

Carleton University

Department of Systems and Computer Engineering

SYSC 2100

Algorithms and Data Structures

Winter 2019

Course Outline

Instructor: Jean-Daniel Medjo Me Biomo, jemeda@sce.carleton.ca

Office Hour: Wednesdays 2-3 pm at ME4239

TA Information and Office hours: See [cuLearn](#)

Course Description and Objectives:

- To introduce students to common programming techniques/algorithms (recursion, searching and sorting, etc.)
- To introduce students to several fundamental abstract data types (ADTs) and data structures. Students will learn how to develop the specifications for ADTs, design their underlying data structures, and implement the ADTs as Java classes. Some common applications of these ADTs will be presented.
- To introduce students to techniques for designing and analyzing algorithms

Learning Outcomes (LOs):

By the end of the course, students will be able to:

- Estimate the computational complexity (Big-O notation etc.) of functions and basic algorithms
- Choose the appropriate data structures and algorithms for a given application/problem
- Write recursive Java methods to solve a variety of computational problems. This includes the ability to:
 - Write pseudo code instructions of an algorithm
 - Abide by Java programming rules
 - Use object-oriented programming
- Solve problems that involve the management of data. This includes the ability to
 - Develop specifications for ADTs
 - Design underlying data structures
 - Implement ADTs as Java classes

Prerequisites:

Precludes additional credit for SYSC 2002 and COMP 2402.

Prerequisite(s): (SYSC 1102 or SYSC 2006) and (SYSC 1101 or SYSC 2004).

Graduate Attributes (GA's)

The Canadian Engineering Accreditation Board requires graduates of engineering programs to possess 12 attributes. Activities related to the learning outcomes listed here are intended to develop students' competence in GA 1 (Programming and Algorithms) and GA 2 (Approach to the Problem and Interpreting the Solution). Data obtained from exam questions related to the four LOs presented above will be collected to assess students' progress towards achieving both GAs. Specifically, LO 1 is geared toward GA 1 only, whereas LOs 2 through 4 all address both GA 1 and 2.

Textbook:

Data Abstraction and Problem Solving with Java: Walls and Mirrors, 3rd edition, by Frank M. Carrano and Janet J. Prichard. Prentice Hall 2011, ISBN-10: 0132122308, ISBN-13: 9780132122306.

I recognize that textbooks are not cheap. So if you can get a (used) version of the textbook, either the 3rd or the 2nd edition, that will work as well. I encourage you to acquire a copy of the textbook early in the term, as the bookstore will not carry them beyond the initial few weeks of classes.

Course Delivery:

I will use [cuLearn](#) for managing course interactions, grades, as well as assignment submissions. I will also use [Poll Everywhere](#) occasionally for live in-class interactions.

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Laboratory Sessions:

A 2-hour weekly lab period has been scheduled, but formal lab sessions will normally not be held at that time. Supplementary lectures or tutorials or the midterm exam may be scheduled for some of the lab periods on an as-required basis; these will be announced in class.

Students can use the undergraduate computer labs whenever the Mackenzie Building and Minto CASE are open, except for those times when labs are reserved for specific courses.

Assignments and Exams:

Students will be evaluated by means of 5 assignments, a quiz, a midterm exam, and a final exam. There will be a total of 5 programming assignments. Doing the assignments is the best way to learn the course material, so students are encouraged not to “write off” any particular assignment just because of its relative low weight in the overall grading scheme. In addition, completing a subset of the assignments will be a pre-requisite for being allowed to write the final exam. Late assignments will not normally be accepted, and will receive a mark of 0; however, students who cannot submit an assignment by the due date for valid medical or compassionate reasons should contact the instructor immediately **and prior to the due** date to arrange for appropriate accommodations (e.g., an extension of the due date). Arrangements must be made in a timely manner, otherwise the assignment will be considered late and not accepted. Note that assignments will be submitted using cuLearn, using the cuLearn server cutoff time. However, all assignments can be submitted multiple times, so I encourage you to submit an early version.

Students are encouraged to discuss design issues when working on assignments; however, you are expected to write your own programs. There is a fine line between cooperating with your classmates (discussing problems and ideas) and copying program code (plagiarism). Not only is plagiarism an instructional offense (see the current Undergraduate Calendar, Academic Regulations of the University, Section 14), but doing the assigned work by yourself is by far the best way to prepare for the exams. Note that it is not only an instructional offence to submit someone else’s work as your own. It is also an instructional offence to knowingly allow someone else to hand in your work as his/her work.

You are encouraged to ask the TA(s) for feedback and suggestions for improving your Java programs. When you ask a TA to help you with one of your programs, you will be expected to present a well-documented listing of your program. The TA(s) may be unable to provide much assistance if all you can show is an undocumented, difficult-to-understand program.

