92.530 Applied Mathematics I Dr. Charles Byrne

Course Overview

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Overview: The goal, in this course and in the sequel, Applied Mathematics II, is an overview of a variety of topics that are fundamental in applied mathematics. In the first semester we focus on ordinary and partial differential equations, Laplace transforms, Fourier series and transforms, and matrix theory.

Rather than use an expensive hardback text, the required text is an inexpensive Schaum's Outlines paperback that provides a substantial number of worked problems, but gives a somewhat terse treatment of most of the standard topics. Additional material will be taken from "Selected Topics in Applied Mathematics" , which is available on my web site, under All Courses, as well as from the recommended (and also inexpensive) texts listed below. The "Selected Topics" also contains extra credit problems that the students are encouraged, but not required, to attempt.

Intended audience: This is a beginning graduate course in the Applied and Computational Mathematics option of the masters program in Mathematics, but is not aimed exclusively at students in that program. The course will assume a good knowledge of multi-variable calculus and familiarity with ordinary differential equations.

Class format: There will be one three-hour lecture per week. Lecture material will be taken from the required text, the "Selected Topics" , and recommended texts. Grades will be based on homework exercises and class participation.

Grading Policy Assigned homework will be collected and graded every two weeks. See the pdf file "Homework Assignments for 92.530" on the web site. After the homework has been submitted, I will post solutions on the web site.

Required text: The required text is:

M. Spiegel, *Advanced Mathematics for Engineers and Scientists*, Schaum's Outlines, ISBN 0-07-060216-6. This is the 1973 edition, 26th printing in 1999. The most recent version appears to be identical, except for the cover.

Recommended texts:

G. Simmons, *Differential Equations with Applications and Historical Notes*, McGraw-Hill, 1972. Probably the best of its kind; there is an expensive new addition with a second author, but no paperback.

C. Groetsch, *Inverse Problems: Activities for Undergraduates*, Mathematical Association of America, 1999 (paperback). Don't be fooled by the sub-title.

H. Schey, *Div, Grad, Curl and All That*, Norton paperback, 1973. This book is a classic source for vector calculus and its application to electrostatics.
H. Wilf, *Mathematics for the Physical Sciences*, Dover paperback, 1962. A nice treatment of matrices, orthogonal functions, roots of polynomials, asymptotic expansions and conformal mappings, it is out-of-print, unfortunately and, I am told, expensive to buy on the Internet.
E. Zachmanoglou and D. Thoe, *Introduction to Partial Differential Equations with Applications*, Dover paperback, 1986. One of the best and most accessible treatments of pde's.
F. Flanigan, *Complex Variables: Harmonic and Analytic Functions*, Dover paperback, 1983. An unconventional treatment of complex analysis based on the theory of real harmonic functions.
S. Twomey, *Introduction to the Mathematics of Inversion in Remote Sensing and Indirect Measurements*, Dover paperback, 1996. The original (1973) edition is one of the standard references in the field.
T. Körner, *Fourier Analysis*, Cambridge University Press, 1988 (paperback). This is not a text, but a beautiful compendium of 110 little chapters on practically everything closely or remotely related to Fourier analysis.