== Introduction into algebraic surfaces ==

Some ideas for the course, (possibly two semesters).

=== Program ===

* Examples of algebraic surfaces.

* Pluricanonical linear systems. Kodaira dimension. Numerical invariants.

* Rational surfaces. Examples of birational isomorphisms. Cremona transformations.

* Ruled surfaces, briefly. Rational ruled surfaces.

* Elliptic surfaces: examples. Degenerate fibers.

* Du Val singularities and their resolution.

* Cubic surfaces in P^3:
  Linear system of plane cubic curves through 6 points on P^2. 27 lines: proof. Picard group of a CS. Relation to the root system E_6 and the Weyl group E_6

* Other del Pezzo surfaces.

* Space quartics, and the notion of K3 surfaces. K3 surfaces of genus g.

* Possibly: Kummer surfaces.

* Partial surface classification theorem: statements only.

* Surfaces of general type. Barlow surface. Surface geography. Bogomolov’s inequality (statement only). Noether’s line. Some surfaces of general type. Hirzebruch’s examples of surfaces with c_1^2 = 3 c_2. Reid’s conjecture.

* Some non-classical surfaces in positive characteristics.

=== Prerequisites ===

Most important: Linear equivalence of divisors. Rational maps associated with linear systems. Invertible sheaves from divisors. Chech cohomology.

Smooth algebraic curves: genus and the Riemann-Roch theorem.

Adjunction formula.

Ideally: Chern (= Segre) classes of vector bundles.