arrays.
4. Write a C program to read and display a string using gets() and puts().
5. Write a C program to demonstrate the use of string handling functions like strlen(), strcpy(), strcat(), and strcmp().

Module-4: Functions

Objective: To develop modular programs using functions and understand parameter passing.

Lab Exercises:

1. Write a program using functions to find the factorial of a number.
2. Write a recursive function to generate the Fibonacci series.
3. Write a function to swap two numbers using call by value and call by reference.
4. Write a function to find the sum of elements in an array passed as argument.
5. Write a function to count vowels in a given string.
6. Write an interactive program that will read in a +ve integer value and determine the following
 - a) If the integer is a prime number
 - b) If the integer is a Fibonacci number

Module-5: Structures, Unions, and Pointers

Objective: To explore user-defined data types and dynamic memory access using pointers.

Lab Exercises:

1. Define a structure Student with members (name, roll no, marks). Write a program to read and display student details.
2. Write a program to create an array of structures for 5 students and print the average marks.
3. Write a program using a structure within a structure (nested structures).
4. Write a program to demonstrate pointer basics: address and dereferencing.
5. Write a program to pass a structure variable to a function using a pointer.
6. Write a program to demonstrate use of union and compare it with structure.

Text Books:

1. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
2. Byron Gottfried, "Schaum's Outline of Programming with C", McGraw-Hill.
3. C How to Program, 9/E, deitel & deitel, Pearson Publication, 2022
4. Programming In C, Reema Thareja, OUP India

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Prentice Hall India Learning Private Limited.
2. Jery R Hanly, "Problem solving and Program design in C", Pearson Education, 7th Edition.
3. R. G. Dromey, How to Solve it by Computer, Pearson Education.
4. Sprankle M., "Problem Solving and Programming Concepts", 7th Edition, Pearson Education, New Delhi, 2006.
5. Kanetkar Y., "Let us C", 4th Edition, BPB publication, New Delhi, 2002.

Gaps in the Syllabus (to meet Industry/ Profession requirements)

POs met through Gaps in the Syllabus:

Topics beyond the syllabus/ Advanced topics/ Design:

POs met through Topics beyond the syllabus/ Advanced topics/ Design



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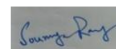
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Paul



Dr. Soumya
Ray

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

DIRECT ASSESSMENT

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40
Continuous Internal Assessment	
% Distribution	
Day to day performance and Lab File	30
Quiz	10
Viva Voce	20
Semester End Examination	
% Distribution	
Examination/ Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	20%	20%	20%	20%	20%
Semester End Examination	20%	20%	20%	20%	20%

Mapping between Cos and Program Outcomes

Course outcome	Program Outcomes (POs)												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3	2	1	1	2	2	1	1	1	1	1	2	2
CO2	3	1	1	1	1	3	1	1	2	1	1	2	3	2	3
CO3	2	3	3	1	2	1	2	2	1	1	1	2	2	2	3
CO4	1	1	3	3	1	1	1	1	1	1	1	1	2	3	3
CO5	3	3	3	1	2	1	1	2	1	1	2	1	1	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping between Cos and Course Delivery (CD) methods

CD Code	Course Delivery Methods	Course Outcome	Course Delivery Method Used
CD1	Lecture by use of Boards/ LCD Projectors	CO1	CD1,CD8
CD2	Tutorials/Assignments	CO2	CD1,CD8,CD9
CD3	Seminars	CO3	CD1,CD2,CD5
CD4	Mini Projects/Projects	CO4	CD1,CD5,CD8, CD9
CD5	Laboratory Experiments/Teaching Aids	CO5	CD1,CD2,CD9
CD6	Industrial/ Guest Lectures		
CD7	Industrial Visits/ In-plant Training		
CD8	Self-learning such as use of PTEL Materials and Internets		
CD9	Simulation		

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Dr. Soumya Ray

Course Information Sheet

Course Code : SC25104
Course Title : Structured and Object-Oriented Programming Lab
Pre-requisite(s) :
Co-requisite(s) :
Credits : 1.5
Class schedule/ week : L: 0 T: 0 P: 3
Class : B.Sc. (Computer Science)
Semester/Level : I/1
Branch : Computer Science

Course Objectives

This course enables the students to:

A.	Learn computer language.
B.	Learn coding for problems.
C.	Learn the problem-solving process through computer.
D.	Know the limitations of system during program execution.
E.	Know the practical application of various programming techniques.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Formulate simple algorithms for arithmetic and logical problems.
CO2	Translate the algorithms to programs.
CO3	Test and execute the programs and correct syntax and logical errors.
CO4	Apply programming to solve simple numerical method problems, differentiation of function and simple integration.
CO5	Decompose a problem into functions and synthesize a complete program using divide and conquer approach.

