

Instructors: Dr. C. DeGagné, Dr. P. Fu      [DeGagne@dal.ca](mailto:DeGagne@dal.ca)      [frank-fu@dal.ca](mailto:frank-fu@dal.ca)  
(Please put '2112' in the subject)

Lectures: MWF 9:35AM – 10:25AM      Teams

Office Hours TBA

---

### Course Description

This course, together with MATH/CSCI 2113.03, offers a survey of the following areas: set theory, mathematical induction, number theory, relations, functions, algebraic structures, and introductory graph theory. The topics to be discussed are fundamental to most areas of Mathematics and have wide applicability to Computer Science.

### Course Prerequisites

Nova Scotia Mathematics 441 or equivalent.

### Course Objectives/Learning Outcomes

This course presents the theory and applications of discrete mathematics. In this course, students will achieve the following outcomes. Student will be able to:

- 1) To understand the structure of logical arguments and mathematical proofs.
- 2) To become familiar with the basic concepts of logic, set theory, number theory, and combinatorics.
- 3) To perform computations in modular arithmetic and to understand the relevant number systems.
- 4) To calculate the number of possible outcomes for problems involving combinations and permutations.
- 5) To prove the correctness of simple recursive algorithms.

### Course Assessment Component

| Component     | Weight (% of final grade) | Date                   |
|---------------|---------------------------|------------------------|
| Participation | 5%                        | Ongoing                |
| Quizzes       | 5%                        | Ongoing                |
| Assignments   | 25%                       | Biweekly               |
| Midterm       | 25%                       | June 12 <sup>th</sup>  |
| Final         | 40%                       | Scheduled by Registrar |

### Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

|    |          |    |         |    |         |   |         |
|----|----------|----|---------|----|---------|---|---------|
| A+ | (90-100) | B+ | (77-79) | C+ | (65-69) | D | (50-54) |
| A  | (85-89)  | B  | (73-76) | C  | (60-64) | F | (<50)   |
| A- | (80-84)  | B- | (70-72) | C- | (55-59) |   |         |

## Course Participation and Quizzes

- 1) Participation will be measured sporadically throughout the course, and students may gain participation grades in the following way:
  - a. TopHat – TopHat is a learning tool that we will use during lecture days, and the main way students can gain participation grades. Starting at the scheduled class start-time, there will be attendance and questions on TopHat that students will be encouraged to participate on. All questions will be open for 24 hours to allow students in different time-zones to participate. We will also use TopHat for live questions and discussion, but these will **not** be used towards participation.
  - b. Personal goals – At the beginning of the term, students will have access to a “personal goals” excel spreadsheet where they can enter their goals for the term which includes all gradable items. Throughout the term, as these gradable items are handed back, students will be welcomed to reflect on whether they reached their goal or not, and if they did not, enter how they will meet the goal the next time.
  - c. Mind map/study document – As we progress throughout the term, students will be able to create a mind-map (see final page) or study notes of the material. Sporadically, I will require students to submit their study document online via BrightSpace. Note: these are **not** your full course notes, but just a summary of the material (which will then be used to study from for the midterm and the exam). Think of this as your “one-page cheat sheet”, though it will not be allowed during the midterm or test.
- 2) The participation grade will be measured 5 times sporadically throughout the term. Each time will be graded out of a maximum of five points, which will follow the rubric below. Students can determine how they want to achieve the five points in a way that works best for them.

|                 | 2                   | 1                      | 0                   |
|-----------------|---------------------|------------------------|---------------------|
| In-Class TopHat | Always participates | Sometimes participates | Doesn't participate |
| Personal Goals  | Always completes    | Sometimes completes    | Doesn't complete    |
| Study Document  | All information     | Some information       | Doesn't complete    |

- 3) Students are **required** to either participate in the live online lectures or watch the uploaded videos of the lectures on Brightspace. After each lecture, students must complete a quiz on webwork which will open at 10:30AM AST and will remain open for 24 hours. Only one attempt is allowed per quiz.

