

DEPARTMENT OF COMPUTER SCIENCE

VISION

- To become a center of excellence in computer science with provision of quality education to mold innovative professionals for nation's welfare.

MISSION

- Providing learner-centric teaching-learning process in excellent infrastructure.
- Grooming the students with professional and social ethics.
- Provide latest tools and technology to the students as a part of learning structure.

PROGRAM OUTCOMES (POs)

- **PO1.Scientific Knowledge:** Ability to apply mathematics, logic, and statistics to the design, development, and analysis of software systems.
- **PO2.Problem Analysis:** Ability to understand, design, and analyze precise specifications of algorithms, procedures, and interaction behavior.
- **PO3.Design/development of Solutions:** Ability to design components, systems and/or processes to meet required specifications.
- **PO4.Conduct Investigations of Complex Problems:** Ability to be equipped with a range of fundamental principles of Computer Science that will provide the basis for future learning and enable them to adapt to the constant rapid development of the field.
- **PO5.Modern Tools Usage:** Ability to demonstrate competence in the practical art of computing in by showing in design an understanding of the practical methods, and using modern design tools competently for complex real-life IT problem.
- **PO6.The Software Engineer and Society:** Ability to develop creative and effective responses to intellectual, professional and social challenges.
- **PO7.Environment and Sustainability:** Ability to apply decision making methodologies to evaluate solutions for efficiency, effectiveness and sustainability.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

- Graduates of the programme will be successful in their professional careers, including entrepreneurship using their knowledge in computer science (90%).
- Graduates of the programme will continue to learn and adopt latest technologies to solve real life problems (60%).
- Graduates of the programme will pursue research and higher education (40%).

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1. Demonstrate mastery of Computer Science in the following core knowledge areas

- Programming Languages and Data Structures
- Databases, Software Development and Maintenance
- Computer Hardware and Architecture

PSO2. Apply problem-solving skills and the knowledge of computer science to solve real world problems.

PSO3. Develop technical project reports and present them orally among the users.

GRADUATE ATTRIBUTES (GAs)

GA1: Knowledge of the discipline: Knowledge of a discipline is defined as "command of a discipline to enable a smooth transition and contribution to professional and community settings. This Graduate Attribute describes the capability of demonstrating comprehensive and considered knowledge of a discipline. It enables students to evaluate and utilise information and apply their disciplinary knowledge and their professional skills in the workplace.

GA2: Creativity: Creativity is a skill that underpins most activities. Students are required to apply imaginative and reflective thinking to their studies. Students are encouraged to look at the design or issue through differing and novel perspectives. Creativity allows the possibility of a powerful shift in outlook and enables students to be open to thinking about different concepts and ideas.

GA3: Intellectual Rigour: Intellectual Rigour is the commitment to excellence in all scholarly and intellectual activities, including critical judgement. The students are expected in having clarity in thinking. This capability involves engaging constructively and methodically when exploring ideas, theories and philosophies. It also relates to the ability to analyse and construct knowledge with depth, insight and intellectual maturity.

GA4: Problem Solving and Design: Problem solving skills empower students within the context of their programmes, personal and professional lives. They can consolidate new and emergent knowledge and develop a deeper understanding of their subject discipline. With an ability to seek out and identify problems, effective problem solvers are able to actively engage with a situation, think creatively, to consider different perspectives to address identified challenge, to try out possible solutions and subsequently evaluate results as a way to make decisions.

GA5: Ethical Practices: Ethical practice is a key component of professionalism and needs to be instilled in curricula across courses. Ethical behavior involves tolerance and responsibility. It includes being open-minded about cultural diversity, linguistic difference, and the complex nature of our world. It also means behaving appropriately towards colleagues and the community and being sensitive to local and global social justice issues.

GA6: Life-Long Learning: The skill of being a lifelong learner means a graduate is open, curious, willing to investigate, and consider new knowledge and ways of thinking. This flexibility of mind means they are always amenable to new ideas and actively seek out new ways of learning or understanding the world.

GA7: Communication and Social Skills: The ability to communicate clearly and to work well in a team setting is critical to sustained and successful employment. Good communication and social skills involve the ability to listen to, as well as clearly express, information back to others in a variety of ways - oral, written, and visual - using a range of technologies.

