Lecture 1
Welcome to CSC 017

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Instructor Information

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- **Office hours:** Tue 1:00-3:00 pm

Course Goals

- Master the concepts of advanced data structures and object-oriented programming.
- Learn practical programming skills.
- Earn hands-on experience by solving real-word problem.
- Master the software engineering interview.
- 3 hours lecture, 1 hour laboratory.
- Course materials: https://guhofstra.github.io/CSC017

Tentative Topics

Week	Topic
1	Introduction to Java Platform
2, 3	Classes and Objects in Java, Inheritance and Polymorphism
4, 5	Java String, Regular Expression, Algorithm Performance Analysis (Big-O)
6, 7	ADT, Generic Class in Java, Exception, Junit Test, Linked lists vs. Arrays
8	Hash Table: Linear Probing vs. Separate Chaining, Hashcode Implementation
9, 10	Balanced Search Trees: 2-3 Tree, Red-Black Tree, B+ Tree
11, 12	Basic Graph Algorithms: Depth-first Search vs. Breadth-first Search, Connected Components, Topological Order
13	Minimum Spanning Trees: Kruskal's Algorithm vs. Prim's Algorithm
14	Shortest Paths: Dijkstra's Algorithm, Bellman-Ford-Moore Algorithm
15	Sorting Algorithms: Heapsort, Quicksort, Mergesort, and Radix Sort
Optional	Multi-threading in Java, data compression

Textbook

- No required textbook.
- Course contents are selected from different books and the Internet including tutorials, open courses, official documents, programming learning platforms, etc.
- Recommended book: Algorithms, 4th Edition by Robert Sedgewick and Kevin Wayne.

External Resources

- Online Comprehensive Tutorial for Java:
  - Java Tutorial - https://www.tutorialspoint.com/java/index.htm
- JDK and Java IDE installation:
  - Install JDK and Eclipse - https://www3.ntu.edu.sg/home/ehchua/programming/howto/JDK_Howto.html
- Official Document for Java Libraries and Utilities:
  - Java API - https://docs.oracle.com/javase/10/docs/api/index.html?overview-summary.html
- Technical Interviews and Coding Challenge:
  - LeetCode - https://leetcode.com/

Grading Policy

- Midterm exam: 30%
- Final exam: 40%
- Programming assignments/labs: 30%

- **Late Days:** Each student is allowed a total of 3 late days for this class, which may be spent in units of one day (24 hours) on any project(s) throughout the semester. Once your late days have been used up, late work will not receive any credit. Late days are intended to handle all issues, including unexpected problems such as illness.

Reasons to Choose Java

- Promise of portability
  - write-once/run-anywhere
- Efficient memory management
  - garbage collection
- Powerful object-oriented programming
  - Inheritance and Polymorphism

Write Once and Run Anywhere

1. Write source code - HelloWorld.java

```
public class HelloWorld {
        public static void main(String[] args) {
                System.out.println("Hello World");
        }
}
```

2. Compile source code - javac HelloWorld.java

Compiler

Java Bytecode

Obtain bytecode - HelloWorld.class

2. Run in JVM - java HelloWorld

Java Virtual Machine

Java API

Native Machine Code

Operating Systems

Hardware

```
Jianchen$ java HelloWorld
Hello World
```

Java is a Platform