## Course Assignments

Assignments will be submitted online using Brightspace. Assignments will open each week on Friday at 12AM AST and will close on the second following Monday at 11:59PM. For example, the first assignment will open on Friday May 8<sup>th</sup> and will close on Monday May 18<sup>th</sup>. Assignments will then be graded and returned the following Monday (so, for example, the first assignment will be returned on Monday May 25<sup>th</sup>). Solutions to the assignments can be posted in Brightspace afterward they are graded.



Faculty of Computer Science

Students are encouraged to work collaborate with their peers for assignments, though each student will need to submit their own work. Students wanting to work with the same people can email either instructor to be put into a Group on Brightspace (groups have access to their own chat). Students will also have access to Student Cafés on Brightspace. These spaces will be held in Collaborate Ultra, and it will be a space where students can meet and talk about the course.

## Midterm and Final Exams

- 1) The midterm will be held on Webwork. Textbooks, course notes and calculators are not permitted during the midterm exam. The midterm will be split into two portions. The first portion will be an independent test worth 75% of the grade, and the second portion will be a collaborative test worth 25% of the grade. The first portion **must** be done independently. You must **not** work with your peers – anyone caught doing so will be taken to Academic Integrity. However, for the second portion, students may either work together or individually. The midterm will open at 9:30AM AST on June 12<sup>th</sup> and will remain open for 24 hours. However, once students access the midterm, they will have two hours to complete the first portion, and one hour to complete the second.
- 2) The final exam will also be on webwork. Textbooks, course notes and calculators are not permitted during the exam. The exam will be split into three parts instead of two. Parts one and two will be identical to the midterm (with the percentages set as 68% and 7%, respectively). Part three will be another individual portion worth the remaining 25%, but it will be completely optional (so if a student chooses to either not do this portion, or does it poorly, only parts one and two will be counted, and will be 90% and 10%, respectively). It will include difficult questions that will test how deeply students grasp the material. Students who wish to achieve an A+ in the course **must** complete this portion and do well – students not attempting this portion can only get **at most** a final grade of A. Again, this third portion is **individual**, and anyone caught working with someone will be taken to Academic Integrity. The exam will open at the scheduled time (which will be determined by the registrar at a later date) and will remain open for 24 hours. Parts one and three will be combined and will have a time limit of three hours (which can be done either entirely on part one, or between both part one and three). Part two will have a time limit of one hour.

For both the midterm and the final, students are encouraged to upload their work to the appropriate place on BrightSpace. This may help the graders give part marks if the answer in webwork is incorrect.

## Course Policies

- 1) Missed assignment will be counted as zero, unless a prior permission is made.
- 2) There will be no makeup midterm or test. If you miss the midterm without **prior** permission, then it will count as a zero. Exceptions are made in two cases: (1) if you obtain the instructor's permission **prior** to a midterm or test (at least 48 hours before), or (2) if you miss a midterm or test for a medical reason and have a doctor's note (you must notify the instructor **prior** to the midterm/test (minimum of one hour), and provide a medical note upon your return). In these



# DALHOUSIE UNIVERSITY

Faculty of Computer Science

cases, the weight of the missed midterm/test will be shifted to the final exam (so, for example, your final exam will be worth 65% of your final grade if you miss the midterm).

- 3) It will not be possible to write the final exam early and there will only be a make-up of the final exam in case of illness or family emergencies.
- 4) Office hours will be held on Collaborate Ultra found in BrightSpace.
- 5) All questions regarding this course must be asked on the BrightSpace discussions threads. Please read all previously asked questions before you post. No questions asked via email will be answered.

## Course Materials

The course has a major presence on Brightspace. For additional reading, students can use the following books.

- 1) "The Book of Proof", Richard Hammack, available at:  
<https://www.people.vcu.edu/~rhammack/BookOfProof/>
- 2) "Discrete Mathematics and Its Application", Kenneth H. Rosen.
- 3) "Lectures in Discrete Mathematics", Edward A. Bender and S. Gill Williamson, available at: <https://cseweb.ucsd.edu/~gill/BWLectSite/>

