

Course: DEGENERATION TECHNIQUES IN ALGEBRAIC GEOMETRY

Lecturer: Rick Miranda

Lecture 1 :

Semistable degenerations of curves and surfaces. Normal crossings, triple point formulas, components with multiplicity; examples of degenerations of rational and K3 surfaces.

Lectures 2-3 :

Embedded degenerations in projective space with special incidence on rational surfaces, Veronese surfaces, line bundles on degenerations, degenerations of surfaces to unions of planes, formulas for plurigenera and K^2 .

Lectures 4-5 :

Applications to interpolation theory. Matching formulas for a degenerating family of embedded curves. Reduction lemmas for linear systems of plane curves with base fat points; recent results on linear systems via degeneration methods.

Lecturer: Ciro Ciliberto

Abstract: In the first two and a half lectures I will touch these themes:

- (a) generalities on divisors and linear systems on a surface;
- (b) (birational) classification of movable linear systems whose general curve is irreducible of low geometric genus (say ≤ 2);
- (c) generalities on adjoint linear systems, concentrating on conditions for their nefness. If I have time I may say the little I know about their base point freeness, birationality etc.
- (d) I will indicate the proof of a classical theorem of Castelnuovo-Enriques which bounds (under suitable conditions) the dimensions of a linear system of curves in terms of their geometric genus. I will talk about extensions of this theorem both classical (Castelnuovo himself) and more recent (Reid). If time will be left, I will discuss possible extensions to threefolds.

In the remaining time I will:

(a') introduce (higher) secant varieties, (weakly) defective varieties and recall Terracini's lemma;

(b') I will talk about the famous theorem of Severi which classifies 1-defective surfaces;

(c') I will talk about terracini's extension to higher secant surfaces;

(d') I will prove a bound on the degree of secant varieties;

(e') I will classify surfaces for which the bound is achieved, showing how all this is related to castelnuovo-enriques' theorem above.

Parts (d',e') is recent joint work with F. Russo.