SE2205b: Algorithms and Data Structures for Object Oriented Design

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Western University

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Background

Pre-requisites:

- Computer Science 1026A/B or ES 1036A/B or the former Computer Science 036a/b
- Computer Science 1027A/B or 1037A/B, or permission from the Department

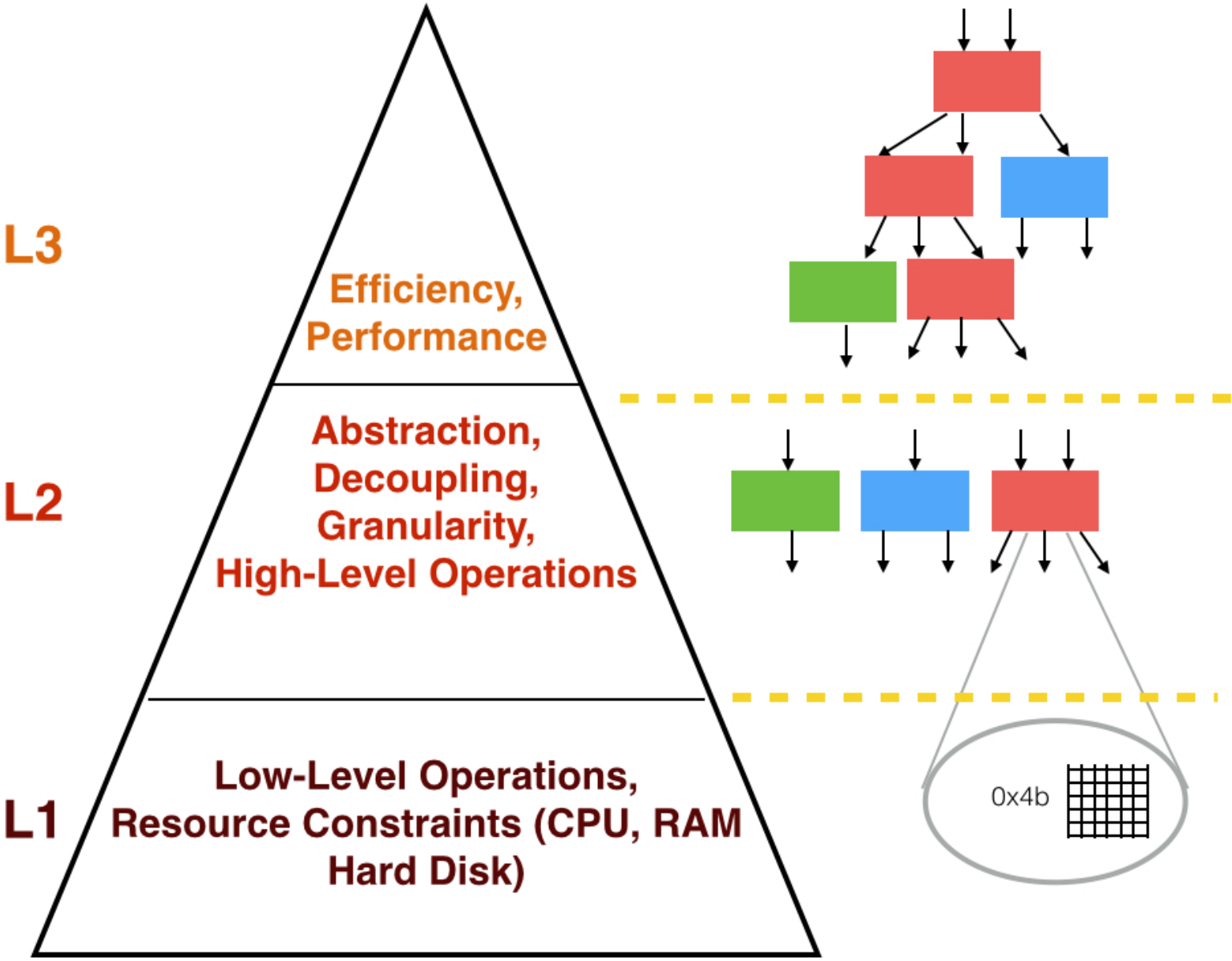
Course Structure:

- Java Programming Language
- Data Structures
- Algorithms

What do these Terms Mean to You?

