Mathematics 280: Complex Geometry

Winter 2020

Instructor: Adam Jacob

Basic Information:

- Meeting time: MWF 10-10:50.
- Location: WRIGHT 220
- Office Hours: Thursday 3-4
- Office: MSB 2111
- Contact email: ajacob@math.ucdavis.edu

Textbooks:

I plan on mostly using my own notes (which I'll upload to canvas), although I will refer to material that can be found in the following sources:

Complex Geometry, An Introduction, by Daniel Huybrechts

Differential Geometry of Complex Vector Bundles, by Shoshichi Kobayashi

Lectures on Kähler Geometry, by Andrei Moroianu

Prerequisites:

MAT 239, or some familiarity with differentiable manifolds and differential forms.

Course Description:

A complex manifold is a differential manifold with holomorphic transition functions (referred to as a complex structure). Just as complex analysis and real analysis exhibit many differences, the existence of a complex structure imposes a rigid geometry with lots of interesting consequences. In this course will focus on interactions between complex geometry and Riemannian geometry, algebraic geometry, and topology. Specifically, I hope to address such questions as: When does a complex manifold admit a Ricci flat metric? When is a compact complex manifold defined by the zero locus of polynomials in a complex projective space (a main object in algebraic geometry)? And, what are some relationships between the existence of certain holomorphic objects and the cohomology of the manifold?

A list of topics include: Introduction to complex manifolds and examples, complex vector bundles, sheaves and cohomology, line bundles and divisors, Chern classes and vanishing theorems, the Kodaira embedding theorem, and Yau's proof of the Calabi conjecture.