Math 557 (Ring Theory)
Course Credits: 3 credits
Time: MWF 10:30 a.m.–11:20 a.m.
Office Hours: Tuesdays, 10 a.m., Math (Brink Hall) 328

Instructor: Brooks Roberts
Email: brooksr@uidaho.edu

- Classroom: BEL (BUCHANAN ENGINEERING LAB) 205
- Prerequisite: Math 461 and Math 462; or equivalent.
- Textbook:
  - Steps in Commutative Algebra (2nd Edition), R. Y. Sharp, *Cambridge University Press*, 2008, ISBN–13: 978–0521646239
- Goals: A set together with one or more binary operations, such as addition or multiplication, is called an algebraic structure. The main objects in this course are algebraic structures called rings and modules. The concept of a ring and the concept of a module have become some of the most fundamental in modern mathematics. The main goal of this course is to present a detailed discussion of the basic ideas underlying ring theory as well as methods to help students tackle further algebra that they will encounter in their research and teaching. If time permits, several specific branches of ring theory will be discussed.
- Topics that will be covered in this course are the following:
  - rings (rings, subrings, ideals, prime ideals, maximal ideals, primary decompositions, and rings of fractions);
  - modules (modules, chain conditions, Noetherian rings/modules, Artinian rings/modules, modules over PIDs, canonical forms for square matrices);
  - further topics in ring theory such as integral dependence, valuations, tensor products, and dimension theory.
- Grading: Grades will be based on homework and exams weighted as follows:

Component	Points	Date
Homework	100	Fridays
Exam 1	100	Friday, October 14, 2022
Exam 2	100	Friday, December 16, 2022 (10:15 a.m.–12:15 a.m.)

The grading scheme is:

Grade	Points
A	300–270
B	269–240
C	239–210
D	209–150
F	149–0

- Homework will be due approximately once a week. Homework will be collected, but we will not grade every problem in a homework set. Rather I will select a few problems to spot-check and base your homework grade on how you did on those problems, with some points also awarded on how complete your work is. No late homework will be accepted. The homework assignments will be announced on the course canvas page. The canvas site for this course can be found at https://canvas.uidaho.edu.

- Exams: The exams may include both an in-class component and a take-home component. The in-class portion would be based on chapter material and homework problems. The take-home portion would be for more difficult proofs. You can take a make-up exam with no penalty if you have a good and verifiable reason why you could not take the exam at the scheduled time and you promptly inform me and arrange to do the make-up.

- Learning Outcomes

  - Students will develop a grasp of the basic concepts in ring theory such as rings/modules and will be able to give examples and non-examples of such concepts.
  - Students will understand theorems arising from the concepts covered in this course.
  - Students will develop skills to apply techniques covered in this course to solve problems pertaining to ring theory.
  - Students will acquire proficiency in this course for further study.

- CDAR: University of Idaho is committed to ensuring an accessible learning environment where course or instructional content are usable by all students and faculty. If you believe that you require disability-related academic adjustments for this class (including pregnancy-related disabilities), please contact Center for Disability Access and Resources (CDAR) to discuss eligibility. A current accommodation letter from CDAR is required before any modifications, above and beyond what is otherwise available for all other students in this class will be provided. Please be advised that disability-related academic adjustments are not retroactive. CDAR is located at the Bruce Pitman Building, Suite 127. Phone is 208-885-6307 and e-mail is cdar@uidaho.edu. For a complete listing of services and current business hours visit https://www.uidaho.edu/current-students/cdar.

- Healthy Vandals Policies: Please visit the University of Idaho COVID-19 webpage often for the most up-to-date information about the U of I's response to Covid-19.