Spring 2020 Math 752, Section 01, Algebraic Topology

Instructor: Prof. Ilya Kapovich

M 7:35pm-9:25pm, HE 922

• Textbooks: No required textbooks. The course will largely rely on the lecture notes. Recommended books: *Algebraic Topology, An Introduction*, by William S. Massey, Springer-Verlag; and *Basic Concepts of Algebraic Topology* by Fred H. Croom, Springer-Verlag
• Prerequisites: Math 340 or Math 751, or an equivalent
• Office hours: Mondays 5pm-7pm in my office HE 917. [I may also be available at other times, by appointment.]
• Instructor contact info: e-mail ik535@hunter.cuny.edu (preferred way of reaching me), office phone 212-772-5303
• My office location: Hunter East 917
• Instructor webpage: http://math.hunter.cuny.edu/ilyakapo/
• There will be homework, due in class approximately once every two weeks. The h/work will be both collected and graded (several selected problems from each h/wk will be graded).
• The final exam for this course (most likely take-home) will follow the Hunter College final exam schedule, date TBD.
• In addition to the required course components (final exam, h/wks), you can earn extra credit by doing a course-related project. These projects are optional. A project involves writing a 5-8 page project paper and doing a blackboard presentation (approximately 30 minutes long) on that paper.
• How this course is graded: The final exam counts as 45% of the grade, and the h/wk is 55% of the grade. An extra credit course project counts as an additional possible 15% of the grade.

Course description

The course will cover the basic concepts of algebraic topology, with some applications. We will try to cover the following topics (to the extent that time allows).

- Review of some general topology concepts, particularly the quotient topology and the disjoint union topology. What does it mean to glue two polygons along an edge?
- Classification of compact surfaces (following Massey's book).
- Homotopy and the fundamental group.
- Seifert-van Kampen theorem, with some applications
- Covering maps and covering spaces
- Index of a self-map of a circle; winding number of a curve. Applications to fixed point theorems in dimension 2 and to the Fundamental Theorem of Algebra.
- Simplicial Homology
- Induced maps on homology, betti numbers and the Euler-Poincare formula for the Euler characteristic.

- Degree of a map, higher-dimensional fixed point theorems, Invariance of Domain Theorem
- If time permits, some additional topic(s), e.g. knots and knot polynomials.