

Topics in Algebraic Topology – Spectral Sequences

Due to the UCLA response to COVID-19, the lectures and office hours will meet online (probably via Zoom) until further notice. This syllabus is tentative and subject to change.

Instructor: Clover May

Class Meetings: MWF 11:00-11:50am, MS 7608 (online for now)

Office Hours: MS 6903, by appointment (online for now)

Email: clovermay@math.ucla.edu

Course Website: <https://ccl.e.ucla.edu/course/view/20S-MATH237-1>

Prerequisites: Graduate algebra and algebraic topology. For example, you should be familiar with modules over rings, cohomology, and higher homotopy groups.

Course Description: This course will serve as an introduction to spectral sequences as a computational tool. Spectral sequences are high-powered algebraic machines used in a variety of settings. The course will focus on applications to algebraic topology.

The main topics include the Serre spectral sequence, constructing spectral sequences via double complexes and exact couples, some applications of spectral sequences, computing some stable homotopy groups of spheres, and the Adams spectral sequence. Time permitting, additional topics include Massey products, Toda brackets, and other spectral sequences such as the May spectral sequence, Bockstein spectral sequence, etc.

Resources:

- [Hatcher's extra chapter on spectral sequences](#)
- [Vakil's note *Spectral Sequences: Friend or Foe?*](#)
- [McCleary's *A User's Guide to Spectral Sequences*](#)
- [Mosher and Tangora's *Cohomology Operations and Applications in Homotopy Theory*](#)
- [Davis and Kirk's *Lecture Notes in Algebraic Topology*](#)

Grading: Students will give presentations near the end of the term on a mutually agreed upon topic. Suggested topics include finding your favorite spectral sequence and describing its construction and/or some computations. Some examples will be listed on the course website soon. Topics should be chosen within the first five weeks of the term. Students will be expected to meet with the instructor (possibly electronically) to discuss their chosen topic, give a practice talk to a fellow student, give verbal and written feedback on a practice talk, and then finally give a 20 minute presentation in class. Grades will be based on completing these tasks and the final presentation.

Accessibility: Students needing academic accommodations based on a disability should contact the Center for Accessible Education (CAE) at (310) 825-1501 or in person at Murphy Hall A255. In order to ensure accommodations, students need to contact the CAE within the first two weeks of the term.