**ANNAMALAI UNIVERSITY**

**221- B. Sc. Data Science**

Programme Structure and Scheme of Examination (under CBCS)

(Applicable to the candidates admitted from the academic year 2023 -2024 onwards)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Course Code | Part | Study Components & Course Title | Credit | Hours/Week | Maximum Marks | | |
| CIA | ESE | Total |
|  |  | SEMESTER – I |  |  |  |  |  |
| 23UTAML11/  23UHINL11/  23UFREL11 | I | Language– I:  பொது தமிழ்-I/  Hindi-I/  French-I | 3 | 6 | 25 | 75 | 100 |
| 23UENGL12 | II | General English – I | 3 | 6 | 25 | 75 | 100 |
| 23UDSCC13 | III | Core – I: Python Programming | 5 | 5 | 25 | 75 | 100 |
| 23UDSCP14 | Core – II: Practical –I:  Python Lab | 5 | 5 | 25 | 75 | 100 |
| 23UMAFE15 | Elective - I  Mathematical Foundations-I | 3 | 4 | 25 | 75 | 100 |
| 23UTAMB16  23UTAMA16 | IV | Skill Enhancement Course – 1 (NME- I)/\*  Basic Tamil – I /  Advanced Tamil – I | 2 | 2 | 25 | 75 | 100 |
| 23UDSCF17 | Foundation Course**:**  Problem Solving Technique | 2 | 2 | 25 | 75 | 100 |
|  |  | Total | 23 | 30 |  |  | 700 |
|  |  | SEMESTER – II |  |  |  |  |  |
| 23UTAML21/  23UHINL21/  23UFREL21 | I | Language– II:  பொது தமிழ்-II/  Hindi-II/  French-II | 3 | 6 | 25 | 75 | 100 |
| 23UENGL22 | II | General English – II | 3 | 6 | 25 | 75 | 100 |
| 23UDSCC23 | III | Core – III: Data Structures and Algorithms | 5 | 5 | 25 | 75 | 100 |
| 23UDSCP24 | Core - IV: Practical II:  Data Structures and Algorithms using Python Lab | 5 | 5 | 25 | 75 | 100 |
| 23UMAFE25 | Elective – II:  Mathematical Foundations-II | 3 | 4 | 25 | 75 | 100 |
| 23UTAMB26  23UTAMA26 | IV | Skill Enhancement Course - 2 (NME - II)/\*  Basic Tamil – II /  Advanced Tamil - II | 2 | 2 | 25 | 75 | 100 |
| 23USECG27 | Skill Enhancement Course 3  Internet and its Applications (Common Paper) | 2 | 2 | 25 | 75 | 100 |
|  |  | Total | 23 | 30 |  |  | 700 |
| NME courses offered to other Department | | | | | | | |
| 23UDSCN16 |  | Fundamentals of Information Technology | 2 | 2 | 25 | 75 | 100 |
| 23UDSCN26 |  | Computer Fundamentals | 2 | 2 | 25 | 75 | 100 |

\* PART-IV: NME / Basic Tamil / Advanced Tamil (Any one)

Students who have not studied Tamil upto 12th Standardand have taken any Language other than Tamil in Part-I, must choose Basic Tamil-I in First Semester & Basic Tamil-II in Second Semester.

Students who have studied Tamil upto 10th & 12th Standardand have taken any Language other than Tamil in Part-I, must choose Advanced Tamil-I in First Semester and Advanced Tamil-II in Second Semester.

**FIRST YEAR –SEMESTER- I**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | | | **Title of the Course** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **External** | **Total** | |
| 23UDSCC13 | | | Python Programming | **CCI** | 5 | - | - | I | 5 | 25 | | 75 | 100 | |
| **Learning Objectives** | | | | | | | | | | | | | |  |
| **LO1** | To make students understand the concepts of Python programming. | | | | | | | | | | | | | |
| **LO2** | To apply the OOPs concept in PYTHON programming. | | | | | | | | | | | | | |
| **LO3** | To impart knowledge on demand and supply concepts | | | | | | | | | | | | | |
| **LO4** | To make the students learn best practices in PYTHON programming | | | | | | | | | | | | | |
| **LO5** | To know the costs and profit maximization | | | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | | | | **No. of Hours** |
| I | **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. | | | | | | | | | | | | | **15** |
| II | **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**.** | | | | | | | | | | | | | **15** |
| III | **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. | | | | | | | | | | | | | **15** |
| IV | **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 a tuple – 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. | | | | | | | | | | | | | **15** |
| V | **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. | | | | | | | | | | | | | **15** |
| **TOTAL HOURS** | | | | | | | | | | | | | | **75** |
| **Course Outcomes** | | | | | | | | | | | **Programme Outcomes** | | | |
| CO | | On completion of this course, students will | | | | | | | | | | | | |
| CO1 | | * Learn the basics of python, Do simple programs on python,   Learn how to use an array. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | | * Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | | Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | | * Work with List, tuples and dictionary, Write program using list, tuples and dictionary. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | | Usage of File handlings in python, Concept of reading and writing files, Do programs using files. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |

