COMP 1805ABC Winter 2023 — Discrete Structures I

Course Outline – last updated January 3rd, 2022

Introduction to discrete mathematics and discrete structures. Topics include: propositional logic, predicate calculus, set theory, complexity of algorithms, mathematical reasoning and proof techniques, recurrences, induction, finite automata, and graph theory. Material is illustrated through examples from computing. Precludes additional credit for MATH 1800.

Prerequisite(s): one Grade 12 university preparation mathematics course. Minimum grade of C- in COMP 1805 is required in order to take COMP 2804, COMP 3005, COMP 3007, or COMP 4001.

Course Information

<table>
<thead>
<tr>
<th>Instructor</th>
<th>Alina Shaikhet (she/her)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact</td>
<td><a href="mailto:alina.shaikhet@carleton.ca">alina.shaikhet@carleton.ca</a></td>
</tr>
<tr>
<td>Office</td>
<td>HP 5137</td>
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<tr>
<td>Lectures</td>
<td>Section A (in-person): Tuesdays &amp; Thursdays 10:05 – 11:25</td>
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<td></td>
<td>Section C (in-person): Wednesdays &amp; Fridays 16:05 – 17:25</td>
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<tr>
<td>Tutorials</td>
<td>(in-person); Check your schedule on Carleton Central</td>
</tr>
<tr>
<td>Lab/TA Co-ordinator</td>
<td>Vojislav Radonjic <a href="mailto:vojislav.radonjic@carleton.ca">vojislav.radonjic@carleton.ca</a></td>
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<tr>
<td>Course Website</td>
<td><a href="https://brightspace.carleton.ca/">https://brightspace.carleton.ca/</a></td>
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<tr>
<td>Course Forum</td>
<td>Discord server (link is available on the course website)</td>
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Course Delivery

- This course will be delivered in-person. This means that lectures, tutorials, and office hours will be in-person on campus.
- Students of sections A, B, and C will share the same course website hosted on Brightspace. Students are required to be familiar with everything posted there. It is recommended to check our course website at least three times a week.
- The instructor and TAs will be available on campus (and/or online) during scheduled hours to answer questions about course content and assignments. A list of teaching assistants and their contact/office hours information together with room locations will be posted once the course starts.
- 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.

Required Textbook and Other Resources

Discrete Mathematics Study Center is a free resource, that was specifically designed for our course. It includes course notes, video lectures, numerous exercises with solutions, and a mock exam.

We do not have an assigned textbook for the course. I recommend you use an interactive textbook from zyBooks. Subscription details can be found on the course website.

Necessary Equipment and Software

Assignments for this course should be submitted as a PDF document that was typed or coded using software of your choice. The most popular choices, such as Microsoft Office, Google Docs, or LaTeX are all capable of typesetting mathematical symbols and producing a pdf document. Handwritten submissions (including those that have been scanned or photographed) are not acceptable and will receive a mark of zero.
SCS Laptop Requirement: Every student that has been enrolled in a 1000-level (i.e., first year) course offered by the School of Computer Science after the 2020/2021 school year is required to have a laptop. This includes COMP1001, COMP1005, and COMP1006. For more information, please visit https://carleton.ca/scs/scs-laptop-requirement/ and then review the requirements at https://carleton.ca/scs/scs-laptop-requirement/laptop-specs/.

Topics Covered
Below is a summary of topics the course will cover:
- Propositional & Predicate Logic
- Validity of Logical Arguments (including Quantifiers)
- Proof Techniques (including Induction)
- Set Theory
- Functions; Countability
- Sequences & Sums
- Intro to Algorithms (performance issues); Big O/Ω/Θ Notation
- Recursive definitions & Recursion
- Graphs
- Relations
A detailed breakdown of topics together with a tentative calendar is available on the course website.

Learning Outcomes
By the end of this course, successful students will have demonstrated their ability to:
- Use mathematically correct terminology and notation to define and reason about fundamental mathematical concepts such as sets, relations, functions, and integers.
- Evaluate mathematical arguments and identify fallacious reasoning.
- Construct mathematical proofs using different techniques.
- Use and analyze recursive definitions.
- Perform asymptotic analysis to describe the running time of different algorithms.
- Demonstrate various traversal methods for graphs.
- Apply critical thinking, logical and analytical reasoning to formulate and evaluate possible solutions to a variety of problems.