G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI
Programme Structure for B.sc Computer Science
(For those admitted from the academic year 2023-24 and onwards)

Category	Course Type	Course Code	Course Title	Contact Hours	Exam Hours	Marks			Credit
						CIA	ES E	Total Marks	
Semester-1									
PART-I	Language	U23TA1L1	Tamil– I	6	3	25	75	100	3
PART-II	Language	U23EN1L1	English - I	6	3	25	75	100	3
PART-III	Core-1	U23CS101	Python Programming	5	3	25	75	100	5
	Core Lab - 1	U23CS1P1	Python programming Lab	5	3	40	60	100	5
	Elective Generic - 1(Allied)	U23CS1A1	Discrete Mathematics	4	3	25	75	100	3
PART-IV	Skill Enhancement Courses 1 (Non Major)	U23CS1S1	Office Automation	2	-	50	-	50	2
	Foundation Course	U23CSFC1	Problem Solving Techniques	2	-	50	-	50	2
TOTAL				30				600	23
Semester-II									
PART-I	Language	U23TA2L2	Tamil– II	6	3	25	75	100	3
PART-II	Language	U23EN2L2	English - II	6	3	25	75	100	3
PART-III	Core-2	U23CS202	Data Structure and Algorithms	5	3	25	75	100	5
	Core Lab- 2	U23CS2P2	Data Structure and Algorithms Lab	5	3	40	60	100	5
	Elective Generic - 2(Allied)	U23CS2A2	Digital Logic Fundamentals	4	3	25	75	100	3

	Comprehension- 1 (Self Study Course- Online Exam)	U23CS2C1	Comprehension in Computer Science – I	-	1	-	50	50	1
PART-IV	Skill Enhancement Courses 2 (Non Major)	U23CS2S2	Introduction to HTML	2	-	50	-	50	2
	Skill Enhancement Course -3	U23CS2S3	Understanding Internet	2	2	-	50	50	2
TOTAL				30				650	24

Semester – I

Part-III B.Sc. Computer Science / Semester – I /

Core-1: PYTHON PROGRAMMING

(U23CS101)

Lecture Hours	: 70	Tutorial Hours	:5
Lab Practice Hours	: -	No. of Credit	: 5
Contact Hours Per Semester	: 75		
Contact Hours Per Week	: 5		
Internal Marks	: 25		
External Marks	: 75		
Total Marks	: 100		

Objectives of the Courses:

- Describe the core syntax and semantics of Python programming language.
- Discover the need for working with the strings and functions.
- Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
- Understand the usage of packages and Dictionaries

Course Learning Outcomes: (for mapping with PO's and PSO's)

CO1: To develop and execute simple Python programs.

CO2: To write simple Python programs using conditionals and looping for solving problems.

CO3: To Decompose a Python program in to functions.

CO4: To represent compound data using Python lists, tuples, dictionaries etc.

CO5: To read and write data from/to files in Python programs

Mapping with Programme Outcomes and Programme Specific Outcomes:

COs \ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
	CO1	3	2	2	3	1	2	2	3	2
CO2	2	2	2	1	2	2	2	1	2	2
CO3	3	2	2	3	2	3	1	3	2	3
CO4	1	2	1	2	2	2	3	2	2	1
CO5	1	1	2	2	2	2	2	2	1	2
Total Contribution of COs to POs	10	9	9	11	9	11	10	11	9	11
Weighted Percentage of COs Contribution to POs	66	60	60	73	60	73	66	73	60	73

0 - No Correlation 1 - Weak 2 - Moderate 3 - Strong

Course Content

UNIT I

L 14 hours

Basics of Python Programming: History of Python-Features of Python-Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation- Operators-Expressions-Type conversions. **Python Arrays:** Defining and Processing Arrays – Array methods.

UNIT II

L 14 hours

Control Statements: Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. **Jump Statements:** break, continue and pass statements.

UNIT III

L 14 hours

Functions: Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. **Function Arguments:** Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion.

Python Strings: String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. **Modules:** import statement- The Python module – dir() function –**Modules and Namespace** – Defining our own modules.

UNIT IV

L 14 hours + T 3hours

Lists: Creating a list -Access values in List-Updating values in Lists- Nested lists -Basic list operations-List Methods. **Tuples:** Creating, Accessing, Updating and Deleting Elements in atuple – Nested tuples–Difference between lists and tuples. **Dictionaries:** Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions- and Methods - Difference between Lists and Dictionaries.

UNIT V

L 14 hours +T 2 hours

Python File Handling: Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods – with keyword – Splitting words– File methods - File Positions- Renaming and deleting files.

Texts Books:

- 1.Reema Thareja, “Python Programming using problem solving approach”, First Edition,2017, Oxford University Press.
2. Dr. R. Nageswara Rao, “Core Python Programming”, First Edition, 2017, Dream tech Publishers.

Reference Books:

- 1.VamsiKurama, “Python Programming: A Modern Approach”, Pearson Education.
- 2.Mark Lutz,” Learning Python”, Orielly.
- 3.Adam Stewarts, “Python Programming”, Online.
- 4.Fabio Nelli, “Python Data Analytics”, A Press.
- 5.Kenneth A. Lambert, “Fundamentals of Python – First Programs”, Cengage Publication.

Website Resources:

1. <https://www.programiz.com/python-programming>
2. <https://www.guru99.com/python-tutorials.html>
3. https://www.w3schools.com/python/python_intro.asp

Part-III B.Sc. Computer Science / Semester – I /
Core-2: PYTHON PROGRAMMING LAB
(U23CS1P1)

Lecture Hours	: -	Tutorial Hours	: -
Lab Practice Hours	: 5	No. of Credit	: 5
Contact Hours per Semester	: 75		
Contact hours per Week	: 5		
Internal Marks	: 40		
External Marks	: 60		
Total Marks	: 100		

Pre-requisite: Basic of programming skill.

