2024-2025
Intermediate Programming (Java)
CMPINF 0401--4 Credits

Description: This is an intermediate course focusing on object-oriented programming and other fundamental programming concepts utilizing the Java programming language. Students are expected to have some previous programming experience prior to taking this course.

Prerequisites: Previous programming experience including basic data types, control constructs, functions and arrays.

Grading: Grading will be based on programming assignments and exams.

Textbook: *Starting Out With Java From Control Structures through Objects*, 5th edition, by Tony Gaddis (ISBN: 978-0-13-285583-9)[i]. Or, you may use any textbook as long as the material that is listed below is included in the book.

The following topics are covered in the University of Pittsburgh CMPINF 0401 course[ii]:

1. Introduction
- Algorithms
- Implementing Algorithms in Java
- Why Java?
- Using the JDK

2. Java Fundamentals
- Data Types and Variables
- User Input and Output
- Numeric Types
- Arithmetic Expressions
- Assignment Operators
- Increment and Decrement Ops
- Precedence and Associativity

3. Decision Structures and Loops
- Boolean Expressions
- The if Statement (and if-else)
- The while Statement
- The for Statement
- Break and Continue
- The switch Statement

4. Classes, Objects, and Methods
- Definitions: Class and Object
- Primitive Types vs. Object Types
- Reference Variables and Implications
- Method Invocation
- Static Methods
- Scope of Variables
- Top-Down Design
- Invocation and Call-by-value

5. Writing Classes
- Elements of a Simple Class
- Public and Private Access: Data Hiding
- Constructor Methods
- Accessors and Mutators
- Static Fields and Methods
- Method Overloading
- Interfaces

6. Arrays
- One-Dimensional Arrays
- Passing Arrays to Methods

- Array Assignment and References
- Two-Dimensional Arrays
- Arrays of Objects

7. Intro. to Linked Lists
- Contiguous vs. non-contiguous data
- Idea of a linked list
- Simple linked list implementation

Side Topic: Files and File Access
- Reading and Writing Text Files
- Formatting Text Output
- Reading and Writing Binary Files
- Detecting End of Input Stream

8. Searching and Sorting
- Sequential Search and Binary Search
- Selection Sort and Insertion Sort
- Java Generics: Using the Same Code for Multiple Types

Side Topic: Intro to Graphical Applications
- "Hello World"
- Events and Event Listeners
- Text and Numerical Input
- Using Graphical Components

- Layout managers

9. Inheritance and Polymorphism
- "Is a" relationship
- Overriding (vs. overloading) Methods
- Composition vs. Inheritance for Class Design
- Protected Access
- Type Object and Inheritance
- Wrapper Classes
- Abstract Classes
- Interfaces as Pseudo-Abstract
- Classes and Pseudo-Multiple
- Inheritance

10. Exceptions
- Try and Catch
- Throwing an Exception
- Exception handling and propagation
- Exceptions in Graphical Applications

11. Recursion
- Idea of recursion
- Base Case and Recursive Case
- Examples: Fibonacci, Binary Search, Towers of Hanoi (optional)

i The Gaddis text does not present all of the topics in the order shown above. If you use the Gaddis text, the following chapter order is recommended: 1, 2, 3, 4, 5, 6, 7, 8, 12, 9, 10, 11, 12, 13, 14, 15. For a more detailed syllabus, see the most recent CHS CMPINF 0401 materials.

ii Topics 1-4 and 6 should be covered very quickly in at most a few classes, as the material should already be familiar to the students through CS 0007 or an equivalent course. The other topics should have more detailed coverage.

Academic Integrity: All College in High School teachers, students, and their parents/guardians are required to review and be familiar with the University of Pittsburgh's Academic Integrity Policy located online at https://www.as.pitt.edu/faculty/policies-and-procedures/academic-integrity-code.

Grades: Grade criteria in the high school course may differ slightly from University of Pittsburgh standards. A CHS student could receive two course grades: one for high school and one for the University transcript. In most cases the grades are the same. These grading standards are explained at the beginning of each course.

Transfer Credit: University of Pittsburgh grades earned in CHS courses appear on an official University of Pittsburgh transcript, and the course credits are likely to be eligible for transfer to other colleges and universities. Students are encouraged to contact potential colleges and universities in advance to ensure their CHS credits would be accepted. If students decide to attend any University of Pittsburgh campuses, the University of Pittsburgh grade earned in the course will count toward the student grade point average at the University. At the University of Pittsburgh, the CHS course supersedes any equivalent AP credit.

Drops and Withdrawals: Students should monitor progress in a course. CHS teacher can obtain a Course Drop/Withdrawal Request form from the CHS office or Aspire. The form must be completed by the student, teacher and parent/guardian and returned to teacher by deadlines listed. Dropping and withdrawing from the CHS course has no effect on enrollment in the high school credits for the course.