SYLLABUS

Module-1: Basics of C Programming

Objective: To familiarize students with basic syntax, data types, variables, program structure, decision making and loops.

Lab Exercises:

1. Write a C program to demonstrate the use of variables and constants.
2. Write a C program to use different data types and print their sizes.
3. Write a C program to take input of various data types and display them.
4. Write a program to demonstrate the use of different types of C tokens (identifiers, keywords, constants, etc.)
5. Write a C program to demonstrate all arithmetic and logical operators.
6. Write a program to evaluate an expression and display the result (with proper operator precedence).
7. Write a C program to find the largest of three numbers using if-else.
8. Write a C program to print the grade of a student using switch-case.
9. Write a program to illustrate the use of for, while, and do-while loops.
10. Write a program to demonstrate break, continue, and goto statements within loops.

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Module-2: Arrays and Strings

Objective: To learn declaration, initialization, and manipulation of arrays and strings.

Lab Exercises:

1. Write a C program to find the sum and average of elements in an array.
2. Write a program to search an element in an array and print its position.
3. Write a C program to perform matrix addition or multiplication using 2D arrays.
4. Write a C program to read and display a string using gets() and puts().
5. Write a C program to demonstrate the use of string handling functions like strlen(), strcpy(), strcat(), and strcmp().

Module-3: : Functions and Structures

Objective: To develop modular programs using functions and understand parameter passing.

Lab Exercises:

1. Write a program using functions to find the factorial of a number.
2. Write a recursive function to generate the Fibonacci series.
3. Write a function to swap two numbers using call by value and call by reference.
4. Write a function to find the sum of elements in an array passed as argument.
5. Write a function to count vowels in a given string.
6. Write an interactive program that will read in a +ve integer value and determine the following
 - a) If the integer is a prime number
 - b) If the integer is a Fibonacci number
7. Define a structure Student with members (name, roll no, marks). Write a program to read and display student details.
8. Write a program to create an array of structures for 5 students and print the average marks.
9. Write a program using a structure within a structure (nested structures).

Module-4 Overview of Object Oriented Programming

Objective: To develop programs using OOPS concepts

Lab Exercises:

1. Create a class **Rectangle** with length and breadth as data members. Include functions to calculate area and perimeter.
2. Write a program to create a class **Book** with data members: title, author, and price. Use a constructor to initialize them and display book details.
3. Define a class **Student** with marks of 3 subjects. Include functions to calculate and display total and average marks.
4. Create a class **BankAccount** with account number, holder name, and balance. Write functions to deposit and withdraw money
5. Write an inline function to calculate the cube of a number.
6. Create a class **Math** with inline functions to calculate square and factorial of a number.

Module-5: Inheritance and Polymorphism

Objective: To develop programs using OOPS concepts

Lab Exercises:

Single Inheritance

1. Create a class Person with name and age. Derive a class Student that adds roll number and marks. Accept and display details using both classes.
2. Create a base class Shape with a function to display area. Derive classes Rectangle and Circle to calculate and display respective areas.

Multilevel Inheritance

3. Create a class University, derive Department from it, and then derive Student from Department. Display data from all levels.
4. Design a class hierarchy where Employee is the base class, Manager is derived from Employee, and SeniorManager is derived from Manager. Show how data flows through the hierarchy.

Multiple Inheritance

5. Create two classes Teacher and Researcher. Derive a class Professor from both, and show how it inherits properties of both.

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6. Create classes Sport and Academics with marks. Derive a class Result that displays total marks using multiple inheritance.

Hierarchical Inheritance

7. Create a base class Account and derive SavingsAccount and CurrentAccount. Each derived class should have its own features. Display complete account details.

Compile-Time (Function Overloading)

8. Create a class Calculator with multiple overloaded add() functions to add two integers, two floats, and three numbers.
9. Overload a function area() to compute area of circle, rectangle, and triangle.

