Math 583 Geometric Group Theory, Winter 2025

Prerequisites: MATH 456 and MATH 576 or equivalent or permission of instructor.

The course will cover the following topics: free group and its subgroups, uniqueness of decomposition into free product. Groups acting on trees, splitting into free product with amalgamation. Bass-Serre theory. Cayley graph, $SL(2, \mathbb{Z})$, isometry groups of the hyperbolic plane. Isoperimetric inequality, word problem, Dehn's algorithm. Small cancellation groups. Quasi-isometries and quasi-geodesics. Groups hyperbolic in the sense of Gromov. Boundaries of hyperbolic groups, Tits alternative. Ends of groups. Gromov's theorem on groups with polynomial growth.

Course instructor: Piotr Przytycki, piotr.przytycki@mcgill.ca

Office hours: by appointment

Excerpts from textbooks: Scott-Wall: Topological Methods in Group Theory, Lyndon-Schupp: Combinatorial Group Theory, Short: Notes on Word-Hyperbolic Groups, Drutu-Kapovich: Geometric Group Theory.

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).

Grading Scheme:
25% two in-class midterms (February 10 and March 26) from the problems similar to homework assignments, where solving at least half of the midterm problems suffices to obtain the maximal score.
75% written final exam testing the knowledge of definitions, theorem statements and proofs from lectures.
The final grade will be increased for students presenting regularly good solutions of homework assignments.

McGill Policy Statements
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.