

MATH 9144B Course Outline

1. Course Information

Course Information

Course Name: Homological Algebra

Course Number: MATH 9144B

Academic Term: Winter 2025-2026

Lecture Time and Location: TBD

List of Prerequisites

MATH 9021A/4121A – Topology (or equivalent)

MATH 9023A/4123A – Rings and Modules (or equivalent)

Unless you have either the prerequisites for this course or written special permission from the Department of Mathematics to enroll in it, you may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on your academic record. This decision may not be appealed.

2. Instructor Information

Instructors	Email	Office	Office Hours
Dr. Hyun Jong Kim	hkim2293@uwo.ca		TBD

Students must use their Western (@uwo.ca) email addresses when contacting their instructors for course related purposes.

3. Course Syllabus, Schedule, Delivery Mode

Basic category theory, Rings and modules, Additive and abelian categories, Sheaves on topological spaces, Chain complexes, Double complexes, Derived functors, Tor and Ext, Spectral Sequences, Group homology and cohomology, Derived categories

Depending on available time, some homological topics that appear in algebraic and arithmetic geometry may be presented to a minor extent; such topics would not be assessed in an exam environment.

Course-level learning outcomes:

- Demonstrate knowledge of the language of category theory and the ability to frame algebraic phenomena in terms of categorical language.
- Demonstrate the capacity to perform basic computations involving algebraic functors, chain complexes, homology/cohomology, and spectral sequences.
- Be able to prove general facts concerning the main topics of the course.

4. Course Materials

Recommended:

Weibel's "An Introduction to Homological Algebra",

Vakil's "The Rising Sea: foundations of Algebraic Geometry"

All course material will be posted to OWL: <https://westernu.brightspace.com/>

Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the [OWL Brightspace Help](#) page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Technical Requirements

LaTeX; all assignment submissions must be a .pdf file rendering of a LaTeX compilation.

5. Methods of Evaluation

Grading Scheme and Assessment Dates

The overall course grade will be calculated as listed below:

Assignments (6; lowest one dropped)	75%
Final Exam	25%

Requirements on Assessment Submissions

Writings on assignment, and exam submissions must be clear and legible to receive full credit. All assignment submissions must be a .pdf file rendering of a LaTeX compilation submitted to Gradescope. Unless otherwise specified, solutions to assignments, midterms, and the final exam must be justified and/or calculations must be shown as appropriate to receive full credit.

On the beginning of all assignment submissions, students must compile any sources other than the lecture contents and lecture notes that they may have consulted in formulating their solutions. Such sources may include, but are not limited to: collaborations/discussions with other people (including, but not limited to, the instructor and other students), Internet resources, articles or textbooks, AI or ML models or interfaces thereof (students are advised, however, that AI or ML models often generate inaccurate and even incoherent statements and that students are responsible for all statements that they include in their assignment submissions), and computer software (such as SageMath). The compilation of these sources should include a brief description of how to identify these sources. Note that no sources may be used in a way that trivializes a problem.

The following is a list recommending students on how to identify the aforementioned potential sources:

- For collaborations/discussions with other people: describe who these people are, say by listing their names (Unless an individual wishes to remain anonymous) and relationship to the submitter of the assignment (e.g. friend, classmate, instructor).
- For Internet resources: write out/copy and paste the URL of the web page consulted.
- For articles or textbooks other than those listed in Section 4: indicate the title, author, and journal/publisher as available, along with identifying information on which parts were specifically consulted (e.g. page number, theorem number, section number).
- For AI or ML models or interfaces thereof: indicate which AI or ML models (e.g. GPT3.5, GPT4, Llama3.1) or interfaces (ChatGPT, perplexity.ai) were used, and summarize what prompts were inputted into said models or interfaces and what responses were outputted.
- For computer software (such as SageMath): summarize what kinds of computations were performed or include a screenshot of relevant code.

Here is a sample statement that compiles sources:

Sources consulted: I collaborated with classmates A, B, along with a friend who wishes to remain anonymous. I also consulted the following webpages: <https://www.blahblahblah.com/weeemathisfun>, <https://www.numbertheoryismindnumbing.com/lalalala> .

I also consulted Section 1.1.1 of the January 23, 2017 version of William Stein's Elementary Number Theory: Primes, Congruences, and Secrets. I also consulted perplexity.ai with the following prompt "Can negative numbers be prime numbers?" to which it responded that "...negative numbers cannot be prime numbers..." and listed reasons why, and yet suggested that "researchers might explore concepts like 'negative primes' with modified definitions". Lastly, I used the following code via SageMath: ``Integer(1001).next_prime()`` to find the next prime number after 1001.

If no sources were consulted in formulating the solutions to the assignment submission, then the compilation must indicate as such, for example by stating “Sources consulted: None”. Each Gradescope assignment will have a place where these compilations are to be submitted. All solutions in assignment submissions must be formulated in the submitter’s “own words”, no matter what sources may have been consulted. Failure to submit a compilation of sources and/or plagiarism on any given assignment may result in a grade of zero on that assignment and/or treated as “Scholastic Offence” (see Section 6).

Use of Generative AI Tools

As described in the “Requirements on Assessment Submissions” section above, students may use AI tools, e.g. to brainstorm ideas, for assignments, but solutions must be formulated in the student’s “own words” and students are responsible for all statements that they make in their solutions.

General information about missed coursework

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs*, posted on the Academic Calendar:

https://uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf,

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult [Accessible Education](#).

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar’s webpage:

https://registrar.uwo.ca/academics/academic_considerations/

All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request **without supporting documentation** in this course. However, the following assessments are excluded from this and, therefore, always require formal supporting documentation:

- The final exam

When a student *mistakenly* submits their one allowed Academic Consideration request **without supporting documentation** for the assessments listed above or those in the **Coursework with Assessment Flexibility** section below, the request cannot be recalled and reapplied. This privilege is forfeited.