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| --- | --- |
| **Textbooks** | |
| 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”, APress. |
| 5. | Kenneth A. Lambert, “Fundamentals of Python – First Programs”, CENGAGE Publication. |
| **Web 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> |
| 4. | https://www.geeksforgeeks.org/python-programming-language/ |
| 5. | https://en.wikipedia.org/wiki/Python\_(programming\_language) |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 2 | 2 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 2 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 15 | 14 | 15 | 15 | 13 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | | **Title of the Course** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | |
| **CIA** | | **External** | **Total** |
| **23UDSCP14** | | Python LAB | **CCII** | **-** | **-** | **5** | **I** | **5** | **25** | | **75** | **100** |
| **Course Objectives**:   1. Be able to design and program Python applications. 2. Be able to create loops and decision statements in Python. 3. Be able to work with functions and pass arguments in Python. 4. Be able to build and package Python modules for reusability. 5. Be able to read and write files in Python. | | | | | | | | | | | | |
| LAB EXERCISES | | | | | | | | | | **Required Hours** | | |
| 1. Program using variables, constants, I/O statements in Python. 2. Program using Operators in Python. 3. Program using Conditional Statements. 4. Program using Loops. 5. Program using Jump Statements. 6. Program using Functions. 7. Program using Recursion. 8. Program using Arrays. 9. Program using Strings. 10. Program using Modules. 11. Program using Lists. 12. Program using Tuples. 13. Program using Dictionaries. 14. Program for File Handling. | | | | | | | | | | **75** | | |
| **Course Outcomes** | | | | | | | | | | | | |
| On completion of this course, students will | | | | | | | | | | | | |
| CO1 | Demonstrate the understanding of syntax and semantics of | | | | | | | | | | | |
| CO2 | Identify the problem and solve using PYTHON programming techniques. | | | | | | | | | | | |
| CO3 | Identify suitable programming constructs for problem solving. | | | | | | | | | | | |
| CO4 | Analyze various concepts of PYTHON language to solve the problem in an efficient way. | | | | | | | | | | | |
| CO5 | Develop a PYTHON program for a given problem and test for its correctness. | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 1 | 3 | 2 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 2 | 2 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 2 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 15 | 15 | 13 | 15 | 13 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |
| --- | --- | --- |
| SEMESTER: I  ELECTIVE: I | **23UMAFE15**  **MATHEMATICAL FOUNDATIONS – I** | CREDIT: 3  HOURS: 4/W |

**UNIT-I: SYMBOLIC LOGIC**

Proposition, Logical operators, conjunction, disjunction, negation, conditional and Bi-conditional operators, converse, Inverse, Contra Positive, logically equivalent, tautology and contradiction. Arguments and validity of arguments.

**UNIT-II: SET THEORY**

Sets, set operations, Venn diagram, Properties of sets, number of elements in a set, Cartesian product, relations & functions

Relations : Equivalence relation. Equivalence class, Partially and Totally Ordered sets

Functions: Types of Functions, Composition of Functions.

**UNIT-III: BINARY OPERATIONS**

Types of Binary Operations: Commutative, Associative, Distributive and identity, Boolean algebra: simple properties. Permutations and Combinations.

**UNIT-IV: DIFFERENTIATION**

Differentiation, Successive differentiation, Leibnitz theorem, Applications of differentiation, Tangent and normal, angle between two curves.

