CMPU-102: Data Structures and Algorithms

Website: https://moodle.vassar.edu/course/view.php?id=16861

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Office Hours: On the calendar (posted on Moodle), or by appointment.

1 Preliminaries

1.1 Course Description

An algorithm defines a method to solve a given problem. A data structure is a specific way of organizing data, so that it can be used efficiently by an algorithm. This course approaches data structures and algorithms from a practical perspective, using Object-Oriented Programming (OOP), and particularly Java, as a framework to learn and experiment with the concepts being discussed. This course consists of two halves – the first focuses on Object Oriented Programming and Java, the second on data structures. Topics covered include:

- Object-Oriented Programming (OOP)
  - Encapsulation
  - Inheritance
  - Polymorphism
  - The Java Programming Language
    - OOP in Java
    - Operators
    - Expressions
    - Control Flow
    - Testing and Debugging
    - Java Documentation (Javadoc)
    - Exceptions
    - The Collectons Framework
    - Input/Output
- Abstract Data Types (Lists, Sets, Queues, Stacks, Maps)
- Data Structures (Arrays, Linked Lists, Array Lists, Hash Sets, Hash Maps)
- Algorithms (Searching, Sorting)

1.2 Prerequisites

The only prerequisite for this course is CMPU-101.

1.3 Learning Environment

This course will consist of a few components – lecture videos, recitations and labs. You will need to watch the lecture videos outside of class time. During the recitations, we will practice the concepts covered in lecture. In labs, you will reinfornace the concepts discussed in recitation. Labs will require the use of a computer. Both recitations and labs will have synchronous and asynchronous participation options. You will be responsible for all information presented in lecture, recitation and lab.

2 Course Content

2.1 Learning Objectives

Upon successful completion of this course you should be able to:

1. Develop programs using object oriented design using the Java programming language.
2. Differentiate among abstract data types, data structures and algorithms.
3. Determine which data structure or algorithm is appropriate for a particular situation.
4. Use common data structures and algorithms in your own code.
5. Create your own data structures and algorithms to solve a specific problem.

2.2 Textbook

There is no required textbook for this course. Here are some additional resources:

- Introduction to Programming Using Java, Eighth Edition by David J. Eck. Online at http://math.hws.edu/javanotes.
- Objects First with Java - A Practical Introduction Using BlueJ, Sixth Edition by David J. Barnes and Michael Kölling.
- Java API. Online at http://docs.oracle.com/javase/10/docs/api/.
- Official Java Tutorial. Online at http://docs.oracle.com/javase/tutorial/.

3 Assignments

This course will include labs, programming assignments, a midterm, and a final. Labs will be evaluated for completion. Programming assignments will expand upon the concepts introduced in class and practiced in lab. You can expect a total of four or five programming assignments, of increasing size and complexity. Programming assigments will be evaluated based on correctness and good programming style. The midterm will be held online on October 8th – there will be no lab that day. The final will be held online during finals period.

We will work hard to grade and give you feedback on all work within a week.

Category	Weight	Details
Labs	20%	labs weekly, averaged
Homework	30%	4-5 assignments, averaged
Midterm	25%	October 8th, online
Final	25%	During finals period, online

4 Policies

4.1 Availability

We will respond to emails within 24 hours, except on weekends. Our office hours are posted on the calendar on the Moodle page. We are also available to meet by appointment.

4.2 Late Policy

Each person is allotted two late days for homework assignments. Each late day extends the deadline of a homework assignment by 24 hours. You may use one late day on two homework assignments, or two late days on one homework assignment. Please email your section instructor before the original deadline letting them know that you plan to use a late day. If you run out of late days, late assignments will incur a penalty of 20% for each day past the deadline. Homework extensions and makeup exams will be granted only in exceptional circumstances (e.g., due to illness or personal/family emergencies). We will likely require confirmation from the Dean of Studies.

4.3 Collaboration and Academic Integrity

In this course, you will have the option of working with a partner for the labs. However, the programming assignments must be done individually. You are welcome to discuss the programming assignments with other students, but you are not permitted to look at another student's code. You are welcome to verbally help someone in debugging their code, but you must do so without looking at it. If you use an external source for your homework, you must cite it. We do not allow solutions to programming assignments from this course to be posted publicly (e.g., to Bitbucket or GitHub). We encourage every student to familiarize themselves with the CMPU department's academic integrity policy: https://www.cs.vassar.edu/integrity.

4.4 Accessibility and Educational Opportunity

Academic accommodations are available for students registered with the Office for Accessibility and Educational Opportunity. Students in need of ADA/504 accommodations should schedule an appointment with the professor early in the semester to arrange for said accommodations.

4.5 Learning Environment

Vassar College is committed to providing a safe and respectful learning environment for all students. An environment free of all forms of discrimination and harassment, including sexual assault, domestic violence, dating violence, and stalking. Vassar College has staff members trained to support students in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, helping with legal protective orders, and more:

- Counseling Service (counselingservice.vassar.edu, 845-437-5700)
- Health Service (healthservice.vassar.edu, 845-437-5800)
- SAVP (Sexual Assault and Violence Prevention, savp.vassar.edu, 845-437-7863)
- SART (Sexual Assault Response Team, available 24/7 by calling the CRC at 845-437-7333)

The SAVP website and the Title IX section of the EOAA website (eoaa.vassar.edu/title-ix/) have more information, as well as links to both on- and off-campus resources.