Discrete Structures I
COMP1805 (Fall 2025)

Course Calendar Description

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.

Instructor	Alexa Sharp (she/her) --- call her Prof Alexa			
Email	**alexasharp3@cunet.carleton.ca** – (but use class forums first!)			
Lectures	A	Thurs & Tues	14:35 - 15:55	in-person
	B	Thurs & Tues	10:05 - 11:25	in-person
	C	Wed & Fri	14:35 - 15:55	in-person
Tutorials	A1	Wed	11:35 - 12:25	in-person
	A2	Wed	18:05 - 18:55	in-person
	A3	Wed	9:35 - 10:25	in-person
	B1	Wed	8:35 - 9:25	in-person
	B2	Wed	19:05 - 19:55	in-person
	B3	Wed	16:35 - 17:25	in-person
	C1	Tue	11:35 - 12:25	in-person
	C2	Tue	13:35 - 14:25	in-person
	C3	Tue	16:35 - 17:25	in-person
Class Location	see Carleton's public class schedule for most up-to-date location			
Student Hours	schedule on brightspace held both in-person and on discord voice channel			
Course Website	https://brightspace.carleton.ca/d2l/home			
Course Resources	lecture zoom link	posted on brightspace		
	lecture recordings	posted on brightspace		
	topic schedule	posted on brightspace		
Q&A Forums	brightspace (primary, structured), discord (non-anonymous, informal)			
Textbook	David Liben-Nowell's *Connecting Discrete Mathematics and Computer Science*. A free PDF version is https://cs.carleton.edu/faculty/dln/book/.			

Students are not required to purchase textbooks or other learning materials for this course.

Inclusivity Statement. I am committed to fostering an environment for learning that is inclusive for everyone regardless of gender identity, gender expression, sex, sexual orientation, race, ethnicity, ability, age, class, etc. All students in the class, the instructor, the course staff, and any guests should be treated with respect during all interactions.

Land Acknowledgement. I would like to acknowledge that the land on which we gather is the traditional, unceded territory of the Anishinaabe Algonquin nation. In doing so, I acknowledge that I and Carleton University have a responsibility to the Algonquin people and a responsibility to adhere to Algonquin cultural protocols. More information on Prof Alexa's work to take some responsibility can be found on brightspace in module "Beyond the Land Acknowledgement."

Learning Outcomes and Topics Covered

By engaging with the course material through practice, a student should be able to:

1. comfortably read, write, and understand mathematical terminology (i.e. vocabulary):
    - sets, functions, logic, graphs, relations, asymptotic notation, recursion
2. comfortably read, write, and understand precise mathematical proofs (i.e. essays):
    - column format, direct proofs, proofs by cases, counterexample, construction, contradiction, contrapositive, induction, and by Pigeonhole Principle.
3. apply specific problem solving and critical thinking skills to solve new math problems:
    - use examples, definitions, and diagrams to first understand the problem,
    - find similar or related problems to compare to and mimic in our approach,
    - consider special cases if the general case is too unwieldy,
    - clearly lay out our assumptions and goals before attempting a proof,
    - recognize a broken proof and use it to find a new approach,
    - think critically about which proof paradigm is most appropriate.

A detailed list of topics to be covered, including dates, deadlines, and required reading for each week, are posted on our course schedule.

Flipped Class

This course uses a *flipped classroom* model, which means that the "lecturing" happens *before* class and the real action happens *during* class. Each week, you'll be expected to watch around 3 hours of video lectures and complete some at-home Wooclap questions (short interactive checkpoints). These prepare you for our two weekly in-person class meetings and one tutorial, where you'll work through a series of structured activities—some solo, some in groups—focused on understanding and constructing *proofs*.

Why flip the class? Because proof-writing is a skill best learned by doing, not just watching. Our in-person time is too precious to spend on me talking at you while you furiously scribble notes. Instead, you'll arrive already primed with the basics, and we'll use class time to grapple with deeper ideas, test your understanding, and practice problem-solving in real time.

It might feel a bit strange at first—especially if you're used to sitting quietly in lecture halls—but stick with it! This format gives you multiple chances to engage with the material, ask questions, make mistakes, and actually *get better* at the hard stuff.

If you're worried about time (and who isn't), there will be no at-home problem sets; your at-home work consists of ensuring you cover the lecture material and get help on any concepts you still struggle with. The formerly-known-as-problem-set exercises will now be completed during class time. It should all work out as far as time is concerned.