**UNIT-V: TWO DIMENSIONAL ANALYTICAL GEOMETRY**

Straight Lines - Pair Straight Lines

**Text Book**

P.R. Vittal, Mathematical Foundations – Maragham Publication, Chennai

**Reference Books**

1. U. Rizwan, Mathematical Foundation - SciTech, Chennai
2. V. Sundaram & Others, Discrete Mathematical Foundation - A.P. Publication, Sirkali.
3. P. Duraipandian& Others, Analytical Geometry 2 Dimension - Emerald publication 1992 Reprint.

**COURSE OUTCOMES**

The students after undergoing this course will be able to

CLO1: Understand operators and solve problems using operators

CLO2: Know the concept of set theory, relations and functions

CLO3: Solve problems using permutation and combination

CLO4: Know the concept of limits, differentiation

CLO5: Solve Problems on straight lines and pair straight lines

**Outcome Mapping:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | POs | | | | | | PSOs | | |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 2 | 3 | 3 | 1 | 2 | 3 | 2 | 2 |
| CLO2 | 2 | 2 | 3 | 3 | - | 3 | 3 | 3 | 1 |
| CLO3 | 3 | 2 | 2 | 3 | - | - | 2 | 3 | 2 |
| CLO4 | 2 | 2 | 3 | 3 | 3 | - | 2 | 3 | 2 |
| CLO5 | 3 | 2 | 3 | 3 | 3 | - | 3 | 3 | 1 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | | | **Title of the Course** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | |
| **CIA** | | **External** | **Total** |
| **23UDSCF17** | | | Problem Solving Techniques | **FC** | 2 | - | - | I | 2 | 25 | | 75 | 100 |
| **Learning Objectives** | | | | | | | | | | | | | |
| LO1 | Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving. | | | | | | | | | | | | |
| LO2 | Implement different programming constructs and decomposition of problems into functions. | | | | | | | | | | | | |
| LO3 | Use data flow diagram, Pseudo code to implement solutions. | | | | | | | | | | | | |
| LO4 | Define and use of arrays with simple applications | | | | | | | | | | | | |
| LO5 | Understand about operating system and their uses | | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | **No. Of. Hours** | | |
| I | **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,4 GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers. | | | | | | | | | | **6** | | |
| II | **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. | | | | | | | | | | **6** | | |
| III | **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. | | | | | | | | | | **6** | | |
| IV | **Data:** Numeric Data and Character Based Data. **Arrays:** One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters. | | | | | | | | | | **6** | | |
| V | **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. | | | | | | | | | | **6** | | |
| **TOTAL HOURS** | | | | | | | | | | | **30** | | |
| **Course Outcomes** | | | | | | | | | | | **Programme Outcomes** | | |
| CO | | On completion of this course, students will | | | | | | | | |  | | |
| CO1 | | * Study the basic knowledge of Computers.   Analyze the programming languages. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO2 | | Study the data types and arithmetic operations.  Know about the algorithms.  Develop program using flow chart and pseudocode. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO3 | | Determine the various operators.  Explain about the structures.  Illustrate the concept of Loops | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO4 | | Study about Numeric data and character-based data.  Analyze about Arrays. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO5 | | Explain about DFD  Illustrate program modules.  Creating and reading Files | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| **Textbooks** | | | | | | | | | | | | | |
| 1 | | **Stewart Venit,** “Introduction to Programming: Concepts and Design”, Fourth Edition, 2010, Dream Tech Publishers. | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | |
| 1. | | https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm | | | | | | | | | | | |
| 2. | | http://www.nptel.iitm.ac.in/video.php?subjectId=106102067 | | | | | | | | | | | |
| 3. | | <http://utubersity.com/?page_id=876> | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO 4** | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 2 |
| **Weightage of course contributed to each PSO** | 15 | 14 | 14 | 15 | 15 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

