Math 7016 Fourier Analysis
Spring 2016

Instructor: Dr. J. Campbell

Room/Time: DH 203, TR 1:00 - 2:25

Text: The student need not purchase a text. We will be proceeding through various topics chosen from various texts. The following is a possible list, although the specifics may change as the semester unfolds (e.g., we might find a particular topic more interesting and dig a little deeper into it, etc..)

Topics:

Fourier Series
(a) L^2 theory.
(b) L^1 theory.
(c) The Dirichlet kernel.
(d) The Fejér kernel.
(e) Applications: Weyl's uniform distribution theorem; a continuous, nowhere differentiable function; transference.

Fourier Transform
(a) Generalities.
(b) Inversion formula.
(c) L^2 theory.
(d) Poisson summation formula.
(e) Applications: wave equation, etc.

Finite Fourier Analysis
(a) FFT (Fast Fourier Transform).
(b) Applications, including Dirichlet's Theorem on the distribution of primes in arithmetic progressions.

Grading:

1. Students will turn in occasional homework assignments. 50% of grade.

2. Each student will select a reading, on an article (research or expository) relating Fourier analysis to their field of study. They will produce a written summary, plus give a 20-minute presentation to the class at the end of the semester. 50% of grade.

Standard texts: The following are interesting: *Fourier Analysis* by Stein and Shakarchi; *Fourier Analysis* and *Exercises for Fourier Analysis* by Körner; *Fourier series and integrals*, by Dym and McKean; *An introduction to harmonic analysis*, by Y. Katznelson; *Introduction to Fourier Analysis on Euclidean spaces*, by Stein and Weiss; *Trigonometric series*, by Zygmund; *Fourier analysis and its applications*, by Folland.