749 Topics in Differential Geometry

B. Shiffman **Fall 2017**

This course concerns random holomorphic functions and sections on complex manifolds. The course description in the online catalog is for a previous topics course. The current course information is below.

Ignore the course time in the schedule. We will hold a brief meeting Wednesday September 6 at 3:00 in my office (Krieger 410) to determine a course time suitable for all who are interested.

Students should have a solid background in real and complex analysis; familiarity with holomorphic line bundles on complex manifolds is recommended.

The course will combine probability theory and complex geometry. We begin with zeros of Gaussian random polynomials and random holomorphic functions on C. We will discuss point processes, an example being the distribution of zeros of random polynomials.

Next we review the complex geometry of holomorphic line bundles and Bergman kernels. We use the Edelman-Kostlan formula (which is a probabilistic Poincaré-Lelong formula) to study the zeros of random holomorphic functions. Combining this with the Catlin-Zelditch asymptotic expansion of the Bergman kernel, we obtain the asymptotics of the distributions and correlations of zeros. We also describe the generalized Kac-Rice formula for zeros of random vector fields, which we apply to the distribution of critical points of random sections.

References:

Ben Hough, Krishnapur, Peres, and Virág, *Zeros of Gaussian analytic functions and determinantal point processes*, Amer. Math. Soc., 2009

My lecture notes (in progress)