MATH-371 **Homology and cohomology**

Raum Sven

Cursus	Sem.	Type
Mathematics	BA6	Opt.

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	Written
Workload	150h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

This course introduces to homology and cohomology of topological spaces and groups as well as their relation via the classifying space of a group.

Content

1. Simplicial homology
2. Singular homology
3. Cellular homology
4. Abstract homology theories
5. Cohomology
6. Group homology and cohomology
7. Classifying spaces

Keywords

algebraic topology, group cohomolgy, homological algebra, classifying spaces

Learning Prerequisites

Required courses

- Topology (MATH-225)
- Rings and fields (MATH-215)

Recommended courses

- Rings and modules (MATH-311)
- Group theory (MATH-211)

Learning Outcomes

By the end of the course, the student must be able to:

- Compare (co)homology theories of spaces
- Use basic algebraic homological algebra
- Choose appropriate methods to compute (co)homology

- Compute (co)homology
- Characterize low degree (co)homology of groups
- Compute models for classifying spaces

Transversal skills

- Continue to work through difficulties or initial failure to find optimal solutions.
- Demonstrate the capacity for critical thinking
- Access and evaluate appropriate sources of information.
- Write a scientific or technical report.
- Use both general and domain specific IT resources and tools
- Take feedback (critique) and respond in an appropriate manner.
- Give feedback (critique) in an appropriate fashion.

Teaching methods

Ex-cathedra course with exercises in the classroom and at home

Expected student activities

- Participate in the course and the exercise sessions
- Solve regular exercises
- Prepare one LaTeX hand-in on examples illustrating the course content
- Give peer-feedback on this LaTeX hand-in
- Prepare one LaTeX hand-in on a short piece of mathematics acquired independently

Assessment methods

Written exam, exercises, LaTeX hand-ins and peer-feedback. In case Art. 3 al. 5 of the regulations of the section apply to some student, the exam form will be decided by the teacher and communicated to the student.

Supervision

Office hours	Yes
Assistants	Yes
Forum	No

Resources

Bibliography

- Allen Hatcher. Algebraic topology. ISBN-13: 978-0-521-79540-1
- Kenneth S. Brown. Cohomology of groups. ISBN-13: 3-540-90688-6
- Charles A. Weibel. An introduction to homological algebra. ISBN-13: 0-521-55987-1

Ressources en bibliothèque

- Algebraic topology / Hatcher
- (electronic version)
- Cohomology of groups / Brown
- An introduction to homological algebra / Weibel
- (electronic version)