

Branch Name:	Artificial Intelligence & Data Science
Program Code	ET108
Course Title:	Data Structures and Algorithm with Python
Course Code:	2ET1080301T
Pre-requisite:	-

Course Objective:

The Objective of this course is to make the students learn about the mapping between data structures & algorithms, designing and analyzing algorithms for real world problems.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Introduction to python: Downloading and installing Python, Variables, operations, assignments, conditional statements, looping statements, functions. Elementary Data Organization: Primitive and Non-primitive data types, Data Structure Types and Operations, Abstract Data Types, Analysis of Algorithms, Space and Time Complexity. Informal introduction to programming, algorithms and data structures via gcd.	04	07
2	Data Structure: Array: Representation of arrays, Applications of arrays, sparse matrix and its representation List: access list items, insert, update and delete operations on list items, perform sorting, coping and join operation on list, various list methods. Dictionary: access items, insert, update and delete operations on dictionary items, nested dictionary, coping and looping dictionaries, various dictionary methods	05	10
3	Stack and Queue: Stack: Implementation of stack, Application of stack: Conversion of Infix to Postfix, Evaluation of Postfix, Queue: Implementation of Queue, Circular Queue, Concept of Priority Queue, Application of Queue	06	15

4	Linked List: Singly linked list: Representation of linked list in memory, Traversing, Searching, Insertion, Deletion from linked list, Polynomial Addition, Doubly Linked list, Circular Linked List.	06	15
5	Tree and Graph: Tree: Tree Terminology, Binary Tree, Binary Tree Traversal, Conversion of General Trees To Binary Trees, Binary Search tree: Insertion, Deletion, Traversal, AVL Trees, Heap, Multi way trees, B-Trees, B+ Tree, 2-3 tree, applications of Trees-the Manipulation of Arithmetic Expressions Graph: Matrix representation of graphs, Breadth First Search, Depth First Search, Spanning Trees	09	20
6	Hashing: The symbol table, Hashing Functions, Collision-Resolution Techniques	02	05
7	Searching and Sorting: Linear Search, Binary Search, Selection sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Radix Sort, Shell Sort	08	18
8	File Structure: Definition of Record, File, Block, Sequential, Indexed and Relative/Random File Organization, Indexing structure for index files, hashing for direct files, Multi - Key file organization and access methods	05	10

Course Outcome:

At the end of this course, the student would be able

1. This course is an introduction to programming and problem solving in Python. It does not assume any prior knowledge of programming.
2. Using some motivating examples, the course quickly builds up basic concepts such as conditionals, loops, functions, lists, strings and tuples.
3. It goes on to cover searching and sorting algorithms, dynamic programming and backtracking, as well as topics such as exception handling and using flesh. As far as data structures are concerned,
4. The course covers Python dictionaries as well as classes and objects for fining user defined data types such as linked lists and binary search trees.

List of References:

1. An Introduction to Data Structures with Applications. By Jean - Paul Tremblay & Paul G.Sorenson Publisher - Tata McGraw Hill.
2. Fundamentals of Computer Algorithms by Horowitz, Sahni, Galgotia Pub. 2001 ed.
3. Introduction to Computation and Programming Using Python by John V Guttag (PHI)
4. Core Python Programming by R. Nageswara Rao, Dreamtech
5. Core Python Programming Second Edition by Wesley J. Chun. (PHI)
6. Professional Python by Luke Sneeringer, Wrox
7. A Practical Introduction to Python Programming by Brian Heinold

e-Resource:

1. <http://nptel.ac.in/courses/106102064/1>
2. https://www.tutorialspoint.com/data_structures_algorithms/
3. <https://www.python.org/>
4. <https://nptel.ac.in/courses/117106113/34>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	This course is an introduction to programming and problem solving in Python. It does not assume any prior knowledge of programming.	2 Understanding
CLO2	Using some motivating examples, the course quickly builds up basic concepts such as conditionals, loops, functions, lists, strings and tuples.	1 Remembering 3 Applying, 2 Understanding
CLO3	It goes on to cover searching and sorting algorithms, dynamic programming and backtracking, as well as topics such as exception handling and using flesh. As far as data structures are concerned,	5 Evaluate, 3 Applying, 4 Analyze
CLO4	The course covers Python dictionaries as well as classes and objects for fining user-defined data types such as linked lists and binary search trees.	3 Applying, 2 Understanding
CLO5	Analyze various structures and their applicability	5 Evaluate, 3 Applying, 4 Analyze
CLO6	Identify the appropriate data structure and algorithm design method for the given application	6 Creating

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes(POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	M	L		M	L	L					M	H			
CLO2		H	M	L	M	L		M		H			H	M		
CLO3	L	L	H		L	H	L	M					H	M		
CLO4		M	M	H		M	L							M		
CLO5	L		M	L	L	L										
CLO6										L		M		H		

H:High, M:Medium, L:Low