

MAS5932—Homological Algebra

Spring 2016

INSTRUCTOR: Dr. Ettore Aldrovandi.

OFFICE: 215 LOV.

OFFICE HOURS: [Announced on the instructor's webpage](#)

Schedule Class will meet on Tuesday and Thursday, 2:00–3:15 pm, in LOV 104

Prerequisites GRV III (i.e. MAS 5311, Abstract Algebra I), or permission by the instructor.

Texts A textbook I will use as reference, at least for the main part of the course, is:

C. A. Weibel *An introduction to homological algebra*. Cambridge University Press.

There are many other excellent sources, either in book format, or available online. The following is a list of items (in no particular order) I may refer to during the course:

1. S. Mac Lane, *Homology*, Springer.
2. Chapter XX in Lang's *Algebra*, Springer.
3. Chapter 1 in Kashiwara and Schapira, *Sheaves on Manifolds*, Springer.
4. M. Kashiwara and P. Schapira, *Categories and Sheaves*, Springer.
5. S. Gelfand and Y. Manin, *Methods of Homological Algebra*, (2nd edition), Springer
6. P. Schapira, *Notes on Homological Algebra*, <http://people.math.jussieu.fr/~schapira/lectnotes/HomAl.pdf>
7. B. Keller: [Derived categories and their uses](#). Chapter of the Handbook of algebra, Vol. 1, edited by M. Hazewinkel, Elsevier 1996.

Course objectives The course objective is to show how a variety of algebraic constructions arising in topology, algebra, and geometry, rather than merely comprising a collection of scattered examples, are in fact part of a unified theory, and to show how the power tools of homological algebra can effectively address several important problems in those areas.

Course content The course will present the constructions leading to homology and cohomology in a systematic fashion. Standard tools of the trade, such as sequences, diagrams, etc. will be introduced. Categories are an important part of this toolbox, and an adequate part of the material will be devoted to their study. Sheaves will be touched upon, but not introduced in a systematic manner.

In slightly more detail a list of topics is as follows:

1. Rings, Modules, Complexes, Homology and Cohomology;
2. Derived Functors;
3. Classical constructions: Hom, Tensor product, Tor, Ext;
4. Applications: Extensions, Resolutions and cohomology for Groups and Algebras;
5. Derived and triangulated categories;
6. Simplicial techniques;
7. Introduction to Homotopical Algebra.

Exams There will be no exams.

Homework Homework will not be collected. Some problems may be assigned in due course for in-class presentation or individual work to satisfy the grading requirements (see below).

Grading Your grade will be based on attendance and at least one in-class presentation toward the end of the course. Presentations will be based on a topic agreed upon in advance with the instructor.

Attendance determines the grade as follows: assuming the presentation requirements are met, the grade is determined according to the following table:

Absences	0-5	6-10	11-15	16-20	> 20
Grade	A	B	C	D	F

Excuses will be considered if the student presents sufficient and verifiable documentation that absences are beyond the student's control (for example, health, or travel required by graduate work). In that case, a make-up project can be used to raise the grade to up a full grade point.

University Attendance Policy Excused absences include documented illness, deaths in the family and other documented crises, call to active military duty or jury duty, religious holy days, and official University activities. These absences will be accommodated in a way that does not arbitrarily penalize students who have a valid excuse. Consideration will also be given to students whose dependent children experience serious illness.

Academic Honor Policy The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to "... be honest and truthful and... [to] strive for personal and institutional integrity at Florida State University." (Florida State University Academic Honor Policy, found at <http://fda.fsu.edu/Academics/Academic-Honor-Policy>.)

Americans With Disabilities Act Students with disabilities needing academic accommodation should: (1) register with and provide documentation to the Student Disability Resource Center; and (2) bring a letter to the instructor indicating the need for accommodation and what type. This should be done during the first week of class.

This syllabus and other class materials are available in alternative format upon request.

For more information about services available to FSU students with disabilities, contact the:

Student Disability Resource Center
874 Traditions Way
108 Student Services Building
Florida State University
Tallahassee, FL 32306-4167
(850) 644-9566 (voice)
(850) 644-8504 (TDD)
sdrc@admin.fsu.edu
<http://www.disabilitycenter.fsu.edu/>