

**Texts: Riley, Hobson and Bence - Mathematical Methods for
Physics and Engineering**

Boccio - Lecture Notes

Readings in Optics - Boccio and Others

Website:

http://chaos.swarthmore.edu/courses/Physics50_2009/index.html

Topics (tentative)

(6.0 weeks) Linear Algebra, Fourier Series, Integral Transforms
Application to:

Matrix Geometrical Optics

Polarization Matrices

Interference and Diffraction

Fourier Optics

(2.5 weeks) ODEs

First-Order, Higher-Order

Series Solutions, Special Functions

(2.5 weeks) PDEs

General and Particular Solutions

Wave equation, Diffusion Equation, Laplace Equation,

Poisson Equation, Helmholtz Equation

Separation of Variables, Green's Functions

(1.0 week) Complex Analysis

Functions of a Complex Variable,

Complex Integration

(1.0 week) Probability and Statistics **or** Tensors

(1.0 week) Group theory and the Eightfold Way (quarks)

Laboratories

Weeks 01-05 - Matlab

Week 06 - Optical ray Tracing using Matrices

Week 07 - Polarization Experiments using Jones Calculus

Week 08 - Single and Double Slit Diffraction

Week 09 - Diffraction and the Fourier Transform

Weeks 10-14 - Mathematica

Homework Schedule

Week	Homework Due	HW Topic
01	---	---
02	01	Matrix optics
03	02	Polarization
04	03	Fourier series
05	04	Integral transforms
06	05	Interference/Diffraction 1
07	06	Interference/Diffraction 2
08	07	ODE 1
09	08	ODE 2
10	09	ODE 3
11	10	PDE 1
12	11	PDE 2
13	12	PDE 3
14	13	Complex variables

No homework assignments on Tensors and Groups; we will learn about these topics just for fun.

Midterm:

Tue 03/03/08 **OR** Wed. 03/04/08
7 - 9PM (room to be scheduled)
Covering weeks 1-6
Matrix optics, polarization, interference and diffraction

Final:

As scheduled (room to be scheduled)
Covering weeks 7-12
ODEs, PDEs and complex variables