

Introduction to the design and implementation of abstract data types and to complexity analysis of data structures. Topics include: stacks, queues, lists, trees, heaps, hash tables, and graphs. Special attention is given to abstraction, interface specification and hierarchical design using an object-oriented programming language (Java).

Precludes additional credit for SYSC 2100.

Prerequisite(s): (COMP 1006 or COMP 1406 or SYSC 2004) with a minimum grade of C-.

Course Information

Instructor	Alina Shaikhet (she/her)		
Contact	alinashaikhet@cunet.carleton.ca		
Office	HP 5137		
Lectures	Section A (in-person): Mon. & Wed. 16:05 – 17:25	Check on Carleton Central	
	Section C (in-person): Wed. & Fri. 13:05 – 14:25	for the room location.	
	Section B (online asynchronous): lecture recordings		
Course Website	https://brightspace.carleton.ca/		
Course Forum	Discord server (link is available on the course website)		
Teaching Assistants	A list of teaching assistants and their contact information and student hours will be		
	posted once the course starts.		

Course Delivery

- This course seamlessly integrates both in-person and online asynchronous sections. Students from either section are welcome to attend in-person classes and access recorded lectures at their own pace. In-person classes have proved to be the most efficient method of learning the material. Meanwhile, recorded lectures give you the flexibility to structure your academic commitments around other obligations, enabling a vital balance between family, work, and educational pursuits.
- **Important note**: While almost all of this course may be taken asynchronously, you must be available in person on campus for our midterm and final exams scheduled by the University.
- Students of the A, B, and C sections will share the same course website hosted on Brightspace. Students are required to be familiar with everything posted there. It is recommended that you check our course website at least three times a week.
- The instructors and TAs will be available during scheduled hours for in-person and online **student hours** to answer questions about course content and assignments.
- We will use Discord as our course forum. The forum is non-anonymous students will be required to use an alias that includes their first and last name, as listed on Brightspace.
- Attendance is optional, but class sessions offer valuable opportunities to ask questions and receive immediate feedback.

Necessary Equipment and Software

There will be a lot of Java programming throughout the course. You will need a Java compiler and your favorite editor. If you do not have Java installed on your computer, you can download it for free from <u>Oracle Java</u>.

You will also need an access to reliable internet and a laptop/desktop computer. Please review the requirements at https://carleton.ca/scs/scs-laptop-requirement/laptop-specs/.

Required Textbook

The textbook for the course is Pat Morin's "Open Data Structures". Free PDF and HTML versions of the book are available at <u>opendatastructures.org</u>. We will use the Java version.



Course Outline – last updated August 25th, 2024

Learning Outcomes

By the end of this course, successful students will have demonstrated their ability to:

- Discuss basic types of data structures, their implementation, application, strengths, and weaknesses.
- Analyze the pros and cons of various solutions to a given problem and make educated decisions which code is best for the given situation.
- Design better code (efficient, reliable, fast, and elegant), leading to software that runs faster and consumes less memory.

Topics Covered

Below is a summary of topics the course will cover:

- Interfaces and Implementation (The Java collections Framework)
- Sequences: lists, stacks, queues, deques
- Array-based and Linked-list based implementations of sequences
- Unordered sets hash tables
- Ordered sets balanced search trees, skiplists
- Priority queues heaps
- Sorting algorithms
- Graphs
- Applications of data structures
- Performance issues

A detailed breakdown of topics and a tentative calendar are available on the course website.

Assessment Scheme

Your performance in this course will be assessed using several components, such as assignments, quizzes, and exams. The grades you achieve on these components will be weighted using the following scheme:

5 Assignments (4 best are counted – 10% each assignment)	40%
11 Weekly Quizzes (untimed within range; 1 attempt; 9 best quizzes are counted)	15%
Midterm (in-person, on campus)	15%
Final Exam (in-person, on campus)	30%

There is an opportunity to receive up to **3%** of **Bonus Points** that will be added to your final grade. Details are on the course website. Bonus points are optional, - not doing bonus points will not negatively impact your final grade.

• There are **5** assignments (we program in Java). The best 4 are worth 40% of your final grade. The lowest assignment grade (out of 5) will be dropped. Please "save" your dropped assignment for unforeseen emergencies. You cannot drop more than one assignment.

The programming components of assignments are marked by an **automatic submission server** hosted on Gradescope (access your account through Brightspace). This means that you will get instant feedback, and you can submit as often as you want - your best grade is recorded.

For each programming assignment, you'll receive skeleton code and files with very specific names – if you change any of these names or a package your class is in, then the server will not be able to compile your submission. Any improperly packaged submissions or code that fails to compile for any reason will result in a mark of zero.

You are expected to demonstrate good programming practices at all times. Note that your code may be penalized if it is poorly written. Before you start coding, you are also expected to do the necessary preparatory work (i.e., devising an algorithm). You may be asked to present either pseudocode or a flowchart before you will receive any assistance from the instructor or a TA.

