Lecture 01

- Course Logistics
- Introduction to Data Structures

IT205: Data Structures (AY 2023/24 Sem II Sec B)

- Course Logistics
- Introduction to Data Structures

Course Logistics

Instructor	**Dr. Arpit Rana** Room-3105, Faculty Block-3 | Office hour: Thursday, 17:00 to 18:00 hrs. Email: arpit_rana@daiict.ac.in
TAs Information	• Mihir Patel (202001017@daiict.ac.in) • Ayush Patel (202001410@daiict.ac.in) • Priyanshi Parmar (202001441@daiict.ac.in) • Parth Thakrar (202001450@daiict.ac.in)
Prerequisites	Discrete Mathematics, C Programming
Eligibility	B.Tech. Semester II Section B

Course Logistics

Credit Weighting	3-0-0-3 (L-T-P-Cr)
Lectures [CEP-102]	Monday: 12:00 to 13:00 hrs., *(sometimes, this lecture may go longer)* Tuesday, Thursday: 10:00 to 11:00 hrs.
Private Study	At least 5 hrs per week
Potential Learning Outcome	● Utilize appropriate basic data structures in problem-solving ● Understand data abstraction and recursion ● Understand program efficiency through analysis of algorithms

Course Logistics

Assessment	*In-Semester Exams (I & II):* *30% (15% + 15%)* *Capstone (Challenge):* *40% (25% + 15%)* *End-Semester Exam:* *30%* Extra Credits: Lecture attendance, Participate on Course Stream
How to Fail	Skip lectures; avoid private study; **cram just before the exam; expect the exam to be a memory test**; last week working on your capstone; be inactive on the course stream
How to Pass	Attend lectures; summarize the notes; expect a problem-solving exam; do your capstone yourself; **do group study**; be active and accurate in the class and on the course stream

Preliminary schedule has been made available on the Google Classroom!

- Course Logistics
- Introduction to Data Structures

What is Data?

Data is a ***value*** or ***set of values*** that convey information.

- 11.36
- 25, 22, 23, 28, 26, 29, 29
- C, C++, Java, Python
- 02/01/2024
- #, $
- RJ12BC9165

I hope that you all know how values are stored on computers.

Each value or collection of all such values is termed data.

What about their Type?

Data is a ***value*** or ***set of values*** that convey information.

- 11.36 // Float or Double
- 19, 22, 23, 21, 18, 20, 20 // Array of integers
- C, C++, Java, Python // Array of strings
- 02/01/2024 // Date
- #, $ // Characters
- RJ12BC9165 // Alphanumeric

What is Data Type?

A data type is a precise description of a category of data that contains two parts:

- The ***allowed values*** for a piece of data of that type.
- The ***allowed operations*** we can perform on a piece of data of that type.

For example:

- A ***person's age*** is a natural number, which would tell us that values like 25 and 100 would be expected, while an age of -2 or "David" would be nonsensical.
- Also, it tells us what operations we could perform (e.g., "add 1 to the age"), and rules out other operations (e.g., "sort these ages alphabetically").

What is Data Type?

Data type also indicate a few facts about a piece of data of that type.

- What amount of memory is required to store?
- How the contents of that memory are to be interpreted?
- What operations are possible on that type of data?
- . . .

What is Information?

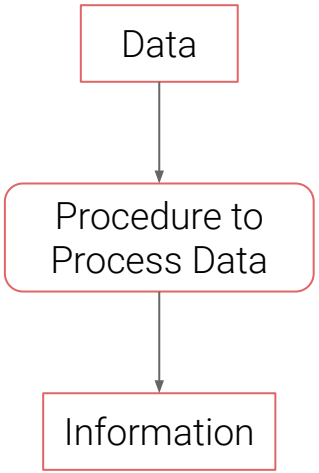
Information can be defined as ***meaningful*** or ***processed*** data.

- 11.36 // Today's average wind speed
- 19, 22, 23, 21, 18, 20, 20 // Minimum temperature in the past week
- C, C++, Java, Python // Names of Programming languages
- 02/01/2024 // Today's date
- #, $ // Currency symbols
- RJ12BC9165 // A vehicle (car) number

