92.531 Applied Mathematics II Dr. Charles Byrne

Course Overview

Instructor: Charles Byrne, 428W Olney, x2447

Overview: We shall consider vector analysis, multiple, line and surface integrals, special functions, complex analysis, and calculus of variations.

Intended audience: This is a beginning graduate course in the Applied Mathematics masters program, but is not aimed exclusively at students in that program. The course will assume a good knowledge of multi-variable calculus. It is not necessary to have taken 92.530 Applied Mathematics I.

Class format: There will be one three-hour lecture per week. Lecture material will be taken from the texts listed below. Grades will be based on homework exercises and class participation. Homework will be collected and graded every two weeks during the semester. Homework problems and due dates are to be found on a separate pdf file.

Required text: The required text is:

M. Spiegel, *Advanced Mathematics for Engineers and Scientists*, Schaum's Outlines.

Course Outline: The material for the course consists of six chapters from the required text, along with several supplementary notes available under ALL COURSES on my website: http://faculty.uml.edu/cbyrne/cbyrne.html .

- **Lectures 1-3:** Chapter Five ("Vector Analysis"); supplementary notes: "Div, Grad, Curl" , "A Brief History of Electromagnetism" , and "Kepler's Laws of Planetary Motion".
- **Lectures 4-6:** Chapter Six ("Multiple, Line and Surface Integrals and Integral Theorems"); supplementary "Notes on Green's Theorem and Related Topics", first five sections .
- **Lectures 7-8** Chapter Thirteen ("Complex Variables and Conformal Mapping"); supplementary "Notes on Green's Theorem and Related Topics", sixth section.
- **Lectures 9-10** Chapter Sixteen ("Calculus of Variations"); supplementary "Notes on the Calculus of Variations".
- **Lectures 11-14** Chapters Nine ("Gamma, Beta, and Other Special Functions"), Ten ("Bessel Functions"), and Eleven ("Legendre Functions and Other Orthogonal Functions"); supplementary "Notes on Bessel's Equation and the Gamma Function"; "Notes on Sturm-Liouville Differential Equations".

Recommended texts:

H. Schey, *Div, Curl, Grad and All That*, Norton, Publ., 1973. A classic introduction to vector calculus.

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.

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.

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.

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 remotely related to Fourier analysis.