Because this course is activity-based and builds on your pre-class work, attendance is essential. The in-person sessions are where you'll practice the key skills—especially writing and understanding proofs—with feedback from me, your TAs, and your peers. These aren't lectures you can "catch up on later"; they're hands-on, collaborative sessions that are hard to replicate on your own. Missing class means missing core learning opportunities—so plan to be there, fully engaged. Lectures will be recorded, if technology permits, but for review purposes.

Community Guidelines

The following values are fundamental to academic integrity and are adapted from the International Center for Academic Integrity[1]. We will seek to behave with these values in mind:

	As students, we will…	**As a teaching team, we will…**
Honesty	• Honestly demonstrate our knowledge and abilities on assignments and exams • Communicate openly without using deception, including citing appropriate sources	• Give you honest feedback on your demonstration of knowledge and abilities on assignments and exams • Communicate openly and honestly about the expectations and standards of the course through the syllabus, and with respect to assignments and exams
Responsibility	• Complete assignments on time and in full preparation for class • Show up to class on time, and be mentally/physically present • Participate fully and contribute to team learning and activities	• Give you timely feedback on your assignments and exams • Show up to class on time, and be mentally & physically present • Create relevant assessments and class activities
Respect	• Speak openly with one another, while respecting diverse viewpoints and perspectives • Provide sufficient space for others to voice their ideas	• Respect your perspectives even while we challenge you to think more deeply and critically • Help facilitate respectful exchange of ideas
Fairness	• Contribute fully and equally to collaborative work, so that we are not freeloading off of others • Not seek unfair advantage over fellow students in the course	• Create fair assignments and exams, and grade them in a fair, and timely manner • Treat all students equitably

[1] This class statement of values is adapted from Tricia Bertram Gallant, Ph.D.

Trust	• Not engage in personal affairs while on class time • Be open and transparent about what we are doing in class • Not distribute course materials to others without authorization	• Be available to all students when we say we will be • Follow through on our promises • Not modify the expectations or standards without communicating with everyone in the course
Courage	• Say or do something when we see actions that undermine any of the above values • Accept a lower or failing grade or other consequences of upholding and protecting the above values	• Say or do something when we see actions that undermine any of the above values • Accept the consequences (e.g., lower teaching evaluations) of upholding and protecting the above values

Students are expected to act responsibly and engage respectfully with other students and members of the Carleton and the broader community. See the 7 Rights and Responsibilities Policy for details regarding the expectations of non-academic behaviour of students. Those who participate with another student in the commission of an infraction of this Policy will also be held liable for their actions.

Online Community Expectations

Please be considerate and respectful while engaging with peers and course staff, including on any course forums; remember that we are all humans, and that your words matter. It is not acceptable to use offensive language or to disparage a person or group, no matter the intent. Please read over our brightspace posting etiquette as well as our discord #rules-please-read channel. You are responsible for behaving within these parameters; violations will result in loss of access privileges to these course resources, and a report to Student Affairs.

If any student witnesses or experiences harassment, I encourage you to reach out to me. Alternatively, you can contact Ombuds Services or Carleton Equity and Inclusive Communities.

Course Work & Assessment Scheme

Schedule, Readings, Deadlines, Lecture Notes & Recordings

The course schedule is a week-by-week listing of topics, resources, and deadlines. For information about Carleton's academic year, including registration and withdrawal dates, see Carleton's Academic Calendar.

Important Dates & Deadlines

Weekly Wooclaps	11:59pm each **Thursday** before that Week's activities begin
Weekly Group Activities	due during the relevant class or tutorial time
Weekly Solo Activities	due during the relevant class or tutorial time
Midterm Test (in-person)	**During class time Nov 4-7, exact date TBD**
Final Test (in-person)	**TBD by Carleton (3h), during finals period**
(Optional) Drills Weeks 1-7	11:59pm on **Sunday Oct 26 (end of fall break)**
(Optional) Drills Weeks 8-12	11:59pm on **Friday Dec 5 (end of term)**

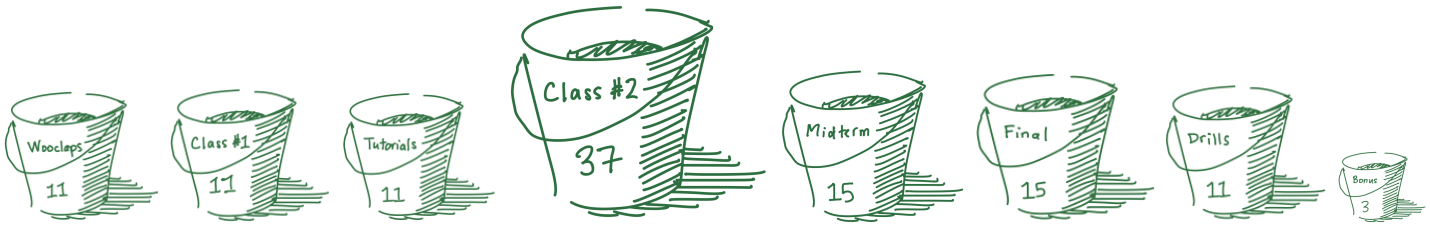
Grade Breakdown

Pre-class Wooclaps	11%	Midterm Test	15%	Bonus (optional)	[3%]
Tutorials	11%	Final Test	15%	Drills (optional)	[11%]
Class #1 Activities	11%	Class #2 Activities	37%		