Run-Time (Virtual Functions / Function Overriding)

10. Create a base class Animal with a virtual function makeSound(). Derive classes Dog and Cat that override the function to give respective sounds.
11. Create a class Vehicle with a virtual function startEngine(). Derive classes Car and Bike, override the function, and invoke through a base class pointer.

Text Books:

1. Kanetkar Y., “Let us C”, 17th Edition, BPB publication, New Delhi, 2020.
2. Balagurusamy E., “Object-Oriented Programming with C++”, 8th Edition, TMH, 2021.

Reference Books:

1. Balagurusamy E., “Programming in ANSI C”, 9th Edition, TMH, 2020
2. Herbert Schildt, C++, The Complete Reference, Tata McGraw-Hill

Gaps in the Syllabus (to meet Industry/ Profession requirements)

POs met through Gaps in the Syllabus:

Topics beyond the syllabus/ Advanced topics/ Design:

POs met through Topics beyond the syllabus/ Advanced topics/ Design

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

DIRECT ASSESSMENT

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40
Continuous Internal Assessment	
% Distribution	
Day to day performance and Lab File	30
Quiz	10
Viva Voce	20
Semester End Examination	
% Distribution	
Examination/ Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	20%	20%	20%	20%	20%
Semester End Examination	20%	20%	20%	20%	20%

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Mapping between Cos and Program Outcomes

Course outcome	Program Outcomes (POs)												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1 3	1 4	1 5
CO1	3	3	3	2	1	1	2	2	1	1	1	1	1	2	2
CO2	3	1	1	1	1	3	1	1	2	1	1	2	3	2	3
CO3	2	3	3	1	2	1	2	2	1	1	1	2	2	2	3
CO4	1	1	3	3	1	1	1	1	1	1	1	1	2	3	3
CO5	3	3	3	1	2	1	1	2	1	1	2	1	1	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping between Cos and Course Delivery (CD) methods

CD Code	Course Delivery Methods	Course Outcome	Course Delivery Method Used
CD1	Lecture by use of Boards/ LCD Projectors	CO1	CD1,CD8
CD2	Tutorials/Assignments	CO2	CD1,CD8,CD9
CD3	Seminars	CO3	CD1,CD2,CD5
CD4	Mini Projects/Projects	CO4	CD1,CD5,CD8, CD9
CD5	Laboratory Experiments/Teaching Aids	CO5	CD1,CD2,CD9
CD6	Industrial/ Guest Lectures		
CD7	Industrial Visits/ In-plant Training		
CD8	Self-learning such as use of PTEL Materials and Internets		
CD9	Simulation		

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SEMESTER – II

Course Information Sheet

Course Code	: SC25113
Course Title	: Introduction to Data Structures
Pre-requisite(s)	:
Co-requisite(s)	: Data Structures Lab
Credits	: 4
Class schedule/ week	: L:3 T: 1 P: 0
Class	: B.Sc. (AI & DS / AI & ML / CS)
Semester/Level	: II/1
Branch	: AI & DS / AI & ML / CS

Course Objectives

This course enables the students to:

A.	Recall fundamentals of algorithms and data structures.
B.	Understand various data types and storage mechanisms.
C.	Apply appropriate data structures for different problems.
D.	Analyze time-space complexities of algorithms.
E.	Evaluate real-life applications using data structures

Course Outcomes

After the completion of this course, students will be able to:

CO1	Analyze algorithm efficiency and data structure properties.
CO2	Apply data structures for modeling computer-based systems.
CO3	Implement and evaluate tree-based structures.
CO4	Select appropriate searching and sorting algorithms.
CO5	Solve real-world problems using graph algorithms

SYLLABUS

MODULE	No. Of Lectures (Hours)
Module-1: Introduction: Introduction to Algorithmic, Asymptotic notations, Complexity-Time- Space Trade off. Data Structure-Definition and classification. Arrays: Representation of Arrays in Memory: Accessing elements of array, performing operations like insertion, deletion, arranging elements and searching, applications of arrays.	8
Module-2: Stacks and Queues: Introduction to data structures like Stacks and Queues. Operations on Stacks and Queues, Array representation of Stacks, Applications of Stacks: Operations of Queues, Representations of Queues, and Applications of Queues.	8
Module-3: Linked Lists: Singly linked lists, Representation of linked list, Operations of Linked list such as Traversing, Insertion and Deletion, Searching, Applications of Linked List. Concepts of Circular linked list and doubly linked list and their Applications, Stacks and Queues as linked list.	8



