Homological Algebra (Math 607)
Fall 2017

Meeting times:	Mon., Wed., and Fri. 12–12:50am in 210 Deady Hall
Instructor:	Ben Elias
Office:	Fenton 210, x6-5629
Office hours:	Mon. and Wed. 10–10:50am.
E-mail:	belias@uoregon.edu
Course website:	http://pages.uoregon.edu/~belias/Classes/607-fall-2017/
Midterm:	None.
Final:	None.

Textbook: See website.

Homeworks and Grading: In an attempt to get people engaged in the class, I will be assigning approximately one problem, taking about half an hour or less, for each lecture. The expectation is that they will be done by the next lecture. I believe exercises are a crucial way to acquire tools, and I want to encourage everyone to do them.

By default, everyone will get a B+. Students with good attendance who do some of the homeworks will get an A-. Students who do most of the homeworks (well) will get an A, and those who do very well on them will get an A+. There are no tests.

Prerequisite: 600 Algebra sequence. Note: 600 Topology sequence will help enormously.

Learning Outcomes: The goal of this course is to cover the standard material in a homological algebra course. Specific goals are to understand and be able to use the following concepts.

(1) Abelian and additive categories.
(2) Chain complexes, homotopies, and the homotopy category.
(3) Derived functors.
(4) Yoneda ext and its ring structure.
(5) Homological dimension. Koszul complexes.
(6) Spectral sequences.
(7) Triangulated categories. The derived category.

In addition, I hope to cover the following additional topics, time permitting.

(1) t-structures, cores, and homological functors.
(2) Grothendieck groups.
(3) Projective covers, Morita equivalence, and other ways to approach abelian categories.
(4) A brief introduction to Khovanov-Qi's Hopfological algebra.

Learning Environment: The University of Oregon strives for inclusive learning environments. Please notify me if the instruction or design of this course results in disability-related barriers to your participation. You are also encouraged to contact the Accessible

Education Center in 164 Oregon Hall at 541-346-1155 or `uoaec@uoregon.edu`. If you are entitled to extra time on exams, make sure to contact the AEC more than one week prior to the exam!

Academic Conduct: The code of student conduct and community standards is at:

`http://conduct.uoregon.edu`

Any type of academic dishonesty will not be tolerated.

In this course, you are encouraged to work on the homework problems with your colleagues. Math is a collaborative activity, and one which is easier to learn as a team. However, when it comes time to write up your homework answers, this should be done individually, without reference to any common solution or the work of others. By writing it up individually, you can really isolate those things you thought you understood in the group, but which did not make sense later. For example:

Ok: a study group works a problem on the blackboard, gets the answer. Erases the answer, each member tries to write up the solution individually, asks questions of the group when something goes wrong.

Not ok: a study group works a problem on the blackboard, gets the answer. Members copy the answer from the board to their homework sheet, or write up the solution while referencing the solution on the board. This is cheating, even if credit is given to your collaborators (otherwise it is also plagiarism).

Definitely not ok: looking up answers to a problem online, even if one does not copy them.

There will be no collaboration on the take-home portions of any exam.

Attendance and Participation: If you miss a class, it is your responsibility to find out what happened in this class from your colleagues. Not all class material is in the book (nor is all material in the lecture either - homeworks are essential). If your grade is borderline between one grade and another, then attendance and participation will be taken into account.

OFFICE HOURS ARE A VASTLY UNDERUSED RESOURCE. I am stuck in my office, waiting to answer your questions, so please use the opportunity!

Please, do not hesitate to ask questions, either in class or in office hours. Chances are that if you are confused, so are many of your colleagues, and they will thank you for speaking up. Office hours should be very helpful. If you can't make office hours, email me to set up an appointment.