Objectives of the Courses:

- To acquire programming skills in core Python.
- To acquire Object-oriented programming skills in Python.
- To develop the skill of designing graphical-user interfaces (GUI) in Python.
- To develop the ability to write database applications in Python.
- To acquire Python programming skills to move into specific branches

Course Learning Outcomes: (for mapping with PO's and PSO's)

CO1:To understand the problem-solving approaches.

CO2:To learn the basic programming constructs in Python.

CO3:To practice various computing strategies for Python-based solutions to real world problems

CO4:To use Python data structures - lists, tuples, dictionaries.

CO5:To do input/output with files in Python.

Mapping with Programme Outcomes and Programme Specific Outcomes:

COs \ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
	CO1	3	2	2	3	1	2	2	3	2
CO2	2	3	3	1	2	2	2	1	2	2
CO3	3	2	2	3	2	3	1	3	2	3
CO4	1	2	3	2	2	2	3	2	2	1
CO5	2	1	2	2	2	2	2	2	2	1
Total Contribution of COs to POs	11	10	12	11	9	11	10	11	10	10
Weighted Percentage of COs Contribution to POs	73	66	80	73	60	73	66	73	66	66

0 - No Correlation 1 - Weak 2 - Moderate 3 - Strong

Course Content

List of Exercises:

1. Write a Python program to read and print values of variables of different data types.
2. Write a Python program to perform addition, subtraction, multiplication, division, integer division and modulo division on two integer numbers.
3. Write a Python program to determine whether the character entered is a vowel or not using conditional statement.
4. Write a Python program to calculate the factorial of a number using loop.
5. Write a Python program to calculate the square root of a number. Use break, continue and pass statements.
6. Write a Python program using function and return statement to check whether a number is even or odd.
7. Write a Python program to print the Fibonacci series using recursion.
8. Write a Python program to reverse the order of the items in the array.
9. Write a Python program that accepts a string from the user and redisplay the same

string after removing vowels from it.

10. Write a Python program to remove all duplicates from a list.

11. Write a Python program that has a list of numbers. (both positive and negative). Make new tuple that has only positive values from this list.

12. Write a Python program that creates a dictionary of radius of a circle and its circumference.

Texts Books:

1. Reema Thareja, "Python Programming using problem solving approach", First Edition, 2017, Oxford University Press.

2. Dr. R. Nageswara Rao, "Core Python Programming", First Edition, 2017, Dream tech Publishers.

Reference Books:

1. Vamsi Kurama, "Python Programming: A Modern Approach", Pearson Education.

2. Mark Lutz, "Learning Python", O'Reilly.

3. Adam Stewart, "Python Programming", Online.

4. Fabio Nelli, "Python Data Analytics", APress.

5. Kenneth A. Lambert, "Fundamentals of Python – First Programs", Cengage Publication.

Website Resources:

1. <https://www.learnpython.org/>

2. https://www.tutorialspoint.com/python_programming/index.asp?gclid=Cj0KCQjwvL-

Part-III B.Sc. Computer Science / Semester – I / Elective Course 1:

DISCRETE MATHEMATICS

(Elective Generic I- U23CS1A1)

Lecture Hours	: 65	Tutorial Hours	: 10
Contact Hours per Semester	: 75	No. of Credit	: 3
Contact hours per Week	: 5		
Internal Marks	: 25		
External Marks	: 75		
Total Marks	: 100		

Pre-requisite: Basic Knowledge of Programming concept.

Objectives of the Courses:

- To know how to solve various problems on discrete mathematics
- To use approximation to solve problems
- To differentiation and integration concept are applied
- To apply , direct methods for solving linear systems
- To discrete solution of ordinary problems

Course Learning Outcomes: (for mapping with PO's and PSO's)

CO1:To Know how to solve various problems on numerical methods.

CO2:To use approximation to solve problems.

CO3: To apply Differentiation and integration concept.

CO4: To apply, direct methods for solving linear systems.

CO5: To apply Numerical solution of ordinary differential equations.

Mapping with Programme Outcomes and Programme Specific Outcomes:

COs \ POs	POs							PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	3	1	2	2	3	2	3
CO2	2	2	2	2	2	2	2	2	2	2
CO3	3	2	2	3	2	3	1	1	2	3
CO4	1	2	1	2	2	1	3	2	2	1
CO5	1	1	2	2	2	2	2	2	1	1
Total Contribution of COs to POs	10	10	9	12	11	10	10	10	11	10
Weighted Percentage of COs Contribution to POs	66	66	60	80	73	66	66	60	73	66

0 - No Correlation 1 - Weak 2 - Moderate 3 - Strong

Course Content

UNIT I

L 15 hours

Set theory-Sets and elements-Specifications of sets-Identity and Cardinality-Set inclusion-Equality of sets-proper sets Power sets-Universal set-Operations on sets-ordered pairs Cartesian product of sets.