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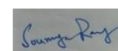
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Module-4: Trees: Basic Terminology, Binary Trees and their representation, binary search trees, various operations on Binary search trees like traversing, searching, Insertion and Deletion, Applications of Binary search Trees, Complete Binary trees. Graphs: Terminology and Representations, Adjacency Matrix and Adjacency List Representation, Directed Graphs and Undirected Graphs.	8
Module-5: Searching and Sorting: Definition. Linear Search, Binary search, Interpolation Search, Transpose Sequential Search. Insertion sort, Selection sort, Quick sort, Merge sort.	8

Text Books:

1. Horowitz and Sahni, “Fundamentals of Data structures”, Galgotia publications.
2. Pai GAV, “Data Structures and Algorithms: Concepts, Techniques and Applications”, Tata McGraw-Hill.

Reference Books:

1. Tannenbaum, “Data Structures”, PHI.
2. Lipschutz Seymour, “Data Structures”, Tata McGraw-Hill.
3. Dozed Adam, “Data Structures and Algorithms in C++”, Thomson Learning.
4. R.L.Kruse, B.P.Leary, C.L.Tondo, “Data structure and program design in C”, PHI,
5. Michael T. Goodrich, “Data Structures and Algorithms in C++”, Wiley India Edition.
6. Tremblay J. P., Sorenson P. G, “An Introduction to Data Structures with Applications”, McGraw-Hill.

Gaps in the Syllabus (to meet Industry/ Profession requirements)

POs met through Gaps in the Syllabus:

Topics beyond the syllabus/ Advanced topics/ Design:

POs met through Topics beyond the syllabus/ Advanced topics/ Design

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

DIRECT ASSESSMENT

Assessment Tool	% Contribution during CO Assessment				
Continuous Internal Assessment	50				
Semester End Examination	50				
Continuous Internal Assessment	% Distribution				
First Quiz	10				
Mid Semester Examination	25				
Second Quiz/ Assignment/Seminar Presentation	10				
Teacher’s Assessment	5				

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]
Semester End Examination	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]

INDIRECT ASSESSMENT

Student Feedback on Faculty

Student Feedback on Course Outcome



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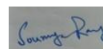
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Mapping between Course Outcomes and Program Outcomes

Course outcome	Program Outcomes (POs)												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3	2	2	2	2	2	3	3	3	3	1	2	2
CO2	3	3	3	2	2	3	2	1	3	2	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	2	3	3	2	2	3
CO4	2	2	2	3	1	2	1	1	1	1	1	1	2	3	3
CO5	3	3	3	1	2	1	1	2	3	3	3	3	1	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping between COs and Course Delivery (CD) methods

CD Code	Course Delivery Methods	Course Outcome	Course Delivery Method Used
CD1	Lecture by use of Boards/ LCD Projectors	CO1	CD1,CD8
CD2	Tutorials/Assignments	CO2	CD1,CD8,CD9
CD3	Seminars	CO3	CD1,CD2,CD5
CD4	Mini Projects/Projects	CO4	CD1,CD5,CD8, CD9
CD5	Laboratory Experiments/Teaching Aids	CO5	CD1,CD2,CD9
CD6	Industrial/ Guest Lectures		
CD7	Industrial Visits/ In-plant Training		
CD8	Self-learning such as use of PTEL Materials and Internets		
CD9	Simulation		

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Course Information Sheet

Course Code : SC25115
 Course Title : Python Programming
 Pre-requisite(s) :
 Co-requisite(s) : Python Programming Lab
 Credits : 3
 Class schedule/ week : L:3 T: 0 P: 0
 Class : B.Sc. (AI & DS / AI & ML / CS)
 Semester/Level : II/1
 Branch : AI & DS / AI & ML / CS

Course Objectives

This course enables the students to:

A.	Understand fundamental programming concepts using Python.
B.	Apply control structures and standard functions effectively.
C.	Use built-in data structures for efficient problem-solving.
D.	Implement OOP principles using Python classes and objects.
E.	Handle file operations and exceptions for robust programs.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Solve computational problems using Python basics.
CO2	Utilize control flow and standard functions efficiently.
CO3	Implement and manipulate data structures like lists and dictionaries.
CO4	Apply OOP concepts in program design.
CO5	Perform data storage and manipulation using file handling

SYLLABUS

MODULE	No. Of Lectures (Hours)
Module-1: Introduction to Python Programming: Introduction, Programming Languages, Features of python language, Getting Started with Python, Programming Errors. Writing a Simple Program, Reading Input from the Console, Identifiers, Variables, Assignment Statements, and Expressions, Simultaneous Assignments, Named Constants, Numeric Data Types and Operators, Evaluating Expressions and Operator Precedence, Augmented Assignment Operators, Type Conversions and Rounding.	7
Module-2: Mathematical Functions, Strings, and Objects: Introduction, Common Python Functions, Strings and Characters, Introduction to Objects and Methods, Formatting Numbers and Strings. Control Structures: Selections: Introduction, Boolean Types, Values, and Expressions, if Statements, Two-Way if-else Statements, Nested if and Multi-Way if-elif-else Statements, Logical Operators, Conditional Expressions, Loops: Introduction, The while Loop, The for Loop, Nested Loops, Keywords break and continue. Looping Constructs: while, do-while, and for loops.	7



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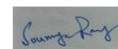
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<p>Module-3: Functions: Introduction, Defining a Function, Calling a Function, Functions with/without Return Values, Positional and Keyword Arguments, Passing Arguments by Reference Values, The Scope of Variables, Default Arguments, Returning Multiple Values.</p> <p>Lists and Arrays :Introduction, List Basics, Copying Lists, Passing Lists to Functions, Returning a List from a Function, Searching Lists, Sorting, Processing Two-Dimensional Lists, Passing Two-Dimensional Lists to Functions, Multidimensional Lists. List to Array conversion and array operation using numpy module.</p>	7
<p>Module-4: Tuples, Sets, and Dictionaries: Introduction, Tuples: Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Tuple methods, Sets: Creating Sets, Manipulating and Accessing Sets, Subset and Superset, Set Operations, Comparing the Performance of Sets and Lists, Dictionaries: Creating a Dictionary, Adding, Modifying, and Retrieving Values, Deleting Items, Looping Items, The Dictionary Methods.</p>	7
<p>Module-5: Objects and Classes: Introduction, Defining Classes for Objects, Immutable Objects vs. Mutable Objects, Hiding Data Fields, Class Abstraction and Encapsulation, Object-Oriented Thinking. Inheritance and Polymorphism: Introduction, Superclasses and Subclasses, Overriding Methods.</p> <p>Files and Exception Handling: Introduction, text input and output : opening a file, Writing Data, Testing a File's Existence, Reading All Data from a File, Writing and Reading Numeric Data, Binary IO Using Pickling, Reading and writing CSV file using pandas, Exception Handling, Raising Exceptions.</p>	7

Text Books:

1. Y. Daniel Liang, "Introduction to programming using python", Pearson Education; First edition (2017).

Reference Books:

1. Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education; Forth edition (2018)
2. Fabio Nelli "Python Data Analytics: With Pandas, NumPy, and Matplotlib" *Second Edition* Apress Media LLC
3. Mark Summerfield, "Programming in Python 3: A Complete Introduction to the Python Language" Pearson Education; Second edition (2018)

Gaps in the Syllabus (to meet Industry/ Profession requirements)

POs met through Gaps in the Syllabus:

Topics beyond the syllabus/ Advanced topics/ Design:

POs met through Topics beyond the syllabus/ Advanced topics/ Design

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

DIRECT ASSESSMENT

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50
Continuous Internal Assessment	
% Distribution	
First Quiz	10
Mid Semester Examination	25
Second Quiz/ Assignment/Seminar Presentation	10
Teacher's Assessment	5

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Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]
Semester End Examination	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]

INDIRECT ASSESSMENT

Student Feedback on Faculty
Student Feedback on Course Outcome

Mapping between Course Outcomes and Program Outcomes

Course outcome	Program Outcomes (POs)												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	2	3	1	2	2	1	2	2	2	2	2	2	2
CO2	3	3	2	2	1	3	2	1	2	3	1	2	2	2	2
CO3	3	3	2	2	1	3	1	1	3	2	2	2	2	2	2
CO4	3	3	2	3	1	2	1	1	2	3	2	3	2	2	3
CO5	3	3	2	3	1	2	2	1	2	2	3	2	2	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping between COs and Course Delivery (CD) methods

