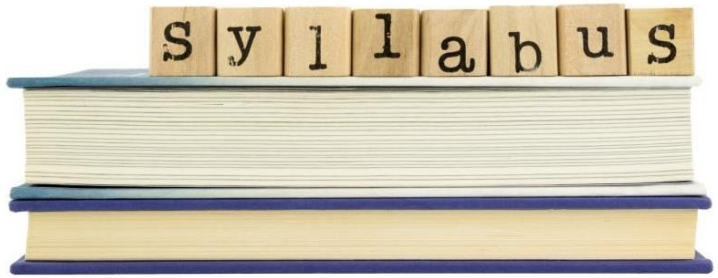
ensia The National School of Artificial Intelligence
المدرسة الوطنية العليا للذكاء الاصطناعي



Data Structure & Algorithms 1

SYLLABUS

Sep – Dec 2023

Course Objectives

- The objective of this course is to introduce students to the **construction** of computer **programs**. Such construction occurs in two phases:

1. Abstract program definition: This involves, in particular, writing algorithms in a language not necessarily understandable by a computer. We will refer to this as the language of specification (**pseudo-code**) of algorithms.

2. Concrete program definition: This entails writing a text that translates the previous algorithms into a language understandable by the computer. At this point, we will talk about a **programming language**.

Course Objectives

- Employ a **methodological approach**, enabling the design and implementation of Algorithms to **solve problems**
- Understand of fundamental programming concepts in **C++** (lab sessions)
- Utilize **control structures** to manage program flow

Course Objectives

- Learn **modular** programming (functions)
- Work with arrays, strings, and matrices to store and manipulate **data**
- Apply **recursion** techniques to solve problems
- Introduce students to advanced topics: **Pointers** & **File handling**

Schedule (14 weeks)

Week	Chapters

1 – 2	**Algorithmic Thinking and Problem Solving**
	• Introduction to Algorithmic Thinking and Problem Solving
	  • Algorithm, Processor, Action
	  • Program and Programming language
	  • Resolution process
	• Algorithm Formalism
	  • Algorithm structure
	  • Flowchart
	  • Declaration
	  • Body

3	**Control Structures:** • Conditional Statements, • Loops (while, for, do..while)

Schedule (14 weeks)

Week	Chapters

4 – 5	**Modular programming**
	• Functions and Modular Programming
	• Function Declaration, Definition, and Calling
	  • Variable Scopes and Parameter Passing
	  • Packages

6 – 9	**Static data structure**
	• 1D array
	• 2D array
	• Advanced Operations on Arrays (Tri / search)
	  • Sorting Algorithms: Bubble Sort
	  • Searching Algorithms: Linear Search
	• Manipulating Strings & struct

Schedule (14 weeks)

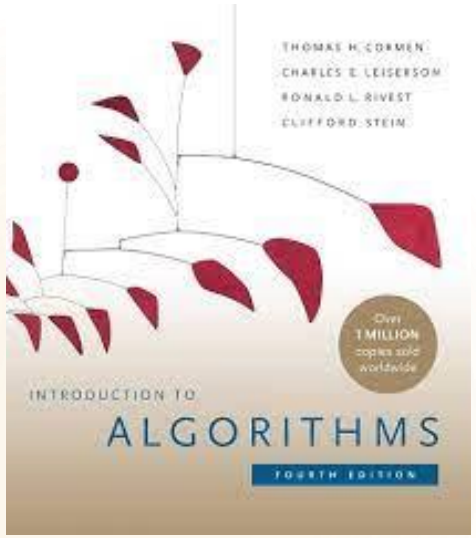
Week	Chapters
10 – 11	**Recursion** • Principles of recursion • Rules • Example 1: Factorial • Other Examples • Fibonacci & Binary search
12 – 13	**Dynamic Memory Allocation** • Dynamic Memory Allocation and Pointers (C++) • Pointer definition • Pointer in C++ • Pointer expression and arithmetic • Applications: • Array of pointers and Linked list
14	**File Handling and Streams**

Assessment and Grading

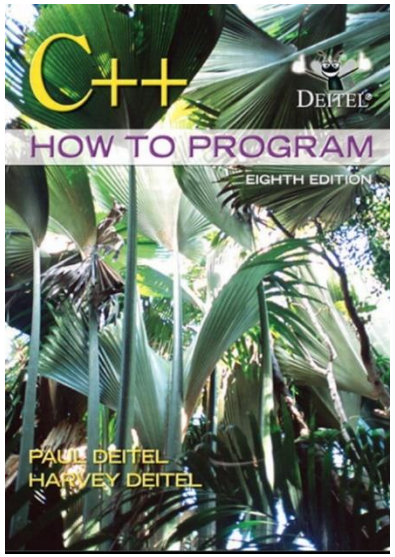
- Final Examination [**60 %**]
- Midterm Examination [**20 %**]
- Tests:
  1. Lab Test [**7** %]
  2. Tutorial Test [**7** %]
- Online Quizzes [**3 %**]
- Lab & Tutorial attendant & Participation [**3 %**]

