

## **Math 9140A Course Outline**

### **1. Course Information**

#### **Course Information**

Math 9140A, Representation Theory, Fall 2026.

The **time and location** are available from the OWL site linked below.

#### **List of Prerequisites**

This course is aimed at MSc and PhD students in Mathematics. The prerequisites are undergraduate group theory and linear algebra.

#### **Enrollment Restrictions**

Enrollment in this course is restricted to graduate students in Mathematics or Applied Mathematics, as well as any student that has obtained special permission to enroll in this course from the course instructor as well as the Graduate Chair (or equivalent) from the student's home program.

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this course or written special permission from the Department of Mathematics to enroll in it, you may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on your academic record.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.

Students are responsible for checking the course OWL site

<https://westernu.brightspace.com/d2l/home/208694>

regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class. Students should also consult the course web page

<https://jdc.math.uwo.ca/M9140a-2026/index.html>

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.

## 2. Instructor Information

| Instructors                | Email      | Office | Phone  | Office Hours |
|----------------------------|------------|--------|--------|--------------|
| Dan Christensen, Professor | jdc@uwo.ca | MC130  | x86530 | After class  |

## 3. Course Syllabus, Schedule, Delivery Mode

This course will study the representation theory of finite groups, as well as some applications. Basic background in group theory and linear algebra will be assumed.

Here are the topics that may be covered. Additional topics will be covered in presentations. We will spend roughly two weeks on each topic.

- Representations of finite groups: irreducibility and complete reducibility.
- Schur's lemma.
- Character theory and the orthogonality relations.
- Induced representations and Frobenius reciprocity.
- Fourier analysis on finite groups.
- Applications to group theory, including Burnside's theorem.
- Probability and random walks on graphs (if time permits).

### Course Learning Outcomes

Upon successful completion of this course, students will be able to:

- Decompose a representation of a finite group into its irreducible constituents, and apply Schur's lemma.
- Compute the character table of a finite group and use it to answer questions about the structure of the group.
- Construct induced representations and apply Frobenius reciprocity.
- Use representation-theoretic methods to prove results in group theory, such as Burnside's theorem.
- Read expository and research-level material in representation theory and communicate it to their peers in a lecture.

### Delivery Mode

This course will be delivered in person.

Class begins: September 10, 2026

Fall Reading Week: October 10 – 18, 2026

Class ends: December 8, 2026

Final examination period: December 11 – 22, 2026

## 4. Course Materials

The text for the course is *Representation Theory of Finite Groups: An Introductory Approach*, by Benjamin Steinberg, Springer, 2012 (Universitext).

Western's library subscription provides free access to the electronic version of this book, so there is no required cost for the textbook. From on campus you can download it from the publisher at <https://link.springer.com/book/10.1007/978-1-4614-0776-8>, which also lists the current price of a printed copy should you prefer one. There are no restrictions on the use of second-hand or earlier printings of this book.

No other learning materials need to be purchased for this course. The following are useful but are not required:

- J.P. Serre, *Linear Representations of Finite Groups*, GTM 42, Springer, 1977.
- A. Baker, *Representations of Finite Groups* ([free course notes](#)).
- S. Sternberg, *Group Theory in Physics*.
- W. Fulton and J. Harris, *Representation Theory*, GTM 129, Springer, 1991.

## 5. Methods of Evaluation

### Grading Scheme and Assessment Dates

The overall course grade will be calculated as listed below:

|                         |     |
|-------------------------|-----|
| Assignments (roughly 6) | 30% |
| Presentation            | 35% |
| Final examination       | 35% |

Assignments will be due roughly every 2 weeks and each assignment will be posted at least one week before it is due. Doing problems and talking about the material are both essential for learning the material in this course, so you are encouraged to discuss the problems with classmates and with me. But you must write up the solutions on your own and must not look at other students' written solutions, nor should you attempt to find solutions to problems online or in textbooks. You should not use an AI assistant to help with the completion of any course assessments. Your solutions should be clear and carefully written, and you should give credit to those who helped you and to any references you used. Assignments will be graded based on both correctness and clarity. Late assignments will not be accepted unless arranged in advance for a good reason.