## Class Content Outline and Important Dates

| Dates  | Module                                      |
|--|---|
| May 6 <sup>th</sup> to May 15 <sup>th</sup>    | Set Theory and Relations                    |
| May 18 <sup>th</sup>                           | Assignment 1 Due                            |
| May 18 <sup>th</sup>                           | No Lecture – Victoria Day                   |
| May 18 <sup>th</sup>                           | Last Day to Change and Add Classes          |
| May 20 <sup>th</sup> to June 3 <sup>rd</sup>   | Logic and Proof                             |
| June 1 <sup>st</sup>                           | Assignment 2 Due                            |
| June 2 <sup>nd</sup>                           | Last Day to Drop without "W"                |
| June 12 <sup>th</sup>                          | Midterm – up to June 3 <sup>rd</sup> topics |
| June 5 <sup>th</sup> to June 22 <sup>nd</sup>  | Functions and Induction                     |
| June 22 <sup>nd</sup>                          | Assignment 3 Due                            |
| June 24 <sup>th</sup> to July 6 <sup>th</sup>  | Counting                                    |
| July 1 <sup>st</sup>                           | No Lecture – Canada Day                     |
| July 2 <sup>nd</sup>                           | Last Day to Drop with "W"                   |
| July 6 <sup>th</sup>                           | Assignment 4 Due                            |
| July 8 <sup>th</sup> to July 22 <sup>nd</sup>  | Number Theory                               |
| July 20 <sup>th</sup>                          | Assignment 5 Due                            |
| July 24 <sup>th</sup> to July 27 <sup>th</sup> | Last Two Classes - Exam Review              |
| To Be Determined                               | Exam  |

## Responsible Computing Policy

Usage of all computing resources in the Faculty of Computer Science must be within the Dalhousie Acceptable Use Policies (<http://its.dal.ca/policies/>) and the Faculty of Computer Science Responsible Computing Policy. For more information please see [https://www.cs.dal.ca/downloads/fcs\\_policy\\_local.pdf](https://www.cs.dal.ca/downloads/fcs_policy_local.pdf)

## Use of Plagiarism Detection Software

All submitted code may be passed through a plagiarism detection software, such as the plagiarism detector embedded in Codio, the Moss (<https://theory.stanford.edu/~aiken/moss/>) Software Similarity Detection System, or similar systems. If a student does not wish to have their assignments passed through plagiarism detection software, they should contact the instructor for an alternative. Please note, that code not passed through plagiarism detection software will necessarily receive closer scrutiny. [https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/university\\_secretariat/policy-repository/OriginalitySoftwarePolicy.pdf](https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/university_secretariat/policy-repository/OriginalitySoftwarePolicy.pdf)

## Copyright Notice

These course materials are designed for use as part of the CSCI courses at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading material to a commercial third party website) may lead to a violation of Copyright law.

## Culture of Respect<sup>1</sup>

Every person has a right to respect and safety. We believe inclusiveness is fundamental to education and learning. Misogyny and other disrespectful behaviour in our classrooms, on our campus, on social media, and in our community is unacceptable. As a community, we must stand for equality and hold ourselves to a higher standard.

### **What we all need to do:**

1. **Be Ready to Act:** This starts with promising yourself to speak up to help prevent it from happening again. Whatever it takes, summon your courage to address the issue. Try to approach the issue with open-ended questions like “Why did you say that?” or “How did you develop that belief?”
2. **Identify the Behaviour:** Use reflective listening and avoid labeling, name-calling, or assigning blame to the person. Focus the conversation on the behaviour, not on the person. For

---

<sup>1</sup> Source: Speak Up! © 2005 Southern Poverty Law Center. First Printing. This publication was produced by Teaching Tolerance, a project of the Southern Poverty Law Center. Full “Speak Up” document found at: <http://www.dal.ca/dept/dalrespect.html>. Revised by Susan Holmes from a document provided April 2015 by Lyndsay Anderson, Manager, Student Dispute Resolution, Dalhousie University, 902.494.4140, [lyndsay.anderson@dal.ca](mailto:lyndsay.anderson@dal.ca) [www.dal.ca/think](http://www.dal.ca/think).

example, “The comment you just made sounded racist, is that what you intended?” is a better approach than “You’re a racist if you make comments like that.”