References

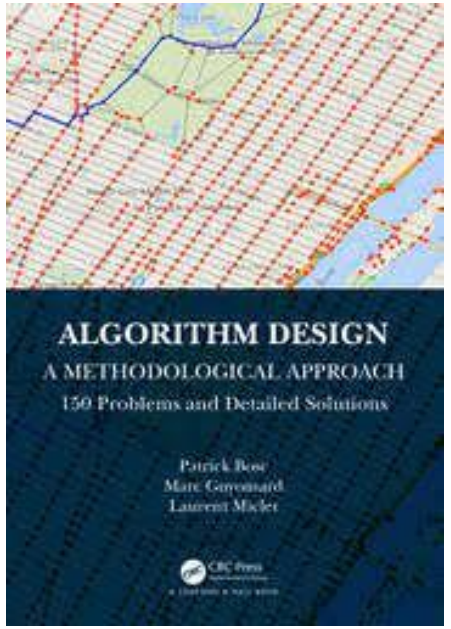
Text books:



Introduction to Algorithms, fourth edition by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stei



C++ How to Program 8th Edition by Paul Deitel, Harvey Deite

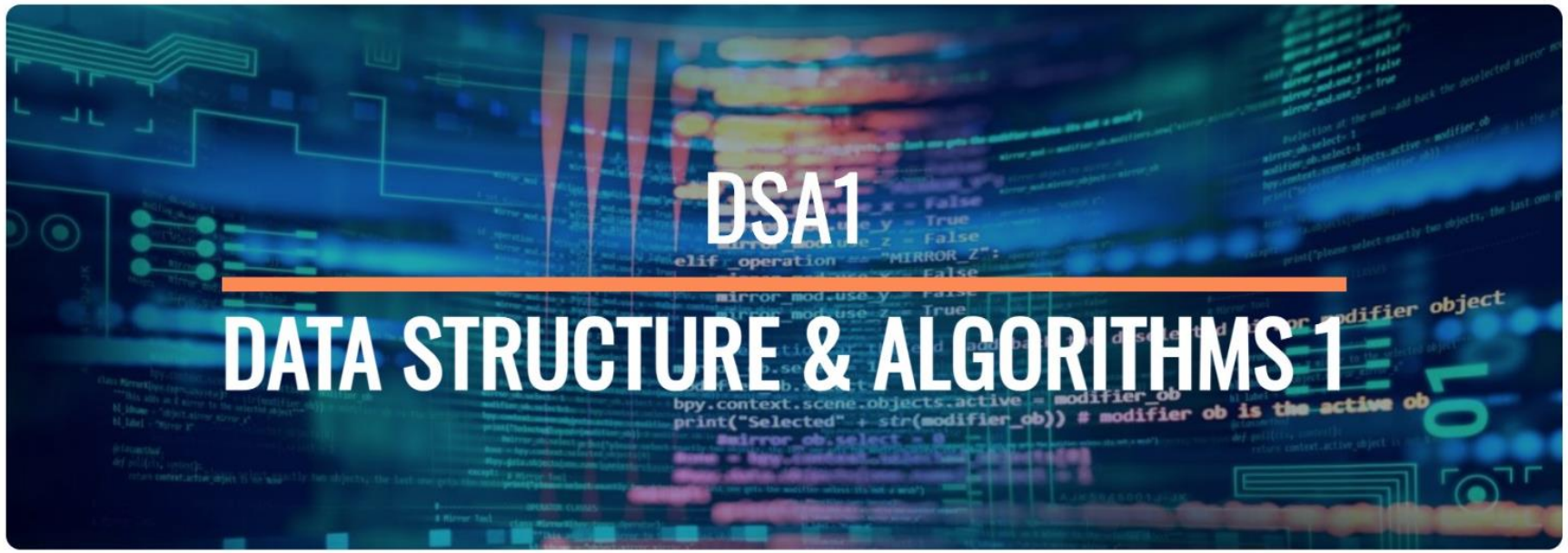


Algorithm Design: A Methodological Approach - 150 problems and detailed solutions

Course Website

Check out the DSA1 course website for additional details and the latest updates:

https://data-structure1.vercel.app



About the Course