- Abstraction
- Decoupling
- Efficiency
- Performance
- Resource Constraints
- Low-level Operations
- High-level Operations
- Granularity

What do these Terms Mean to You?



What do these Terms Mean to You?

L1:

- Use a comprehensive **toolset** that allows for highly detailed customization at the **bit/address level**
- Deals with concerns about low-level system **restrictions**

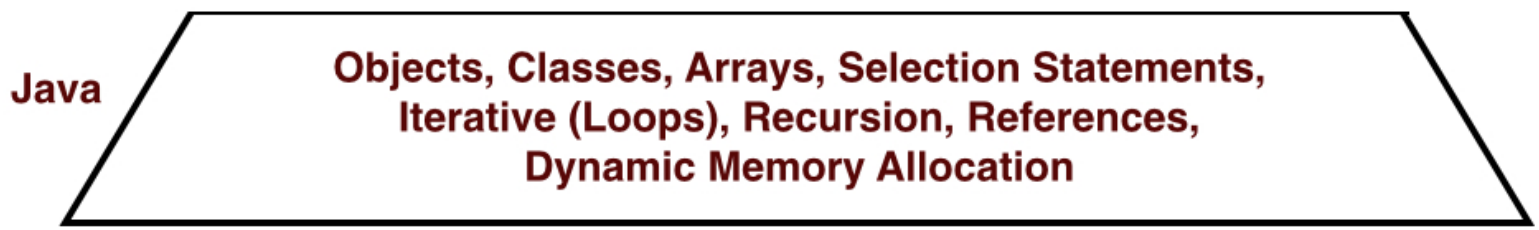
L2:

- Implementation of basic building blocks (need to know the **inner-workings**)
- Construct well-defined interfaces to access and perform operations on these blocks
- Draw upon tools and requirements from L3

L3:

- Use building blocks with well-defined interfaces to construct algorithms or software systems with **good performance**
- Inner-workings of building blocks are unknown

How Course Concepts Relate to One Another?



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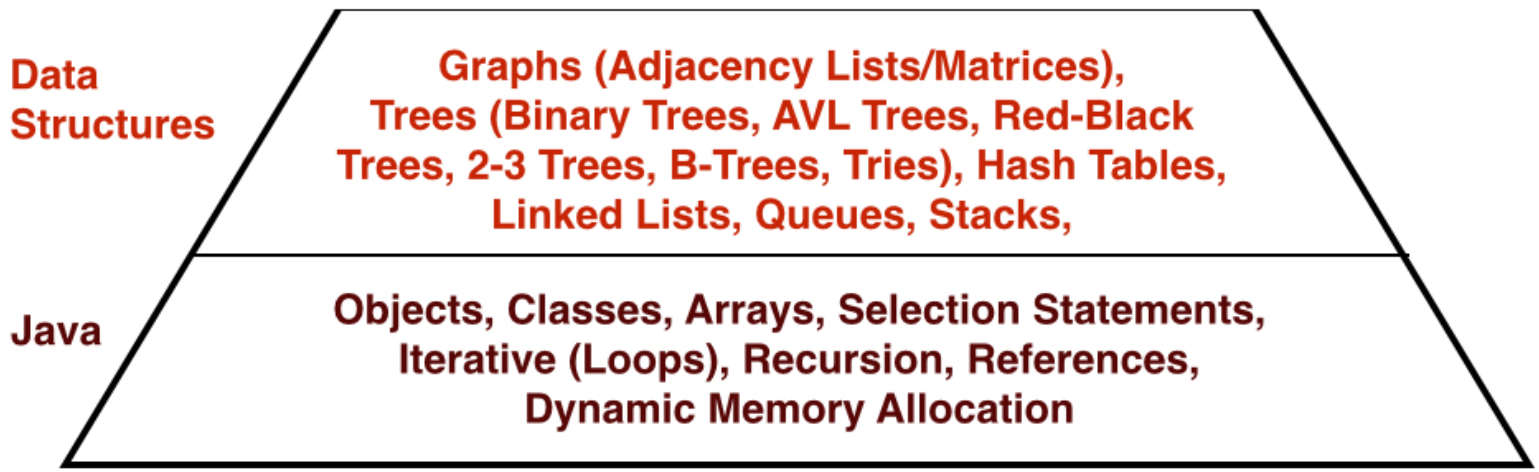