UNIT II

L 15 hours

Relations and functions-Definition-example- Relations on sets- Equivalence relations- Equivalence Class – Functions.

UNIT III

L 12 hours +T 3 hours

Mathematical logic Introduction – Statement (Propositions) – Laws of Formal Logic – Basic Set of Logical operators/operations - Propositions and Truth Tables – Algebra Propositions - Tautologies and Contradictions – Logical Equivalence – Logical Implication – Normal Forms.

UNIT IV

L 12 hours + T 3 hours

Matrix algebra Introduction – Definition of a Matrix - Types of Matrices – Operations on Matrices – Related Matrices – Transpose of a Matrix – Symmetric and Skew-symmetric Matrices – Complex Matrix – Conjugate of a Matrix – Determinant of a Matrix – Typical Square Matrices.

UNIT V

L 11 hours + T 4 hours

Adjoint and Inverse of a Matrix – Singular and Non-singular Matrices – Adjoint of a Square Matrix – Properties of Adjoint of a Matrix – Properties of Inverse of a Matrix.

Text Book:

1. Discrete mathematics, Swapan kumar chakraborty and Bikash kanti Sarkar, Oxford University, Press 2. Wesley j. Chun, "Core Python Application.

Reference Books:

1. Discrete Mathematics, Third Edition, Seymour Lipschutz and Marc Lars Lipson, Tata McGraw Hill Education Private Limited.
2. Discrete Mathematical Structures with Applications to Computer Science by J.P. Tremblay, R. Manohar TMH edition.

Website Resources

1. <https://dev.to/shamimularefin/best-discrete-mathematics-resources-that-all-should-know-1d09>
2. <https://discrete.openmathbooks.org/dmoi3.html>

**Part-IV B.Sc. Computer Science / Semester – I /
Skill Enhancement Course-I: Office Automation
(U23CS1S1)**

Lecture Hours	: 30	Tutorial Hours	: -
Lab Practice Hours	: -	No. of Credit	: 2
Contact Hours per Semester	: 30		
Contact hours per Week	: 2		
Internal Marks	: 50		
External Marks	: -		
Total Marks	: 50		

Pre-requisite: Basic skills in Computer operations

Objectives of the Courses:

- The major objective in introducing the Computer Skills course is to impart training for students in Microsoft Office which has different components like MS Word, MS Excel and Power point.
- The course is highly practice oriented rather than regular class room teaching.

To acquire knowledge on editor, spread sheet and presentation software.

Course Learning Outcomes: (for mapping with PO's and PSO's)

CO1: To understand the basics of computer systems and its components.

CO2: To learn the basic concepts of a word processing package.

CO3: To apply the basic concepts of electronic spreadsheet software.

CO4: To create a presentation using Power-Point tool.

CO5: To apply the basic concepts of database management system.

Mapping with Programme Outcomes and Programme Specific Outcomes:

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	3	1	2	2	3	2	3
CO2	2	2	2	1	2	2	2	1	2	2
CO3	3	2	2	3	2	3	1	3	2	3
CO4	1	2	1	2	2	2	3	2	2	1
CO5	1	1	2	2	2	2	2	2	1	1
Total Contribution of COs to POs	10	9	9	11	9	11	10	11	9	10
Weighted Percentage of COs Contribution to POs	66	60	60	73	60	73	66	73	60	66

0 - No Correlation 1 - Weak 2 - Moderate 3 - Strong

Course Content

UNIT I

L 6 hours

Introductory concepts: Memory unit – CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems & its features: DOS – UNIX– Windows. Introduction to programming languages.

UNIT II

L 6 hours

Word Processing: Open, Save and close word document; Editing text – tools, formatting, bullets; Spell Checker - Document formatting – Paragraph alignment, indentation, headers and footers, numbering; printing – Preview, options, merge.

UNIT III

L 6 hours

Spreadsheets: Excel – opening, entering text and data, formatting, navigating; Formulas – entering, handling and copying; Charts – creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics.

UNIT IV

L 6 hours

Database Concepts: The concept of data base management system; Data field, records, and files, Sorting and indexing data; Searching records. Designing queries, and reports; linking of data files; Understanding Programming environment in DBMS; Developing menu drive applications in query language (MS – Access).

UNIT V

L 6 hours

Power point: Introduction to Power point - Features – Understanding slide typecasting & viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition – Animation effects, audio inclusion, timers.

Text Book:

1. Peter Norton, “Introduction to Computers” –Tata McGraw-Hill.

Reference Book:

1. Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, “Microsoft 2003”, Tata McGraw-Hill.

