MATHEMATICS 4331

Galois Theory

Semester: Winter 2023
CRN: 98478
Time: Tu and Th 9:00–10:15 a.m.
Classroom: HH-3013

Professor: Dr. Mikhail V. Kotchetov
Office: HH-2002
Phone: 864-7947
Email: `mikhail@mun.ca`

Recommended Text: Joseph Rotman. *Galois theory.* Second ed. Universitext. Springer–Verlag, New York, 1998. In addition, you may find the following references useful:

- Serge Lang. *Algebra.* Revised third ed. Graduate Texts in Mathematics, 211. Springer-Verlag, New York, 2002.
- W. Keith Nicholson. *Introduction to abstract algebra.* Fourth ed. John Wiley & Sons, Hoboken, 2012.

Prerequisites: MATH 2051 and MATH 3320.

Attendance: You are expected to attend and participate in class. If you miss a class, you will be responsible for finding out what material was covered and studying it on your own.

Announcements, homework, solutions, and marks will be posted on Brightspace (formerly known as D2L) at `https://online.mun.ca`. In case of any changes in the delivery and evaluation method for this course, you will be informed via Brightspace.

Office Hours: Tuesdays and Thursdays 10:30–11:30 a.m.

Evaluation:

Homework	20%	about 8 assignments
Midterm exam	30%	written in class on **February 14**
Final exam	50%	

Homework: Assignments will include problems of computational nature as well as theoretical problems that require writing proofs. Both types of problems will also appear on the exams.

Exam delivery: The midterm and final exams are expected to take place on campus. If it becomes necessary to conduct any of them online, you will be informed in advance via Brightspace.

Missing homework or midterm exam: *There is no possibility of deferring the midterm exam or receiving credit for a late or missing homework assignment.*

If you have to miss the midterm exam for an acceptable reason (including illness), you must notify me as soon as possible, and in any case no later than 48 hours after the

scheduled exam time. You will also be responsible for providing me with appropriate documentation within seven calendar days. In the event of an excused absence, the percentage allotted to the midterm exam will be assigned to the final exam.

If you do not turn in a homework assignment and provide an acceptable reason and appropriate documentation within seven calendar days, your total mark will be based on the remaining assignments. At most two assignments may be forgiven in this manner.

If you miss an assignment/midterm and do not provide an acceptable reason, you will receive a zero score for that assignment/midterm.

Missing the final exam: Deferred final examinations are administered by the Department of Mathematics & Statistics. It is a part of the responsibility of students to discover the correct time and date of the final examination in each course for which they are registered, so deferred exams will *not* be granted to students who claim to have misread or been confused in any way by the examination timetable. If you miss the final examination for unacceptable reasons, you will receive a final exam mark of zero. Acceptable reasons are outlined in Section 6.8 of the University Regulations. Students must use the department's online form to apply for a deferral.

Accommodation of students with disabilities: Memorial University of Newfoundland is committed to supporting inclusive education based on the principles of equity, accessibility and collaboration. Accommodations are provided within the scope of the University Policies for the Accommodations for Students with Disabilities. Students who may need an academic accommodation are asked to initiate the request with the Glenn Roy Blundon Centre at the earliest opportunity.

Academic integrity: Students are expected to adhere to those principles which constitute proper academic conduct. A student has the responsibility to know which actions, as described under Academic Offences in the University Regulations, could be construed as dishonest or improper. Students found guilty of an academic offence may be subject to a number of penalties commensurate with the offence including reprimand, reduction of grade, probation, suspension or expulsion from the University. For more information regarding this policy, students should refer to the University Regulations for Academic Misconduct (Section 6.12 of the University Regulations in the University Calendar).

Important Dates: Please refer to the University Diary for a complete list.

January 5, Thursday	Lectures begin
January 19, Thursday	Last day to add courses or drop with 100% fee refund
February 14, Tuesday	**Midterm exam**
February 20–24	Winter semester break
March 2, Thursday	Last day to drop courses without academic prejudice
April 6, Thursday	Lectures end
April 12–21	**Examination period**

Syllabus (subject to change; topics marked with * will be covered if time permits)

1. Review of groups and rings

   - Groups, rings, homomorphisms.
   - Domains and fields.
   - Polynomial rings.
   - Symmetric polynomials.
   - Irreducible polynomials, Gauss' Lemma and its applications.

2. Field extensions

   - A splitting field of a polynomial.
   - Finite and algebraic field extensions.
   - Separability and extension of isomorphisms.

3. Galois theory

   - Galois group of a field extension.
   - Roots of unity.
   - Galois extensions.
   - Fundamental Theorem of Galois Theory and its applications.

4. Solvability of polynomial equations by radicals

   - Classical formulas.
   - Criterion of solvability by radicals.
   - Galois groups of quadratics, cubics and quartics.*
   - Constructibility by ruler and compass.*