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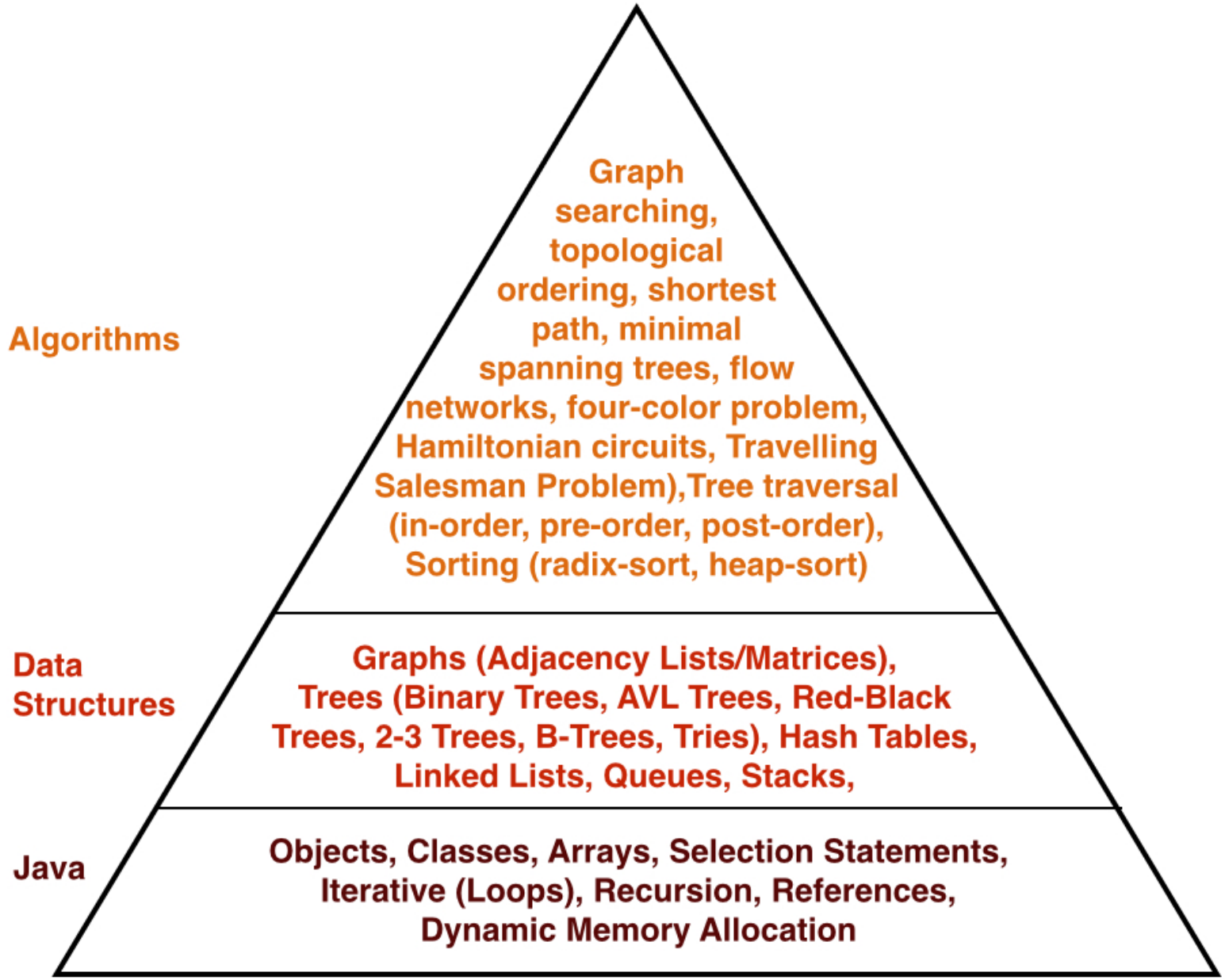

