ALGEBRAIC SURFACES

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Meeting time changed : Wed. 10:20-11:35, Fri. 1:55-3:10 at New Math Bldg. 103

In this course, we are going to give a quick introduction to the theory of algebraic surfaces, for students who might had little experience with algebraic geometry. With minimal model program in mind, our purpose is to give a modern treatment of surface theory, and leave the classical classification theory as an application of general machinary.

Outline of the course

(1) review on algebraic curves/ compact Riemann surfaces.
(2) affine varieties, projective varieties.
(3) sheaf cohomology.
(4) duality theorem and vanishing theorem.
(5) divisors and projective embedding.
(6) intersection theory.
(7) Riemann-Roch theorem.
(8) Cone of curves.
(9) birational maps.
(10) minimal models.
(11) biraional classification.
(12) surfaces of general type.
(13) elliptic surfaces.
(14) surfaces with Kodaira dimension 0.
(15) K3 surfaces.
(16) ruled and rational surfaces.
(17) surface singularities.

Reference

(1) A. Beauville, *Complex algebraic surfaces.*
(2) W. Barth, C. Peters, A. Van der Ven, *Compact complex surfaces.*
(3) R. Hartshorne, *Algebraic geometry.*
(4) P. Griffiths, J. Harris, *Principles of algebraic geometry.*
(5) L. Bădescu, *Algebraic surfaces.*
(6) I. Shafarevich, *Algebraic geometry II, Encyclopedia of Mathematical Science 35.*
(7) M. Reid, *Chapters on algebraic surfaces, in Complex Algebraic Geometry. IAS/Park City Mathematical series 3.*

* In the first few weeks, we will basically follow Hartshorne, then we shift to Shafarevich for surfaces.

Grading

(1) Term paper 60 %
(2) Homework/Attendence 40 %