Buckets

The wooclaps, tutorials, and class #1 activities are our "low stakes" activities: they are marked for completion (i.e. effort) rather than correctness. The tests and class #2 activities are our "higher stakes" activities: they are marked for correctness.

You can think of each assessment category as being a bucket with a given capacity. For example, the Wooclap bucket has capacity 11; the Bonus bucket has capacity 3. Your final mark will be the sum of what you put in all your buckets, except the Drills bucket, for a max of 103.



Each bucket can be filled by assessments of that type, and many buckets have **more opportunities to fill the bucket than that bucket's capacity** (so you don't have to complete each assessment perfectly to fill a bucket.) For example, there will be 44 available marks with which to fill your Class #2 Activities bucket, 13 available marks to fill your Wooclaps, Tutorials, and Class #1 Activities buckets, and >3 available marks to fill your Bonus bucket. This provides you with flexibility to skip an assessment (or more) and still fill your bucket, or only do part of an assessment and still have that work count. This is strictly better than a "drop some number of

lowest assessments" policy. If you overflow a bucket, that overflow contributes (in a complex way) to your Bonus bucket. The Drills bucket is special; you can use the drill bucket to fill up to 2 marks of each of the low-stakes buckets (Wooclaps, Class #1 Activities, Tutorials.)

Example:

- If you do all the Class #2 Activities at an 84% average, you will have accumulated (44)(84%) = 37 marks, which will fill your bucket. A "drop the lowest activity" policy would've gotten something like (37)(84%)=31 marks, significantly less.

Pre-Class Wooclaps (11%)

Each week, you'll watch a set of short lecture videos (about 10–17 in total, adding up to ~3 hours) and complete a series of Wooclap questions based on them. These will be multiple-choice or short-answer questions designed to help you process the content and spot any gaps in understanding *before class*. The Wooclaps are due **Thursdays at 11:59pm at the beginning of the relevant week**, *no exceptions*, since we'll build on that material in our in-person sessions. Think of them as your ticket to class: low-stakes, but essential for staying on track. These are marked for completion (i.e. effort).

There are a total of 12 weeks of wooclaps, but the first week is considered practice; 2 of the 11 marks can be filled using your (optional) Drills bucket.

Class #1 Activities (11%)

Our first class each "week" is all about **practice, not perfection**. You'll work through a mix of group and solo proof-based activities that build directly on the concepts from the video lectures. These aren't copy-paste problems—they're similar in spirit, but they'll stretch your understanding and help you get comfortable with the techniques. These activities are **completion-based**, so the focus is on honest effort, not getting everything right the first time. They're also great prep for the correctness-based solo activities of Class #2. Come ready to try things, talk things through, and make a few mistakes—that's where the learning happens.

There are a total of 12 weeks of classes, but the first week is considered practice; 2 of the 11 marks can be filled using your (optional) Drills bucket.

Tutorial Activities (11%)

Tutorials happen between Class #1 and Class #2 and are led by your TAs—but the vibe is similar to Class #1. You'll get more practice with proof-based activities, again working both in groups and on your own. These sessions give you a chance to solidify what you've learned, ask questions, and keep building the skills you'll need for the correctness-based solo work in Class #2. It's a great time to check your understanding before the stakes go up.

There are a total of 12 weeks of tutorials, but the first week is considered practice; 2 of the 11 marks can be filled using your (optional) Drills bucket.

Class #2 Activities (11%)

This is your weekly solo spotlight. In Class #2, you'll work on proof-based activities on your own —no group work, no internet, no notes. These activities are marked for correctness and are designed to assess your understanding of the material you've been practicing all week. A TA will be there to supervise (and offer encouragement), but this is your chance to show what you know, unaided. If you've attended Class #1 and Tutorial, these activities will be familiar to you.

There are a total of 44 marks allocated for these activities, not counting the first week which is considered practice. To account for emergencies and life conflicts, we will take your mark out of 37; the remaining 7 points (should you obtain any) will count towards bonus.

