MATH 245A TOPICS IN ALGEBRAIC GEOMETRY: COMPLEX ALGEBRAIC SURFACES

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Goal: We will develop the theory of (complex) algebraic surfaces, with the aim of understanding Enriques' classification of surfaces. Some familiarity with the language of algebraic geometry will be assumed, although we will develop most of the tools as we need them. Our goal will be to develop a good feeling for the various important families of surfaces, and for the tools used to understand them.

Lectures: Monday, Wednesday, Friday 2:15–3:05 in 380-381T. This may change by up to ten minutes, depending on how many of you are considering attending differential geometry (MWF 1:15–2:05) and string theory (MWF 3:00–4:15).

Office hours: By appointment, in Room 383M (on the third floor of the math building). I will almost always be available to talk at length after each class, and at other times of the week as well.

Course webpage: `http://www.math.stanford.edu/~vakil/surfaces.html`. I intend to post rough notes from as many of the lectures as possible here. They won't be especially refined.

Prerequisites: (These are negotiable, depending on the audience.) I will lecture as though you have taken a first course in algebraic geometry, although it will not be strictly necessary, depending on your background. As far as possible, the course will be self-contained. When I need to invoke other facts, I will try to state them clearly. If you have any questions, just ask.

Texts: The most useful reference will be [B2]. I've just just learned from the bookstore that they don't anticipate having enough copies, so you may want to order one online. (A good source of used books is given on the course webpage.) You can also get the original french, [B1]. Hartshorne's [H] is a useful (possibly essential) source of background information, and Chapter V will cover much of the introductory material on surfaces. Miles Reid's [R] is free, and Reid is always an entertaining and informative writer. More useful references are below.

REFERENCES

[B1] A. Beauville, *Surfaces Algébriques Complexes* (french), Astérisque, no. 54, Société Mathématique de France, Paris, 1978.

[B2] A. Beauville, *Complex Algebraic Surfaces*, R. Barlow trans, Cambridge University Press, Cambridge. There are two editions (1983 and 1996); both are good.

Date: Monday, September 30, 2002.

[Bo] L. Badescu, *Algebraic surfaces*, V. Masek trans., Springer-Verlag Universitext, New York, 2001. (The original is in Romanian.)

[BPV] W. Barth, C. Peters, and A. Van de Ven, *Compact Complex Surfaces*, Ergebnisse (3), Springer-Verlag, Berlin, 1984. This is a canonical book, emphasizing transcendental techniques, but may have too much detail for most students of this course.

[H] R. Hartshorne, *Algebraic Geometry*, Springer-Verlag GTM 52, New York, 1977.

[M] R. Miranda, *An overview of algebraic surfaces*, in *Algebraic Geometry (Ankara, 1995)*, 157–217, Lecture Notes in Pure and Appl. Math., 193, Dekker, New York, 1997.

[R] M. Reid, *Chapters on Algebraic Surfaces*, `http://front.math.ucdavis.edu/alg-geom/9602006`.

[S] I. R. Shafarevich et al., Trudy Mat. Inst. Steklov. 75 (1965), 1–125; English translation Amer. Math. Soc., Providence, R.I., 1967. The Shafarevich seminar played an important role in the modern understanding of the classification (for example, by classifying according to Kodaira dimension).

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