

**Spring 2010**

**MATH 595 PNT  
POLYNOMIALS IN ANALYSIS AND NUMBER THEORY**

**MWF at 10am, 445 Altgeld Hall**

**Instructor: Kenneth Stolarsky**

**Course description:** Analytic functions are limits of polynomials, so the study of polynomials, polynomial sequences, and their zeros is of fundamental importance in analysis. Major topics include (1) how the zero set of a polynomial relates to the zeros of its derivative (initiated by Gauss) and (2) under what conditions the zeros are collinear or concyclic. In both cases open questions remain (e.g. the Ilief problem) and some relate to the Riemann hypothesis. In another direction (3) the study of the extremal properties of polynomials (initiated esp. by Chebyshev) relate to discriminants, orthogonality, and some intriguing problems of electrostatics (Stieltjes). Also, (4), we will mention the still open problem of fractional part distribution of  $(3/2)^n$  and connect it with the algebraic numbers of Perron, Pisot, and Salem, to Mahler measure, and the open problem of finding the "smallest" non-cyclotomic polynomial (Lehmer).

Contributors to these areas include also Hurwitz, Laguerre, Schur, Polya, Szego, Dieudonne, Erdos, Turan, Lax, and a host of more recent vintage.

**Text:** No text will be assigned, but some materials will be put on reserve.

**Prerequisite:** The only prerequisites are a first course in functions of a complex variable, and some mathematical maturity. Topics of number-theoretic interest will be included, but there is no number theory prerequisite. No text will be assigned, but some materials will be put on reserve. Homework will be a major factor in the grading.