

INTRODUCTION TO RINGS AND MODULES, MATH 323 - JANUARY-APRIL, 2018

1. GENERAL INFORMATION

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

Homework: There will be weekly or biweekly homework assignments, posted here on Mondays. The due date of each problem set will be specified here. The first homework will be posted on Monday January 8.

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 (tentative) dates for the two midterms are: Tuesday February 13 and Thursday March 22.

Grades: Grades will be computed as the maximum of the following:

- Homework 10%, Midterms 20%+20%, Final exam 50% or
- Homework 10%, Best midterm score 20%, Final exam 70%.

The grades of those students who miss a midterm will be computed by the second method.

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 + **Midterm**.
- **Week 7.** 9.1, 9.2, 9.3, 9.4. Polynomial rings and UFDs, Irreducibility Criteria.
Winter break.
- **Week 8.** 10.1, 10.2, 10.3. Modules, Quotient Modules, Homomorphisms, Direct Sums.
- **Week 9.** 10.3 Free modules. 10.4, 10.5. Tensor product of modules. Exact sequences. Flat, Injective, Projective modules.
- **Week 10.** 10.5 Continued: more examples.
- **Week 11.** Possible review, or more examples from previous chapters + **Midterm**.
- **Week 12.** 12.1, 12.2, 12.3. Modules over PIDs and applications .
- **Week 13.** 12.3. More examples and discussions.