CD Code	Course Delivery Methods	Course Outcome	Course Delivery Method Used
CD1	Lecture by use of Boards/ LCD Projectors	CO1	CD1,CD8
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CD7	Industrial Visits/ In-plant Training		
CD8	Self-learning such as use of PTEL Materials and Internets		
CD9	Simulation		

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Course Information Sheet

Course Code : SC25117
 Course Title : Mathematics for Computing
 Pre-requisite(s) :
 Co-requisite(s) :
 Credits : 3
 Class schedule/ week : L:3 T: 0 P: 0
 Class : B.Sc. (AI & DS / AI & ML / CS)
 Semester/Level : II/1
 Branch : AI & DS / AI & ML / CS

Course Objectives

This course enables the students to:

A.	Recall foundational concepts of probability and statistics.
B.	Analyze and represent data using statistical tools.
C.	Understand discrete and continuous probability distributions.
D.	Apply sampling techniques and parameter estimation.
E.	Evaluate hypotheses using standard testing methods.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Apply basic probability rules and Bayes' theorem.
CO2	Visualize and interpret statistical data.
CO3	Work with discrete and continuous distributions.
CO4	Estimate population parameters using sampling techniques.
CO5	Perform hypothesis testing in decision-making

SYLLABUS

MODULE	No. Of Lectures (Hours)
Module-1: Probability: Basics of Probability, Sum and Product Rule, Conditional Probability, Independent event, Bayes theorem.	7
Module-2: Basics of Statistics: Statistics, Data Collection and representation (Descriptive Statistics), Bar Chart, Histogram, Ogive, Pie Chart, Steam- leaf representation. Mean, Mode, Median (percentile, Quartile and Box Plot), Deviation, Variance and Standard Deviation.	7
Module-3: Random Variable: Discrete Random Variable, Bernoulli and Poisson Distribution, Mean and Variance. Continuous Random Variable, Expectation and Variance, Moment, Normal Distribution, Uniform distribution, Exponential distribution.	7
Module-4: Sampling Distribution and Estimation of Parameters : Purpose and Principal of Sampling, Central Limit Theorem, Sampling distribution, Mean of Sampling Distribution and its variance, Sampling distribution of difference of mean, Meaning of Statistical estimation, Method of Maximum Likelihood, point and Interval Estimation, confidence limits for population mean.	7
Module-5: Hypothesis Testing: Significance Level, Procedure of Testing hypothesis, Testing hypothesis about the population mean, Testing hypothesis about the difference in two means, Types of errors.	7



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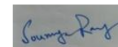
Mr. Anurag
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Text Books:

1. Sheldon, M.Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Elsevier.
2. Walpole, Myers, Myers, Ye, "Probability and Statistics for Engineers and Scientists", Prentice, Hall.

Gaps in the Syllabus (to meet Industry/ Profession requirements)

POs met through Gaps in the Syllabus:

Topics beyond the syllabus/ Advanced topics/ Design:

POs met through Topics beyond the syllabus/ Advanced topics/ Design

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

DIRECT ASSESSMENT

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50
Continuous Internal Assessment	
% Distribution	
First Quiz	10
Mid Semester Examination	25
Second Quiz/ Assignment/Seminar Presentation	10
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]
Semester End Examination	20%[10]	20%[10]	20%[10]	20%[10]	20%[10]

INDIRECT ASSESSMENT

Student Feedback on Faculty

Student Feedback on Course Outcome

Mapping between Course Outcomes and Program Outcomes

Course outcomes	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	1	3	1	1	1	2	2	2	1	3	2	2	2
CO2	2	2	1	3	1	1	1	2	2	2	1	3	2	2	2
CO3	2	2	1	2	1	1	1	2	2	2	1	3	2	2	2
CO4	2	2	1	2	1	1	1	2	2	2	1	3	1	1	1
CO5	2	2	1	1	1	1	1	2	2	2	1	3	1	1	1

Correlation Levels 1, 2 or 3 as defined below:

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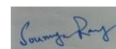
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Mapping between COs and Course Delivery (CD) methods