• Weekly quizzes give you high-level practice on the lecture-specific course material. The quizzes mainly consist of multiple-choice questions on Brightspace. They are untimed and will be accessible for several days. You will have one attempt for each quiz. There are 11 quizzes, but you can drop two quizzes with the lowest grade.



• The midterm and final exams will be held in-person on campus for sections A, B, and C of the course. The midterm will be scheduled by the University outside of regular class hours and could occur on a Friday evening, Saturday, or Sunday. The final exam will be scheduled during the exam period. The midterm and final are closed-book exams. The final exam is cumulative (covers all course material), mandatory, but there is no double-pass rule.

Important Dates and Deadlines in EST (Ottawa time)

ASSIGNMENT 1	Tuesday	September 24	by 23:59
ASSIGNMENT 2	Tuesday	October 8	by 23:59
MIDTERM	scheduled by the University		
ASSIGNMENT 3	Tuesday	November 5	by 23:59
ASSIGNMENT 4	Tuesday	November 19	by 23:59
ASSIGNMENT 5	Tuesday	December 3	by 23:59
FINAL EXAM	scheduled by the University during exam period		

Quizzes are due every Tuesday by 23:59, beginning with Quiz 1, due September 17. Please note that there will be no quiz deadline during the fall break.

Important dates and deadlines can be found here: <u>https://carleton.ca/registrar/registration/dates/academic-dates/</u>, including class suspension for fall, winter breaks, and statutory holidays.

Late Policy, Accommodations for Missed Work, and other Important Considerations

Assignments, quizzes, midterm, and final exams must be completed individually. Collaboration between students is strictly disallowed and will be reported to the Dean of Science as an academic integrity offence. Penalties for such offences can be found on the <u>ODS web page</u>. Students must complete all coursework by themselves.

Late quizzes and exams are never accepted for any reason.

Late assignments will be accepted for up to 12 hours after the deadline without penalty. No late assignments will be accepted after that. Do not email your assignments to instructor or TAs.

Assignment submissions are handled by an **automatic submission server**, and there is no "grace period" with respect to a deadline. Technical problems do not exempt you from this requirement, so if you wait until the last minute and then have issues with your connection, you will still receive a mark of zero. Consequently, when you work on your assignments you are advised to:

- start early,
- periodically submit your progress (assignments consist of several parts, and you can receive partial marks even if some of the parts are incomplete),
- attempt to submit your final submission at least one hour in advance of the due date and time.

A student may miss up to 1 assignment and 2 quizzes for medical, compassionate, or other reasons without penalty. No explanation is required. If you miss more than that, a mark of zero will be used for the missed items when the final grade is computed.

Students with an **illness during the span of time a midterm** is offered might be granted an exemption. You need to **contact your instructor right away** and provide a copy of the Carleton University Self Declaration Form (<u>https://carleton.ca/registrar/wp-content/uploads/self-declaration.pdf</u>). The weight of the midterm will then be applied to the final exam mark.

Assignments are posted well in advance of their due dates. **Illness does not excuse a student from completing an assignment**. No provision is made for missed assignments, and no extra credit assignments will be available.

If you wish to appeal a mark (assignment, quiz, or midterm) you must **make the appeal within 7 days** of the mark being posted on Brightspace. After that we will not be obliged to accept appeals or change marks.



Including the time spent attending lectures, completing practice problems, and working on other course material, students can expect to spend at least twelve (12) hours per week on this course.

Communication

Course announcements will be posted on Brightspace and forwarded to students' cmail accounts. It is your responsibility to stay informed about deadlines and due dates. I recommend checking your email daily and visiting the course website at least three times a week.

Students are asked to pose all questions related to course content using the official course Discord forum. **Do not send private direct messages** to the instructor and the TAs on Discord unless asked to do so.

You should **avoid emailing** the instructor directly unless the question contains confidential information or is of a personal nature. All emails regarding the course should be sent from **your Carleton email account** and should contain "COMP2402" in the subject, along with a few words describing the content of the email. Due to a high volume of emails, the instructor will respond to student emails within **2 business days**. This timeframe excludes weekends, statutory holidays, and periods of University closure.

Please remember to be kind and treat your peers and the teaching team with respect. Do not post anything on our Discord that could be construed as offensive. Violations will result in loss of access privileges to these course resources and a report to Student Affairs. If you are not sure what can be considered offensive, please read this: https://carleton.ca/studentaffairs/online-conduct/.

Course Copyright

All materials created for this course (i.e., video recordings, course notes, coding examples, PowerPoint slides, assignments, quizzes, assignment code bases, tests, and exams) remain the intellectual property of the instructor and are **protected by copyright**. They are intended for the personal and non-transferable use of students registered in the course. Reproducing, reposting, and/or redistributing any course materials, in part or in whole, without the written consent of the instructor, is a copyright violation and is strictly prohibited. Many students are eager to post their work on GitHub, but you must be careful **not** to include copyrighted material.