Midterm & Final (15%, 15%)

While tests aren't particularly representative of how you may use your computer science knowledge in practice, they provide some advantages:

- Studying for the tests hopefully improves your memory so that some of the more fundamental information can be recalled quickly.
- Tests encourage you to review all the course material, not just what is needed for the problem sets, tutorials, and drills.

The midterm and final are both worth 15%. Both are a mix of multiple-choice-style questions and proofs that must be answered in-person during a scheduled time. The final is cumulative. More information about the tests will follow at least a week before the test in question.

Parts of the midterm and final are drawn from the drills, wooclaps, and exercises related to the various activities, so you will know a bit what to expect. You do not need to pass the tests or final to pass the course, but if you don't take them they count as a 0. These tests are in-person.

Drills (Optional) (11 points)

While the end goal of this course is to get you comfortable writing your own full-blown proofs, there are a lot of necessary "building block" skills to pick up first. Just as a soccer player prepares for matches with passing and shooting drills, you can prepare for your proof-based activities with focused drills that target vocabulary, notation, and approaches you need to solve problems and communicate your solution. The drills make the "smaller stuff" second nature, so that you can more easily put it together into masterful, comprehensive proofs.

Each topic has associated drills available on brightspace. These are optional, and they are "due" at the midpoint and end of semester. Multiple attempts are allowed and encouraged with the highest score kept. Think of this as duo-lingo for discrete math.

Up to 2 marks of each of the low stakes buckets can be filled using Drills; any remaining points (should you obtain any of them) will count towards bonus.

Bonus (a.k.a. Extra Credit)

There are many opportunities for bonus points, if you have the time and inclination. Any activity marks or drills you achieve over the maximum (as described above) are available for bonus, as well as other opportunities throughout the semester. The bonus opportunities and the weights associated with them will be tracked on brightspace under the Bonus module. **They are not one-for-one transferable from other buckets.**

Bonus points are completely optional, so ignore them if they are not for you. Bonus points will add at most 3% to your final mark, and they cannot be applied to an F grade.

Late Policy, Emergencies, and Accommodation for Missed Work

All of the in-class activities must be done during class time, no exceptions. If you have to miss a class, remember that you can "fill" your various activity buckets in different ways, so you can make up (some) losses. This means you do not have to submit a self-declaration form in the case that you have to miss a class. But keep in mind that there are only so many points that can be made up with alternatives, so please, please save this for emergencies such as personal or family illnesses. Note that these accommodations are for short-term concerns related to missed work; if you are experiencing chronic, ongoing challenges which necessitate a broader solution, I recommend reaching out to the Paul Menton Centre and/or the Care Support team. You need to do a minimum amount of practice in this course in order to deeply engage with the material, as such, further accommodations will not be available.

Suggested Workflow

In a **perfect** world, your course workflow for the week (Thursday-Thursday) would be:

- By Thursday 11:59 pm: for each topic on brightspace under the relevant week's module
    - *skim* the reading for that topic in the textbook (10-20 mins/topic), look over the The More You Know document for some topics-specific math review, or skim the lecture notes to get an idea for the new terminology and results we'll be covering.
    - Watch the video lectures to be exposed to the new material (3h/week).
    - Complete the wooclaps for each video before Thursday 11:59 pm (2h/week).
- Attend class #1 (Friday for section C, Tuesday for sections A/B) where you complete group and solo activities related to the week's topics.
- Attend tutorial (Tuesday for section C, Wednesday for sections A/B) where you complete group and solo activities related to the week's topics.
- Attend class #2 (Wednesday for section C, Thursday for sections A/B) where you complete solo activities based on the activities in class #1 and tutorial.
- (Optional, anytime) do Drills to practice the vocabulary, notation, and high-level concepts (optional 1-2h/week).
- Reference the textbook and lecture notes as needed.

Of course, this workflow won't work for you all, but it is something to aspire to.

Late Registration

While the registrar will allow you to register for this course as late as Sept 16th, **we strongly discourage registration past Sept 9th**, as it is difficult to miss more than one week and still catch up. We do not wait until Sept 16th to start the material; we start on Sep 3rd! If you choose to join the course late, it is your responsibility to read the following document to get caught up. There are no special accommodations for late registrants.

Necessary Equipment, Accounts & Software

You will need:

- an internet-enabled device (laptop/desktop/tablet) and access to reliable internet. Please review the requirements at https://carleton.ca/scs/scs-laptop-requirement/laptop-specs/.
- (free) accounts on kahoot, wooclap, and discord; use a recognizable name on these platforms.

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/.