**FIRST YEAR –SEMESTER- II**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | | | **Title of the Course** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | **External** | | | **Total** |
| **23UDSCC23** | | | DATA STRUCTURES AND ALGORITHMS | **CC**  **III** | **5** | **-** | **-** | **II** | **5** | **25** | **75** | | | **100** |
| **Learning Objectives** | | | | | | | | | | | | | | |
| LO1 | Understand the meaning asymptotic time complexity analysis and various data structures | | | | | | | | | | | | | |
| LO2 | To enhancing the problem solving skills and thinking skills | | | | | | | | | | | | | |
| LO3 | To write efficient algorithms and Programs | | | | | | | | | | | | | |
| LO4 | To make the students learn best practices in PYTHON programming | | | | | | | | | | | | | |
| LO5 | To understand how to handle the files in Data Structure | | | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | | | **No. Of. Hours** | |
| I | **Arrays and ordered Lists** Abstract data types – asymptotic notations – complexity analysis- Linked lists: Singly linked list – doubly linked lists - Circular linked list, General lists- stacks – Queues – Circular Queues – Evaluation of expressions | | | | | | | | | | | | **15** | |
| II | **Trees and Graphs** Trees – Binary Trees – Binary Tree Traversal – Binary Tree Representations – Binary Search Trees - threaded Binary Trees - Application of trees (Sets). Representation of Graphs – Graph implementation – graph Traversals - Minimum Cost Spanning Trees – Shortest Path Problems-Application of graphs | | | | | | | | | | | | **15** | |
| III | **Searching and Sorting** Sorting – Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Selection Sort. Searching – Linear search, Binary search | | | | | | | | | | | | **15** | |
| IV | **Greedy Method and Dynamic programming** Greedy Method: Knapsack problem– Job Sequencing with deadlines – Optimal storage on tapes. General method – Multistage Graph Forward Method– All pairs shortest path – Single source shortest path – Search Techniques for Graphs – DFS – Connected Components – Bi-Connected Components | | | | | | | | | | | | **15** | |
| V | **Backtracking** General Method – 8-Queen‟s – Sum Of Subsets – Graph Colouring – Hamiltonian Cycles – Branch And Bound: General Method – Travelling Sales Person Problem | | | | | | | | | | | | **15** | |
| **TOTAL HOURS** | | | | | | | | | | | | | **75** | |
| **Course Outcomes** | | | | | | | | | | | | **Programme Outcomes** | | |
| CO | | On completion of this course, students will | | | | | | | | | |  | | |
| CO1 | | To understand the asymptotic notations and analysis of time and space complexity  To understand the concepts of Linked List, Stack and Queue. | | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO2 | | To understand the Concepts of Trees and Graphs  Perform traversal operations on Trees and Graphs.  To enable the applications of Trees and Graphs. | | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO3 | | To apply searching and sorting techniques | | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO4 | | To understand the concepts of Greedy Method  To apply searching techniques. | | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO5 | | Usage of File handlings in python, Concept of reading and writing files, Do programs using files. | | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| **Textbooks** | | | | | | | | | | | | | | |
| 1 | | Seymour Lipshutz(2011),Schaum‟s Outlines - Data Structures with C, Tata McGraw Hill publications. | | | | | | | | | | | | |
| 2 | | Ellis Horowitz and SartajSahni (2010), Fundamentals of Computer Algorithms, Galgotia Publications Pvt., Ltd. | | | | | | | | | | | | |
| 3 | | Dr. K. Nagesware Rao, Dr. Shaik Akbar, ImmadiMurali Krishna, Problem Solving and Python Programming(2018) | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1. | | Gregory L.Heileman(1996), Data Structures, Algorithms and Object-Oriented Programming, McGraw Hill International Edition, Singapore. | | | | | | | | | | | | |
| 2. | | A.V.Aho, J.D. Ullman, J.E.Hopcraft(2000). Data Structures and Algorithms, Addison Wesley Publication. | | | | | | | | | | | | |
| 3. | | Ellis Horowitz and SartajSahni, Sanguthevar Raja sekaran (2010) ,Fundamentals of Computer Algorithms, Galgotia Publications Pvt.Ltd. | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| 1. | | https://www.tutorialspoint.com/data\_structures\_algorithms/index.htm | | | | | | | | | | | | |
| 2. | | <https://www.programiz.com/dsa> | | | | | | | | | | | | |
| 3. | | https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/ | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 1 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 2 |
| **Weightage of course contributed to each PSO** | 15 | 15 | 15 | 15 | 13 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | | **Title of the Course** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
| 23UDSCP24 | | DATA STRUCTURES AND ALGORITHMS USING PYTHON LAB | **CC IV** | - | - | 5 | II | 5 | 25 | 75 | | 100 |
| **Objectives**  To predict the performance of different algorithms in order to guide design decisions, provide theoretical estimation for the required resources of an algorithm to solve a specific computational problem | | | | | | | | | | | | |
| **LIST OF PROGRAMS** | | | | | | | | | | | **Required Hour** | |
| 1. Perform stack operations  2. Perform queue operations  3. Perform tree traversal operations  4. Search an element in an array using linear search.  5. Search an element in an array using binary search  6. Sort the given set of elements using Merge Sort.  7. Sort the given set of elements using Quick sort.  8. Search the Kth smallest element using Selection Sort  9. Find the Optimal solution for the given Knapsack Problem using Greedy Method.  10. Find all pairs shortest path for the given Graph using Dynamic Programming method  11. Find the Single source shortest path for the given Travelling Salesman problem using  Dynamic Programming method  12. Find all possible solution for an N Queen problem using backtracking method  13. Find all possible Hamiltonian Cycle for the given graph using backtracking method | | | | | | | | | | | **75** | |
| **Course Outcomes** | | | | | | | | | | | | |
| CO | On completion of this course, students will | | | | | | | | | | | |
| CO1 | To understand the concepts of Linked List, Stack and Queue. | | | | | | | | | | | |
| CO2 | Concepts of Trees and Graphs. Perform traversal operations on Trees and Graphs.  To enable the applications of Trees and Graphs. | | | | | | | | | | | |
| CO3 | To apply searching and sorting techniques | | | | | | | | | | | |
| CO4 | To determine the concepts of Greedy Method To apply searching techniques. | | | | | | | | | | | |
| CO5 | Usage of File handlings in python, Concept of reading and writing files, Do programs using files. | | | | | | | | | | | |
| **Learning Resources:**   * **Recommended Texts**   + - 1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , “Fundamentals of Data in C”, Universities Press       2. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition ,“Fundamentals of Computer Algorithms “ Universities Press * **Reference Books**   + - 1. Seymour Lipschutz ,”Data Structures with C”, First Edition, Schaum’s outline series in computers, Tata McGraw Hill.       2. R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008.  1. A.K.Sharma, Data Structures using C , Pearson Education India,2011. 2. G. Brassard and P. Bratley, “Fundamentals of Algorithms”, PHI, New Delhi, 1997. 3. A.V. Aho, J.E. Hopcroft, J.D. Ullmann,, “The design and analysis of Computer 4. Algorithms”, Addison Wesley, Boston, 1974 5. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms, Third edition, MIT Press, 2009 6. Sanjoy Dasgupta, C.Papadimitriou and U.Vazirani , Algorithms , Tata McGraw-Hill, 2008. | | | | | | | | | | | | |
| **Course Outcomes** | | | | | | | | | | | | |
| CO | On completion of this course, students will | | | | | | | | | | | |
| 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:**

