《Homological Algebra》 Syllabus

1. Basic course information

course name	Differential Topology	course code	MATH1326
Course Level	Undergraduate	Credit/Contact Hour:	3/48
Major:	undergraduates and gradautes	Teaching Language	English
Prerequisite	Abstract Algebra (MATH1224) ; Linear Algebra (MATH1112)	Prerequisite suggestion	One of the following: Topology (MATH1313), Introduction to Topology (MATH1233) Differential Topology (MATH1224)
School/Institute	Institute of Mathematical Sciences	Instructor	Daniel Skodlerack

2.Course Introduction

Homology groups and cohomology groups have been proven to be suitable answering questions in, for example, differential and algebraic topology. It is very striking to show that two topological spaces are non-homeomorphic in computing singular homology groups. In differential topology computing certain cohomology groups (de Rham, compact de Rham or compact vertical de Rham) is used to study manifolds and vector bundles. Those theories (homology and cohomology) have a lot in common in their formalism. In this course we are going to study homology and cohomology theories for abelian categories and tools for computations like spectral sequences.

3.Learning Goal

Getting profound in using derived functors, spectral sequences and having a first knowledge about derived categories.

4.Instructional Pedagogy

Lecture and self-reading and homework. The complete material will be published on the website www.skodleracks.co.uk

5. Course Content and Schedule

Chapter	Teaching Contents	Week	Contact Hours	Teaching Modes
[Weibel,Ch1]	Chain complexes	1 to 3	8	Lecture
[Weibel,Ch2,Ch3 until S3.5]	Derived functors	3 to 6	10	Lecture
[Weibel,S3.6]	Universal coefficient theorem	7	2	Lecture
[Weibel,Ch4]	Homological dimension	7 to 10	10	Lecture
[Weibel,Ch5]	Spectral sequences	11 to 13	10	Lecture
[Weibel,Ch10]	Derived categories	14 to 16	8	Lecture

6.Grading Policy

Homework: 40%; ; Final: 60%.

7. Textbook & Recommended Reading

(1) Textbook

book name	author	press	publication time	ISBN	edition
An introduction to homological algebra	Charles Weibel	Cambridge University Press	1994-03	9780521559874	1

An introduction to homological algebra	Joseph J Rotman	Springer	2009	978-0-387-24527-0	2
A course in homological algebra	P.J. Hilton, U. Stammbach	Springer	1971	978-0-387-90033-9	2

(2) Recommended Reading

In Chinese: 同调代数引论, 佟文廷, 高等教育出版社, 1998-01, 9787040062397, 1st edition

8.Academic Integrity

This course highly values academic integrity. Behaviours such as plagiarism and cheating are strictly prohibited.

9.Other Information (Optional)