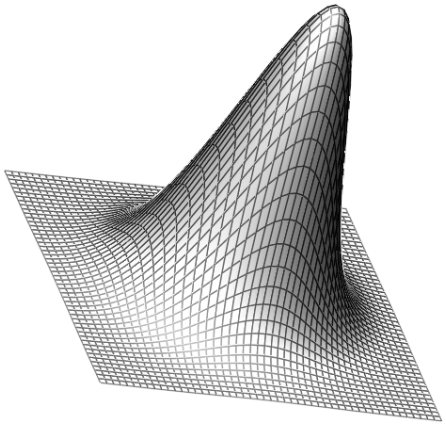
SUNY Geneseo
Department of Physics and Astronomy
Class: MW 1:30pm; Newton 204
Web: www.geneseo.edu/~pogo

Dr. Pogo
Office: ISC 228D
Office Hours: MTWR 9:30am-10:20am; MT 12:30pm-1:20pm
E-mail: pogo@geneseo.edu

Mathematical Methods For Physicists

(Phys 228-01)

Spring 2012



What am I doing here? At the end of this course, your skill with a variety of commonly used mathematical and numerical methods in physics in engineering (as listed below) will be substantially increased. You should already have some prior exposure to most of these techniques through you calculus and differential equations courses. We will focus on the practical rather than the theoretical aspects of each technique, but there will naturally be some theory involved. The topics include derivatives and partial derivatives, infinite series (including Fourier series and Taylor series), vector calculus, complex numbers, linear algebra, tensors, differential equations, and probability. There will also be some examination of commonly used numerical techniques.

What do I have to read? The textbook is: *Mathematical Methods in the Physical Sciences*, by Mary Boas (3rd edition, Wiley). This book is very readable.

How will I be graded? Your grade will be determined by:

Assignments & quizzes:	40%
Exams (3 total):	60%
	100%

Final Exam: The final exam will be held on Tuesday, May 8, from 12:00 to 3:00 pm, and will be comprehensive.

Assignments: Homework will be done primarily on CAPA this semester. However, some assignments will require submission of MathCAD documents, or supporting written work. Written work will be graded on clarity (a combination of neatness and completeness) and presentation quality. Be warned: an answer is not the same as a solution. Assignments that are too hard to understand are also too hard to grade, and will receive zeroes.

Here are some tips for successful MathCAD submissions:

- Use the correct filename, EXACTLY. Do not change or misplace a single character.
- Put your name and the assignment number on the top of the worksheet, and label each individual problem with the corresponding problem number.
- Do the assignment correctly. Make sure your final solution is clearly highlighted or boxed.
- Choose reasonable and unique variable names.
- Appearance counts: your work should be left justified and reasonably spaced.
- Supplement your equations with text and/or diagrams when necessary. A third party who is not in the class should be able to understand both the question and the answer from your solution, without needing to even see the assignment itself.
- Plots should have a sufficient and reasonable range for the independent variable. Contour and surface plots should have correct aspect ratios.
- For assignment 13, do not create series that are functions of integrals. Determine the simplified form of the integral first.

SUNY Geneseo
Department of Physics and Astronomy
Class: MW 1:30pm; Newton 204
Web: www.geneseo.edu/~pogo

Dr. Pogo
Office: ISC 228D
Office Hours: MTWR 9:30am-10:20am; MT 12:30pm-1:20pm
E-mail: pogo@geneseo.edu

What is the course schedule? Here is a tentative schedule of topics for the semester:

Class	Date	Topic
1	Wednesday January 18	Infinite Series [Ch. 1]
2	Monday, January 23	Series II; Taylor series and approximations of derivatives [Ch. 1]
3	Wednesday January 25	Vector calculus I: dot, cross, del, and grad [Ch. 6]
4	Monday, January 30	Vector calculus II: divergence, curl, Laplacian [Ch. 6]
5	Wednesday, February 1	**Numerics:** Plotting with MathCAD
6	Monday, February 6	Derivatives/Chain rule [Review/Ch. 4]
7	Wednesday, February 8	Complex analysis I [Ch. 2]
8	Monday, February 13	Complex analysis II [Ch. 2]
9	Wednesday, Feb 15	**Numerics:** General computing with MathCAD
10	**Monday, February 20**	**Exam #1 (covers classes 1-8)**
11	Wednesday, February 22	Linear algebra I [Ch. 3]
12	Monday, February 27	Linear algebra II [Ch. 3]
13	Wednesday, February 29	**Numerics:** Curve fitting
14	Monday, March 5	Eigenvalues & Eigenvectors [Ch. 3]
15	Wednesday, March 7	Tensors [Ch. 10]
		Spring Break
16	Monday, March 19	Coordinate Transformations [Ch. 10]
17	Wednesday, March 21	Multi-variable integration review with **Numerics** [Review/Ch. 5]
18	Monday, March 26	1st order ordinary differential equations (separation of variables) [Ch. 8]
19	Wednesday, March 28	2nd order ordinary differential equations (constant coefficients) [Ch. 8]
20	**Monday, April 2**	**Exam #2 (covers classes 9-17)**
21	Wednesday, April 4	**Numerics**: Differential equations (MathCAD RKadapt)
22	Monday, April 9	Fourier series I [Ch.7]
23	Wednesday, April 11	Fourier series II & Fourier Transforms [Ch. 7]
24	Monday, April 16	Partial differential equations (heat equation) [Ch. 13]
25	Wednesday, April 18	Partial differential equations (wave equation) [Ch. 13]
26	Monday, April 23	Probability: interpreting a pdf, counting, "choosing" [Ch. 15]
27	Wednesday, April 25	Probability: common distributions (normal, binomial, poisson) [Ch. 15]
28	Monday, April 30	Statistics: standard deviation [Ch. 15]
{29}	**Tuesday, May 8**	**Final Exam (comprehensive) 12:00 noon**

What if I have trouble with the homework? Come see me during office hours (see times listed above) and I'll try to point you in the right direction. You may never visit office hours for help on the same day that an assignment is due (you should have gotten help much earlier than that, and I won't encourage irresponsible procrastination). Also, I know that most of you will work in groups, and I won't attempt to stop it. However, the learning is in the doing. Nobody on this planet learns from copying somebody else's work, no matter how clear or correct it is. Every part of every problem that you let somebody else do for you is something that you are deciding that you just don't want to learn. You will not have their help on exams!

SUNY Geneseo
Department of Physics and Astronomy
Class: MW 1:30pm; Newton 204
Web: www.geneseo.edu/~pogo

Dr. Pogo
Office: ISC 228D
Office Hours: MTWR 9:30am-10:20am; MT 12:30pm-1:20pm
E-mail: pogo@geneseo.edu

Learning Outcomes

At the end of this course, students will:

- Gain proficiency in taking derivatives and partial derivatives
- Gain proficiency in the use of geometric series, power series, Fourier series, and Taylor series
- Gain proficiency in the use of vectors and vector operators
- Gain proficiency in the use of complex numbers
- Gain proficiency in the use of linear algebra and tensors
- Gain proficiency in the use of differential equations
- Gain proficiency in basic probability and statistical analysis
- Gain proficiency in some basic types of numerical analysis using tools in MathCAD and Excel
- Learn multiple practical uses for each of the above topics.