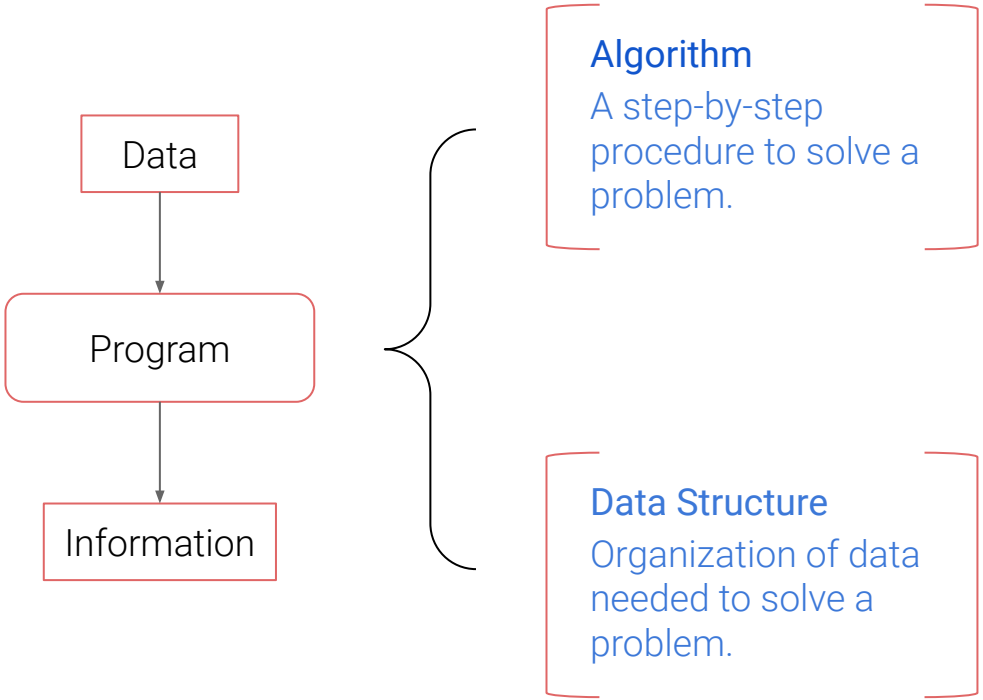
Data ⟶ Information

To get the required information from the data, we need to ***define certain processes*** and then ***apply*** the corresponding process on the data.

- 19, 22, 23, 21, 18, 20, 20
  - Which day was the coldest in the past week?
  - What is the expected temperature tomorrow?
- RJ12BC9165
  - To which state does this car belong?
  - In which area was this car registered?



Data ⟶ Information: Data Structures & Algorithms



Classic Data Structures

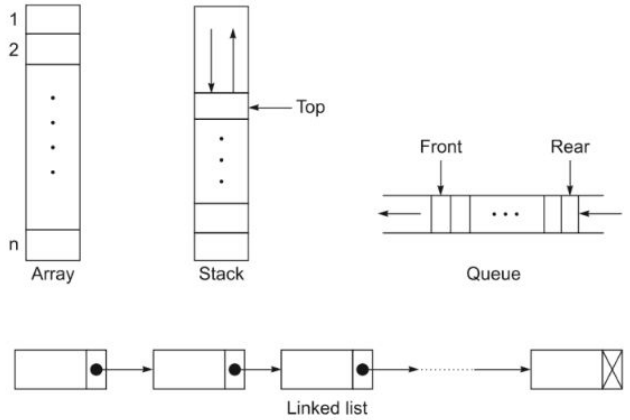
Classic data structures are widely used in various applications and can be used to build many complex data structures.

- Arrays
- Linked lists
- Stacks
- Queues

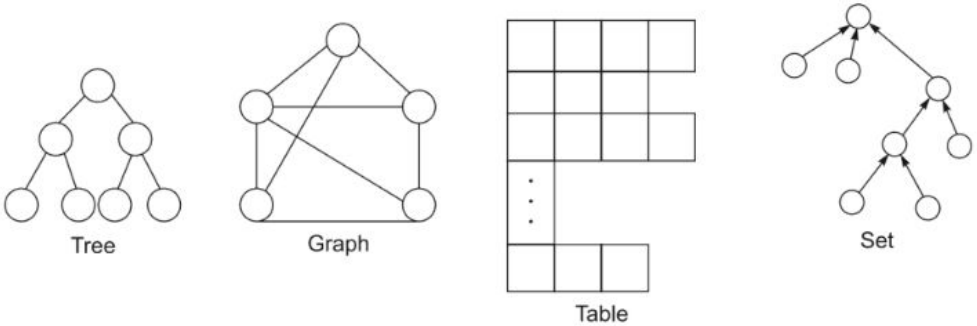
- Trees
- Graphs
- Tables
- Sets

Classic Data Structures

Linear



Non-linear



Next Lecture

- Abstract Data Type