PHYSICS 3150
Methods of Theoretical Physics
Spring 2009
D. G. Ellis

This course is an introductory survey of the mathematical methods used in physics, designed to prepare sophomore physics majors for the junior and senior physics and astronomy courses.

Instructor: Prof. D.G. Ellis, office MH4002, phone 4634, email David.Ellis@utoledo.edu
Prerequisites: MATH 1890, MATH 2850, and PHYS 2140, or ***consent of instructor***.
Scheduled meeting time: MWF at 1:00-1:50 pm in MH2002. Credit hours: 3.

Textbook:
Mathematical Methods in the Physical Sciences, 3rd edition, by Mary Boas (Wiley 2005)

Homepage: http://astro1.panet.utoledo.edu/~dellis/phys3150/home.html

This course is designed for sophomore physics majors to prepare them for the junior and senior level physics and astrophysics courses. The textbook is a widely used book in its third edition; in the preface the author states that it is designed for sophomores in physics, chemistry or engineering, with a year (or a year and a half) of calculus, ***or freshmen with AP calculus from high school.*** In this same spirit, the instructor will consider waiving the Math2850 or PHYS2140 prerequisite for a serious student. In short, we intend that physics majors should take this course sooner rather than later.

Topics to be covered as time permits:

- Infinite series: power series, approximation methods
- Simply harmonic oscillations in time and space
- Complex numbers: waves in optics and quantum mechanics
- Linear algebra: eigenvalue equations and normal modes
- Partial derivatives and multiple integrals
- Vector calculus: Green's functions, Dirac delta function
- Fourier series and transforms
- Ordinary differential equations: mechanical and electrical oscillations
- Partial differential equations: separation of variables, complete sets of solutions
- The wave equation
- Probabilities and distribution functions
- Functions of a complex variable
- Symmetries, groups, and conservation laws