In the second half of the semester, each student will give a 50 minute presentation on a topic related to the course. A list of potential topics is provided on the course web page.

The final examination will be a three hour examination, held during the December examination period, and covering the whole course. No books, notes, calculators or other electronic devices will be permitted.

### Use of Generative AI Tools

Not permitted. See below for more details.

### **General information about missed coursework**

Graduate students who are unable to complete an assessment because of illness or other extenuating circumstances should contact the course instructor as soon as possible.

Students experiencing longer-term impacts on their academic responsibilities should consult Accessible Education and their Graduate Chair.

All requests for academic consideration must be made within 48 hours after the assessment date or submission deadline, and must be accompanied by supporting documentation.

### **Evaluation Scheme for Missed Assessments**

If an assignment is missed and sufficient documentation is provided, the assignment may be handed in up to one week late, or its weight may be redistributed to the other assignments, depending on the period covered by the documentation. If the presentation is missed, it will be rescheduled; if that is not possible, its weight will be added to the final examination. If the final examination is missed and sufficient documentation is provided, a make-up examination will be arranged.

## **6. Additional Statements**

### **6.1 Accessible Education**

Western is committed to achieving barrier-free accessibility for all its members, including graduate students. As part of this commitment, Western provides a variety of services devoted to promoting, advocating, and accommodating persons with disabilities in their respective graduate program.

Graduate students with disabilities (for example, chronic illnesses, mental health conditions, mobility impairments) are strongly encouraged to register with Accessible Education (AE), a confidential service designed to support graduate and undergraduate students through their academic program. With the appropriate documentation, the student will work with both AE and their graduate programs (normally their Graduate Chair and/or Course instructor) to ensure that appropriate academic accommodations to program requirements are arranged. These accommodations may include individual counselling, alternative formatted literature, accessible campus transportation, learning strategy instruction, writing exams and assistive technology instruction.

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](http://academicsupport.uwo.ca/accessible_education/index.html)

### **6.2 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](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”)

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

[https://uwo.ca/univsec/pdf/academic\\_policies/appeals/graduate\\_requests\\_for\\_relief\\_procedure.pdf](https://uwo.ca/univsec/pdf/academic_policies/appeals/graduate_requests_for_relief_procedure.pdf)

### **6.3 Scholastic Offences**

Scholastic offences are taken seriously and students are directed to read the Scholastic Offences policy, specifically, the definition of what constitutes a Scholastic Offence:

[https://uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_offences.pdf](https://uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_offences.pdf)

Procedures on Scholastic Offences:

[https://uwo.ca/univsec/pdf/academic\\_policies/appeals/graduate\\_scholastic\\_offence\\_procedure.pdf](https://uwo.ca/univsec/pdf/academic_policies/appeals/graduate_scholastic_offence_procedure.pdf)

In this course, scholastic offences include: copying solutions from other students, online sources, textbooks, etc.; showing your work to other students; using a large language model or any other source to help with solutions; 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 the final examination will be a failing grade in the course. The penalty for each academic offence involving an assignment will be a grade of 0 on that assignment as well as a penalty of negative 5% on the overall course grade. The penalty for an academic offence involving the presentation will be a grade of 0 on the presentation. In some cases, the penalty can include expulsion from the program. All academic offences are added to your student record.

### **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.

### **6.4 Support Services**

Students who are in emotional/mental distress should refer to [Mental Health Support at Western](#) 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 is going through or has gone through these traumatic events. If you are experiencing or have experienced GBSV (either recently or in the past), you will find information about support services for survivors, including emergency contacts on the [Wellness and Wellbeing website](#). To connect with a case manager or set up an appointment, please contact [support@uwo.ca](mailto:support@uwo.ca).