The quiz and midterm exams will be held in-class. Quiz and midterm exam papers will be returned to the students. Re-evaluations may be considered based on specific requests by you, but will be performed without your presence. Students who are unable to write the exam because of illness or other circumstances beyond their control must provide evidence. In the case of illness, this requires a medical certificate dated no later than one working day after the exam. The certificate must specify the date of the onset of the illness, the (expected) date of recovery, and the extent to which the student was/is incapacitated during the time of the examination. If this information is provided to the instructor no later than **three working days** after the exam, the marks for the quiz will be transferred to the midterm; a deferred midterm may be offered to the student. Otherwise, the mark for the missed exam will be zero.

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Final Exam:

The final examination is for evaluation purposes only and will not be returned to students. You will be able to make arrangements with the instructor or with the department office to see your marked final examination after the final grades have been made available.

The final exam will be held during the University's April examination period. For SYSC 2100, **only students who completed at least four out of five programming assignments are eligible** to write the final examination or, where circumstances warrant, apply to the Registrar's Office for deferral of the final exam. **Completed** means any assignment mark greater than 0 (note that in case of confirmed cases of plagiarism, the usual penalty is to be awarded zero on an assignment). In case of deferral, the following rule will apply:

Students who miss the final exam may be granted permission to write a deferred examination (see the Undergraduate Calendar for regulations on deferred exams). These students have additional months to study and a less crowded examination schedule compared to their colleagues who write the final exam in April. As such, it is only fair to expect substantially better performance from these students on the deferred examination than on the April final exam.

Grading Scheme and Schedule:

To pass the course, a student must pass the final examination (D- or better). For these students, the marks will be calculated as follows:

Assignments:	25%
Quiz:	5%
Midterm exam:	20%
Final exam:	50%

The complete schedule of assignments, exams, and their weights are listed in the following table (programming assignments are due at noon on their deadline day – but you are welcome to submit them earlier):

	Assign. 1	Assign. 2	Assign. 3	Assign. 4	Assign. 5	Quiz	Midterm	Final Exam
Handed out	Jan. 18	Feb. 1	Feb. 15	Mar. 1	Mar. 15			
Due	Feb. 1	Feb. 15	Mar. 1	Mar. 15	Mar. 29	Feb. 5	Feb. 28	April
Weight	5%	5%	5%	5%	5%	5%	20%	50%

Please note that the quiz, the midterm, and final exams will be closed book.

Week-by-Week breakdown:

Week 1:	Introduction
Week 1–Week2:	Recursion
Week 3:	Data Abstraction
Week 4:	Example Abstract Data Type: Linked Lists
Week 5:	Problem Solving with Recursion
Week 6:	Stacks
Week 7:	Queues
Week 8:	Algorithm Efficiency/Complexity
Week 9:	Trees
Week 10:	Tables and Priority Queues
Week 11:	Advanced Tables: Hashing
Week 12:	Graphs

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General Regulations

Attendance: Students are expected to attend all lectures and lab periods. The University requires students to have a conflict-free timetable. For more information, see the current *Undergraduate Calendar, Academic Regulations of the University, Section 1.2, Course Selection and Registration and Section 1.5, Deregistration*.

Health and Safety: Every student should have a copy of our Health and Safety Manual. A PDF copy of this manual is available online: <http://sce.carleton.ca/courses/health-and-safety.pdf>

Deferred Term Work : Students who claim illness, injury or other extraordinary circumstances beyond their control as a reason for missed term work are held responsible for immediately informing the instructor concerned and for making alternate arrangements with the instructor and in all cases this must occur no later than three (3.0) working days after the term work was due. The alternate arrangement must be made before the last day of classes in the term as published in the academic schedule. For more information, see the current *Undergraduate Calendar, Academic Regulations of the University, Section 2.6, Deferred Term Work*.

Appeal of Grades : The processes for dealing with questions or concerns regarding grades assigned during the term and final grades is described in the *Undergraduate Calendar, Academic Regulations of the University, Section 2.7, Informal Appeal of Grade and Section 2.8, Formal Appeal of Grade*.

Academic Integrity: Students should be aware of their obligations with regards to academic integrity. Please review the information about academic integrity at: <https://carleton.ca/registrar/academic-integrity/>. This site also contains a link to the complete Academic Integrity Policy that was approved by the University's Senate.

Plagiarism: Plagiarism (copying and handing in for credit someone else's work, **as well as allowing someone else to copy your own work**) is a serious instructional offense that will not be tolerated. Please refer to the section on instructional offenses in the Undergraduate Calendar for additional information.

Academic Accommodation: You may need special arrangements to meet your academic obligations during the term. You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at <http://www.carleton.ca/equity/> For an accommodation request, the processes are as follows:

- **Pregnancy obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see <https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>
- **Religious obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see <https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>
- **Academic Accommodations for Students with Disabilities:** The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your

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PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult <https://carleton.ca/pmc/students/dates-and-deadlines/> for the deadline to request accommodations for the formally-scheduled exam (if applicable).

- **Survivors of Sexual Violence:** As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: <https://carleton.ca/sexual-violence-support/>.
- **Accommodation for Student Activities:** Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see <https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

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