

**MATH 5035/4035: Topics in Commutative Algebra**  
Winter 2024

**Instructor:** Professor Sara Faridi ([faridi@dal.ca](mailto:faridi@dal.ca))  
**Office:** Chase 314  
**Lectures:** Mondays & Wednesdays & Fridays 1:35 -- 2:25 pm, Chase 227  
**Office Hours:** By appointment  
**Website:** Brightspace

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**Course Description:** *The course will be built around developing the language to understand and tools to potentially solve a problem a combinatorial commutative algebra.*

*Topics will include (and will be adjusted throughout the semester as needed): Basics of commutative algebra; monomial ideals in polynomial rings; free resolutions; resolutions of monomial ideals using combinatorial topology; simplicial complexes, cell complexes, polyhedral complexes; discrete Morse theory, and more as needed.*

**Course Prerequisites:** *Dalhousie MATH 4045 (Module Theory)*

**Required Course Material:** *I will be using different sources, no textbook required.*

**Course Assessment:** *The structure of the course is so that we all write a paper, jointly, about the main problem in the course. Students will be expected to contribute sections to this manuscript, carry out computations, and give presentations on specific topics or research papers. We will aim to write a concise, coherent and beautiful manuscript that can be potentially submitted for publication.*

*Students are expected to be in class in order to pass this course. If you will be absent, please discuss with me in advance.*

*Graduate Students: there is no homework or exam.*

*Undergraduate students: will receive homework (worth 25% of the final grade) and a midterm (worth 25% of the final grade). The last 50% will be a written project.*

**Course Policies:** *Homework will be assigned at the end of each topic. All or some problems on each assignment will be graded. Homework is to be handed in at the beginning of class, and is expected to be original work from the student. All sources used for solving homework problems must be properly cited. Copying (complete or outlines of) solutions from any source is not acceptable. Late homework counts as zero, but at the end of the term the two lowest homework grades for each student will be dropped. A missed exam counts as zero unless a doctor's note is presented or prior arrangements have been made with me. Calculators, textbooks, online searches and notes are not allowed in exams.*

**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)		

## Student Resources and Support

### University Policies and Programs

Important Dates in the Academic Year (including add/drop dates): [http://www.dal.ca/academics/important\\_dates.html](http://www.dal.ca/academics/important_dates.html)  
Classroom Recording Protocol: [https://www.dal.ca/dept/university\\_secretariat/policies/academic/classroom-recording-protocol.html](https://www.dal.ca/dept/university_secretariat/policies/academic/classroom-recording-protocol.html)  
Dalhousie Grading Practices Policies: [https://www.dal.ca/dept/university\\_secretariat/policies/academic/grading-practices-policy.html](https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html)  
Grade Appeal Process: [https://www.dal.ca/campus\\_life/academic-support/grades-and-student-records/appealing-a-grade.html](https://www.dal.ca/campus_life/academic-support/grades-and-student-records/appealing-a-grade.html)  
Sexualized Violence Policy: [https://www.dal.ca/dept/university\\_secretariat/policies/health-and-safety/sexualized-violence-policy.html](https://www.dal.ca/dept/university_secretariat/policies/health-and-safety/sexualized-violence-policy.html)  
Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>

### Learning and Support Resources

General Academic Support – Advising (Halifax): [https://www.dal.ca/campus\\_life/academic-support/advising.html](https://www.dal.ca/campus_life/academic-support/advising.html)  
General Academic Support – Advising (Truro): <https://www.dal.ca/about-dal/agricultural-campus/ssc/academic-support/advising.html>  
Student Health & Wellness Centre: [https://www.dal.ca/campus\\_life/health-and-wellness.html](https://www.dal.ca/campus_life/health-and-wellness.html)  
On Track (helps you transition into university, and supports you through your first year at Dalhousie and beyond): [https://www.dal.ca/campus\\_life/academic-support/On-track.html](https://www.dal.ca/campus_life/academic-support/On-track.html)  
Indigenous Student Centre: [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.html)  
Indigenous Connection: <https://www.dal.ca/about-dal/indigenous-connection.html>  
Elders-in-Residence (The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit the office in the Indigenous Student Centre or contact the program at [elders@dal.ca](mailto:elders@dal.ca) or 902-494-6803: <https://cdn.dal.ca/content/dam/dalhousie/pdf/academics/UG/indigenous-studies/Elder-Protocol-July2018.pdf>  
Black Student 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.html](https://www.dal.ca/campus_life/international-centre.html)  
South House Sexual and Gender Resource Centre: <https://southhousehalifax.ca/about/>  
LGBTQ2SIA+ Collaborative: <https://www.dal.ca/dept/vpei/edia/education/community-specific-spaces/LGBTQ2SIA-collaborative.html>  
Dalhousie Libraries: <http://libraries.dal.ca/>  
Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>  
Dalhousie Student Advocacy Services: <https://www.dsu.ca/dsas?rq=student%20advocacy>  
Dalhousie 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)  
Human Rights and Equity Services: <https://www.dal.ca/dept/hres.html>  
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)  
Study Skills/Tutoring: [http://www.dal.ca/campus\\_life/academic-support/study-skills-and-tutoring.html](http://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html)  
Faculty of Science Advising Support: <https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html>

### Safety

Biosafety: <http://www.dal.ca/dept/safety/programs-services/biosafety.html>  
Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>  
Radiation Safety: <http://www.dal.ca/dept/safety/programs-services/radiation-safety.html>  
Laser Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety/laser-safety.html>

### University Policies and Statements

### Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit or e-mail the Indigenous Student Centre at 1321 Edward St or [elders@dal.ca](mailto:elders@dal.ca). Additional information regarding the Indigenous Student Centre can be found at: [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.html)

### Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: <https://www.dal.ca/about-dal/internationalization.html>

### Academic Integrity

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all 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. Additional academic integrity information can be found at: [https://www.dal.ca/dept/university\\_secretariat/academic-integrity.html](https://www.dal.ca/dept/university_secretariat/academic-integrity.html)

### Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre ([https://www.dal.ca/campus\\_life/academic-support/accessibility.html](https://www.dal.ca/campus_life/academic-support/accessibility.html)) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (<https://www.dal.ca/about-dal/agricultural-campus/student-success-centre.html>)

### Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

### 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). Additional diversity and inclusion information can be found at: <http://www.dal.ca/cultureofrespect.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 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. The full Code of Student Conduct can be found at: [https://www.dal.ca/dept/university\\_secretariat/policies/student-life/code-of-student-conduct.html](https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html)

### Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at: [https://www.dal.ca/dept/university\\_secretariat/policies/academic/fair-dealing-policy-.html](https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html)

### Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at: [https://www.dal.ca/dept/university\\_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html](https://www.dal.ca/dept/university_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html)

### Student Use of Course Materials

Course materials are designed for use as part of this course 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 to a commercial third-party website) may lead to a violation of Copyright law.