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| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 2 | 2 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 1 | 2 |
| **Weightage of course contributed to each PSO** | 15 | 15 | 14 | 14 | 13 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |
| --- | --- | --- |
| SEMESTER: II  ELECTIVE- II | **23UMAFE25**  **MATHEMATICAL FOUNDATIONS- II** | CREDIT: 3  HOURS: 4/W |

**UNIT-I: MATRICES**

Multiplication of matrices, Singular and Non-Singular matrices, Adjoint of a Matrix, Inverse of a matrix Symmetric and Skew-Symmetric, Hermitian and Skew-Hermitian, Orthogonal and unitary matrices, Rank of a matrix, Solution of Simultaneous Linear equations by Cramer’s rule.

**UNIT-II: MATRICES**

Test for Consistency and Inconsistency of linear equations, (Rank Method), characteristic roots and characteristic vectors, Cayley - Hamilton theorem,

**UNIT-III: INTEGRATION**

Integration Simple problems, integration of rational function involving algebraic expressions of the form

Integrations using simple substitutions, integrations involving trigonometric functions of the form , integration by parts.

**UNIT-IV : INTEGRATION**

Applications of Integration for (i) Area under plane curves, (ii) Volume of solid of revolution.

**UNIT-V: ANALYTICAL GEOMETRY OF THREE DIMENSION**

Planes, straight lines.

**Text Book.**

P.R. Vittal, Mathematical Foundations – Maragham Publication, Chennai

**Reference Books**

1. U. Rizwan, Mathematical Foundation - SciTech, Chennai
2. V. Sundaram & Others, Discrete Mathematical Foundation - A.P. Publication, Sirkali.
3. Manicavachagompillay& Natarajan. Analytical Geometry part II - Three Dimension S. Viswanathan (printers & publication) Put Ltd., 1991.

