

Syllabus

Algebraic Topology I

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	Position	Associate Professor			Major	Mathematics
	Group	Mathematics				

1. Course Description

Algebraic topology is a branch of mathematics which uses tools from abstract algebra to study topological spaces. The basic goal is to find algebraic invariants that classify topological spaces up to homeomorphism, though usually most classify up to homotopy equivalence. In the class, we shall study the following concepts and related theories:

1. Fundamental group
2. Homology group
3. Classification of surfaces

As an application, we also study the topological action of $\mathbb{Z}/2$ on the topological spaces, and try to classify them topologically.

2. Teaching Methods

Lecture and discussion

3. Evaluation

Homework / discussion : 30%

Midterm : 30%

Final exam : 40%

4. TextBooks

5. Lecture Schedule

Week	Lecture contents	Lesson type	Remark
1	Homotopy of Paths, The fundamental group		
2	Covering spaces, Computation of fundamental groups		
3	retractions and fixed points, the fundamental theorem of algebra		
4	Borsuk–Ulam theorem, Deformation retracts		
5	Fundamental groups		
6	Jordan separation theorem, Jordan curve theorem		
7	Imbedding Graphs in the plane, The winding number		
8	Midterm	Midterm	
9	Free groups		
10	Seifert–van Kampen theorem		
11	Fundamental group of torus		
12	Homology	Discussion	
13	Classification of surfaces		
14	Classification of surfaces		
15	Classification of real Bott manifolds		
16	Final exam	Final term	

6. Others

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