Evaluation Scheme for Missed Assessments

When a student misses the Final Exam and their Academic Consideration has been granted, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under [Special Examinations](#)), especially for those who miss multiple final exams within one examination period.

Coursework with Assessment Flexibility

By policy, instructors may deny Academic Consideration requests for the following assessments with built-in flexibility:

Flexible Completion

Quizzes. This course has 6 assignments, and the 5 assignments with the highest marks are counted towards your final grade. Should extenuating circumstances arise, students do not need to request Academic Consideration for the first missed assignment. Academic consideration requests will be denied for the first missed assignment. Academic Consideration requests may be granted when students miss more than 1 assignment, and these additional (2nd, 3rd ...) missed assignments will be reweighted to the final exam.

Deadline with a No-Late-Penalty Period

Assignments. Students are expected to submit each of the assignments by the deadline listed. Should extenuating circumstances arise, students do not need to request Academic Consideration and they are permitted to submit their assignment up to 48 hours past the deadline without a late penalty. Should students submit their assessment beyond 48 hours past the deadline, a late penalty of 50% per day will be applied. Academic Consideration requests may be granted only for extenuating circumstances that started before the deadline and lasted longer than the No-Late-Penalty Period (48 or 72 hours).

6. Additional Statements

6.1 Religious Accommodation

When a recognized religious holiday or observance conflicts with an examination, test, or other scheduled academic obligation, students must request accommodation via the University's Student Absence Portal (SAP). This request should identify the conflict and specify which course component(s) (e.g. test, midterm, exam) are affected.

Students are encouraged to submit the SAP request as early as possible, but no later than two weeks before any examination, or one week before any mid-term test or quiz, to allow sufficient time for adjustment.

The SAP request serves as official notification to both the course instructor and the Academic Advising Office, in accordance with University policy:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

The Faculty of Science considers religious accommodations as scheduling conflicts. Instructors should provide either a make-up exam or an earlier sitting of the same exam to accommodate the student.

For more information on recognized religious holidays, please visit the Diversity Calendar posted on the Equity, Diversity & Inclusion website - <https://www.edi.uwo.ca>

6.2 Academic Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf.

6.3 General Academic Policies

The website for Registrar Services is <https://www.registrar.uwo.ca/>.

Use of @uwo.ca email: In accordance with policy, https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf, the centrally administered e-mail account provided to students will be considered the individual's official university email address. It is the responsibility of the account holder to ensure that emails received from the University at their official university address are attended to in a timely manner.

Requests for Relief (formally known as “appeals”)

Policy on Request for Relief from Academic Decision:

https://uwo.ca/univsec/pdf/academic_policies/appeals/requests_for_relief_from_academic_decisions.pdf

Procedures on Request for Relief from Academic Decision (Undergraduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/undergrad_requests_for_relief_procedure.pdf

Procedures on Request for Relief from Academic Decision (Graduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/graduate_requests_for_relief_procedure.pdf

6.4 Scholastic Offences

Policy on Scholastic Offences:

https://uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_offences.pdf

Procedures on Scholastic Offences (Undergraduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/undergrad_scholastic_offence_procedure.pdf

Procedures on Scholastic Offences (Graduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/graduate_scholastic_offence_procedure.pdf

Use of Electronic Devices During Assessments

In courses offered by the Faculty of Science, the possession of unauthorized electronic devices during any in-person assessment (such as tests, midterms, and final examinations) is strictly prohibited. This includes, but is not limited to: mobile phones, smart watches, smart glasses, and wireless earbuds or headphones.

Unless explicitly stated otherwise in advance by the instructor, the presence of any such device at your desk, on your person, or within reach during an assessment will be treated as a *scholastic offence*, even if the device is not in use.

Only devices expressly permitted by the instructor (e.g., non-programmable calculators) may be brought into the assessment room. It is your responsibility to review and comply with these expectations.

Use of Generative AI Tools

Unless otherwise stated, the use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is **not permitted** in the completion of any course assessments, including but not limited to: assignments, lab reports, presentations, tests, and final examinations.

Using such tools for content generation, code writing, problem solving, translation, or summarization—when not explicitly allowed—will be treated as a **scholastic offence**.

If the use of generative AI is permitted for a particular assessment, the conditions of use will be specified by the instructor in advance. If no such permission is granted, students must assume that use is prohibited. It is your responsibility to seek clarification before using any AI tools in academic work.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Computer-marked multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

6.5 Support Services

Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, requests for relief, exam conflicts, and many other academic-related matters: <https://www.uwo.ca/sci/counselling/>.

Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health/>) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence (GBSV) and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced GBSV (either recently or in the past), you will find information about support services for survivors, including emergency contacts, at:

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. If you have any questions regarding accommodations, you may also wish to contact Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

Learning-skills counsellors at Learning Development and Success (<https://learning.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Additional student-run support services are offered by the USC, <https://westernusc.ca/services/>.

This course is supported by the Science Student Donation Fund. If you are a student registered in the Faculty of Science or the Schulich School of Medicine and Dentistry, you pay the Science Student Donation Fee. This fee contributes to the Science Student Donation Fund, which is administered by the Science Students' Council (SSC). One or more grants from the Fund have allowed for the purchase of

equipment integral to teaching this course. You may opt out of the Fee by the end of September of each academic year by completing the online form linked from the Faculty of Science's Academic Advising site. For further information on the process of awarding grants from the Fund or how these grants have benefitted undergraduate education in this course, consult the Chair of the Department or email the Science Students' Council at ssc@uwo.ca.