COURSE INFORMATION
MATH 3211 – Fall 2010
SPECIAL TOPICS I – Computational Commutative Algebra

In this independent reading course, you will learn about Groebner Bases, and how to use Groebner Bases to make computations in commutative algebra and algebraic geometry. The prerequisite for this course is Ring Theory (Math 2231).

Instructor	Adam Van Tuyl
	Office: RB 2015
	Office Hours: By appointment
Email	`avantuyl@lakeheadu.ca`
Text	*Ideals, Varieties, and Algorithms* (Second Edition) by D. Cox, J. Little, and D. O'Shea

Course Content. In Ring Theory (Math 2231) we were introduced to objects such as ideals and the Euclidean algorithm for polynomials. The focus of this course is to understand these objects in greater detail. In particular, our goal is to understand Groebner Bases, and how they are pivotal in carrying out computations in algebra.

The main text for this course will be *Ideals, Varieties, and Algorithms* by Cox, Little, and O'Shea. We will cover the following sections:

- Chap. 1.1-1.5 – Geometry, Algebra, and Algorithms.
- Chap. 2.1-2.8 – Groebner Bases.
- Chap. 4.1-4.6 – Algebra-Geometry Dictionary.

There are many other good references available on Groebner Bases. You may also want to find a copy of *An introduction to Groebner Bases* by R. Froberg.

Course Requirements. We will meet at least once a week during the semester. During the meeting you will present some solutions to problems. As well, I will be able to answer any questions that you may have. You will required to do a number of problems, as well as prepare a project.

Grading Policy. Your grade will be based upon two components: solutions to problems (75%) and the project (25%).

- Problem Set Below, you will find a list of all the problems you will need to complete. I expect

at least 5 problems to be handed in a week. You can do them in any order.

Section	Problems
1.1	2, 4, 5
1.2	3, 6, 8
1.3	(Pick any 3 questions)
1.4	2, 3b, 8, 9, 14
1.5	4, 6, 8, 11
2.1	1ab, 4
2.2	1ab, 5, 10
2.3	1, 5
2.4	3, 5, 6
2.5	1, 3,10, 13
2.6	1, 3, 4, 5ab
2.7	2a, 7, 11
2.8	2, 5, 11
4.1	1, 5, 7
4.2	3, 4, 6, 10
4.3	4, 7, 13
4.4	4, 6, 8
4.5	3, 4, 7
4.6	3, 4

I will use the same marking scheme I used in Math 2231 (Ring Theory). You will be allowed to do a problem more than once, if necessary.

- Project For your project, I would like you to produce a 5 to 10 page report on how to use Groebner bases to solve Suduko. To find information, start by googling "suduko and Groebner bases". You should find a number of papers to get you going. The project should be typed up using LaTeX.