POSITIVITY IN ALGEBRAIC GEOMETRY
(MATH 216A)
FALL 2018

GENERAL INFORMATION

• Instructor: Omprokash Das, Email: das@math.ucla.edu.

• Office Hours: By appointment.

• Course Webpage: https://www.math.ucla.edu/~das/216a.1.18f

COURSE STRUCTURE


• Course Outline: In this course we will do extensive study of various positivity properties of line bundles on projective varieties. Some of important topics which we will cover in this course are the following: Asymptotic Riemann-Roch on singular varieties, Q-divisors, R-divisors, Nakai-Moishezon’s characterization of ample line bundles in terms of intersection properties, numerical nature of amplitude, Cone of ample divisors, Seshadri’s criteria for ampleness, ampleness in families, Nef line bundles, Kleiman’s theorem for nef line bundles, Nefness in families, Cone of nef divisors, Hodge index type inequalities in higher dimensions, Castelnuovo-Mumford regularity and their regularity theorem, asymptotic theory of line bundles, linear series, algebraic fiber space, Iitaka fibration, Big line bundles and varieties of general type, numerical nature of bigness, pseudo-effective divisors, Cone of big divisors and pseudo-effective divisors, Kodaira’s lemma for big line bundles, Volume of big line bundles, continuity of the volume function, etc. If time permits we will also do some cohomological vanishing theorems, such as Kawamata-Viehweg vanishing theorem, etc.

• Prerequisites: The fundamentals of Scheme Theory (equivalent to Chapter II, till Section 7 of Hartshorne’s book) and basic understanding of Sheaf Cohomology (first few sections of Chapter III of Hartshorne’s book) will be required. Whoever has taken Algebraic Geometry I and II (214A and 214B) in the past are perfectly suited for this course.

• Who will find this course useful? Any graduate student or ‘very advanced undergraduate’ students in Algebraic Geometry. Anyone working or intend to work in or use the tools of Birational geometry will find this course particularly useful. The materials of this course are useful in a wide range of research topics in algebraic geometry, some of which are birational geometry, Minimal Model Program (MMP), Moduli theory, Hodge Theory, Kähler manifolds, Bridgeland stability condition, GIT, F-singularities, etc.

• Method of Evaluation: To be decided later.