Website Resource:

1. Web content from NDL / SWAYAM or open source web resource.

Part-IV B.Sc. Computer Science / Semester – I / Foundation Course:

**Problem Solving Techniques
(Foundation Course-U23CSFC1)**

Lecture Hours	: 30	Tutorial Hours	: -
Lab Practice Hours	: -	No. of Credit	: 2
Contact Hours per Semester	: 30		
Contact hours per Week	: 2		
Internal Marks	: 50		
External Marks	: -		
Total Marks	: 50		

Pre-requisite: Basic of Problem-solving skills

Objectives of the Courses:

- To understand the importance of algorithms and programs, and to know of the basic problem solving strategies.
- To learn efficient strategies and algorithms to solve standard problems, thus laying a firm foundation for designing algorithmic solutions to problems.

Course Learning Outcomes: (for mapping with PO's and PSO's)

CO1:To understand the systematic approach to problem solving.

CO2:To know the approach and algorithms to solve specific fundamental problems.

CO3:To understand the efficient approach to solve specific factoring-related problems.

CO4: To understand the efficient array-related techniques to solve specific problems.

CO5: To understand the efficient methods to solve specific problems related to text processing.

Mapping with Programme Outcomes and Programme Specific Outcomes:

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	3	1	2	2	3	2	3
CO2	2	2	2	1	2	2	2	1	2	2
CO3	3	2	2	3	2	3	1	2	2	3
CO4	1	2	1	2	2	2	3	2	2	1
CO5	2	1	2	2	2	2	2	2	1	1
Total Contribution of COs to POs	11	10	9	9	11	11	10	10	11	10
Weighted Percentage of COs Contribution to POs	73	66	60	60	73	73	66	60	73	66

0 - No Correlation 1 - Weak 2 - Moderate 3 - Strong

Course Content

UNIT I

L 6 hours

Introduction: History, characteristics and limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices. Types of Computers: PC, Workstation, Minicomputer, Main frame and Supercomputer. **Software:** System software and Application software. **Programming Languages:** Machine language, Assembly language, High-level language, 4GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers.

UNIT II

L 6 hours

Data: Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC). **Structured Programming:** **Algorithm:** Features of good algorithm, Benefits and drawbacks of algorithm. **Flowcharts:** Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts. **Pseudocode:** Writing a pseudocode. Coding, documenting and testing a program: Comment lines and types of errors. **Program design:** Modular Programming.

UNIT III

L 6 hours

Selection Structures: Relational and Logical Operators - Selecting from Several Alternatives – Applications of Selection Structures. **Repetition Structures:** Counter Controlled Loops – Nested Loops– Applications of Repetition Structures.

UNIT IV

L 6 hours

Data: Numeric Data and Character Based Data. **Arrays:** One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters.

UNIT V

L 6 hours

Data Flow Diagrams: Definition, DFD symbols and types of DFDs. **Program Modules:** Subprograms-Value and Reference parameters- Scope of a variable - Functions -Recursion. **Files:** File Basics-Creating and reading a sequential file- Modifying Sequential Files.

Texts book:

1.Stewart Venit, “Introduction to Programming: Concepts and Design”, Fourth Edition, 2010, Dream Tech Publishers.

Reference Book:

1. Techniques of Problem Solving, By Steven G.Krantz

Web Resources:

- 1.<https://www.codesansar.com/computer-basics/problem-solving-using-computer.html>.
- 2.<http://www.nptel.iitm.ac.in/video.php?subjectId=106102067>.

Semester – II

Part-III B.Sc. Computer Science / Semester – II / Core-3: DATA STRUCTURES & ALGORITHMS (U23CS202)

Lecture Hours	: 70	Tutorial Hours	: 5
Lab Practice Hours	: -	No. of Credit	: 5
Contact Hours Per Semester	: 75		
Contact hours Per Week	: 5		
Internal Marks	: 25		
External Marks	: 75		
Total Marks	: 100		

Pre-requisite: Basic knowledge in data and representations.

Objectives of the Courses:

- To impart the basic concepts of data structures and algorithms.
- To acquaint the student with the basics of the various data structures and make the students knowledgeable in the area of data structures.
- This course also gives insight into the various algorithm design techniques

Course Learning Outcomes: (for mapping with PO's and PSO's)

CO1: To introduce the concepts of Data structures and to understand simple linear data structures.

CO2: Learn the basics of stack data structure, its implementation and application

CO3: Use the appropriate data structure in context of solution of given problem and demonstrate a familiarity with major data structures.

CO4: To introduce the basic concepts of algorithms

CO5: To give clear idea on algorithmic design paradigms like Dynamic Programming, Backtracking, Branch and Bound.

Mapping with Programme Outcomes and Programme Specific Outcomes:

COs \ POs	POs									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	3	1	2	2	3	2	3
CO2	2	2	2	1	2	2	2	1	2	2
CO3	3	2	2	3	2	3	1	3	2	3
CO4	1	2	1	2	2	2	3	2	2	1
CO5	1	1	2	2	2	2	2	2	1	1
Total Contribution of COs to POs	10	9	9	11	9	11	10	11	9	10
Weighted Percentage of COs Contribution to POs	66	60	60	73	60	73	66	73	60	66

0 - No Correlation 1 - Weak 2 - Moderate 3 - Strong

Course Content

UNIT I

L 15 hours

Abstract Data Types (ADTs)- List ADT-array-based implementation linked list implementation singly linked lists-circular linked lists doubly-linked lists-applications of lists-Polynomial Manipulation- All operations-Insertion-Deletion-Merge-Traversal.

