Rings and Fields

Winter 2021, MATH 3158
[School of Mathematics and Statistics](), [Carleton University]()

Instructor: [Daniel Panario]()
Email: [daniel@math.carleton.ca]()
Lectures: Tuesdays and Thursdays 10:05-11:25. **Hybrid, on Zoom:** on Tuesdays online, synchronous; on Thursday asynchronous.
Office hours: Thursdays 9:05-9:55, or by appointment (send me mail or talk with me).
Tutorials: Tuesdays 13:35-14:25. **Tutor:** Mackenzie Powers.

General Information

- **Calendar description:** Rings, integral domains, Euclidean and principal ideal domains, fields, polynomial rings over a field, algebraic extensions of fields, the fundamental theorem of Galois theory, finite fields, applications.

- **Course objectives:** The purpose of this course is to introduce students to rings, field extensions and Galois theory. The list of topics we plan to cover include: rings and polynomial rings, homomorphisms and ideals, quotient rings, maximal ideals, unique factorization domains, factoring integer polynomials, fields, extension fields, algebraic and transcendental elements, minimal polynomials, symbolic root adjunction, degree of a field extension, multiplicativity of degree, algebraically closed fields, splitting fields, constructions with a compass and straightedge, finite fields, Frobenius map, counting irreducible polynomials over finite fields, primitive elements, field automorphisms, Galois groups, normal and separable extensions, action of Galois group on roots, fundamental theorem of Galois theory, cyclotomic fields, Kummer extensions, solvability by radicals, Galois groups of a finite field.
  The exact topics may be revised as the term progresses.

- **Textbooks:** we intensively use
  - Algebra by Michael Artin, and
  - Abstract Algebra: Theory and Applications, by Tom Judson.
  Other textbooks of interest include:
  - Algebra with Galois Theory by Emil Artin,
  - Galois Theory by David Cox,
  - Fields and Rings by Irving Kaplansky,
  - Introduction to Abstract Algebra by Keith Nicholson,
  - Galois Theory by Ian Stewart.
  The above books are available at Carleton's library.

- **Prerequisites:** MATH 2100 or permission of the School.

- **Classes begin:** Tuesday January 12, 2021.
  Classes end: Tuesday April 13, 2021.

- **Evaluation:** we plan to use e-proctoring for the midterm and final exam; webcam and microphone are required for e-proctoring.
  - Quizzes in tutorials of Tuesday January 26, February 9, February 23, March 9 and March 30: **20%** (total).
  - Midterm test on Thursday March 18: **20%**.
  - Assignment handed-out on Thursday March 4, due date Thursday March 25: **20%**.
  - Final exam: **40%**.

- **Withdrawal:** The last day for withdrawal from the course without academic penalties is the last day of classes.

- **Academic Integrity:**
The University states unequivocally that it demands academic integrity from all its members. Academic dishonesty, in whatever form is ultimately destructive to the values of the University. Students who violate the principles of academic integrity through dishonest practices undermine the value of the Carleton degree. Dishonesty in scholarly activity cannot be tolerated. Any student who violates the standards of academic integrity will be subject to appropriate sanctions. If you are unsure whether something you are doing is actually cheating just ask the instructor.

- **Academic Accommodation:**
You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:
    - **Pregnancy and Student Parental Leave:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the Parental Leave Guide.
    - **Academic Accommodations for Students with Disabilities:** The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable).
    - **Religious obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the Religious Observation Guide.

Contact Information:

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