Assessment Scheme
Your performance in this course will be assessed using several components:
- There are 5 assignments. The best 4 are worth 32% of your final grade. The lowest assignment grade (out of 5) will be dropped. Late assignments will be accepted for up to 12 hours after the deadline with a penalty of 10 (out of 100) points of the mark. The solutions will be posted within 24 hours after the deadline. No late assignments will be accepted after that. For each assignment, you will be submitting exactly one PDF file typed/coded using Microsoft Office, Google Docs, or LaTeX. Handwritten submissions (including those that have been scanned or photographed) are not acceptable and will receive a mark of zero. Compressed files (e.g., “zip”, “rar”, “tar”, etc.) or documents in another format (e.g., “doc”, “docx”, “rtf”, “txt”, etc.) will be penalized and may receive a mark of zero. Assignments will be submitted on Brightspace. Do not email your assignments to instructor or TAs.
- Tutorials are short lessons where you can practice solving new problems under our guidance. Attending live tutorials is not mandatory but is highly encouraged. Tutorials give you practice solving questions similar to what you will have in your assignments, tests, and final exam. In addition, attending tutorials provides a way to connect with the TAs and classmates. Tutorials are followed by an online activity (aka Tutorial quizzes). There will be 7 tutorials each followed by a Tutorial quiz. Tutorial quizzes are mandatory and should be submitted by a specified deadline. Each tutorial quiz is worth 2% of your final mark (14% total). Tutorial quizzes are not timed and will be open for several days. No lowest grade will be dropped, but you will be given two attempts on each quiz (with your best score being recorded). Tutorials start Monday, January 16th.
There will be 4 tests worth 24% of your final mark. Tests will be delivered online via Brightspace. You will be given a range of time to start, and once started, a limited time to finish. Tests are mandatory and open-book. Open-book refers to class materials only (including slides, notes, textbooks, and approved websites). Any websites or material not approved are strictly forbidden. There will be no tutorials during the week a test is offered.

The final exam will be in-person and scheduled by the University during the exam period. The final exam is cumulative and closed-book. It is mandatory, but there is no double-pass rule.

The grades you achieve on these components will be weighted using the following scheme:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weightage</th>
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<tbody>
<tr>
<td>5 Assignments (4 best are counted – 8% each assignment)</td>
<td>32%</td>
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<tr>
<td>7 Tutorial Quizzes (2% each, 2 attempts with the best score recorded)</td>
<td>14%</td>
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<tr>
<td>4 Tests (6% each)</td>
<td>24%</td>
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<tr>
<td>Final Exam</td>
<td>30%</td>
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There is an opportunity to receive up to 5% 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.

Important Dates and Deadlines in EST (Ottawa time)

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<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Time</th>
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<tr>
<td>TUTORIAL QUIZ 1</td>
<td>Monday January 23</td>
<td>by 23:59</td>
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<tr>
<td>ASSIGNMENT 1, TUTORIAL QUIZ 2</td>
<td>Monday January 30</td>
<td>by 23:59</td>
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<tr>
<td>TEST 1</td>
<td>Friday February 3</td>
<td>1-hour test within range 9:00 – 18:00</td>
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<tr>
<td>ASSIGNMENT 2, TUTORIAL QUIZ 3</td>
<td>Monday February 13</td>
<td>by 23:59</td>
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<tr>
<td>TEST 2</td>
<td>Friday February 17</td>
<td>1-hour test within range 9:00 – 18:00</td>
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<tr>
<td>ASSIGNMENT 3, TUTORIAL QUIZ 4</td>
<td>Monday March 6</td>
<td>by 23:59</td>
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<tr>
<td>TEST 3</td>
<td>Friday March 10</td>
<td>1-hour test within range 9:00 – 18:00</td>
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<tr>
<td>ASSIGNMENT 4, TUTORIAL QUIZ 5</td>
<td>Monday March 20</td>
<td>by 23:59</td>
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<tr>
<td>TUTORIAL QUIZ 6</td>
<td>Monday March 27</td>
<td>by 23:59</td>
</tr>
<tr>
<td>TEST 4</td>
<td>Friday March 31</td>
<td>1-hour test within range 9:00 – 18:00</td>
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<tr>
<td>ASSIGNMENT 5, TUTORIAL QUIZ 7</td>
<td>Monday April 10</td>
<td>by 23:59</td>
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<tr>
<td>FINAL EXAM</td>
<td>scheduled by the University during exam period</td>
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Other important dates and deadlines can be found here, including class suspension for fall, winter breaks, and statutory holidays.

Lab/TA Co-ordinator

We have a lab/TA coordinator assigned to this course offering. The lab coordinator is responsible for organizing and overseeing the tutorial sections of the course and also imposing submission rules to help ensure that marking goes smoothly. If you notice any mistakes within a tutorial, have issues with a tutorial teaching assistant, or have other tutorial-related questions, the lab coordinator should be your first point of contact. The lab coordinator is also responsible for distributing assignments to teaching assistants for marking. If you are missing an assignment grade or are unsure about the status of your assignment, you can contact the lab coordinator.

Important Considerations

Assignments, tutorial quizzes, and tests must be completed individually. Collaboration between students is strictly disallowed.

Late tutorial quizzes, late tests, and late assignments (assignments that are more than 12-hours late) are never accepted for any reason. All the submissions are handled electronically 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:

- 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.

If any of the files you submit cannot be opened, you will receive a mark of zero. Consequently, after you upload your submission to Brightspace you must re-download it immediately and ensure that:

- your submission is the correct type of file and has the correct filename and extension,
- each of your .pdf files can be opened with Adobe Acrobat Reader (for marking purposes)

You are expected to show all your work (i.e., include every step) on everything you submit for marks in this course; a solution that is technically correct will still receive a mark of zero if it is not accompanied by the work required to reach it.

