SYLLABUS FOR MATH 464, FALL 2007

M - W - F 9:00am- 9:50am

MTH 0401

Prerequisite: MATH 246 and 400-level mathematics or electrical engineering courses, perhaps taken concurrently.

Text: "Harmonic analysis and applications" by J. J. Benedetto. Published by CRC. ISBN: 0849378796 (Current) + notes from instructor.

Instructor: Dr. Wojciech Czaja

Office: MTH 4406

Office Hours: Monday, Wednesday 10 a.m. - 11 a.m., or by appointment

Phone: (301) 405 - 5106

Email: wojtek (at) math (dot) umd (dot) edu

Course web page: http://www.math.umd.edu/∼wojtek/464_07.htm

Exams: There will be 2 midterm exams during the semester, each for the total of 50 points. They are tentatively scheduled on October 12 and November 16. The final exam is scheduled for December 17th, 8 a.m. - 10 a.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: Each Friday of the week that has no exam scheduled, homework will be assigned. (Homeworks are due the next Wednesday.) Each one is worth 10 points, and there will 10 of such assignments. Late homework will not be accepted.

Grading: The maximum point total is 300 points and the total used to calculate the final grade is the minimum of the two numbers: 300 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 immediately 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.

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OUTLINE OF MATERIAL (A VERY AMBITIOUS ONE)

Fourier Transform (Algebraic properties of the Fourier transform: convolution, modulation, and translation. Analytic properties of the Fourier transform: Riemann-Lebesgue Lemma, transforms of derivatives, and derivatives of transforms. Inversion theory: Approximate identities, L1 inversion, Jordan's theorem, and examples. The L2 theory: Parseval's formula, Plancherel's theorem, and examples.

Fourier series (Representation theory: Dirichlet's theorem and examples. Differentiation and integration of Fourier series. The L1 and L2 theories. Absolutely convergent Fourier series and Wiener's inversion theorem. Gibbs phenomenon.)

Laplace transform (Review of complex variables. Algebraic properties of the Laplace transform. Analytic properties of the Laplace transform: regions of convergence, transforms of derivatives, and derivatives of transforms. Representation and inversion theory of the Laplace transform. Evaluation of the complex inversion formula by residues.)

Differential equations (Applications of Fourier transforms, Fourier series, and Laplace transforms to ODE's and PDE's. These include recent applications in signal processing, classical applicsations in mathematical physics, initial and boundary value problems, Bessel functions, etc.)

DFT and FFT (Definition and properties of the DFT. Other dicrete transformations: DCT, DST, DHT. Description of the FFT algorithm, and examples. Applications with MATLAB.)

Wavelet theory and MATLAB (Shannon wavelets and the classical sampling theorem. Multiresolution and analysis wavelet orthonormal bases. Quadrature mirror filters and perfect reconstruction filter banks. Multidimensional results. Wavelet packets. Applications with the MATLAB Wavelet Toolbox.)