Topics Summary

- **Reintroduction to Java**
  - Syllabus & introductions
  - Variables & expressions
  - Methods, main(), locals, classes
  - Control structures: for, if, etc.
  - File I/O
- **Class Design I (Composition)**
  - Class composition
  - Inheritance comparisons
  - Constructors & copy Constructor
  - Getters & setters
  - Overriding Methods
    - toString()
    - equals(Object o)
    - clone()
  - Overloading Methods
    - Constructors
    - println()
  - Encapsulation & information hiding
  - Interface vs. implementation
  - Instance vs. static variables and methods
- **Class Design II (Inheritance)**
  - Parent and child classes
  - What is and is not inherited
  - Shape <- Square, Circle
  - Pair <- Fraction, Money
  - Exception <-ArrayListException
- **Class Design III (Interfaces)**
  - "Extends" vs. "implements"
  - Comparable & Runnable code
  - Serializable, Cloneable interfaces
  - Collections
  - Sets
  - Lists
  - Maps
  - Concrete implementations of collection interfaces (HashSet, HashMap, etc.)
- **Class Design IV (Generics)**
  - Class type parameters
  - Methods type parameters
- **Memory**
  - Primitives
  - Objects
    - References & pointers
    - By reference & by value
  - Privacy leaks
- **Data Structures I (Using Arrays)**
  - Abstract data types and implementing a structure using another data structure, such as an array.
  - Arrays as Lists (ArrayList, V1.0): insert, remove, shiftLeft, indexOf, size, contains
  - Stacks, queues
- **Data Structures II (Using Links)**
  - Linked data structures
  - Linked lists and implementing stacks and queues using linked lists
  - Node class
  - Use of private inner classes
  - Recursive list operations
- **Data Structures III (Trees)**
  - K-nary trees
  - Binary Search Trees
    - IntTree
    - ComparableTree
    - Binary Search Tree Storage rule
  - Tree methods implemented recursively:
    - insertInSubtree()
    - inorderWalk()
    - indexOf()
    - size()
- **Exception Handling & Inheritance**
  - Exception & RuntimeException
  - Try/catch/finally and throws
  - Catch-or-Declare
  - Custom exception classes
- **Recursion**
  - Concepts: Tail recursion, infinite recursion, stack overflow, etc.
  - How to write recursive methods
  - List operations: size(), toString(), indexOf(), etc.
  - Binary search recursively
- **Complexity & Big-O Notation**
  - Find g(x), c & k given f(x)
  - Reduction rules
  - Counting code & loops
  - Functional decomposition
  - Tradeoffs: time vs. memory, etc.
- **Searching**
  - Linear iterative and recursive
  - Binary iterative and recursive
- **Sorting**
  - Bubble sort
  - Selection sort
  - Insertion sort
  - Quick sort
  - Merge sort
- **Commenting and Documentation**
  - Test suite and harness
  - javadoc