

Foundations of Data Structure

Programme Overview

Data structures provide a means to manage large amounts of data for use in databases and internet indexing services. Efficient data structures are key for designing efficient algorithms and obtaining maintainable software design.

In this Computer Science course, you will start by learning basic data types, such as numbers, and gradually build a conceptual framework for organizing and managing efficient structures. A preliminary understanding of implementing sequence structures such as stacks, queues, and linked lists, will also be covered.

Course content

The topics covered in this course:

- Basic Data Types, Notion of an Abstract Data Type
- Mathematical Properties of Sequences
- Special Types of Sequences: Stacks, Queues, Strings
- Implementation of Sequence Type: Arrays and Linked Lists
- Trees
- Sets and Maps
- Graphs

The detailed description is given below:

Topic 1: Basic Data Types and Abstract Data Type

- Learn the basic Built-in Data Types
- Know how to build on with Data Structures and Algorithm
- Learn to identify and strive to solve the Programming problem
- Get a clear disposition on Abstract Data Types

Topic 2: Numbers

- Learn how Mathematical Induction can be used to define Operations
- Know the Peano Axioms

- Learn Operations with Binary Representations

Topic 3: Sequences

- Get to know Sequences
- Learn Concatenation
- Learn how to use Balanced Parenthesis Sequence
- Know the basics of Queue
- Learn the functions and functionality of Lists

Topic 4: Implementation of Sequence Type: Arrays and Linked Lists

- Know how to implement Stacks
- Learn the implementation of Stacks using Arrays and Linked Lists
- Know how to implement Queues
- Learn the implementation of Queues using Arrays and Linked Lists

Topic 5: Trees

- Know the basics of Binary Tree
- Learn how to operate the Binary Search Tree
- Learn about General Trees and Rooted Trees

Topic 6: Sets, Maps, and Graphs

- Learn the nitty-gritties of Graph representation
- Know the sequence of node in Walk, Path and Cycle
- Learn how to traverse a graph
- Know more about the search and sort

Teaching Faculty

[Prof \(Retired\) Deepak B. Phatak](#), Dept. of CSE, IIT Bombay

[Prof Ajit Diwan](#), Dept. of CSE, IIT Bombay

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Duration and Venue

Registration Opens	July 1, 2020
Registration Ends	October 16, 2020
Course Starts	July 15, 2020
Course Ends	November 15, 2020
Total Duration	6 weeks

This course will be conducted in a self-paced mode, i.e. all the lecture videos, slides, reading materials, activities, and graded assignments will be released on when the course starts. This gives you the flexibility of progressing and completing the graded assignments at your own pace. However, but one would need to complete them before the course ends.

Who Should Attend

Basic knowledge of programming and Object-Oriented Programming is essential for this course.

Course Fee and Certification

The registration fee for the course is **Rs. 475/-**. However, register before **16 August 2020** for **Rs. 375/-** only to avail an early bird registration discount. Please note that the registration fee once paid is neither refundable nor adjustable under any circumstances.

Important payment instructions:

In case of a course fee transaction failure, the participant will get an auto generated mail with instructions for further process. Please go through the mail carefully. If the amount is already debited to your account, please do not make another payment. In case of a double payment (or more than once), please send a mail to dbpaccounts@cse.iitb.ac.in requesting for a refund. The participant will also have to check the following link for his/her vendor creation in order to get a refund. IIT Bombay will not be able to process

the refund (for any reason) if the vendor creation, as per IIT Bombay's requirement, is not completed by the participant. **Link**:- <https://portal.iitb.ac.in/vrp/index.jsp>

Honor Code Certificates will be issued on successful completion of the course based on the grading policy mentioned in the course. Please note that all certificates will be issued online. No hard copies will be given.

How to Apply

Enrollment will be strictly online, and no other mode of application will be entertained. The online registration for the course will start on **1 July 2020**. It will remain open till **16 October 2020**.

Registration process for the Program:

- Sign up using your valid email id on the website:
<https://www.it.iitb.ac.in/lakshya/signup.html>
- After verification, your account will be created
- Login on the website with the verified account
- Go to Announcements, select the program and register
- After successful registration, you will receive an automated email. Your name will be listed in the “**List of Participants page**”
- Thereafter register on IITBombayX site (<https://courses.iitbombayx.in/register>) using the same email id to access the course content

Note

The course content is released under Open Source License. All participants must agree that the content contributed by them in any form, (assignments, questions, etc.) would be released under Open Source Licence, by accepting the terms mentioned under ‘No Objection Certificate’. All contributors will be acknowledged.