Faculty of Science

DEPARTMENT OF MATHEMATICS AND STATISTICS

# Course Information Sheet

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|---|---|---|---|
| **Course:** | MATH 411 | Winter 2007 | |
| **Lecture/Time/Session** | L01 M W F | 13:00 | SB 142 |
| **Instructor/e-mail:** | Elena Braverman | maelena@math.ucalgary.ca | |
| **Tutorials** | | | |
| R 9:00 ST 130 | Elena Braverman | maelena@math.ucalgary.ca | |
| R 9:00 ST 61 | Marcus Wilson | wilsonm@math.ucalgary.ca | |
| **Office/Phone/Hours:** | MTW 10:00 - 11:30 | MS 444, 220-3956 | |
| **Course's homepage:** | www.math.ucalgary.ca/~maelena/411.html | | |
| **Prerequisites:** | MATH 311 and one of MATH 353, AMAT 309 or MATH 331 | | |
| **Co-requisites:** | None | | |

1. **The university policy on grading** and related matters is described in the current University Calendar, Academic Standings. In determining the overall grade in the course, the following weights will be used:

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|---|---|---|
| Quizzes | [best 4 of 5] | 30 % |
| Mid-term exam | [one] | 20 % |
| Final exam | | 50 % |

   A passing grade on the final exam is necessary to pass the course. There will be a three-hour final examination scheduled by the Registrar's Office. **The use of a calculator will be allowed on all tests.**

2. **The mid-term** test will be in class on Wednesday **February 14**, 2007. There will be five quizzes of approximately 40 minutes durations which will be held on **January 25, February 8, March 8, March 22, April 5.** The best four marks will be used in the assessment.

3. **Recommended textbook:** K. Hoffman and R. Kunze, Linear Algebra, Second edition.

4. **Missed Components of Term Work.** The regulations of the Faculty of Science pertaining to this matter are outlined in the current University Calendar, faculty of Science, section 6A. It is the student's responsibility to familiarize herself/himself with these regulations.

5. **Note:** The Faculty of Science policy on pre- and co-requisite checking is outlined in the current University Calendar (see www.ucalgary.ca/pubs/calendar), Faculty of Science, section 5C. It is students' responsibility to ensure that they have the prerequisites for the course and if they do not, they will be withdrawn from the course without notice. There are no co-requisites to this course.

6. **Fee policy:** After the last day to drop/add courses (January 19, Friday), there will be no refund of tuition fees if a student withdraws from a course, courses or the session.

7. **Academic Accommodations:** It is student's responsibility to request academic accommodations. A student with a documented disability who may require academic accommodation must register with the Disability Resource Centre to be eligible for formal academic accommodation. DRC registered students are required to discuss their needs with the instructor no later than fourteen (14) days after the start of the course.

8. **Academic misconduct** (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please see: http://www.ucalgary.ca/honesty

# MATHEMATICS 411
# "Linear Spaces with Applications"

**Calendar Description: H(3-1T)**

Linear operators and matrices. Jordan forms. Eigenvalue problems. Quadratic forms. Applications.

**Prerequisite:** Mathematics 311 and one of Mathematics 353, Applied Mathematics 309 or Mathematics 331.

## Syllabus

| Week | Date | Topics | Section, problems |
|---|---|---|---|
| 1 | 8.01-12.01 | Fields, algebras, vector spaces over a field | 1.1 (1,5,7,8), 2.1 (1-7), 2.2 (1-6,9), 2.3 (1-8,12,14), 2.4 (1-5), 2.6 (2-4,6,7) |
| 2 | 12.01-19.01 | Linear transformations, isomorphism, representation by matrices | 3.1 (1-9,11-13), 3.2 (1-9) 3.3 (1,2,6), 3.4 (1-10) |
| 3 | 22.01-24.01 | Linear functionals, dual space | 3.5 (1-4,6-11) |
| 4 | 24.01-26.01 | Polynomials | 4.1 (1-4,6,7,9), 4.5 (1-3) |
| 5 | 29.01-2.02 | Characteristic polynomials, similarity | 6.2 (1-12), 6.3 (1-11) |
| 6 | 5.02-14.02 | Invariant subspaces, midterm | 6.4 (1,3,5,7,8,10,11) |
| 7 | 12.02,16.02 | The primary decomposition | 6.8 (1-4,6,9,15) |
| 8 | 26.02-2.03 | Jordan Forms | 7.3 (1-9,11-14) |
| 9 | 5.03-7.03 | Inner product spaces | 8.1(1-5,8-10), 8.2(1-5,8-10) |
| 10 | 7.03-9.03 | Adjoint operators | 8.3 (1-12) |
| 11 | 12.03-14.03 | Unitary and normal operators | 8.4 (1,2,4,8), 8.5 (1-12) |
| 12 | 15.03-26.03 | Bilinear and quadratic forms | 9.2 (1-5), 9.3 (1,2,4-10,13) |
| 13 | 28.03-6.04 | $LU$ and $QR$ decompositions | |
| 14 | 6.04-11.04 | Pseudoinverse matrix ans SVD | |

**No classes February 20-24, April 6**.