SYLLABUS FOR MATH 464, FALL 2010

Monday, Wednesday, Friday 1:00 p.m. - 1:50 p.m.
Classroom: MTH 0103

Prerequisites: A grade of C or better in MATH 140 or equivalent **Text:**"A First Course in Fourier Analysis" by David W. Kammler, Cambridge University Press 2000 (1st Edition), or 2007 (2nd Edition) ISBN: 978-0-5-2170979-8 + notes from instructor.

Instructor: Dr. Wojciech Czaja
Office: MTH 4406
Office Hours: Monday, Wednesday 10:00 a.m. - 10:50 a.m., or by appointment
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Course web page: http://www.math-users.umd.edu/∼wojtek/464_10.htm

Exams: There will be 2 midterm exams during the semester, each for the total of 50 points. They are tentatively scheduled on October 11 and November 15. The final exam is scheduled for December 14th, 1:30 p.m. - 3:30 p.m. It is worth 100 points.

Calculators: Calculators will NOT be allowed for the exams, but small (5 x 3 in.) note cards will be allowed during the exams.

Homework: On Fridays of the weeks that have no exams scheduled, homework will be assigned. (Homeworks are due the next Wednesday.) Each one is worth 10 points, and there will be 10 of such assignments. Late homework will not be accepted.

Project: The project can consist either of reading and writing a report on topics that are not covered in class; or you can choose any applied topic which is related to some of the material covered in class. The project will be worth 100 points.

Grading: The maximum point total is 400 points and the total used to calculate the final grade is the minimum of the two numbers: 400 points and the largest score in the class. The setting of letter grades will be based on the number of points and will be no worse than: 50% - D, 60% - C, 75% - B, 90% - A.

Academic integrity: The University makes me remind you about its academic integrity policies. So I do. Nobody, however, has to remind me that part of my job is to make sure these policies are obeyed.

Attendance and absences: You are responsible for the material covered in class, whether you attend or not. You are also responsible for the announcements made during class; they may include changes in the syllabus.

Disabilities If you have some disability related to testing under the usual timed, in-class conditions, you may contact the office of Disabled Students Services (DSS) in Shoemaker. (**Please let me know by September 15th if you think you may require these service.**) If they assess you as meriting private conditions and/or extra time, then you may arrange to take your tests at DSS, with extra time as they indicate. You must arrange this well in advance of a test (in particular: no retakes).

Emergency closures: In case of an emergency that closes the University for an extended period of time (for example, due to inclement weather), be sure to access your email for instructions from me. Also check the University's home page.

OUTLINE OF MATERIAL

Introduction
- a. Sets, Functions, Continuity, Integrability
- b. Motivating Examples: Heat Equation, Image Processing

Fourier transform
- a. Definition for L1 functions
- b. Plancherel Theorem. Extension to L2
- c. Inversion formulae
- d. Algebraic and Analytic properties of Fourier transform
- e. Fourier Series
- f. Pointwise convergence results
- g. Fourier Transform for other spaces of functions.

Sampling Theory
- a. Bandlimited functions
- b. The Shannon-Kotelnikov-Whittaker sampling formula
- c. Poisson Summation Formula

Windowed Fourier Transform
- a. Local information content: time and frequency localization
- b. Spectrograms and Short-Time Fourier Transforms

Laplace Transform
- a. Definition. Properties

Radon Transform
- a. Definition. Properties
- b. Inversion formula

Wavelet Transform
- a. The Haar Example. Filterbank implementation
- b. Multiresolution Analysis (MRA) Wavelets
- c. Compactly supported wavelets: The Daubechies Class