

## Math 4120B/9020B Winter 2025 Course Outline

(Redacted Version without dates/times/locations)

### 1. Course Information

#### Course Information

- *Course Name:* Mathematics 4120B/9020B (FIELD THEORY)
- *Academic Term:* Winter 2025 (FW24)

#### List of Prerequisites

Math 3020A/B and Math 3120A/B.

#### Course Learning Outcomes:

Students will be able to identify, formulate and solve problems in intermediate linear algebra, including proof writing.

Students will be able to present mathematical information, including proofs, in correct mathematical English.

In particular, students will demonstrate these competences in the following topics:

- Finitely generated field extensions and their properties.
- Algebraic, separable and inseparable extensions.
- Splitting fields and algebraic closures.
- Finite fields and cyclotomic extensions and their Galois theory.
- Automorphism groups of field extensions
- Fundamental theorem of Galois theory
- Galois groups of polynomials
- Solvable and Radical Extensions.

Unless you have either the requisites for this course or written special permission from your Dean's Designate (Department/Program Counsellors and Science Academic Advisors) to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

## 2. Instructor Information

Section	Instructor	Email	Office
001	Nicole Lemire	<a href="mailto:nlemire@uwo.ca">nlemire@uwo.ca</a>	

### Course Contact Policies

- Students must use their Western (@uwo.ca) email address when contacting their professor.

## 3. Course Syllabus, Schedule, Delivery Mode

### Course Syllabus

Automorphisms of fields, separable and normal extensions, splitting fields, fundamental theorem of Galois theory, primitive elements, Lagrange's theorem. Finite fields and their Galois groups, cyclotomic extensions and polynomials, applications of Galois theory to geometric constructions and solution of algebraic equations.

### Course Delivery:

This is an in-person course, with 3 in-person lecture hours per week.

### Course Schedule

Section	Instructor	Lecture Room	Lecture Time
001	Nicole Lemire		

### Contingency Plan

Although the intent is for this course to be delivered in person, should any university-declared emergency require some or all of the course to be delivered online, either synchronously or asynchronously, the course will adapt accordingly. The grading scheme will **not** change. Any assessments affected will be conducted online as determined by the course instructor.

### Key Sessional Dates:

<i>Classes begin:</i>	January 6, 2025
<i>Last day to drop a course without showing WDN:</i>	January 14, 2025
<i>Spring Reading Week:</i>	February 15-23, 2025
<i>Last day to drop a course without academic penalty:</i>	December 2, 2024

*Classes end:*  
*Study Days:*  
*Exam period:*

April 4, 2025  
April 5-6, 2025.  
April 7-30, 2025

## 4. Course Materials

### Textbook:

No textbook is required. Course notes will be provided.

It is advisable to consult textbooks for reference. Note that there are many good references for Galois theory.

The closest reference is Abstract Algebra, Third Edition, by David S. Dummit, and Richard M. Foote, published by John Wiley and Sons, Inc. The course material corresponds to material in Chapters 13 and 14 of the text, plus some possible additional topics.

We will not follow the primary reference strictly. There are many other possible good references, including:

- J. Rotman, Galois theory, 2nd ed., Springer 1998
- J.-P. Escofier, Galois theory, Springer 2001
- S. H. Weintraub, Galois theory, 2nd ed., Springer 2009
- I. Stewart, Galois theory, 3rd ed., Chapman & Hall 2004
- J. Brzezinski, Galois theory through Exercises, Springer 2018.
- or any good algebra book, e.g.:
- S. Lang, Algebra, 3rd ed., Addison-Wesley 1993

## Learning Management System (OWL)

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.

All students are expected to be aware of information, and make use of materials, posted on the course website. Important information will be posted on the Announcement tab of the website.

*Note:* We will use the announcements tool of OWL Brightspace to send out course announcements. Students are responsible to keep the announcement notification on in their account to make sure to receive all course announcements.

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.

### Other online platforms/apps used in the course:

Other than the OWL Brightspace website, discussed above, we will use the following website:

*Gradescope:* To upload written assignments and to access the graded midterm

### Technical Requirements

In addition to pencil, paper and eraser, you need to have access to:

- Computer or laptop able to run a recent version of web browser such as Chrome, Safari or Firefox.
- Stable high-speed internet connection.
- Document scanner device or app.

### Further Course Policies

- All in-person or online interactions with peers, as well as communication with TAs or Professors for this course should be conducted in a professional and respectful manner. Failure to do so will result in academic discipline.
- Recording lectures without the explicit consent of the Professor or TA is grounds for academic discipline.
- Course content created by a faculty member is considered the faculty member's intellectual property; it should not be distributed, shared in any public domain, or sold by a student or other third party without prior written consent of the faculty member.

