Homotopy Theory

Instructor and Class Information

Lecturer:	Course Num.:
Office:	Lecture Room:
Phone:	Lecture Times:
Email:	Office Hours:

About Course Goals

FORMAT

The course will meet three times a week for 55 minutes each meeting. Instruction will be mainly by lecture delivered by the instructor. It may also include occasional in-class discussion as well as short student presentations, particularly, by post-candidacy students.

DESCRIPTION & GOALS

This course provides students with a solid working knowledge in the basic techniques of Homotopy Theory and constitutes a natural continuation of the Math 6801-6802 sequences in Algebraic Topology. Topics will center around properties and calculations with higher homotopy groups as well as the more general theory of fibrations and fiber bundles. The course should be of interest to all students with research interests in topology or geometry.

PREREQUISITES

This section is open only to mathematics post-candidacy students and requires, in addition, the permission of the instructor.

Textbook

MAIN REFERENCE

Allen Hatcher:*"Allen Hatcher"*. (Chapter 4) Cambridge Univ Press, 2002. ISBN: 0521795400.
    Freely available at https://www.math.cornell.edu/~hatcher/AT/AT.pdf

ADDITIONAL REFERENCES

G. W. Whitehead: *"Elements of Homotopy Theory"*. GTM **61**, Springer 1978. ISBN: 0387903364.

S.-T. Hu: *"Homotopy Theory"*. Academic Press, 1959. (5th Printing 1971) ISBN: 0123584507.

Assessments

READING, PARTICIPATION, AND ATTENDANCE

Students are required to read scheduled textbook materials and actively participate in class room discussions that arise from lecture material. Students are expected to attend all classes.

RESEARCH ORIENTED PRESENTATION

Post-candidacy students in this section are required to deliver a half hour presentation that both synthesizes lecture material and connects it to relevant research questions, more advanced

theoretical topics, or applications in other fields of mathematics. The topic and required independent reading will be determined by the instructor individually in negotiation with the student. Presentations may also be replaced by respective research papers upon the request of the student.

Grading

COURSE GRADE

The grades for this course section are "satisfactory" (S) or "unsatisfactory" (U). A satisfactory outcome requires continued active participation in class (weighed about 20%) and is further based on the student's performance during the presentation (weighed about 80%).

Weekly Schedule

Week 1	Review of CW complexes, higher homotopy groups
Week 2	Relative homotopy groups, functorial properties, fundamental group actions.
Week 3	Pair exact sequence, compression lemma , Whitehead Theorem.
Week 4	Cellular and CW approximation
Week 5	Whitehead & Postnikov Towers
Week 6	Homotopy Excision Theorem and computations
Week 7	Moore spaces and Eilenberg–MacLane space
Week 8	Hurewicz maps, general Hurewicz Theorem
Week 9	Homotopy Lifting Property, (Serre) Fibrations, fiber bundles
Week 10	Long Exact Sequences for fibrations, applications to spheres and Lie groups
Week 11	Whitehead products, stable homotopy groups, ring structures
Week 12	Loop spaces & Suspension, exact and coexact Puppe sequences
Week 13	Relations to cohomology theory and characteristic classes
Week 14	Obstruction Theory

General Policies

ACADEMIC MISCONDUCT

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct (http://studentaffairs.osu.edu/info_for_students/csc.asp)."

DISABILITY SERVICES

Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated and should

inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; http://www.ods.ohio-state.edu/.