Collaboration & Academic Integrity

Everything you submit for evaluation (i.e., assignments, quizzes, examinations, etc.) must be the result of your own work and only your own work. If you copy more than five consecutive words or any non-trivial snippet of code from a single source without providing a valid reference, then that is considered plagiarism and an example of academic misconduct.

You are never permitted to copy (or copy and modify) solutions (even if incomplete) from anyone or from the Internet. It is also a serious offense to help someone else commit plagiarism. You are never permitted to provide another person access to the rough work, assignment/quiz specifications, or source code that you or anyone else has written. If you suspect that someone has been able to acquire a copy of your work, then you must inform the instructor of the course immediately. Please also note that **electronic tools may be used to analyze and compare submissions** to ensure that no instances of academic misconduct have been committed.

If you are unsure of the expectations regarding academic integrity (how to use and cite references, if unauthorized collaboration with lab- or classmates is permitted (and, if so, to what degree), then you must **ASK** your instructor. Sharing assignment or quiz specifications or posting them online (to sites like Chegg, CourseHero, OneClass, etc.) is **ALWAYS** considered academic misconduct. You are **NEVER** permitted to post, share, or upload course materials without explicit permission from your instructor. Academic integrity offences are reported to the office of the Dean of Science. Information, process and penalties for such offences can be found on the ODS webpage: https://science.carleton.ca/students/academic-integrity/.

Examples of academic integrity offences include giving/emailing your solutions (even if incomplete) to other students; posting course materials or solutions to a website (including GitHub) at any time (even after the conclusion of the course); copying solutions from any sources, even cited ones; working with other students; getting help from



anyone other than the course TAs or the instructor; submitting solutions (even if incomplete), written by anyone other than the student submitting the work.

Many of the assessed activities in this course were designed to be completed by an individual working alone. Unless it is explicitly stated otherwise, the **use of any AI system will be considered academic misconduct**. This includes, but is not limited to, chatbots or code generators (e.g., ChatGPT, Google Gemini, Microsoft Copilot), research assistants (e.g., Elicit), and image generators (e.g., Stable Diffusion, Dall-E), etc.

An exception to the above rule is made for automated grammar and punctuation checking tools (such as Grammarly).

SCS Computer Laboratory

Students taking a COMP course can access the SCS computer labs. The lab schedule and location can be found at: <u>https://carleton.ca/scs/tech-support/computer-laboratories/</u>. All SCS computer lab and technical support information can be found at: <u>https://carleton.ca/scs/tech-support/</u>. Technical support staff may be contacted in-person or virtually, see this page for details: <u>https://carleton.ca/scs/tech-support/contact-it-support/</u>.

Undergraduate Academic Advisors

The Undergraduate Advisors for the School of Computer Science are available in Room 5302HP; or by email at <u>scs.ug.advisor@cunet.carleton.ca</u>. The undergraduate advisors can assist with information about prerequisites and preclusions, course substitutions/equivalencies, understanding your academic audit and the remaining requirements for graduation. The undergraduate advisors will also refer students to appropriate resources such as the Science Student Success Centre, Learning Support Services and Writing Tutorial Services.

University Policies

Academic Calendar. For information about Carleton's academic year, including registration and withdrawal dates, see <u>Carleton's Academic Calendar</u>.

Academic Accommodations. Carleton is committed to providing academic accessibility for all individuals. Please review the academic accommodation available to students here: <u>https://students.carleton.ca/course-outline/</u>.

Student Academic Integrity Policy. Every student should be familiar with the Carleton University Student Academic Integrity policy. A student found in violation of academic integrity standards may be sanctioned with penalties which range from a reprimand to receiving a grade of F in the course, or even being suspended or expelled from the University. Examples of punishable offences include plagiarism and unauthorized collaboration. Any such reported offences will be reviewed by the office of the Dean of Science. More information on this policy may be found on the ODS Academic Integrity page: Academic Integrity | Faculty of Science (carleton.ca).

Plagiarism. As defined by Senate, "plagiarism is presenting, whether intentional or not, the ideas, expression of ideas or work of others as one's own". Such reported offences will be reviewed by the office of the Dean of Science. More information and standard sanction guidelines can be found here: <u>https://science.carleton.ca/students/academic-integrity/</u>. Please note that content generated by an unauthorized A.I.-based tool *is* considered plagiarized material.

Unauthorized Collaboration. Senate policy states that "to ensure fairness and equity in assessment of term work, students shall not co-operate or collaborate in the completion of an academic assignment, in whole or in part, when the instructor has indicated that the assignment is to be completed on an individual basis".

I will continually strive to create inclusive learning environments and would therefore appreciate your support and feedback. If you have any concerns, please contact me as soon as possible.