## 5. Methods of Evaluation

### Grading Scheme and Assessment Dates

The overall course grade will be calculated as listed below:

Assignments:	25%
Midterm Test:	35%
Final Exam:	40%

#### Assignments:

There will be 5 assignments with tentative due dates:

Each assignment will be due at. These are tentative due dates. Any changes to these due dates will be announced on OWL.

#### Midterm Test

The midterm test will contain problems from the course content covered in the first six weeks of the term. The tentative date for the midterm will be:

There will be a makeup midterm exam for those who have been granted Academic Considerations for the midterm exam. The tentative date for the makeup midterm will be:

Note that the date and time of the midterm and the makeup midterm will be finalized after they are reviewed by Exam Central. Both the midterm and the makeup midterm will be in-person exams which will take place on campus. The locations of the exams will be posted closer to the dates of these exams.

#### Final Exam

The final exam will cover all the course material with more focus on the last part of the course. It will be a three-hour long exam and will take place in-person during the final exam period: April 7-30, 2025. It will be scheduled by the Registrar's office.

#### 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://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/academic\\_consideration\\_Sep24.pdf](https://www.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/](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:

- **Final Exam** (Defined by policy)
- **Midterm** (Designated by the instructor as the one assessment that always requires documentation when requesting Academic Consideration)

If 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

### Assignments:

**It will not be necessary to request Academic Consideration for assignments.** The lowest assignment grade will be dropped. For the remaining assignments, any grade that is less than the student's final exam grade will be replaced by the final exam grade. This includes any number of missed assignments. In other words, missed assignments and assignments with grades lower than the final exam will be reweighted to the final exam. Do not request Academic Consideration for missed assignments and do not inform your professor about missed assignments, as these adjustments will be done automatically.

**Note: This means that there will be no reason to request an Academic Consideration without supporting documentation in this course.** The midterm and final exam are ineligible and no Academic Considerations are required for assignments.

See also the **Coursework with Assessment Flexibility section** below for the 48 hour No-Late-Penalty Period for assignments, which allows you to hand in any assignment up to 48 hours late.

### Midterm:

If you miss the midterm due to any circumstance, you must provide an academic consideration covering the date of the test. A makeup midterm will be available to those who are granted an academic consideration in the week following the midterm exam.

In cases where a student misses the midterm exam and the makeup midterm exam and can provide an academic consideration for both absences, the weight of the midterm will be transferred to the final exam.

### **Final Exam:**

When a student misses the Final Exam, they are expected to contact the Academic Counselling office of their Faculty of Registration as soon as they can do so. The Academic Counselling office will assess the eligibility of the student to be granted an Academic Consideration. If an Academic Consideration has been granted, the student will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam).

If a student misses the Final Exam and the Special Examination and has been granted Academic Consideration for both exams, the date of the next Special Examination (if another Academic Consideration is granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred.

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:**

**Assignments:** This course has 5 Assignments, and the 4 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. It will not be necessary to request Academic Considerations for any additional missed assignments. These additional missed assignments will be automatically transferred to the final exam.

#### **Deadline with a No-Late-Penalty Period**

**Assignments.** Students are expected to submit each of the 5 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. After the No-Late-Penalty period, assignments will not be accepted and will be considered to be

missed. As already stated, there is no reason to request Academic Considerations. If a student has missed more than 1 assignment, and has failed to submit any subsequent assignment by the end of the No-Late-Penalty Period, the weight of that missed assignment will be automatically transferred to the final exam.

## 6. Additional Statements

### Religious Accommodation

When conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible but not later than two weeks prior to the writing of the examination (or one week prior to the writing of the test).

Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays:

<https://www.edi.uwo.ca>.

### 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](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf).

### Academic Policies

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

In accordance with policy,

[https://www.uwo.ca/univsec/pdf/policies\\_procedures/section1/mapp113.pdf](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 e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

NO calculators or other electronic devices or any other aids are allowed on tests and exams.

**Scholastic offences** are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).



**Scholastic offences** include: Copying solutions from other students, online sources, textbooks, etc.; showing your work to other students; uploading questions or solutions to a web site; and accessing a web site used for providing solutions (even if you do not use any solutions on the site).

The **penalty** for an academic offence involving a midterm or final will be a **failing grade in the course**. The **penalty** for each academic offence involving homework will be a grade of 0 on the homework set as well as a penalty of **negative 5% on the overall course grade**.

In some cases, the penalty can include expulsion from the program. All academic offences are added to your student record.

**Only in the event of a university-declared emergency requiring some or all of the course to be delivered online:** the tests and examinations in that period will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at:

<https://remoteproctoring.uwo.ca>.

### **Support Services**

Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, appeals, 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 and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (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](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](mailto: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. You may also wish to contact Accessible Education at

[https://academicsupport.uwo.ca/accessible\\_education/index.html](https://academicsupport.uwo.ca/accessible_education/index.html)

if you have any questions regarding accommodations.

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.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital/>.

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