**COURSE OUTCOMES**

On successful completion of the course, the students will be able to

CLO1: Understand different types of matrix operators

CLO2: Know the concept of Consistency and Inconsistency of linear equations

CLO3: Solve different forms of Integration

CLO4: Find the Area and volume using integration for real world problems.

CLO5: Know the concept of Planes, straight lines

**Outcome Mapping:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | POs | | | | | | PSOs | | |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 2 | 3 | 3 | 1 | 2 | 3 | 2 | 2 |
| CLO2 | 2 | 2 | 3 | 2 | - | 3 | 3 | 3 | 1 |
| CLO3 | 3 | 3 | 2 | 3 | - | - | 3 | 3 | 2 |
| CLO4 | 3 | 3 | 3 | 3 | 3 | - | 2 | 3 | 2 |
| CLO5 | 3 | 2 | 3 | 2 | 3 | - | 3 | 3 | 1 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | | **Title of the Course** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
| **23UDSCN16** | | Fundamentals of Information Technology | **NME-1** | 2 | - | - | I | 2 | 25 | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | |
| **LO1** | Understand basic concepts and terminology of information technology. | | | | | | | | | | | |
| **LO2** | Have a basic understanding of personal computers and their operation | | | | | | | | | | | |
| **LO3** | Be able to identify data storage and its usage | | | | | | | | | | | |
| **LO4** | Get great knowledge of software and its functionalities | | | | | | | | | | | |
| **LO5** | Understand about operating system and their uses | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | **No. Of. Hours** | |
| I | **Introduction to Computers:**  Introduction, Definition, .Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations of computer | | | | | | | | | | **6** | |
| II | **Basic Computer Organization:**  Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types. Non Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers. | | | | | | | | | | **6** | |
| III | **Storage Fundamentals:**  Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives | | | | | | | | | | **6** | |
| IV | **Software:**  Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w | | | | | | | | | | **6** | |
| V | **Operating System:**  Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux. | | | | | | | | | | **6** | |
| **TOTAL HOURS** | | | | | | | | | | | **30** | |