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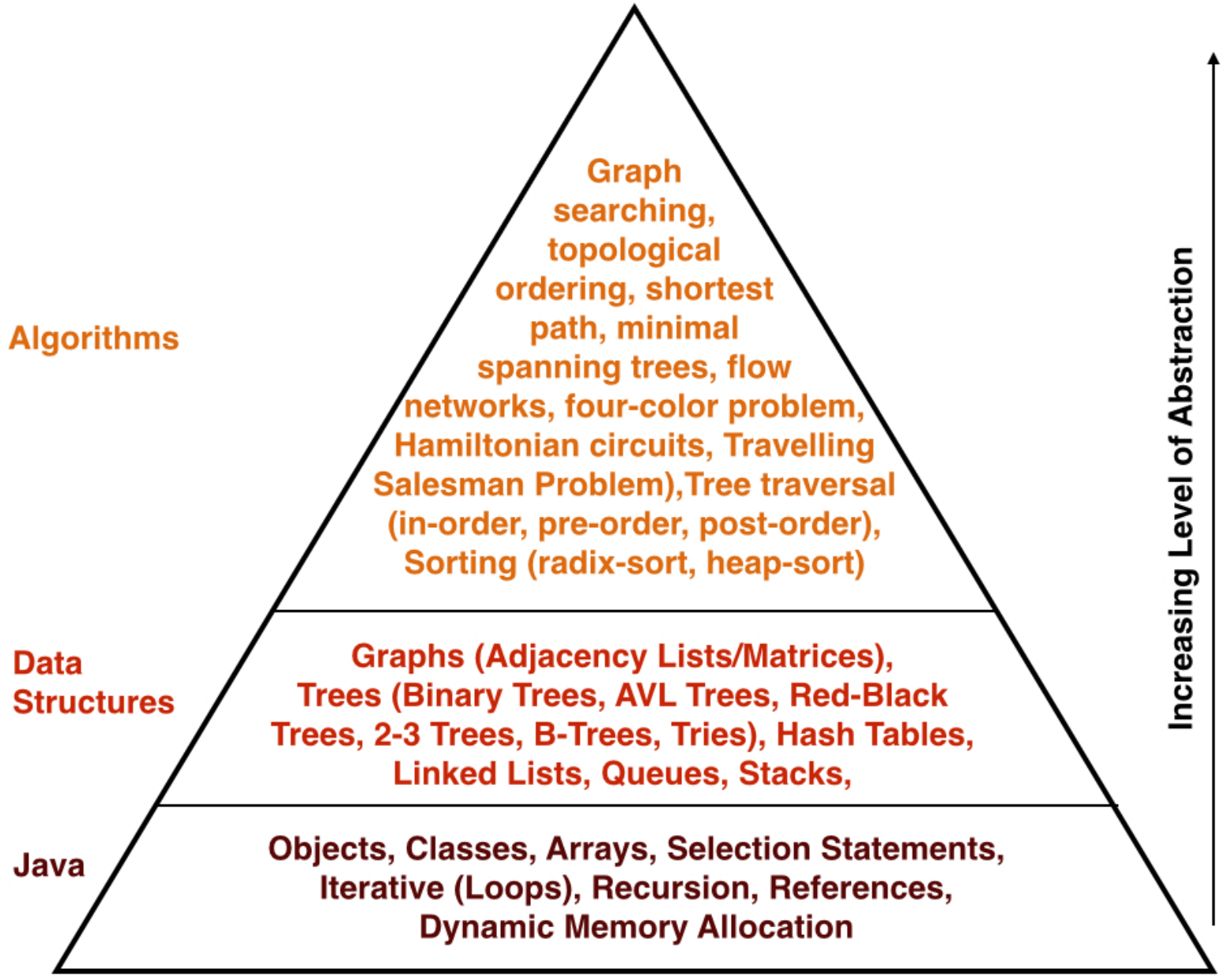
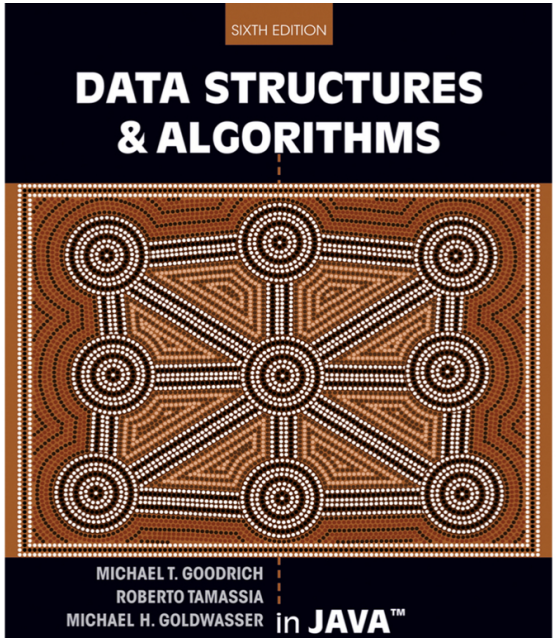


