COMP 121 – OBJECT-ORIENTED DATA STRUCTURES AND ALGORITHMS 1

Winter 2018

General Information

Description

This course continues the objected-oriented approach to software construction. The student learns and reflects on advanced object-oriented techniques, algorithm efficiency, class hierarchies, and data structures. To support the concepts and principles of software construction, the student will design, code, test, debug, and document programs using the Java programming language. Design principles, I/O, exception handling, linear data structures (lists, stacks, and queues), and design patterns are emphasized in addition to the object-oriented techniques of inheritance and polymorphism.

Prerequisites

- Introduction to Computer Science and Object-Oriented Programming (COMP 111)

Course Outcomes

- Upon successful completion of this course, students will be able to:
    1. Apply the advanced object-oriented principles of inheritance and polymorphism to analyze real-world problems and design, implement, and test solutions.
    2. Detect and correct runtime program errors using exceptions.
    3. Read and write random access and sequential files of text and binary data.
    4. Analyze space and time complexity of algorithms.
    5. Design, implement, test, debug, and document linear data structures.
    6. Use lists, stacks, and queues to solve problems.
    7. Recognize and apply the design patterns of Strategy, Template Method, Iterator, and Adapter in object-oriented designs.

Course Materials

Required Materials

- Horstmann, C. (2015). Big Java (6th ed.). Hoboken, N.J: John Wiley & Sons. ISBN: 9781119056447 (print), 9781119141594 (e-text).
  Note: This book will be used again in COMP 321.
- Koffman, E., & Wolfgang, P. (2016). Data structures: Abstraction and design using Java (3rd ed.). Hoboken, NJ: John Wiley & Sons. ISBN: 9781119239147 (print), 9781119186526 (e-text).
  Note: This book will be used again in COMP 311.
- Freeman, E., & Freeman E. (2004). Head first design patterns. Sebastopol, CA: O'Reilly Media, Inc. ISBN: 9780596007126 (print), 9781449331498 (e-text).
  Note: This book will be used again in COMP 311 and recommended in COMP 321.
- Please take note of the "General Technology Requirements" and "Special Technology Requirements" identified in the Academic Bulletin, including the Windows XP operating system with Service Pack 2.

- Sun Java Development Kit 1.7.0 update 1 contains the Java compiler and libraries needed to create and execute Java-based programs on your computer.
- Sun Java Development Kit Documentation 1.7.0 contains the HTML-based API documentation needed as reference for the library classes.
- BlueJ 3.0.6 custom Franklin version is the Integrated Development Environment (IDE) in which the lab assignments and activities for this class will be edited, compiled, and run.
- COMP 121 Learning Activity support files are required for completing the Guided Learning Activities in select weeks. They contain pre-built BlueJ projects that you will modify and run

Obtaining Course Materials

- A digital copy of the textbook (e-textbook) for this course is accessible via VitalSource, an online platform for digital instructional materials. Clicking on any link to the book from within the course will direct you to an object from which a digital copy of the textbook can be opened in a new browser tab. For a detailed walkthrough on accessing the digital copy of the textbook, please refer to this tutorial.

Course Outline

Course Topics

Week 1	Inheritance and Polymorphism
Week 2	Abstract Classes and Interfaces
Week 3	Strategy and Template Method Design Patterns
Week 4	Files and Exception
Week 5	SDLC, Modeling, and Efficiency
Week 6	Generics, Array-based collections, and Iterators
Week 7	Array-based lists and ListIterators
Week 8	Singly-linked Collections and Iterators; Adapter design pattern
Week 9	Doubly-linked, circular lists and iterators; Decorator design pattern
Week 10	Stack operations and algorithms
Week 11	Queue operations and algorithms
Week 12	Final Exam and Reflection