

## MAT 247S Algebra II - Jan–April 2009

### Course Information

Instructor:	Fiona Murnaghan
Office:	Bahen 6266
Phone:	978-8208
Office Hours:	Tuesday 5:10-6, Wednesday 5:10-5:45, and by appointment.
Textbooks:	<i>Linear Algebra</i> , Friedberg, Insel and Spence ( <i>fourth edition</i> ) (required) <i>Groups and Symmetry</i> , Armstrong (used for the last part of the course)
Class Times:	Monday 1:20–2, Tuesday 1:10-3, MB128
Tutorial:	Thursday 1:10-2, starting January 15th (assuming no TA strike).
Course web page:	Go to <a href="http://www.math.toronto.edu">www.math.toronto.edu</a> and look under undergraduate courses or: go to <a href="http://www.math.toronto.edu/murnaghan">www.math.toronto.edu/murnaghan</a> and click on Mat 247.

**Marking Scheme:** There will be one term test and a final exam, as well as 7 to 9 problem sets. The course mark will be the maximum of the two numbers Mark 1 and Mark 2.

Mark 1: 25% problem sets, 15% term test, 60% final exam.

Mark 2: 25% problem sets, 30% term test, 45% final exam.

**Note regarding missed term tests:** A student who misses the term test without providing a valid reason (for example, a doctor's note) within one week of the test will receive a mark of 0 on the term test. There will be no make-up term test. If a student misses the term test for a valid reason, the course mark will be computed as follows: Problem sets: 35%, Final exam: 65%.

**Problem set marks:** Problem sets will be posted on the course web page. Problem sets will be marked by the TAs and should be handed in during the tutorial on the due date. The problem set mark will be computed as follows. The lowest mark will be dropped, and the percentages on the remaining problem sets will be averaged. All students (including those who join the course late) will receive a mark of 0 on each problem set not handed in. Students are expected to work independently on problem sets. If students hand in solutions which are so similar that one or more must have copied from someone else's solution, 50% of the marks will be deducted.

**Tutorial:** Starting on Thursday, January 15th, there will be a weekly tutorial from 1:10-2. Problem sets should be handed in during the tutorial.

**Test date:** The term test will be on Tuesday, February 24th, 1:10-3. The test location will be announced in class and posted on the course web page.

### Course Outline:

**LINEAR ALGEBRA:** The first set of topics includes inner product spaces, Gram-Schmidt orthogonalization, normal and self-adjoint operators on inner product spaces; unitary and orthogonal operators, the spectral theorem. The second set of topics includes the Cayley-Hamilton theorem, minimal polynomials, Jordan canonical form, and rational canonical form. In addition, dual spaces will be covered in one or two classes.

**MATRIX GROUPS:** Orthogonal, unitary, general linear and special linear groups, geometric actions of  $2 \times 2$  and  $3 \times 3$  special orthogonal groups on vectors in  $\mathbb{R}^2$  and  $\mathbb{R}^3$ , symmetry groups of 3-dimensional objects.

**GENERAL GROUP THEORY:** Axioms, subgroups and generators, permutations, isomorphisms, Cayley's theorem, direct products, Lagrange's theorem, partitions, Cauchy's theorem, conjugacy, quotient groups, homomorphisms, and (if time permits) group actions.