

INTRODUCTION TO RINGS AND MODULES, MATH 323 - JANUARY-APRIL, 2019

1. GENERAL INFORMATION

- Instructor: Rachel Ollivier, ollivier@math.ubc.ca
- Course website:
<http://www.math.ubc.ca/~ollivier/Math323-2019.html>
- Text: Dummit and Foote, Abstract Algebra.

Homework: There will be biweekly homework assignments posted on the website. The due date of each problem set will be specified. The first homework will be due on Tuesday January 15 in class.

Tests: There will be two midterm exams (in class) and a final exam. The tests will be closed book-closed notes tests. Calculators will not be allowed. The dates for the two midterms are: Thursday February 7 and Thursday March 21.

Grades: Grades will be computed as:

- Homework 15%, Midterms 25%, Final exam 60%

Synopsis: The course will cover more or less Chapters 7-10 and 12. Highlights of the course will be an introduction to the vocabulary of exact sequences, projective, injective, flat modules (which should help prepare for later courses on homological algebra), as well as the classification of f.g. modules over a PID and its applications, in particular to the classification of finite abelian groups and to the reduction of linear operators.

2. SCHEDULE

Here is a rough course schedule, subject to later adjustments. It will be updated weekly.

- **Week 1.** 0.2, 0.3. Integers, Integers mod n . 7.1. Rings
- **Week 2.** 7.2. Examples of Rings, 7.3. Homomorphisms, Ideals, Quotient Rings.
- **Week 3.** 7.3. Examples. 7.4. Properties of Ideals.
- **Week 4.** 7.4 continued. Properties of Ideals. 7.6. Chinese Remainder Theorem and applications.
- **Week 5.** 8.1 Euclidean Domains. 8.2, 8.3 . PIDs and UFDs.
- **Week 6.** 8.2 and 8.3 continued.
- **Week 7.** 9.1, 9.2, 9.3, 9.4. Polynomial rings and UFDs, Irreducibility Criteria. + Midterm
Winter break.
- **Week 8.** 10.1, 10.2, 10.3. Modules, Quotient Modules, Homomorphisms, Direct Sums. Free modules.
- **Week 9.** 12.1, 12.2, 12.3. Modules over PIDs and applications.
- **Week 10.** 12.3. More examples and discussions.
- **Week 11.** Review
- **Week 12.** 10.4, 10.5. Tensor product of modules. Exact sequences.
- **Week 13.** Flat, Injective, Projective modules.