Textbooks



- **Required**: Michael T. Goodrich, et al., Data Structures and Algorithms in Java, Wily, 6th Edition, 2014, ISBN: 978-1-118-77133-4 (or older edition)
- **Recommended**: Gayle Laakmann McDowell. Cracking the Coding Interview, Career Cup, 6th Edition, 2015, ISBN: 978-0-9847828-5-7 (or 5th edition).

General Learning Objectives

- Introduce advanced programming theory and concepts that **build** upon material covered in pre-requisite courses
- Practise rigorous and innovative computational thinking that can be applied across a **broad range of engineering fields**
- Tie programming concepts **back to the curriculum** by illustrating how the fundamental programming toolset can be applied to construct **efficient computational solutions** for problems
- Demonstrate that programming does not merely involve memorizing a language but consists of a **rich set of foundational concepts** that can be used almost anywhere for problem solving

Lectures

Structure:

- Powerpoint slides
- Interactive component (written, programming)
- Strongly encourage you to attend all lectures

Classroom Etiquette:

- Attend lectures on time
- Do not be disruptive (ringing cell phones, discussion amongst yourselves while I am teaching)

Questions:

- Office hours every Wednesday 11 a.m. to 12 p.m.
- Emails: Allow for some time (a day or two)

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Weightings

- **Labs** 30%: 3 Lab Assignments
  - Complete in groups of two
- **Midterm** 20%: One midterm (Feb 15)
- **Final Exam** 50%: Cumulative
- All tests are written, no aid sheets/calculators are permitted

SE2205b – Tentative Course Schedule – Winter 2019

W	Date	Topic	Assignment		Labs Consultation Hours
			out	in	
1	Jan 9	Course Overview			
	Jan 11	Java Review			
2	Jan 16	Recursion	Assign1		
	Jan 18	Algorithm Analysis			
3	Jan 23				Lab1
	Jan 25	Linked Lists, Queues			
4	Jan 30	Stacks			Lab2
	Feb 1	Collections/Lists			
5	Feb 6	Iterators			Assignment 1
	Feb 8	Binary Trees			
6	Feb 13	Tree Traversal	Assign 2	Assign1	
	Feb 15	Midterm			
7	Feb 18-Feb 22	Spring Reading Week – no classes			
7	Feb 27	Binary Search Trees, AVL Trees			Lab3
	Mar 1	Red-Black Trees, Heaps			
9	Mar 6	General Trees			Assignment 2
	Mar 8	Graph Searching	Assign 3	Assign 2	
10	Mar 13	Topological Ordering			Lab4
	Mar 15	Shortest Paths in Graphs			
11	Mar 20	Minimal Spanning Trees			Lab5
	Mar 22	Other Graph Algorithms			
12	Mar 27	Dynamic Programming			Assignment 3
	Mar 29			Assign 3	
13	Apr 3	Sorting			
	Apr 5	Review			

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Plagiarism in Individual Submissions

- Work on all individual lab assignments by fully **cooperating** with your partner
- **Practise!** Although the solutions may seem obvious when you collaborate, things are different when you attempt it on your own
- Plagiarism is **NOT** acceptable especially in an academic setting
- We use a sophisticated **similarity-checking** tool that analyzes the structure rather than just the syntax
- There are very **heavy consequences** for plagiarism

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General Remarks

- Be **inquisitive**, enjoy this course and learn as much as possible
- Many concepts introduced here will be useful directly or indirectly in the future
- Take advantage of many additional practise problems and code samples that will be provided
- Aim to understand everything thoroughly, everything will simply follow