How to Get Help

There are many ways to get help on your work in this course that do not violate the course's academic integrity policy. Please use these resources; they are there for you!

- Peruse the Week 0 (Prerequisite) module on brightspace if you want a refresher of certain topics from primary and secondary school.
- Attend all classes and tutorials; it's where you get hands-on practice with proofs.
- Reference the problem solving tips sheet (on brightspace and the schedule)
- Check the Q&A Forum on brightspace or discord and ask questions there
    - please read the posting etiquette so that you get the fastest, most useful answer
- Go to Student Hours (schedule on brightspace and on this spreadsheet)
    - dedicated times through the week for the course staff to meet with YOU. Pop in to introduce yourself, ask questions about the course, or discuss course content.
    - good for questions not suited to forums (e.g. that require more back-and-forth),
    - some student hours are in-person, some on discord.
- Check the Q&A on discord (ideally after you've searched brightspace and discord to confirm it hasn't been answered there.)
- Refer to the The More You Know document before video lectures to give you a refresher on the specific definitions, notation, and concepts from previous lectures that will be cropping up during that topic.

Academic Integrity and Generative AI

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 collaboration. Any such reported offences will be reviewed by the office of the Dean of Science. Information on this policy may be found on the ODS Academic Integrity page here.

Plagiarism. As defined by the 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 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".

Proofs require a lot of creative thinking, which benefits from bouncing ideas off of other people.

You **may** talk with peers and TAs, and use generative AI for group activities. But **you must formulate and write up (i.e. problem solve) your solo activity solutions on your own, with no outside help (human or generative AI) except for paper (not electronic) resources.** That is, you may use notes and other paper resources for your solo work, but you may not use any electronic device as we cannot effectively proctor electronic devices.

You **must not** use the internet or generative AI (e.g. chatGPT) to search for or solicit approaches or ideas for solo activities. You may use these sources to help with low-level questions (e.g. definitions, examples) on group activities, or ask about general course concepts (e.g. proof techniques). Think of them as a tutor, not someone doing your work for you.

You **must not** post any of the assessments or their solutions online (to sites like Chegg, CourseHero, OneClass, etc.) at any point in time. You are never permitted to post, share, or upload our copyrighted course materials without explicit permission from your instructor.

Any violation of these rules is a very serious offence and will be treated as such; they are reported to the Dean of Academic Integrity, who launches an investigation. Academic integrity is upheld in this course to the best of Prof Alexa's abilities, as it protects the students that put in the effort to work on the course assessments within the allowable parameters.

Note that contract cheating sites are known, unauthorized, and regularly monitored. Some of these services employ misleading advertising practices and have a high risk of extortion.

Statement of Accommodation

The Carleton University Information on Academic Accommodation applies to this course. Here is information on how to apply for academic accommodation. If you are allowed extra time on tests, you will get an email at least a week before the test to coordinate. If there is anything Prof Alexa can do to help you succeed, please let her know as soon as possible so that she can accommodate accordingly.

Copyright

Prof Alexa is the exclusive owner of copyright and intellectual property of all course materials, including all notes, problem sets, tutorials, quizzes, handouts, videos, etc. **You may not reproduce or distribute lecture notes, activities, solutions, quizzes, or any other course materials publicly for any reason, or allow others to, without express written consent.**

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@carleton.ca**. The undergraduate advisor can assist with information about prerequisites and preclusions, course substitutions/equivalencies, understanding your academic audit and the remaining requirements for graduation. The undergraduate advisor will also refer students to appropriate resources such as the Science Student Success Centre, Learning Support Services and Writing Tutorial Services.

Mental Health

If you are struggling, please do not hesitate to reach out. I am happy to listen, and/or direct you to resources that might help. In terms of class, if you need extra help or missed a lesson, don't stress! There is a lot of flexibility built into the grading scheme. Remember that Carleton also offers an array of mental health and well-being resources, which can be found here.

University Policies

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

SCS Tech Support

Technical support information can be found at: https://carleton.ca/scs/tech-support/. Technical support is available in room HP5161 Monday to Friday from 9:00 until 17:00 or by emailing **SCS.Tech.Support@cunet.carleton.ca**.

Student Concerns

If you have any concerns regarding this course, your first point of contact is me. Please email me or visit during my student hours, and I will do my best to address your concerns. If I cannot resolve the issue, the next point of contact is the School of Computer Science at studentconcerns@scs.carleton.ca. If the concern remains unresolved, the final point of contact is the Office of the Dean of Science at ODScience@carleton.ca. Please follow this order of contact.

Note: You can also bring your concerns to Ombuds services.