UNIT II

L 15 hours

Stack ADT-Operations- Applications- Evaluating arithmetic expressions 15 – Conversion of infix to postfix expression-Queue ADT-Operations Circular Queue- Priority Queue- deQueue applications of queues.

UNIT III

L 10 hours + T 2 hours

Tree ADT-tree traversals-Binary Tree ADT-expression trees applications of trees-binary search tree ADT- Threaded Binary TreesAVL Trees- B-Tree- B+ Tree – Heap-Applications of heap.

UNIT IV**L 15 hours**

Definition- Representation of Graph- Types of graph-Breadth first traversal – Depth first traversal- Topological sort- Bi-connectivity – Cut vertex- Euler circuits-Applications of graphs.

UNIT V**L 15 hours +T 3 hours**

Searching- Linear search-Binary search-Sorting-Bubble sort-Selection sort-Insertion sort-Shell sort-Radix sort-Hashing-Hash functions Separate chaining- Open Addressing-Rehashing Extendible Hashing.

Texts books:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education 2014, 4th Edition.
2. Reema Thareja, “Data Structures Using C”, Oxford Universities Press 2014, 2nd Edition

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, McGraw Hill 2009, 3rd Edition.
2. Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education 2003

Website Resources:

1. <https://www.programiz.com/dsa>
2. <https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/>

**Part-III B.Sc. Computer Science / Semester – II / Core Lab-2: DATA
STRUCTURES & ALGORITHMS LAB
(U23CS2P2)**

Lecture Hours	: -	Tutorial Hours	: -
Lab Practice Hours	: 75	No. of Credit	: 5
Contact Hours per Semester	: 75		
Contact hours per Week	: 5		
Internal Marks	: 40		
External Marks	: 60		
Total Marks	: 100		

Pre-requisite: Basic skills in problem solving

Objectives of the Courses:

- To understand and implement basic data structures using C
- To apply linear and non-linear data structures in problem solving.
- To learn to implement functions and recursive functions by means of data structures
- To implement searching and sorting algorithms

Course Learning Outcomes: (for mapping with PO's and PSO's)

CO1:Implement data structures using C

CO2:Implement various types of linked lists and their applications

CO3:Implement Tree Traversals

CO4: Implement various algorithms in C

CO5: Implement different sorting and searching algorithms

Mapping with Programme Outcomes and Programme Specific Outcomes:

COs \ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
	CO1	3	2	3	2	1	2	2	3	2
CO2	2	2	2	1	2	2	2	1	3	2
CO3	3	2	2	3	2	3	1	3	2	3
CO4	2	2	3	2	2	2	3	2	2	1
CO5	1	1	2	2	2	2	2	2	3	1
Total Contribution of COs to POs	11	9	12	10	9	11	10	11	12	10
Weighted Percentage of COs Contribution to POs	73	60	60	66	60	73	66	73	60	66

0 - No Correlation 1 - Weak 2 - Moderate 3 - Strong

Course Content

List of Exercises:

Implement the following exercises using C Programming language:

1. Search an element in a list using Binary Search.
2. Implementation of Stack- Push and Pop.
3. Implementation of Queue – Enqueue and Dequeue
4. Implementation of Binary Tree Traversals using recursion.
 - a) Pre-Order b) In-Order c) Post-Order
5. Implementation of Breadth First Search algorithm.
6. Implementation of Depth First Search algorithm.
7. Implementation of Merge Sort
8. Implementation of Quick Sort

Text Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education 2014, 4th Edition.
2. Reema Thareja, "Data Structures Using C", Oxford Universities Press 2014, 2nd Edition.

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", McGraw Hill 2009, 3rd Edition.
2. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003.

Website Resource:

1. <https://www.programiz.com/dsa>.

Part-III B.Sc. Computer Science / Semester – II / Elective Generic 2:
Digital Logic Fundamentals
(U23CS2A2)

Lecture Hours	:55	Tutorial Hours	: 5
Lab Practice Hours	: -	No. of Credit	: 3
Contact Hours per Semester	:60		
Contact hours per Week	: 4		
Internal Marks	:25		
External Marks	:75		
Total Marks	:100		

Pre-requisite: Basic knowledge in data and representations.

Objectives of the Courses:

- To understand and implement of digital logic fundamentals.
- To apply linear and non-linear data structures in problem solving.

Course Learning Outcomes: (for mapping with PO's and PSO's)

CO1: To understand the concepts of number system

CO2: To learn conversions.

