

CS201- Data Structures

Week 01

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Agenda

- Introduction to Course & Conduct
 - Description
 - Objective
 - Learning Outcomes
 - Grading Scheme
 - Textbook
- Data Vs. Information Vs. Knowledge Vs. Wisdom
- Abstract Data Types
- Algorithm + Data Structures = Program
- Man vs. Machine
- Conclusion

Course Description

- Data Structures is a core course in Computer Science curriculum.
- It is an essential building block for solving applied problems with computers.
- The course will introduce the fundamentals of data structures and will provide thorough understanding of how to systematically organize data inside a computer system.

Course Description

- The course discusses basic memory management for efficiently solving problems on both time and space requirements.
- A variety of data structures will be discussed theoretically, their efficient implementations and application cases will also be discussed.
- The student will learn abstraction, encapsulation and structures for efficiently processing information in a variety of scenarios.

Course Objectives

- To understand the design of fundamental data structures and algorithms for problem solving through computer system.
- To study the tradeoff choices in the design and implementation of data structures
- To provide a rigorous “hands-on” experience with implementing different data structures in a high-level programming language
- To analyze time/space tradeoff for different solutions to the same problem.

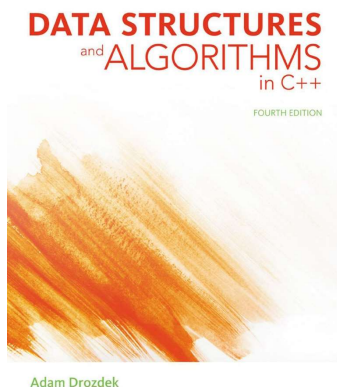
Learning Outcomes

- Student will be able to learn and understand basic/advanced data structures
- Student will be able to perform analysis of data structures choices for any real-world application.
- Student will learn the tradeoff with different choices of data structures
- Student will be able to write computer solutions for efficiently store, retrieve manipulate and update the data stored inside computers.

Grading Scheme

■ Programming Assignments	20%
■ Quizzes	10%
■ Midterm Exam	15%
■ Final Exam	40%
■ Class Project	10%
■ Class Participation	05%

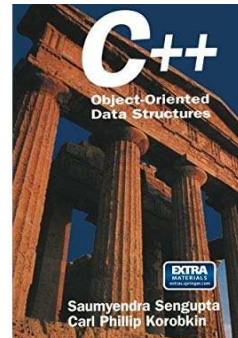
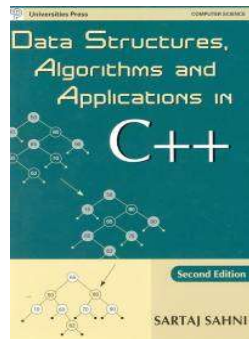
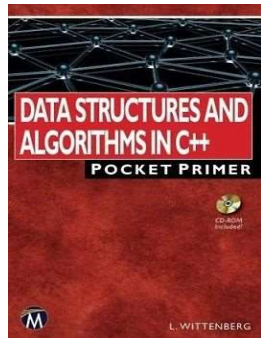
Textbook & References



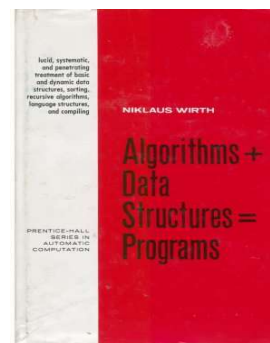
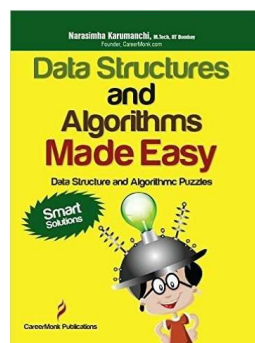
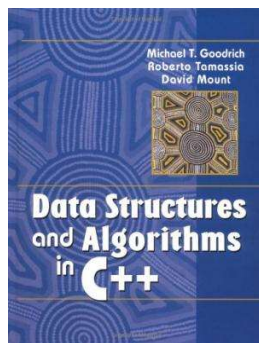
Leading Text in CS

- Strengthen your understanding of data structures and their algorithms for the foundation you need to successfully design, implement and maintain virtually any software system

Some Good References



Some Good References



Programming Assignments

- There will be 3 programming assignments, each assignment may contains 2-4 problems.
- These programming assignments will be on Hackerrank through invitation.
- The assignments are for individual, plagiarism will not be tolerated.
- You need to access the platform with your nu mail Ids.

Quizzes

- There will be 4-5 quizzes – all surprise quizzes
- Best n-1 will be counted
- Weightage 10%

Midterm Exam

- Two midterm exams – one hour each as per policy.
- Weight 7.5% each

Final Exam

- There will be a 3 hours exam as per policy.
- Weightage 40%

Class Participation

- Very important instrument for creating an impact.
- I appreciate questioning...
- Weightage 5%

Class Projects

- There will be a class project -You can have 2-3 members- members allow within sections.
- Weightage 10%
- The “Theme” for CS201- Data Structures class project is “Bioinformatics”
- We will have 3-4 BOF meeting during the course for the class projects.
- Class project call and schedule will be announced later.

Consultancy Hours

■ Consultancy Hours:

Monday: 2-4 PM in my office – prior appointment required

Thursday: 2-4 PM in my office – prior appointment required

Friday: 8-9am at café informal (individual + groups)- this will not be regular, I will announce it on slate but it will be more often.

■ Contact me

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Data vs. Information vs. Knowledge

■ Data

- Raw – facts
- Data in electronic form is easy to retrieve, manipulate, fused and remember.
- Data is not always in a shape to facilitate information and knowledge

■ Information

- Interplay with data in context

■ Knowledge

- Some actionable information for ROI

Information vs. Knowledge vs. Wisdom

- Wisdom

- Related to the interplay of knowledge and apply some deductive reasoning.

Abstract Data Types (ADT)

- ADTs are a theoretical concept in computer science.
- An abstract data type (ADT) is basically a logical description or a specification of components of the data and the operations that are allowed, that is independent of the implementation.

Definition – Data Structures

- Logical and formal abstract way to represent and store data in such a way that it will quickly available for processing within the application context.
- It is an organized collection of data which perform a set of operations effectively on the data. These set of operations are formally related to an idea of specific processing related to problem solving.

Definition – Algorithm

- An algorithm is a fancy to-do list for a computer. Algorithms take in zero or more inputs and give back one or more outputs.
- You explicitly need to tell a computer to perform each step that eventually transform some input into a desire output. It should be finite set of instruction.

Algorithm+ Data Structures = Program

- This was title of a very good book by Niklaus Wirth
- Half of the problem is selecting the right data structures and half of the problem is to select the algorithm.

Man Vs. Machine

- Computation -Processing
- Memory
- Abilities
 - Sequential vs. Parallel
 - Optimized vs. Satisfier
 - Algorithmic

Conclusion

- Data structures and algorithm are integral parts of problem solving through computer.
- Human and computer ways of solving problems are different.
- Data, Information and Knowledge are distinguishable concepts for representation.