

'396' Undergraduate Research Project Application Form

Version: 200603

Office for Undergraduate Research in Science
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Email: victor.chisholm@mcgill.ca Web: www.mcgill.ca/science/ours/

INSTRUCTIONS FOR STUDENTS

- **All fields are required, unless indicated otherwise.**
- Download and print this form. Complete Section C and sign.
- See "How students can apply" instructions in Section B.
- Your supervisor or department will tell you if you are selected for this project. If so, you will receive a code to register for a '396' course on MINERVA.

SECTION A: SUPERVISOR INFORMATION

Name: Alexei Miasnikov **Email:** alexeim@math.mcgill.ca
Phone: 514-398-5476 **Website:** _____
Supervisor's **Course**
Department or **Number:** MATH396
Unit: Mathematics and Statistics

SECTION B: PROJECT INFORMATION

Term: Summer 2008 **Project start & end dates:** May 15 – Aug. 31, 2008

Project title: Groups and Graphs

Project description: When J. Stallings introduced his approach to subgroups of free groups it immediately changed the whole field. A Stallings' folding is a folded directed graph with edges labeled by elements of a finite set X and with a distinguished vertex v . When viewed as a finite deterministic automaton it accepts a language which corresponds to a finitely generated subgroup of the free group $F(X)$ with basis X . Conversely, for every finitely generated subgroup of the free group $F(X)$ one can effectively construct a Stallings' folding which accepts the subgroup. We propose to study this correspondence between finite graphs and finitely generated subgroups of free groups.
The first type of questions concerns with algebraic properties of subgroups that are induced by a particular graph property of their Stallings' foldings. For example, can we characterize subgroups with planar foldings? Another type of questions comes from recent break-through in computer science related to, so-called compressed words. We intend to develop a theory of compressed foldings of subgroups and apply it to complexity of algorithmic problems in groups.

Prerequisites: 1 term completed at McGill + CGPA \geq 3.0; or permission of instructor.

Grading scheme: The final report is 80%, assignments count for the other 20% of the final grade

Other: _____

Status: Mark with an x. **This project is...**
 Open to applicants
 Already taken; no more positions available this term
 Taken, but contact me for other possible projects this term

Ethics, safety, and training: Which of the following, if any, is involved? Mark with an x.
 Animal subjects
 Human subjects
 Biohazardous substances
 Radioactive materials
 Handling chemicals
 Using lasers

For undergraduate students, ethics and safety compliance is the supervisor's responsibility.

How students can apply: Bring this application form and your advising transcript to me during office hours.

SECTION C: STUDENT INFORMATION. (1) PRINT LEGIBLY AND SIGN. (2) SEE "HOW STUDENTS CAN APPLY" IN SECTION B.

Name: _____ **McGill ID:** _____
Email: _____@mail.mcgill.ca **Phone:** _____
Program: _____ (e.g., B.Sc. Maj. Chem. Minor Biology) **Level:** U0 / U1 / U2 / U3
I have not applied for another 396 course in this term. **(circle one)**
Student signature: _____ **Date:** _____

SECTION D: APPROVALS. (1) PRINT NAMES & SIGN. (2) NOTIFY OFFICE FOR UNDERGRADUATE RESEARCH IN SCIENCE. (3) GIVE STUDENT CODE TO REGISTER FOR COURSE ON MINERVA.

Supervisor: _____ **Date:** _____
Unit Chair, Director, or designate - I certify that this project conforms to departmental requirements for 396 courses. _____ **Date:** _____