CO3: To construct truth table

CO4: To learn SOP and POS

CO5: To understand various simplifications

Mapping with Programme Outcomes and Programme Specific Outcomes:

COs \ POs	POs									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	2	2	3	2	3
CO2	2	2	2	1	2	2	2	1	2	2
CO3	3	2	2	3	2	3	1	3	2	3
CO4	2	2	1	2	2	2	3	2	2	1
CO5	1	1	2	2	2	2	2	2	1	1
Total Contribution of COs to POs	11	9	9	10	9	11	10	11	9	10
Weighted Percentage of COs Contribution to POs	73	60	60	66	60	73	66	73	60	66

0 - No Correlation 1 - Weak 2 - Moderate 3 - Strong

Course Content

UNIT I

L 11 hours

Number Systems :Codes and Digital Logic Binary Number System –Binary to Decimal Conversion – Decimal to Binary Conversion –Octal Numbers –Hexadecimal Numbers –The ASCII Code –The Excess- 3 Code –The Gray Code. Digital Logic:The Basic gates NOT, OR , AND –Universal Logic Gates NOR,NAND – AND-OR Invert Gates.

UNIT II

L 11 hours

Combinational Logic: Circuits Boolean Laws and Theorems – Sum of Products Method–Truth Table to Karnaugh Map –Pairs, Quads and Octets –Karnaugh Simplifications –Don't Care Conditions –Product of Sums Method –Product of Sums Simplification.

UNIT III

L 11 hours +T 2 hours

Data Processing and Arithmetic circuits :Multiplexers –Demultiplexers –1-of-16-Decoders –BCD- to-Decimal Decoders – Seven-Segment decoders –Encoders –Exclusive-OR gates. Arithmetic Circuits:Binary Addition –Binary Subtraction –Unsigned Binary Numbers –Sign-Magnitude Numbers – 2's Complement Representation –2's Complement Arithmetic.

UNIT IV

L 11 hours

Flip-Flops :RS Flip Flops –Edge Triggered RS Flip Flops -Edge Triggered D Flip Flops -Edge Triggered JK Flip Flops –JK Master Slave Flip Flops.

UNIT V

L 11 hours + T 3 hours

Registers : Types of Registers –Serial in serial out –serial in parallel out –parallel in serial out –parallel in parallel out–Universal Shift Register.

Text Book:

1.Digital Principles and Applications, by Albert Paul Malvino & DonaldP.Leach, Seventh Edition, McGraw Hill Education Private Limited.

Reference Book:

1.Fundamentals of Digital Circuits, A.Anand Kumar, Second Edition,PHI Learning Private Limited2. 2.Digital design, M.Morris Mano, Third Edition, Pearson Education.

Website Resources:

1. <https://www.tutorialspoint.com/>

Part-IV B.Sc. Computer Science / Semester – II /
Skill Enhancement Course-2: Introduction to HTML
(U23CS2S2)

Lecture Hours	:30	Tutorial Hours	: -
Lab Practice Hours	:-	No. of Credit	: 2
Contact Hours per Semester	:30		
Contact hours per Week	:2		
Internal Marks	:50		
External Marks	:-		
Total Marks	:50		

Pre-requisite: Basic knowledge in numerical ability.

Objectives of the Courses:

- To improve the quantitative skills of the students.
- To prepare the students for various competitive exams.

Course Learning Outcomes: (for mapping with PO's and PSO's)

CO1:To gain knowledge on LCM and HCF and its related problems.

CO2:To get an idea of age, profit and loss related problem solving.

CO3:Able to understand time series simple and compound interests.

CO4: To understand the problem related to probability, and series.

CO5: To able to understand graphs, charts etc.

Mapping with Programme Outcomes and Programme Specific Outcomes:

POs COs	PO1	PO2	PO3	PO4	PO5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CO1	3	2	2	3	1	2	2	3	2	3
CO2	2	2	2	1	2	2	2	1	2	2
CO3	3	2	2	3	2	3	1	3	2	3
CO4	1	2	1	2	2	2	3	2	2	1
CO5	1	1	2	2	2	2	2	2	1	1
Total Contribution of COs to POs	10	9	9	11	9	11	10	11	9	10
Weighted Percentage of COs Contribution to POs	66	60	60	73	60	73	66	73	60	66

0 - No Correlation 1 - Weak 2 - Moderate 3 - Strong

Course Content

UNIT I

L 6 hours

Introduction to HTML: Designing a Home page – History of HTML – HTML generations- HTML Documents-Anchor tag –Hyperlinks –Sample HTML documents.

UNIT II

L 6 hours

Head and Body section: Header Section –Title-Prologue-Links-Colorful web page –Comments lines Designing the body: Heading printing –Aligning the headings-Horizontal rule- paragraph- Tab settings-Image and pictures Embedding PNG format Images.

UNIT III

L 6 hours

Ordered and unordered lists: List-Unordered lists- headings in a list – ordered lists- Nested lists. Table handling: Tables- table creation in HTML- Width of the Tables and cells-Cells spanning multiple rows/Columns- Coloring cells – Column specification.

