

MATH 4161 Algebraic Topology IV || Epiphany 2020: manifolds and cohomology

Class Monday and Friday 1400 – 1500, CLC 406 and CM107.
Problem class weeks 13,15,17,19, Tuesday 1300-1400 CM105.

Professor: Mark Powell

Office: CM233.

email: mark.a.powell@durham.ac.uk

Office hours: Monday 10–12, Friday 11-12, or by appointment.

Plan for the course: The aim of the course is to learn about manifolds and cohomology of spaces. We will learn its key properties, how to compute it, and some applications. Here is the plan for the course this term. It is loosely based on material in Chapters 1 and 3 of Hatcher's book.

- (1) Covering spaces.
- (2) Hom groups and cohomology of spaces.
- (3) Properties of cohomology.
- (4) Universal coefficient theorem.
- (5) Tensor products and homology with coefficients.
- (6) Manifolds, orientations and fundamental classes.
- (7) Cup product and elementary computations.
- (8) Cap product and Poincaré duality.
- (9) Computing cup products.
- (10) Applications of cup and cap products.
- (11) Borsuk-Ulam theorem.

Lecture notes: I expect you to attend lectures and take your own notes during the lecture. If you are absent, I expect you to copy the notes of a friend or acquaintance. I will type notes containing the main definitions and statements, with references to Hatcher's Algebraic Topology book or Friedl's Algebraic Topology lecture notes for proofs, most of which will also be explained in lectures, along with discussion of examples.

<http://pi.math.cornell.edu/~hatcher/AT/ATpage.html>

https://www.uni-regensburg.de/Fakultaeten/nat_Fak_I/friedl/2018_algebraic-topology-iv.pdf

Homework: Homework will be due in fortnightly in lecture the Monday immediately prior to each problem class.

2

Please talk to me or email me to discuss any special circumstances that I ought to be aware of.