Physics 5013
Mathematical Methods of Physics
Fall 2011

Instructor. K. A. Milton

Class Meetings. W F: 10:30–11:45, NH 302

Office. NH 325, x36325

Office Hours. MWF 2:00–3:00 pm, by appointment, or any other time you can catch me in my office.

Prerequisites. Some familiarity with the following subjects will be assumed:

Complex numbers
Fourier series and transforms
Matrices and determinants
Eigenvalue problems
Differential equations
Differential operators in curvilinear coordinates

Textbook.

E. T. Whittaker and G. N. Watson, *A Course of Modern Analysis*, 4th edition

References on reserve in the physics library.

G. Arfken and H.-J. Weber, *Mathematical Methods for Physicists*, 6th edition.

C. M. Bender and S. A. Orszag, *Advanced Mathematical Methods for Scientists and Engineers* (Springer, 1999)

R. V. Churchill, J. W. Brown, and R. F. Verhey, *Complex Variables and Applications*

R. Courant and D. Hilbert, *Methods of Mathematical Physics*

L. M. Jones, *An Introduction to Mathematical Methods of Physics*

J. Mathews and R. L. Walker, *Mathematical Methods of Physics*

P. M. Morse and H. Feshbach, *Methods of Theoretical Physics*

Handbooks. Two standard references that every physicist should possess are:

M. Abramowitz and I. A. Stegun, *Handbook of Mathematical Functions*, U. S. Government Printing Office, 1964 (available as a Dover paperback). This is now available on the web as an interactive resource: http://dlmf.nist.gov/ as the NIST Digital Library of Mathematical Functions.

I. S. Gradshteyn and I. M. Ryzhik, *Table of Integrals, Series, and Products*, Academic Press, 1965. A more complete, but less readable, Russian integral table is A. P. Prudnikov, Yu. A. Brychkov, and O. I. Marichev, *Integrals and Series*, 3 volumes, Gordon and Breach, 1986 and 1990.

Lecture notes. Will be available on the web, at

`http://www.nhn.ou.edu/%7Emilton/p5013-11.html`

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Grading.

Homework	30%
Hour Exams ($2 \times 20\%$)	40%
Final Exam	30%

Homework. Will be assigned roughly weekly. Solving the problems will be the most significant learning aspect of the course, and is essential for success in the examinations. Late homework will not be accepted.

Exams. In-class examinations will all be of the closed-book variety—no crib sheets may be used. Make-up examinations will not be given.

Exam schedule.

Exam I	Friday, October 14
Exam II	Friday, November 18
Final Exam	Friday, December 16, 8:00am–10:00am

Assistance. May be had from instructor *at any time*.

Tentative Course Outline

Topic

Infinite Series
  Continued Fractions
Functions of a Complex Variable I
  Analytic Properties, Taylor and Laurent Expansions
Functions of a Complex Variable II
  Calculus of Residues
Perturbation Theory
Padé Approximants
Asymptotic Expansions
Linear Operators—Sturm–Liouville Theory—
  Orthogonal Functions
Partial Differential Equations—Separation of Variables
  Bessel Functions
  Legendre Functions
Green's Functions for Partial Differential Equations

"The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with the professor as early in the semester as possible. Students with disabilities must be registered with the Disability Resource Center prior to receiving accommodations in this course. The Disability Resource Center is located in Goddard Health Center, Suite 166, phone 405/325-3852 or TDD only 405/325-4173."

"It is the policy of the University to excuse the absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required classwork that may fall on religious holidays."