UNIT IV

L 6 hours

Frames: Frame set - Definition – Frame definition –Nested Frames Web Page Design Project: Frameset Definition – Animals – Birds – Fish Forms: Action attributes –Method attributes – Enctype attribute – Drop down list- sample forms.

UNIT V

L 6 hours

DHTML and Style sheets: Defining styles –Elements of styles- Linking a style sheet to an HTML document –Inline styles –Internal & External style sheets – Multiple styles.

Text Book:

1. World Wide Web Design with HTML, C. Xavier, TMH, 2001.

Reference books:

1. Internet & World Wide Web, H.M.Deital, P.J.Deital & A.B.Goldberg, Pearson Education
2. Fundamentals of information technology, Mathew's lenon and Alxis leon, Vijay Nicole privatelimited, Chennai.

Website Resources:

1. <https://www.programiz.com/dsa>
2. <https://www.W3Schools.com>

Part-IV B.Sc. Computer Science / Semester – II /

Skill Enhancement-3: Understanding Internet

Lecture Hours	: 30	Tutorial Hours : -
Lab Practice Hours	: -	No. of Credit : 2
Contact Hours per Semester	: 30	
Contact hours per Week	: 2	
Internal Marks	: -	
External Marks	: 50	
Total Marks	: 50	

Pre-requisite: Basic knowledge in office automation / Excel.

Objectives of the Courses:

- The objective of this course is to help the students learn the advanced features of Excel.
- To summarise, analyse, explore, and present visualisations of data in the form of charts, graphs.

Course Learning Outcomes: (for mapping with PO's and PSO's)

CO1:To handle large amounts of data.

CO2:To aggregate numeric data and summarize into categories and subcategories.

CO3: To filtering, sorting, and grouping data or subsets of data.

CO4:To create pivot tables to consolidate data from multiple files.

CO5:To presenting data in the form of charts and graphs.

Mapping with Programme Outcomes and Programme Specific Outcomes:

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	3	1	2	2	3	2	3
CO2	2	2	2	1	2	2	2	1	2	2
CO3	3	2	2	3	2	3	1	3	2	3
CO4	1	2	1	2	2	2	3	2	2	1
CO5	1	1	2	2	2	2	2	2	1	1
Total Contribution of COs to POs	10	9	9	11	9	11	10	11	9	10
Weighted Percentage of COs Contribution to POs	66	60	60	73	60	73	66	73	60	66

0 - No Correlation 1 - Weak 2 - Moderate 3 - Strong

Course Content

UNIT I

L 6 hours

Man and Machines - Human Capability of five senses to see, hear, smell, speak and act - Basic Structure of a Computer - Data - Characteristics of a Computer-History of Computers - - Classification of Computers.

UNIT II

L 6 hours

Application Software and Programming Languages - Application Software - Packaged Software Products (Off-the-Shelf Products) - Office Automation - Core Banking System - Enterprise Software Products – SAP - Sales Force – Oracle - CRM and ERP - Early High Level Programming Languages - Translators (Compilers and Interpreters) – FORTRAN – BASIC – COBOL – PASCAL - C Language - Web Programming Languages – HTML - Java Script - Objected Oriented Programming with C++ - C++ Language - C# Language - Java Programming
 - Modern Programming Language – Python - GO Language - Swift Language - Kotlin Language
 - R Language - Artificial Intelligence Languages - Database Management Software.

UNIT III

L 6 hours

Digital Transformation - Data (High Value Commodity) - Digital Transformation in Business - Features of Digital Transformation - 15 Banking and Financial Services Industry (BFSI) - Human Resource Management – Healthcare - Big Data Analytics in Healthcare - Virtual Reality Wearable medical device.

UNIT IV

L 6 hours

Cyber Security - IT Assets - Risk and Vulnerabilities - Computer Security Types - Fundamental Principles of Security - Physical Safety and Security - Access Control - Biometric Access Control - Network Security - AAA Server -- Firewall – Malware – Spyware – Adware – Spamware – Virus – Ransomware – Worms - Trojan Horse.

UNIT V

L 6 hours

Computer Virus - Types of Computer Viruses - Antivirus Protection - Digital Signature - Cyber Crime – Hacking – Phishing - Spam e-mails - Attack using Malware - ATM Skimming – Ransomware - Fake News - Deep fake – Cyberbullying.

Text Book:

1. Fundamentals of Internet and Emerging Technologies (2021), C. Xavier, New Age International Publishers Ltd., New Delhi., Chapters 1, 2, 3 and 9 to 16 only.

Reference Books:

1. Introduction to Computer Science, Second Edition, ITL Education Solutions Ltd, Pearson Education.
2. Introduction to Computers, Peter Norton, 7th Edition, McGraw Hill Education
3. Fundamentals of Computers, V.Rajaram, 5th Edition, PHI.

Website Resource:

1. Website Resources from NDL Library, E-content from open source libraries.