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CD6	Industrial/ Guest Lectures		
CD7	Industrial Visits/ In-plant Training		
CD8	Self-learning such as use of PTEL Materials and Internets		
CD9	Simulation		



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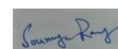
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Course Information Sheet

Course Code : SC25114
Course Title : Data Structures Lab
Pre-requisite(s) :
Co-requisite(s) : Introduction to Data Structures
Credits : 1.5
Class schedule/ week : L: 0 T: 0 P: 3
Class : B.Sc. (AI & DS / AI & ML / CS)
Semester/Level : II/1
Branch : AI & DS / AI & ML / CS

Course Objectives

This course enables the students to:

A.	Recall and implement core data structures using C.
B.	Apply data structures to solve standard algorithmic problems.
C.	Analyze performance of sorting and searching techniques.
D.	Use graphs and trees for problem modeling.
E.	Demonstrate real-world application of data structures.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Identify suitable data structures for given problems.
CO2	Measure time and space complexity of implementations.
CO3	Implement various sorting and searching algorithms.
CO4	Use trees and graphs to solve problems efficiently.
CO5	Justify design decisions for problem-specific data structures

SYLLABUS

Module-1:

Arrays and Strings: Implement static and dynamic arrays, In-place array reversal, rotation, sorting (bubble, selection, insertion), Basic string operations: palindrome check, substring search, 2D arrays: matrix operations, transposition, diagonal sums

Module-2:

Linked Lists: Singly Linked List: Create, insert, delete, traverse, Doubly Linked List: Insert at beginning, end, delete node, Circular Linked List implementation, Reversal and searching in linked lists

Module-3:

Stacks and Queues: Implement stack using arrays and linked lists, Infix to postfix conversion, postfix expression evaluation, Implement queues: simple, circular, and dequeue (double-ended queue), Priority queues basics

Module-4:

Trees and Recursion: Binary Tree creation, Preorder, Inorder, Postorder traversals (recursive and iterative), Binary Search Tree (BST): insert, search, delete, Height, leaf count, depth of tree

Module-5:

Graphs and Hashing: Graph representation: adjacency matrix and list, BFS and DFS traversals, Detect cycles in undirected and directed graphs, Hash tables: chaining and open addressing, Collision resolution strategies

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Text Books:

1. Baluja, G. S. Data Structure through C. New Delhi: Ganpat Rai Publications.
2. Pai, G. A. V. Data Structures and Algorithms: Concepts, Techniques and Applications. Tata McGraw-Hill.
3. Horowitz, E., Sahni, S., & Susan, A. Fundamentals of Data Structures in C. University Press.

Reference Books:

1. Tremblay, J. P., & Sorenson, P. G. An Introduction to Data Structures with Applications. McGraw-Hill.
2. Lipschutz, S. Data Structures. Tata McGraw-Hill.
3. Drozdek, A. Data Structures and Algorithms in C++. Thomson Learning, New Delhi.

Gaps in the Syllabus (to meet Industry/ Profession requirements)

POs met through Gaps in the Syllabus:

Topics beyond the syllabus/ Advanced topics/ Design:

POs met through Topics beyond the syllabus/ Advanced topics/ Design

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure**DIRECT ASSESSMENT**

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40
Continuous Internal Assessment	
% Distribution	
Day to day performance and Lab File	30
Quiz	10
Viva Voce	20
Semester End Examination	
% Distribution	
Examination/ Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	20%	20%	20%	20%	20%
Semester End Examination	20%	20%	20%	20%	20%

Mapping between Cos and Program Outcomes

Course outcome	Program Outcomes (POs)												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3	3	2	2	3	2	3	2	3	3	3	2	3
CO2	2	2	2	3	2	1	1	1	2	1	1	2	3	2	3
CO3	2	3	3	1	1	1	1	2	1	1	1	2	2	2	3
CO4	3	3	3	3	2	1	2	2	3	3	3	3	3	3	3
CO5	3	3	3	3	2	2	2	2	1	1	3	3	3	3	3

Correlation Levels 1, 2 or 3 as defined below:

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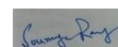
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Mapping between Cos and Course Delivery (CD) methods

