Math 8246 Group Theory Spring Semester 2011

Instructor
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Office Hours: MWF 11:15 - 12:05 or MWF 1:25 - 2:15 by appointment.

The first half of this semester will be devoted to the **cohomology of groups**. After that we will finish the semester with **representations of the symmetric groups** done in arbitrary characteristic. Both these topics would benefit from a semester-long course.

Texts
There will be no text to purchase. I will distribute notes from time to time and you may find the following books helpful. The first four are entirely about group cohomology:
K.S. Brown, Cohomology of Groups, Graduate Texts in Math. 87, Springer-Verlag 1982.
K.W. Gruenberg, Cohomological Topics in Group Theory, Lecture Notes in Math. 143, Springer-Verlag 1970.
A. Adem, R.J. Milgram, Cohomology of finite groups, Springer, 2004.
J.F. Carlson et al, Cohomology of finite groups, Kluwer 2003.
The following have sections on group cohomology:
C.A. Weibel, An introduction to homological algebra, Cambridge University Press, 1994.
P. Hilton & U. Stammbach, A course in homological algebra, Graduate Texts in Mathematics 4, Springer 1997.
D.S. Dummit and R.M. Foote, Abstract Algebra, Wiley.
J.J. Rotman, Advanced modern algebra, Prentice Hall, 2002.
D.J. Benson, Representations and cohomology I, Cambridge 1991.
If we get as far as studying crystallographic groups the following book is useful:
H. Brown et al, Crystallographic groups of four-dimensional space, Wiley 1978.

Syllabus for cohomology of groups
Basic homological algebra.
Projective resolutions, Ext, extensions of modules.
Definition of group cohomology.
Interpretations of low dimensional groups: the Schur multiplier, group extensions, the first homology and cohomology groups.
I will then make a choice from:
Relations with subgroups: the Schur - Zassenhaus theorem.
Applications: crystallographic groups
Further topics such as ring structure, methods of computation.

Course Assessment
I intend assign a set of homework problems roughly every 2 weeks, giving a total of six homework assignments altogether. If you make a genuine attempt at 50% or more of the questions you will get an A for the course. You do not have to obtain correct solutions to these questions, only make genuine attempts (in my opinion). I may introduce some innovative method of grading your work.

Expectations of written work
Most of the time in the conventional homework problems, to satisfy my criterion of making a genuine attempt you will need to write down explanations for the calculations and arguments you make. Where explanations need to be given, these should be written out in sentences i.e. with verbs, capital letters at the beginning, periods at the end, etc. and not in an abbreviated form.
I encourage you to form study groups. However everything to be handed in must be written up in your own words. If two students hand in identical assignments, they will both receive no credit.

Prerequisites
The content of the Math 8201/2 algebra sequence is sufficient as a prerequisite. This semester will be largely independent of the group theory studied in the Fall Semester, but I will at some points use properties of free groups and of semidirect products.

Incompletes
These will only be given in exceptional circumstances. A student must have satisfactorily completed all but a small portion of the work in the course, have a compelling reason for the incomplete, and must make prior arrangements with me for how the incomplete will be removed, well before the end of the quarter.

Date of this version of the schedule: 1/18/2011