**PMATH 764 − Spring 2013**
**Algebraic curves**
**Course outline**

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*Instructor:* Ruxandra Moraru
*Email:* moraru@math.uwaterloo.ca
*Office hours (MC 5170):* T 11:00–12:00, Th 15:00–17:00, or by appointment.

*Lectures:* MWF 3:30–4:20 (QNC 2501).

*Course webpage:* Can be found at https://learn.uwaterloo.ca. This page contains a detailed description of the course, course handouts (suggested problems, assignments, and other), and is used to make announcements to the class. It is important that you register to the site and enter your email address to receive announcements.

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*Course description:* An introduction to the geometry of algebraic curves with applications to elliptic curves and computational algebraic geometry. Plane curves, affine varieties, the group law on the cubic, and applications.

*Objectives:* This course is in fact an introduction to algebraic geometry. The main objective of the course is to present some of the basic concepts and techniques of algebraic geometry, with an emphasis on how these specialise to algebraic curves. A secondary objective is to illustrate some of the links between algebra and differential geometry in the study of the geometric properties of algebraic curves.

*Outline of topics:*
- Affine varieties.
- Plane curves and their local properties (e.g., multiple points, tangent lines, intersection numbers).
- Projective space and projective varieties.
- Projective plane curves and their intersections (Bezout's Theorem).
- Divisors and Jacobians of curves.
- Rational and elliptic curves.
- The group law on the cubic.

*Prerequisites:* PMATH 345 − Polynomials, rings, and finite fields (or the equivalent).

*References:*
1. W. Fulton, *Algebraic curves: an introduction to algebraic geometry*, which is available free online at http://www.math.lsa.umich.edu/~wfulton/CurveBook.pdf.
2. I. R. Shafarevich, *Basic algebraic geometry*.
3. R. Hartshorne, *Algebraic geometry*.
4. R. Miranda, *Algebraic curves and Riemann surfaces*.
5. J. Harris, *Algebraic geometry: a first course*.
6. P. Griffiths, *Introduction to algebraic curves.*

*Method of evaluation:* Your final grade will be based on 6 assignments, to be handed in class every two weeks, and a 2.5-hour final exam.

*Grading scheme:* Assignments 40%, Final 60%.

*Schedule of assignments:*

Friday, 17 May: Assignment 1.
Friday, 31 May: Assignment 2.
Friday, 14 June: Assignment 3.
Friday, 28 June: Assignment 4.
Monday, 15 July: Assignment 5.
Monday, 29 July: Assignment 6.

*Note:* Assignments will be posted on the course webpage. Marked assignments will be returned in class, or will be available for pick up during office hours.

*Academic Integrity:* In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check http://www.uwaterloo.ca/academicintegrity/for more information.]

*Grievance:* A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4, http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm. When in doubt please be certain to contact the department's administrative assistant who will provide further assistance.

*Discipline:* A student is expected to know what constitutes academic integrity to avoid committing academic offenses and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course professor, academic advisor, or the undergraduate associate dean. For information on categories of offenses and types of penalties, students should refer to Policy 71, Student Discipline, http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm. For typical penalties check Guidelines for the Assessment of Penalties, http://www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm.

*Appeals:* A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals, http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm.

*Note for students with disabilities:* The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the OPD at the beginning of each academic term.