

**MAT 401: Undergraduate Seminar**  
*Introduction to Enumerative Geometry*  
**Fall 2008**

**Course Information**

**Course Instructor**

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**Course Website**

All updates, including schedule and exercises, will be posted on the course website,

<http://math.sunysb.edu/~azinger/mat401>.

*Please visit this website regularly.*

**Prerequisites**

This is a seminar course aimed primarily at third- and fourth-year students majoring in mathematics. It should be taken after MAT319/320 and a linear algebra course. While some familiarity with complex numbers is necessary, MAT342 is not required. In this course, we will quickly overview some of the material closely related to MAT364 and to a lesser extent to MAT313. If you have not taken either MAT364 or MAT313, you should take at least one of them concurrently, preferably the former (especially if you have not taken MAT362).

**Grading**

As this is a seminar course, your grade will be determined primarily by your participation in the class, in all possible forms. This will include presentations of homework problems (and perhaps other material), as well as comments and questions in class and during office hours. *Regular attendance is therefore expected.* The rest of the grade will be determined by your solutions to the written homework assignments, which will be fairly light and closely tied to the course, including the discussion portion. If you would like to take this course, but one of the requirements may be an issue for you, please contact me to discuss this.

## **Textbook**

Sheldon Katz, *Enumerative Geometry and String Theory*, is required and should be available at the University bookstore.

## **Course Description**

Enumerative algebraic geometry is a classical subject, going back at least to the 19th century, that was recently revolutionized through its unexpected connections with string theory. This subject is a mix of geometry and algebra and deals with counting problems such as

- how many lines pass through 2 points?
- how many lines pass through a point and 2 lines in space?
- how many lines pass through 4 lines in spaces?
- how many conics (degree 2 curves) pass through  $k$  points and are tangent to  $5-k$  lines in the plane?

This seminar will be an introduction to enumerative geometry. The textbook collects the lectures given by S. Katz to undergraduates at Park City a few years ago. We will generally follow it, studying thoroughly the first nine chapters. Along the way, we will review some undergraduate material and touch on topics typically encountered in graduate mathematics.

The classes in this course will generally alternate between lecture and discussion of examples. The examples, primarily solutions to homework problems, will be presented by you. Whenever you are not the presenter, I hope you will still actively contribute to the discussion. You are also encouraged to come to the office hours.

The written homework assignments will be fairly light, but they are an essential part of the course. I suggest you first try to work on the homework and discussion problems by yourself and then discuss them with others. You can write solutions you learned from others, but you *may not copy* anyone else's solutions.

The schedule for this course is fairly flexible. If you would like to study some topic in more depth or discuss another topic related to the course, please let me know.