Math 7811.01 Syllabus **Autumn 2016**

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

Math 6802 (or equivalent strong background in algebraic topology)

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. (5^{th} Printing 1971) ISBN: 0123584507.

Assessments

Homework Assignments

There will be approximately 10 homework assignment sheets, which will typically contain several fully described problems as well as a list of numbers of textbook problems. Due dates of assignments will announced and set typically a week after the assignments are published

Final Project

The final project is a more extensive written assignment that will draw on techniques acquired throughout the semester. It will be published about two weeks before the end of classes and will

be dues at the beginning of finals week.

CLASS PARTICIPATION AND ATTENDANCE

Although attendance is not regularly monitored frequent absences are likely to be noted and may factor into the grade in borderline cases.

Grading

COURSE SCORE

A course score will be computed from the above assessments. Homework assignments will count 70% towards the grade and the final project 30%.

LETTER GRADES

Letter grades will be determined based on the course score. The approximate minimum scores letter grades are 80% for an "A", 73% for an "A-", 67% for a "B+", 55% for a "B-", and 40% for a "C-". The exact cut-off scores may vary depending on the difficulty of assignments.

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/.