McGill University
Department of Mathematics and Statistics
MATH 599 Topics in geometry and topology: Topology and Geometry of 3-Manifolds Winter 2018

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Office hours: by appointment

Textbook: Allen Hatcher *Notes on Basic 3-Manifold Topology* , William P.Thurston and Silvio Levy *Three-Dimensional Geometry and Topology*, complementary reading: Bruno Martelli: *An Introduction to Geometric Topology*

Prerequisities: knowledge what is the fundamental group and covering space (for example MATH 576)

Syllabus: A compact oriented surface is homeomorphic either to a sphere, a torus obtained from gluing opposite sides of a square, or to a surface obtained from gluing the sides of a hyperbolic polygon. The goal of the course is to indicate a similar classification in dimension 3. We will start following the notes of Hatcher, where two classical decompositions (prime and JSJ) of a 3-manifold into smaller pieces are described.
We will then follow the book of Thurston edited by Levy. Thurston conjectured that each piece carries one of the 8 model geometries. We will discuss each of the geometries, provide examples, and study their fundamental groups.
The most ubiquitous geometry is the hyperbolic geometry, on which we will focus at the end of the course. Some of the examples will be geometrically finite hyperbolic groups (obtained as surfaces from gluing finite polyhedra), and quasifuchsian groups. We will finish with a sketch of the proof of Mostow's rigidity theorem saying that for a compact hyperbolic 3-manifold, its fundamental group determines its isometry type.

Half of the class time will be devoted to the lecture per se. The other half will be devoted to solving together the weekly problems from the homework assignment (they will not be due in writing, but students will be expected to show the solutions on board during the class).

Assessement:
75% final exam from the proofs.
25% two midterms from the problems similar to homework assignments, where solving at least half of the midterm problems suffices to obtain the maximal score: February 13 and March 29
The final grade will be increased for students presenting regularly good solutions of homework assignments.

Academic Integrity: McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see http://www.mcgill.ca/integrity/ for more information).

Language Policy: In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

Extraordinary Circumstances: In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.