Students with an illness during the span of time a test or tutorial 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 (https://carleton.ca/registrar/wp-content/uploads/self-declaration.pdf). Please note that a student cannot, for any reason, be exempted from more than two (2) tutorials or more than one (1) of the tests.

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. However, a student may miss up to 1 assignment for medical, compassionate, or other reasons without penalty; you do not need to notify your instructor. If you miss more than that, a mark of zero will be used for the missed items when the final grade is computed.

If you wish to appeal a mark (assignment, quiz, or test) 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. All complaints regarding assignment marks should be brought to the attention of the TA who marked it. Only if the TA does not address the problem to your satisfaction should you bring the matter to the instructor. All appeals must be done no later than 7 days after the assignment has been graded. There will be no remarking after that.

Additional Notes

Including the time spent attending lectures, completing practice problems, and working on other course material, students can expect to spend at least nine (9) hours per week on this course.

Students are asked to pose all questions related to course content using the official course Discord server. Students 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.

Attendance

Attendance is optional for the lectures and tutorials. Note that class times will be opportunities to ask the instructor and the TAs questions and get real-time feedback.

Course Copyright

All materials created for this course (i.e., video recordings, course notes, coding examples, PowerPoint slides, assignments, tutorials, quizzes, 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.

Academic Integrity

Everything you submit for marks in this course (i.e., assignments, quizzes, examinations, etc.) must be the result of your own work and must be completed individually. Collaborating on any course work is strictly disallowed and will
be reported as an academic integrity offence. 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 collaboration with lab- or classmates is permitted (and, if so, to what degree), then you must ASK your instructor. Sharing assignment or quiz/test/exam specifications/solutions or posting them online (to sites like Chegg, CourseHero, OneClass, etc. or even GitHub) is ALWAYS considered academic misconduct. You are NEVER permitted to post, share, or upload course materials and your course work 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 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.

SCS Computer Laboratory

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

Undergraduate Academic Advisor

The Undergraduate Advisor for the School of Computer Science is available in Room 5302C HP; or by email at scs.ug.advisor@cunet.carleton.ca. 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.

COVID-19 policies

It is important to remember that COVID is still present in Ottawa. The situation can change at any time and the risks of new variants and outbreaks are very real. There are number of actions you can take to lower your risk and the risk you pose to those around you including being vaccinated, wearing a mask, staying home when you’re sick, washing your hands and maintaining proper respiratory and cough etiquette.

Feeling sick? Remaining vigilant and not attending work or school when sick or with symptoms is critically important. If you feel ill or exhibit COVID-19 symptoms do not come to class or campus. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In all situations, you must follow Carleton’s symptom reporting protocols.

Masks: Carleton has paused the COVID-19 Mask policy, but continues to strongly recommend masking when indoors, particularly if physical distancing cannot be maintained. It may become necessary to quickly reinstate the mask requirement if pandemic circumstances were to change.

Vaccines: While proof of vaccination is no longer required as of May 1 to attend campus or in-person activity, it may become necessary for the University to bring back proof of vaccination requirements on short notice if the situation and public health advice changes. Students are strongly encouraged to get a full course of vaccination, including booster doses as soon as they are eligible, and submit their booster dose information in cuScreen as soon as possible. Please note that Carleton cannot guarantee that it will be able to offer virtual or hybrid learning options for those who are unable to attend the campus.
All members of the Carleton community are required to follow requirements and guidelines regarding health and safety which may change from time to time. For the most recent information about Carleton’s COVID-19 website and review the Frequently Asked Questions (FAQs). Should you have additional questions after reviewing, please contact covidinfo@carleton.ca.

**Doctor’s note or medical certificate:** in effect for Winter 2023 term. In place of a doctor’s note or medical certificate, students are advised to complete the self-declaration form available on the Registrar’s Office website to request academic accommodation for missed course work including exams and assignments. Students should also discuss with the course instructor the required accommodations arising from the COVID-19 situation.

### University Policies

**Academic Calendar.** For information about Carleton’s academic year, including registration and withdrawal dates, see Carleton’s Academic Calendar.

**Pregnancy Obligation.** 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, visit Equity Services.

**Religious Obligation.** 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, visit https://carleton.ca/equity/focus/discrimination-harassment/religious-spiritual-observances/.

**Academic Accommodations for Students with Disabilities** If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC 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 your instructor as soon as possible to ensure accommodation arrangements are made. For more details, visit the Paul Menton Centre website.

**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 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: 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 the policy.

**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 awarded penalties which range from a reprimand to receiving a grade of F in the course or even being expelled from the program or University. Examples of punishable offences include: plagiarism and unauthorized co-operation or collaboration. Information on this policy may be found here.

**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. Standard penalty guidelines can be found here.

**Unauthorized Co-operation or Collaboration.** Senate policy states "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". Please refer to the course outline statement or the instructor concerning this issue.

Students are invited to discuss any concerns with the instructor at the earliest opportunity.