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| --- | --- | --- |
| **Course Outcomes** | | **Programme Outcomes** |
| CO | On completion of this course, students will |  |
| CO1 | * Learn the basics of computer, Construct the structure of the required things in computer, learn how to use it. | PO1, PO2, PO3, PO4, PO5, PO6 |
| CO2 | * Develop organizational structure using for the devices present currently under input or output unit. | PO1, PO2, PO3, PO4, PO5, PO6 |
| CO3 | Concept of storing data in computer using two header namely RAM and ROM with different types of ROM with advancement in storage basis. | PO1, PO2, PO3, PO4, PO5, PO6 |
| CO4 | * Work with different software, Write program in the software and applications of software. | PO1, PO2, PO3, PO4, PO5, PO6 |
| CO5 | Usage of Operating system in information technology which really acts as a interpreter between software and hardware. | PO1, PO2, PO3, PO4, PO5, PO6 |
| **Textbooks** | | |
| 1 | Anoop Mathew, S. Kavitha Murugeshan (2009), “ Fundamental of Information Technology”, Majestic Books. | |
| 2 | Alexis Leon, Mathews Leon,” Fundamental of Information Technology”, 2nd Edition. | |
| 3 | S. K Bansal, “Fundamental of Information Technology”. | |
| **Reference Books** | | |
| 1. | Bhardwaj Sushil Puneet Kumar, “Fundamental of Information Technology” | |
| 2. | GG WILKINSON, “Fundamentals of Information Technology”, Wiley-Blackwell | |
| 3. | [A Ravichandran](https://www.bookganga.com/eBooks/Books?AID=5563813659127023211) , “Fundamentals of Information Technology”, Khanna Book Publishing | |
| **Web Resources** | | |
| 1. | <https://testbook.com/learn/computer-fundamentals> | |
| 2. | https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html | |
| 3. | https://www.javatpoint.com/computer-fundamentals-tutorial | |
| 4. | https://www.tutorialspoint.com/computer\_fundamentals/index.htm | |
| 5. | https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 3 | 2 | 3 | 3 | 2 |
| **Weightage of course contributed to each PSO** | 15 | 15 | 14 | 15 | 14 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | | | | **Title of the Course** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
| 23UDSCN26 | | | | Computer fundamentals | **NME-II** | 2 | - | - | II | 2 | | 25 | 75 | 100 |
| **Learning Objectives** | | | | | | | | | | | | | | |
| LO1 | | | Discuss the Introduction about Computer and its Components. | | | | | | | | | | | |
| LO2 | | | To Perform the Microsoft Word, Excel, PowerPoint and its operations. | | | | | | | | | | | |
| LO3 | | | To get Knowledge about the Internet and Intranet | | | | | | | | | | | |
| LO4 | | | Insert heading levels within a web page. | | | | | | | | | | | |
| LO5 | | | Insert ordered and unordered lists within a web page. Create a web page. | | | | | | | | | | | |
| **UNIT** | | | **Contents** | | | | | | | | | | **No. Of. Hours** | |
| I | | | **Introduction to Computers** - Generations of Computer – Data and Information – Components of Computer – Software – Hardware – Input Devices - Output Devices –– Types of Operating System. | | | | | | | | | | **6** | |
| II | | | **MS Word**: Introduction – Elements of Window – Files, Folders and Directories – Text Manipulating: Cut, Copy, Paste, Drag and Drop – Text Formatting: Font – Style, Size, Face and Colors (Both foreground and background) – Alignment - Bullets and Numbering - Header and footer- watermark – inserting objects (images, other application document) – Table creation – Mail merge. | | | | | | | | | | **6** | |
| III | | | **Ms Excel**: Introduction – Inserting rows and columns – Sizing rows and columns – Implementing formulas – Generating series - Functions in excel – Creation of Chart – Inserting objects – Filter – Sorting – Inserting worksheet. | | | | | | | | | | **6** | |
| IV | | | **MS PowerPoint**: Introduction – Slides Manipulation (Inserting new, Copy, paste, delete and duplicate slides) – Slide show– Types of Views – Types of Animations – Inserting Objects – Implementing multimedia (Video and Audio) – Templates (Built-in and User-Defined). | | | | | | | | | | **6** | |
| V | | | **Internet**: Introduction to Internet and Intranet – Services of Internet - Domain Name – URL – Browser – Types of Browsers – Search Engine - E-Mail – Basic Components of E-Mail –.How to send group mail. **E-Commerce**: Digital Signature – Digital Currency – Online shopping and transaction. | | | | | | | | | | **6** | |
| **TOTAL HOURS** | | | | | | | | | | | | | **30** | |
| **Course Outcomes** | | | | | | | | | | | **Programme Outcomes** | | | |
| CO | | On completion of this course, students will | | | | | | | | |  | | | |
| CO1 | | * Understand the basics of Computer and its Generations.   Be able to understand the components of computer. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | | To Understand the introduction about MS Word.  Be able to perform the Elements of window, Text Formatting, Text Manipulating options in MS Word. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | | To Understand the introduction about MS Excel.  Be able to inserting and sizing the cells  Implementing formulas and inserting worksheet. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | | To Understand the introduction about MS PowerPoint  Be able to perform the slides manipulation.  Implementing Multimedia and templates. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | | To Understand the introduction about Internet and Intranet.  Be able to access the browsers.  To get knowledge about basic components of E-Mail and E-Commerce | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | | |
| 1 | G. Manjunath, “Computer Basics”, Vasan Publications, 2010. | | | | | | | | | | | | | |
| 2 | Pradeep K. Sinha&PritiSinha, “Computer Fundamentals”, 6th Edition, BPB Publications, 2004. | | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| 1. | <https://www.tutorialspoint.com/computer_fundamentals/index.htm> | | | | | | | | | | | | | |
| 2. | <https://www.tutorialspoint.com/basics_of_computers/index.htm> | | | | | | | | | | | | | |
| 3. | <https://www.tutorialspoint.com/word/index.htm> | | | | | | | | | | | | | |
| 4. | <https://www.tutorialspoint.com/excel/index.htm> | | | | | | | | | | | | | |
| 5. | <https://www.tutorialspoint.com/powerpoint/index.htm> | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 2 | 2 | 3 | 3 | 2 |
| **CO 3** | 2 | 3 | 3 | 3 | 3 | 3 |
| **CO 4** | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 2 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 14 | 13 | 15 | 14 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**