|  |  |  |  |
| --- | --- | --- | --- |
|  |  | STUDENT REPORT  Sachin Rajbhar / Python MOOC File / 1-08-23  41221139  BCA |  |
|  |  |  |  |
| Govt sets up hub for connecting mentors, investors to startups from smaller  citiesDSA : Frozen types of sets of data structures using python | lecture : 46 -  YouTube  Submitted To: Ms. Kiran Dhangar | | | |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  | |
| Python Data Structures and Algorithms - GeeksforGeeks |  | TABLE OF CONTENTS |  |
|  |  | Contents  Learning Outcome of the course [1](#_Toc124077433)  [Expected Outcome of the course 2](#_Toc124077435)  [Description of content being learnt 3](#_Toc124077436)  [Perspective area where technology is used 4](#_Toc124077437)  [Industry Relevance 5](#_Toc124077438) |  |

|  |  |  |
| --- | --- | --- |
| Learning outcomes   PROF. MADHAVAN MUKUND  Department of Computer Science and Engineering  Chennai Mathematical Institute  The learnings of this course are:   * To understand why Python is a useful scripting language for developers. * To learn how to design and program Python applications. * To learn how to use lists, tuples, and dictionaries in Python programs. * To learn how to identify Python object types. * To learn how to use indexing and slicing to access data in Python programs. * To define the structure and components of a Python program. * To learn how to write loops and decision statements in Python. * To learn how to write functions and pass arguments in Python. * To learn how to build and package Python modules for reusability. * To learn how to read and write files in Python. * To learn how to design object‐oriented programs with Python classes. * To learn how to use class inheritance in Python for reusability. * To learn how to use exception handling in Python applications for error handling. * To understand algorithms   INTENDED AUDIENCE : Students in any branch of mathematics/science/engineering, 1styear  PRE-REQUISITES : School level mathematics.  LEARNING OUTCOMES: This course should be of value to any company requiring programming skills & Problem solving and programming capability.  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.  ABOUT INSTRUCTOR :  Prof. Madhavan Mukund studied at IIT Bombay (B.Tech) and Aarhus University (PhD). He has been a faculty member at Chennai Mathematical Institute since 1992, where he is presently Professor and Dean of Studies. His main research area is formal verification. In addition to the NPTEL MOOC programme, he has been involved in organizing IARCS Instructional Courses for college teachers. He is a member of ACM India's Education Committee. He has contributed lectures on algorithms to the Massively Empowered Classroom (MEC) project of Microsoft Research and the QEEE programme of MHRD. |  | |
| Expected OutcomesExpected Learning Outcomes  * Describe the basics of the Python programming language * Install Python and write your first program * Use variables to store, retrieve and calculate information * Utilize core programming tools such as functions and loops * Perform implementation of Data Structures * Implement Algorithms in python * Understand dynamic programming   Python programming is powering the global job market because the benefits of Python are clear. Python is one of the top three programming languages in the world, and is poised to become the most popular, according to[ZDNet](https://www.zdnet.com/article/programming-languages-python-could-soon-overtake-c-and-java-as-most-popular/). In fact, according to the[PYPL Index](https://pypl.github.io/PYPL.html), Python is the most popular programming language world-wide, so if you want to work in a different country, you have a good chance of landing a job in, say, Switzerland or Australia. Where would you like to work? Adding [Python](https://www.simplilearn.com/why-python-is-essential-for-data-analysis-article) to your skill set could be your ticket to anywhere. COURSE DESCRIPTION **Week 1:** Informal introduction to programmin, algorithms and data structures viagcd Downloading and installing Python gcd in Python: variables, operations, control flow - assignments, condition-als, loops, functions  SUMMARY: These are the course-wide materials as well as the first part of Chapter One where we explore  what it means to write programs. We finish Chapter One and have the quiz and first assignment in the class.  Loops and iteration complete our four basic programming patterns. Loops are the way we tell Python to do  something over and over.  Introduced to notation of algorithms using the GCD example.  **Week 2:** Python: types, expressions, strings, lists, tuples Python memory model: names, mutable and immutable values List operations: slices etc Binary search Inductive function denitions: numerical and structural induction Elementary inductive sorting: selection and insertion sort In-place sorting  SUMMARY: Values have types like int, float, & bool and Determining the operations allowed  Names inherit type from currently assigned values and we can assign values of different types to a name  TextValues- type STR, Slices extracting Substrings, & cannot update string directly i.e. immutable  List are Sequences of values (mutable, of uniform type & lists may be nested), can be accessed by value at a position  Functions are a very good way to organize code in logical chunks & passing arguments have a local scope , functions must be defined before use.  **Week 3:** Basic algorithmic analysis: input size, asymptotic complexity, O() notation Arrays vs lists Merge sort Quicksort Stable sorting  SUMMARY: Learning Sorting techniques like Merge Sort, Insertion Sort, Stable Sort etc.  Analysis of Time Complexities of algo’s **Week 4:** Dictionaries More on Python functions: optional arguments, default values Passing functions as arguments Higher order functions on lists: map, lter, list comprehension  SUMMARY: To summarize, a dictionary is a more flexible association of values to keys than you have  in a list; the only constraint that python imposes is that all keys must be immutable  values. You cannot have keys, which are mutable values. So, we cannot use dictionaries  or list themselves as keys, but you can have nested dictionaries with multiple levels of  these.  when we pass functions to other functions and in situations like sorting, you can make your  sorting more flexible by passing your comparison function which is appropriate to the values we  will sort. **Week 5:** Exception handling Basic input/output Handling files String processing  SUMMARY: we start dealing with input output and files  exceptions will be rather more common as we saw earlier one of the examples we  mentioned was a file is not found or a disk is full.  to interact with files we do it  through file handles, which actually corresponds to the buffers that we use to interact  between the memory and the file on the disk.  One is the statement pass which is the special statement that does nothing and can  be used whenever you need an empty block. **Week 6:** Backtracking: N Queens, recording all solutions Scope in Python: local, global, nonlocal names Nested functions Data structures: stack, queue Heaps  SUMMARY: to unsertand local, global scopes , functions inside functions , backtrack  Implementation of Data Structures like Stack, Queue  Understanding of operations performed on them  **Week 7:** Abstract datatypes Classes and objects in Python "Linked" lists: find, insert, delete Binary search trees: find, insert, delete Height-balanced binary search trees SUMMARY: heaps are a tree based implementation of priority queues in which both  insert and delete max can be done in log n time.  the insert and delete min work exactly like insert and delete max, except that the comparisons are  reversed  Understanding lists BST Traversal And much more… **Week 8:** Effcient evaluation of recursive definitions: memoization Dynamic programming: examples Other programming languages: C and manual memory management Other programming paradigms: functional programming  SUMMARY: So, dynamic programming is just a strategy to further optimize this memoized recursion. This  memoized recursion tells us that we will store values into a table as and when they are computed.  Python has to allocate space always in a dynamic manner, it has to keep as  you use a name, it has to find space for it and the space requirement may change if the  value changes it’s type.  **My Note**  It's great!  Starting from the history of computation to revealing the intricacies of the Python programming  language, this course is just what you require to get your hands-on with Python.  The problem sets have really good quality questions, for instance, you learn to make a Hangman  Game in Python during Week 3!  If you diligently follow along the course which is instructor-paced, you are sure to have  your programming basics crystal clear in your mind.  I also recommend taking CS50 (Harvard university) at some time during your first year  at university.  *Thank you* | |  |

|  |  |  |
| --- | --- | --- |
| perspective area of technology |  | |
| Flexibility Not only is Python easy to learn, but also, it’s flexible. Over [125,000 third-party Python libraries](https://pypi.org/) exist that enable you to use [Python for machine learning](https://www.simplilearn.com/what-is-python-used-for-article), web processing, and even biology. Also, its data-focused libraries like pandas, NumPy, and matplotlib make it very capable of processing, manipulating, and visualizing data — which is why it’s favored in data analysis. It’s so accommodating, it’s often called the “[Swiss Army Knife](https://www.ctotech.io/blog/python/why-python3-insights-in-the-swiss-army-knife-of-coding/)” of computer languages. Used in Many Industries Thanks to the benefits of Python’s and its flexibility, you can find it in just about any industry. New Python programmers aren’t limited to just data science. Instead, you can work in:   * Finance and trading * Scientific and mathematical computing * Web development * System automation and administration * Computer graphics * Basic game development * Security and penetration testing * General and application-specific scripting * Mapping and geography (GIS software) | |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| industryrelevance | | |  | |
