

# MATHEMATICS 5P10 (Fall 2011)

## Modern Algebra

- Professor: Dr. Yuanlin Li  
Room MC J422  
Email: yli@brocku.ca  
Home Page: <http://spartan.ac.brocku.ca/~yli/5P10/5p10f11.html>
- Lectures: TR: 11:00 - 12:30 pm (J409A)
- Office Hours: TR: 1:00 - 2:00 pm or by appointment
- Textbooks: 1. *An Introduction to the Theory of Groups*, 4th edition, by Joseph J. Rotman, Springer-Verlag, New York, Inc. 1995 (**corrected second printing 1999**)  
2. *Algebra*, first edition, by Thomas W. Hungerford, Springer-Verlag, New York, Inc. 1974
- Prerequisite: MATH 3P13
- Marking Scheme:  
Four Assignments: 40%  
Midterm Exam: 30%  
Course Project (regarded as the final exam): 30%
- Course Content: This course covers 3 basic topics (groups, rings and modules) in algebra. The details are as follows:
1. Topics in Groups: Groups and Homomorphisms, The Isomorphism Theorems, Symmetric Groups and G-sets, The Sylow Theorems, Subnormal and Normal Series, Solvable and Nilpotent groups, \*Free groups. (Chapters 1-6 in Rotman's book)
  2. Ring Theory: Rings and Homomorphisms, Ideals, Factorization in Commutative Rings, Rings of Quotients and Localization, Rings of Polynomials and Formal Power series. (Chapter 3 in Hungerford's book)
  3. Modules: Modules, Homs and Exact Sequences, Free Modules and Vector Spaces, Projective and Injective Modules, Tensor Products, Modules over PID. (Chapter 4 in Hungerford's book)
  4. Further Topics in Rings and Modules: Chain Conditions, Prime and Primary Ideals, Primary Decompositions, Simple and Primitive Rings, The Jacobson Radical, Semisimple Rings. (Chapters 8 and 9 in Hungerford's book)

Course Project: This project will help you develop your research abilities. Students are expected to work on your own. Several topics will be given, and each student will choose a topic from the given list. No two individuals should choose the same topic. In order to complete the project, you will need to study reference books related to your chosen topic. Research papers and books can be found from the library, through an inter-library loan, through an internet search, or by using academic databases such as “mathsciencenet”. More detailed instructions will be given in class. An outline of your project is due on Oct. 7, a draft copy (optional) is due on Nov. 17, and the final copy is due on Nov. 25. Each student will also be expected to give a presentation of its project. Your marks for the project will be based on both your final copy and your presentation.

Exams and Assignments:

Exam	Date	Mark
Midterm	Tuesday, Nov. 1	30%
AS #	Due Date	Mark
1	Friday, Sep. 30	10%
2	Friday, Oct. 21	10%
3	Friday, Nov. 11	10%
4	Friday, Dec. 2	10%
Project	Due Date	Mark
Outline	Oct. 7	2%
Draft Copy	Nov. 17	optional
Final Copy	Nov. 25	20%
Presentation	Last week	8%

Notes:

(1) The Midterm exam will be 60 minutes long and held during the regular lecture time. There is no final exam and your research project will be regarded as the final exam.

(2) **This course also emphasizes good mathematical writing. Students will be expected to write their solutions to assignments using a very readable and logical mathematical style.** The assignments are due at 4 pm on the due dates. **No late assignments will be accepted.** The solution to each homework will be posted after the due date. Please attach a cover page to your assignment. This should bear (at the top) **your name, student number, course number and assignment number.** A sample cover page can be found in the **Course Home Page.**