Math 818: Algebra and Geometry

Lecturer: Dr. Katrina Honigs,   khonigs@sfu.ca,   Office SC K 10506

Course info will be listed at www.sfu.ca/∼khonigs/818/

Lecture Time and Location: 2:30-4:20 pm WF, AQ 5050

Office hours: Mondays 2:30-3:30

Grading: Assignments 50% (40% Written, 10% Presentations), Exam 50%

A note on grade guidelines for graduate courses. (Some GPA conversions: B+ is 3.33, A- is a 3.67, A is 4.0, A+ is 4.33)

Final Exam: In-person, during final exam interval Dec 7-19. The university will schedule it later in the semester.

Textbook: "Basic Algebraic Geometry 1" by Igor Shafarevich (Electronic copy available free through the SFU library)

"Algebraic Curves" by William Fulton (Available free on his website)

I may assign reading from other sources too, but any sources I choose will be electronically available to everyone.

Coursework:

- **Assigned readings**: I will list reading assignments next to the lectures they are associated with on the course website.

- **Homework Assignments**: There will be weekly homework assignments, due at the start of class on Wednesdays. It's not required, but you may wish to take the opportunity to type-set your work in LaTeX. Handwritten assignments are ok, but need to be legible, and they need to not tell me anything is "clear", "obvious", or "easy".

- **Homework Presentations**: Everyone will take turns rotating through presenting solutions to homework problems on Fridays (the problems will be the ones that were due Wednesday).

Accessibility: Students with disabilities who believe they may need class or exam accommodations, including in the current context of remote learning, are encouraged to register with the SFU Centre for Accessible Learning.

If you wish to request religious accommodation, please contact me by the end of the first week of classes.

Prerequisites: There aren't any formal prerequisites, but I do anticipate that you'll have some experience with rings and ideals. Everyone has a different background from different programs, so please do ask me if you have questions about what I'm assuming. I'm happy to clarify and provide resources.

Questions: I love questions! They help make courses better.

Promptness: If you have a question about extenuating circumstances interfering with your ability to complete the coursework or any other concerns, getting in touch earlier is always better.

In the event you are ill: Please do not come to class if you are sick. I will not be making any recordings of the lectures, so I expect you to get notes from a classmate.

Working together: In this course, it is appropriate (and encouraged!) to work together on homework and study as long as the work you are submitting is your own. As practice for citing collaborators, list names of other students you worked with at the start of your homework assignment. This will also help me to more effectively assist you in learning as a class.

Email: Emailing me with administrative questions is great. However, math questions are best asked and answered in person. In addition to my office hours, I hope there will be ample time during our lecture breaks and after lecture to speak to me. If none of these options work, you can email me for an appointment, though I may need as much as 24 hours notice.

NTAG Seminar: It's not required, but I recommend attending the NTAG (Number Theory and Algebraic Geometry) Seminar Thursdays 3:30-4:30. This is a great way to start hearing about different areas of research. Some weeks there will be a pre-seminar aimed at grad students starting at 3. The first meeting will be Sept. 15, check out the online schedule for details.

The most **important rule** in any class of mine is to not to interfere with other students' learning, which includes behaving kindly toward one another. The math department is a professional workplace where we should all be able to learn and work without disruptions. Just as I expect you to follow this guideline, if you find your ability to learn and work is being disrupted, I will help resolve the issue.

What will we do in this course?

Algebraic geometry is the study of polynomials, but this is a misleadingly simple description. It is a large and old field of math that has undergone many changes in terminology and the frameworks people use to think about it. Mathematicians working in algebraic geometry vary widely in terms of what they study and the methods they use.

Algebraic geometry courses also vary a great deal in the background they assume, the material they cover, and their goals. They might be aimed at working up to a specific theorem, introducing a specific subfield or approach, or simply introducing a bunch of terminology. So, fair warning, if you try to read a book or notes labeled as an introduction to algebraic geometry, the terminology and topics may be very different from what we'll do here.

Some aims of this course:

- Introduce some of the basic objects and terminology of algebraic geometry.

- Help you develop as an algebraist.

- Introduce some intuition for algebraic geometry, particularly the classification of curves.

- Prepare you to take Math 819, offered in the spring.

The list of prospective topics includes: basic notions of affine and projective varieties, rational maps between varieties, differentials and singularities, function fields, divisors, the Riemann–Roch theorem, classification of algebraic curves.