3. **Appeal to Principles:** This can work well if the person is known to you, like a friend, sibling, or co-worker. For example, “I have always thought of you as a fair-minded person, so it shocks me when I hear you say something like that.”
4. **Set Limits:** You cannot control another person’s actions, but you can control what happens in your space. Do not be afraid to ask someone “Please do not tell racist jokes in my presence anymore” or state “This classroom is not a place where I allow homophobia to occur.” After you have set that expectation, make sure you consistently maintain it.
5. **Find or be an Ally:** Seek out like-minded people that support your views, and help support others in their challenges. Leading by example can be a powerful way to inspire others to do the same.
6. **Be Vigilant:** Change can happen slowly, but do not let this deter you. Stay prepared, keep speaking up, and do not let yourself be silenced.

## University Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and the Senate.

<https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=69&chapterid=3457&loaduseredits=False>

## Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

[http://www.dal.ca/dept/university\\_secretariat/academic-integrity.html](http://www.dal.ca/dept/university_secretariat/academic-integrity.html)

## Accessibility

The Advising and Access Services Centre is Dalhousie’s centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of: a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (NS, NB, PEI, NFLD).

[http://www.dal.ca/campus\\_life/student\\_services/academic-support/accessibility.html](http://www.dal.ca/campus_life/student_services/academic-support/accessibility.html)

## Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don’t follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and



Faculty of Computer Science

informal manner perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

[https://www.dal.ca/campus\\_life/safety-respect/student-rights-and-responsibilities/student-life-policies/code-of-student-conduct.html](https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/student-life-policies/code-of-student-conduct.html)

### Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2).

<http://www.dal.ca/cultureofrespect.html>

### Recognition of Mikmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mikmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit the office in the McCain Building (room 3037) or contact the programs at [elders@dal.ca](mailto:elders@dal.ca) or 902-494-6803 (leave a message).

## Student Resources and Support

### Advising

**General Advising** [https://www.dal.ca/campus\\_life/academic-support/advising.html](https://www.dal.ca/campus_life/academic-support/advising.html)

**Science Program Advisors:** <https://www.dal.ca/faculty/science/current-students/academic-advising.html>

**Aboriginal Student Centre:** [https://www.dal.ca/campus\\_life/communities/native.html](https://www.dal.ca/campus_life/communities/native.html)

**Black Advising Centre:** [https://www.dal.ca/campus\\_life/communities/black-student-advising.html](https://www.dal.ca/campus_life/communities/black-student-advising.html)

**International Centre:** [https://www.dal.ca/campus\\_life/international-centre/current-students.html](https://www.dal.ca/campus_life/international-centre/current-students.html)

### Academic supports

**Library:** <https://libraries.dal.ca/>

**Writing Centre:** [https://www.dal.ca/campus\\_life/academic-support/writing-and-study-skills.html](https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html)

**Studying for Success:** [https://www.dal.ca/campus\\_life/academic-support/study-skills-and-tutoring.html](https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html)

**Copyright Office:** <https://libraries.dal.ca/services/copyright-office.html>

**Fair Dealing Guidelines** <https://libraries.dal.ca/services/copyright-office/fair-dealing.html>

### Other supports and services

**Student Health Services:** [https://www.dal.ca/campus\\_life/health-and-wellness/health-services/services.html](https://www.dal.ca/campus_life/health-and-wellness/health-services/services.html)

**Counselling:** [https://www.dal.ca/campus\\_life/health-and-wellness/counselling.html](https://www.dal.ca/campus_life/health-and-wellness/counselling.html)

**Student Advocacy:** <https://www.dsu.ca/services/community-student-services/student-advocacy-service>

**Ombudsperson:** [https://www.dal.ca/campus\\_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html](https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html)

### Safety

#### Research Lab Safety

[https://www.dal.ca/content/dam/dalhousie/pdf/dept/safety/lab\\_policy\\_manual\\_2007.pdf](https://www.dal.ca/content/dam/dalhousie/pdf/dept/safety/lab_policy_manual_2007.pdf)

**Biosafety:** <https://www.dal.ca/dept/safety/programs-services/biosafety.html>

**Chemical Safety:** <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

**Radiation Safety:** <https://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

**Scent-Free Program:** <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>