CD Code	Course Delivery Methods	Course Outcome	Course Delivery Method Used
CD1	Lecture by use of Boards/ LCD Projectors	CO1	CD1,CD8
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CD3	Seminars	CO3	CD1,CD2,CD5
CD4	Mini Projects/Projects	CO4	CD1,CD5,CD8, CD9
CD5	Laboratory Experiments/Teaching Aids	CO5	CD1,CD2,CD9
CD6	Industrial/ Guest Lectures		
CD7	Industrial Visits/ In-plant Training		
CD8	Self-learning such as use of PTEL Materials and Internets		
CD9	Simulation		



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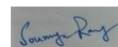
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Course Information Sheet

Course Code : SC25116
Course Title : Python Programming Lab
Pre-requisite(s) :
Co-requisite(s) : Python Programming
Credits : 1.5
Class schedule/ week : L: 0 T: 0 P: 3
Class : B.Sc. (AI & DS / AI & ML / CS)
Semester/Level : II/1
Branch : AI & DS / AI & ML / CS

Course Objectives

This course enables the students to:

A.	Understand practical implementation of Python basics.
B.	Develop programs using control flow and data types.
C.	Apply data structures like lists, sets, tuples and dictionaries.
D.	Demonstrate object-oriented programming in Python.
E.	Perform file handling and data manipulation using Python libraries

Course Outcomes

After the completion of this course, students will be able to:

CO1	Write basic programs using operators and data types.
CO2	Implement control structures and logic-based tasks.
CO3	Manipulate data using Python data structures.
CO4	Build class-based programs demonstrating OOP features.
CO5	Handle files and process data using pandas and CSV modules.

SYLLABUS

Module-1:

Implementation of mathematical operations using python, Use of various operators in python, Using type conversion, python built in functions.

Module-2:

Implementation of If-else _elif structures, Nest if-else structures, Iterative programs to display pyramid patterns etc Using of Jump statements etc.

Module-3:

Implementation of functions: Writing function for factorial, gcd, lcm and Fibonacci etc. Recursive functions concept. Implementation of List Basics, Copying Lists, Searching Lists, Sorting, Processing Two-Dimensional Lists Multidimensional Lists. List to Array conversion and array operation using numpy module.

Module-4:

Implementation of Tuples, Sets, and Dictionaries in python: Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Tuple methods, Sets: Creating Sets, Manipulating and Accessing Sets, Set operations Dictionaries: Creating a Dictionary, Adding, Modifying, and Retrieving Values, Deleting Items, Looping Items, The Dictionary Methods.

Module-5:

Implementation of Programs on Defining Classes for Objects, Inheritance, and polymorphism, text input and output: opening a file, Writing Data, Testing a File's Existence, Reading All Data from a File, Using the pandas for operation on CSV file, Programming to implement exception handling.

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Text Books:

1. Y. Daniel Liang, "Introduction to programming using python", Pearson Education; First edition (2017).
2. Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education; Forth edition (2018)

Reference Books:

1. Fabio Nelli "Python Data Analytics: With Pandas, NumPy, and Matplotlib" *Second Edition* Apress Media LLC
2. Mark Summerfield, "Programming in Python 3: A Complete Introduction to the Python Language" Pearson Education; Second edition (2018)

Gaps in the Syllabus (to meet Industry/ Profession requirements)

POs met through Gaps in the Syllabus:

Topics beyond the syllabus/ Advanced topics/ Design:

POs met through Topics beyond the syllabus/ Advanced topics/ Design

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure**DIRECT ASSESSMENT**

Assessment Tool	% Contribution during CO Assessment
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Semester End Examination	40
Continuous Internal Assessment	
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Semester End Examination	
% Distribution	
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Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	20%	20%	20%	20%	20%
Semester End Examination	20%	20%	20%	20%	20%



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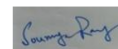
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Mapping between COs and Program Outcomes

Course outcome	Program Outcomes (POs)												Program Specific Outcomes		
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CO2	3	3	2	1	2	2	1	1	2	3	1	2	2	2	2
CO3	3	1	2	1	2	2	1	2	3	2	2	2	2	2	2
CO4	3	3	3	1	2	2	2	2	2	3	2	3	2	2	3
CO5	3	3	3	2	2	2	3	2	2	2	3	2	2	2	2

Correlation Levels 1, 2 or 3 as defined below:

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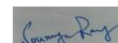
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