SWAYAM PRABHA
Free DTH Channel for Education

Programming, Data Structures and Algorithms using Python

SWAYAM Prabha Course Code: R14

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INSTITUTE	Chennai Mathematical Institute (CMI)
COURSE OUTLINE	This course is an introduction to programming and problem solving in Python. It does not assume any prior knowledge of programming. Using some motivating examples, the course quickly builds up basic concepts such as conditionals, loops, functions, lists, strings and tuples. It goes on to cover searching and sorting algorithms, dynamic programming and backtracking, as well as topics such as exception handling and using files. As far as data structures are concerned, the course covers Python dictionaries as well as classes and objects for defining user defined datatypes such as linked lists and binary search trees. **Course Outline** 1. Informal introduction to programming, algorithms and data structures viagcd,Downloading and installing Python,gcd in Python: variables, operations, control flow - assignments, conditionals, loops, functions. 2. Python: types, expressions, strings, lists, tuples | Python memory model: names, mutable and immutable values | List operations: slices etc.- Binary search | Inductive function definitions: numerical and structural induction | Elementary inductive sorting: selection and insertion sort | In-place sorting. 3. Basic algorithmic analysis:input size,asymptotic, complexity,O() notation | Arrays vs lists | Merge sort | Quicksort | Stable sorting. 4. Dictionaries | More on Python functions: optional arguments, default values | Passing functions as arguments | Higher order functions on lists: map, filter, list comprehension. 5. Exception handling | Basic input/output | Handling files | String processing. 6. Backtracking: N Queens, recording all solutions | Scope in Python: local, global, nonlocal names | Nested functions | Data structures: stack, queue | Heaps.

	7. Abstract datatypes | Classes and objects in Python | "Linked" lists: find, insert, delete | Binary search trees: find, insert, delete | Height-balanced binary search trees. 8. Efficient evaluation of recursive definitions: memorization | Dynamic programming: examples | Other programming languages: C and manual memory management | Other programming paradigms: functional programming.