| **Python Commands Demand** According to[Forbes](https://www.forbes.com/sites/gilpress/2021/06/27/salaries-and-job-opportunities-for-data-scientists-continue-to-rise/?sh=2c11a7424276), companies accelerated data science and analytics hires this past year. You can fill one of those jobs if you learn Python programming. Why? You’ll understand once you’ve mastered the benefits of Python. | | | |  |
|  |  | Because of its high level of functionality, many industries can’t do without it, including: web development, data science and data analysis, machine learning, startups, and the finance industry, among others. | |  |
| What is Python Used For?1. GENERAL-PURPOSE WEB DEVELOPMENT AND BUILDING WEB APPLICATIONS Python is one of the simplest programming languages in terms of syntax, and we mean that in a good way.  Treehouse points out that Disqus, NASA, PBS, and even Reddit use Python for their websites.  In fact, Python is one of the programming languages you can use to program a Raspberry Pi — a single-board computer (not a dessert!) — and there are many real-world projects that promote using a Raspberry Pi to learn Python code and [make some cool Python projects.(opens in a new tab)](https://projects.raspberrypi.org/en/projects?software%5b%5d=python)  There are many pre-built Python libraries and web frameworks, including Pyramid, [Django, and Flask.(opens in a new tab)](https://www.codementor.io/garethdwyer/flask-vs-django-why-flask-might-be-better-4xs7mdf8v) Python is especially great for using on back end web development projects — including creating APIs — shortening the amount of time you spend on projects by allowing you to repurpose lines and lines of code.  For the aspiring back end programmers out there who enjoy high readability and clean syntax, Python is definitely worth looking into. 2. SCIENTIFIC COMPUTING + DATA SCIENCE Python is also used for scientific research and computing (among other real-world applications) and even has several science-friendly or science-specific libraries, like SciPy, scikit-learn, and:   * Astropy for astronomy * Biopython for biology and bioinformatics * Graph-tool for statistical analysis of graphs * Psychopy for neuroscience and experimental psychology   And lots, lots more. Here’s a [list of all of Python’s scientific libraries(opens in a new tab)](https://stxnext.com/blog/2018/09/20/most-popular-python-scientific-libraries/).  Python’s role in parsing data, scripting, and functionality in terms of writing algorithms is definitely one great advantage of learning it. With tools like pandas and NumPy to help navigate data sets and data visualization, it’s no wonder that Python is one of the most popular programming languages when dealing with big data.  Thanks to the undeniable rise of data science, chances are that more and more tech roles will revolve around it — and you’ll already have one of the leading programming languages in your toolkit.  [(back to top)](https://skillcrush.com/blog/what-is-python-used-for/#toc) 3. MACHINE LEARNING Yes, technically, machine learning falls under data science (#2 on our list), but bear with me here. Using Python for machine learning is pretty cool, so it felt like it warranted an additional line item.  Machine learning includes things like speech recognition, deep learning, artificial intelligence, financial services, even the recommendations Netflix serves up every time you log in that make you think, “How do they know?!” (Although, fun fact: Netflix also employs a team that manually tags videos as well.) 4. STARTUPS Along with being research friendly, Python has a lot of business applications. Take, for example, Dropbox, which is Python-based.  Dropbox started when Drew Houston kept forgetting his flash drive as a student. It was initially a solution he could use for himself, a party of one. By November of 2012, 100 million people were using Dropbox, which was no big deal because… Dropbox was built on Python. 5. FINTECH + THE FINANCIAL INDUSTRY In 2016, [HackerRank released a survey(opens in a new tab)](https://blog.hackerrank.com/emerging-languages-still-overshadowed-by-incumbents-java-python-in-coding-interviews/" \t "_blank) of various industries, revealing which programming languages they were prioritizing when hiring developers, programmers, and engineers. When it came to FinTech, Python dominated the pack. | | | |  |

|  |  |
| --- | --- |
|  |  |