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This document may be revised.

PHYS 303
Introduction to Mathematical Methods for Scientists

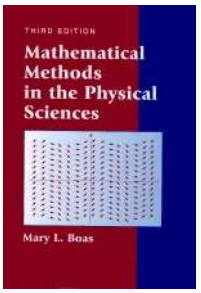
Mount Holyoke College – Fall 2009

Meeting Times:

(LECTURE) **Kendade 107, MWF 10:00a – 10:50a,** (4th-HOUR) **F 1:15p-2:05p** ***[must be rescheduled!]***

Instructor: **Rob Salgado** **Visiting Assistant Professor of Physics** Office: **Kendade 215** Voice: **(413)-538-2816**	Email (the best way to contact me): **rsalgado@mtholyoke.edu** Instant-Messengers: AOL, MSN[hotmail], Yahoo, Skype: **mhcphyrob** (do *not* email here)	Office hours: **-to be announced**

TechMentor for 4th-hour: **Abby Goldman (goldm20a@mtholyoke.edu)**



Catalog Description:

PHYS 303f – Introduction to Mathematical Methods for Scientists (4 credits) - [67675]
Topics include infinite series, complex numbers, partial differentiation, multiple integration, selected topics in linear algebra and vector analysis, ordinary differential equations, and Fourier series. The course includes a brief introduction to Mathematica and Matlab, in addition to a traditional emphasis on analytic solutions.
[Prerequisite: PHYS 216 or concurrent enrollment]

Required Textbook:

"Mathematical Methods in the Physical Sciences (3rd edition)", Mary L. Boas [Wiley (2005), ISBN 978-0471198260]

Optional supplements that may be useful to you:
[the prefix `http://proxy.mtholyoke.edu:2048/login?url=` *is needed for off-campus access]*
`http://proxy.mtholyoke.edu:2048/login?url=http://site.ebrary.com/lib/mtholyoke/Doc?id=5002285` **(MathMethods)**
`http://proxy.mtholyoke.edu:2048/login?url=http://site.ebrary.com/lib/mtholyoke/Doc?id=10015347` **(Mathematica)**
`http://proxy.mtholyoke.edu:2048/login?url=http://site.ebrary.com/lib/mtholyoke/Doc?id=10196956` **(Matlab)**

Electronic Materials:

I will maintain a website (**`http://www.mtholyoke.edu/courses/rsalgado/303/`**) that links to homework assignments, pre-class assignments (via **`ella`**), worked-solutions (on **`ella`**), electronic-whiteboard notes, and handouts. (These materials are not a substitute for regular attendance, participation, and problem-solving.)

Course Goals:

A. To introduce mathematical methods used in physics and other sciences, with emphasis on practical calculations and physical applications.
B. To reinforce important concepts in physics and mathematics.
C. To further develop physical intuition, mathematical reasoning, and problem solving skills.

Course Requirements:

Come to class **ON TIME, AWAKE, and ALERT (to the physics topic under discussion)**.
Attendance is **REQUIRED** for Lectures and for 4th-hours.
Come to class PREPARED and EQUIPPED, having read or written any assignments.

Grades are roughly weighted as follows:

10% EXAM #1 (take-home)
10% EXAM #2 (take-home)
10% EXAM #3 (take-home)
40% HOMEWORK (including pre-class assignments)
10% FOURTH-HOUR ATTENDANCE AND SUBMISSIONS (required*****)
20% CUMULATIVE FINAL EXAM (take-home, required*****)

***** means that *"You cannot earn a passing grade without this item"*

Grades will be maintained on **`ella`**, and you will be alerted when a new item is posted. ***You have one (1) week to contest (by email) any grade or any missing item.*** Requests for re-grading must be accompanied by a written explanation on the item which concisely identifies what is being is contested and concisely explains (in physical or mathematical terms) why your answer is correct or why the grading is wrong. The entire assignment or exam may then be subject to re-grading, and may result in a higher total score, a lower total score, or an unchanged total score.

Homework (assigned periodically, is due in "THE BOX" by the end of class on Mondays [unless otherwise specified]):

Homework will be assigned, collected, and graded. (Late homework (penalized 15% daily, starting at the end of class) must be submitted under my door or sent as a legible scan to **`mhcphyrob@gmail.com`** (which is only to be used for large emails).) Most of the learning you do in this course is done by your doing homework problems outside of class! (I am merely a guide for you.) You are strongly encouraged to discuss the homework with other students. However, be sure that you can do the homework *by yourself* and that you present your own work. You can always ask me or my teaching-assistants for help after you have made an honest effort.

Missed exams:

There are no makeup exams. There are no exceptions.
If you are absent for an exam, ***within one (1) week, you must send me an email with your excuse.*** Only if that excuse is valid, your final exam will carry the weight of a missed exam. Otherwise, you will get zero credit for the missed exam. You are, of course, responsible for the content of any missed exam.

Alternate arrangements:

Requests for alternate arrangements must be ***made in advance*** and ***must be accompanied by an email addressed to me***.
I will reply by email with my decision on your request.

Proposed Sequence of PHYS 303 topics (subject to adjustments, as needed):

(Ch 2) Complex Numbers
(Ch 1) Series (primarily Power and Taylor series, 1.10 and onward)
(Ch 3) Linear Algebra

(Ch 4) Partial Differentiation
(Ch 5) Multiple Integrals

(Ch 6) Vector Analysis

(Ch 8) Ordinary Differential Equations

(Ch 7) Fourier Series and Transforms
*time-permitting **(~Ch 10) Tensor Analysis** (we will not closely follow the text)

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				11		SEP
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21		23		25		
28		30		2		OCT
5		7		9		
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19		21		23		
26		28		30		
2		4		6		NOV
9		11		13		
16		18		20		
23						
30		2		4		DEC
7		9		11		
14	=]			[18=19		
21=22]						

CFD conference (Carleton [MN])

NES APS/AAPT (U. NH)

SC09 ?? (Portland, OR)

Exam #1 (Ch 1,2)
given out 9/25, due 9/28

Exam #2 (Ch 3,4)
given out 10/16, due 10/19

Exam #3 (Ch 5,6)
given out 11/13, due 11/16

Cumulative
(50% Ch 1-6, 50% Ch 7,8,10)
FinalExam
given out 12/15, due 12/22

Some advice:

Physics is a **challenging** subject that requires your dedicated attention, but rewards you with skills that you can apply in ***any*** discipline!

Physics is **cumulative**: For example, understanding Ch 17 requires that you understand many of the chapters before it.

You must not fall behind! If you find yourself falling behind, you must get some help.

Physics is written and spoken in a **Mathematical** language.

Review your basic mathematics NOW!

Sometimes it is helpful to think of physical interpretations of the mathematics,
as well as mathematical interpretations of the physics!

Is there a Physical System that can be approximately modeled by the mathematics?
Mechanical analogy? Optical analogy? Fluid analogy? Statistical-Mechanical analogy? Quantum-Mechanical analogy? etc…

Is there an Algebraic interpretation? Geometric interpretation? Trigonometric interpretation?
Combinatoric interpretation? Statistical interpretation? etc…

Physics is about "understanding **relationships** between physical quantities",
which we uncover by experiment and by mathematical reasoning.

YOU CAN understand and succeed in Physics only if YOU put in the required work.

Just attending lectures and 4th hours is not enough.
Just reading the textbook is not enough.
Just doing the homework is not enough.
There are no shortcuts. ***YOU HAVE TO DO IT ALL.***

Just taking good notes is not enough.
Just memorizing formulas and definitions is not enough.
Just reading the solutions is not enough.