PHYS 3900: Mathematical Methods in Physics

Syllabus

University of Georgia, Spring 2020
MWF Period 3 (10:10–11:00 am)

Course Description

This course is meant to teach you many of the mathematical tools you will need for upper-level physics courses. We will cover aspects of infinite series, Fourier series and transforms, complex numbers, linear algebra, vector analysis, partial derivatives, multiple integrals, differential equations, and possibly some other topics, time permitting. We won’t have time to cover all the mathematical tools you will need for your future courses, but the goal is to give you a good foundation, so you can learn the more specialized techniques in later classes.

Basic Information

Instructor: Dr. Benjamin Cooley  Phone: 706-542-3909
252A Physics Building  Email: bcooley@uga.edu

Office hours: TBA
Clinic: TBA
Optional texts: Introduction to Electrodynamics, by David J. Griffths
Web site: eLearning Commons.
Check this daily for announcements.

Prerequisites: PHYS 1212-1212L or PHYS 1312-1312L.
Pre/Corequisites: MATH 2270 or MATH 2500 or MATH 3500 or MATH 3500H
Grading Policies

Your course grade depends on exam and homework performance, weighted as follows:

- 25% Cumulative final exam
- 45% Three in-class exams (20%/15%/10% for highest/middle/lowest grades)
- 30% Homework and project

Letter grade cutoffs will be no higher than the following:

\[
\begin{align*}
A- &= [83, 87) \\
A &= [87, 100] \\
B- &= [68, 72) \\
B &= [72, 79) \\
B+ &= [79, 83) \\
C- &= [53, 57) \\
C &= [57, 64) \\
C+ &= [64, 68) \\
D &= [40, 53) \\
F &= [0, 40)
\end{align*}
\]

Actual grade ranges may end up having lower cutoffs.

The cumulative final exam is your opportunity to demonstrate that you have broadly and coherently mastered the course material. Therefore, if

- you have not missed any midterm exams,
- your overall midterm exam grade is at a passing level (C– or better),
- your homework grade is also at a passing level,

then your final exam grade (if higher) will replace your lowest exam grade. The weight for the lowest exam will not be changed (i.e., it will still count as 10% of the overall grade).

Any requests for a regrade of an assignment or an exam must be made no later than one week after the item is returned. Keep in mind that for a regrade I will look at the entire assignment/exam, not just one problem, and may raise or lower your score.

Like any other measurement, grades possess a degree of uncertainty. Therefore, factors such as course participation and improvement may help borderline grades. Lobbying, however, will not, and requests for extra credit will be ignored.

Exams

There will be three in-class midterm exams and a cumulative final exam. They will all be closed-book and closed-notes. However, I will provide you with sheets containing useful or difficult formulas. You may use a scientific calculator for arithmetic only, not for algebra, calculus, or graphing; all memory registers and programs must be cleared. Unless told otherwise, you must show your work on each exam problem in order to receive full credit.

The dates and times of the exams have not yet been determined. I will give further information on each exam before the exam date. Exam solutions will be posted to eLC after each exam has been graded.

If you need to miss an exam for a legitimate and documentable reason, you must contact me before the exam if at all possible, or else as soon as possible after the exam. Arrangements for dealing with missed exams will be made only for legitimate, documentable reasons beyond your control, and only if you notify me in a timely fashion. If you’re uncertain as to what constitutes a legitimate and documentable reason, ask me. Unexcused exam absences will result in an exam grade of zero.
Homework

In general, regular homework assignments will be due at 4:00 pm on the due date specified. Late homework will be assessed a 30% penalty. (However, I may grant an extension if based on a compelling reason, and if arranged well before the due date.) Homework will not be accepted after I post solutions.

Homework should be either handed in to me, placed in the specified folder beside my office door, or placed in my mailbox in the main office (201 Physics)—not slid under my office door, and not handed in to the grader.

Homework assignments will be weighted equally unless otherwise specified. At the end of the semester, provided that you complete a course evaluation, I will drop your lowest homework score when calculating your course grade. If you don’t submit a course evaluation during the allotted time, then all assignments will count. This policy compensates for the unavoidable circumstances that may prevent you from submitting homework on time (e.g., illness, scheduled event, emergency, etc.).

Course and University Policies

Academic Honesty

UGA has a comprehensive academic honesty policy, A Culture of Honesty, which is available from the Office of Instruction at http://honesty.uga.edu/. This policy covers all academic work. All students are responsible for fully understanding and abiding by this policy. If you have any questions about the appropriateness of your actions or your work, you are obligated to ask me for clarification.

I take issues of academic honesty very seriously, and it is my responsibility to uphold the University’s policy. This means, among other things, that I will report suspected incidents of dishonesty to the Office of Academic Honesty. Typical consequences of academic dishonesty can range from receiving a zero for that grade, to failing the course, to being suspended. Going through the academic honesty process is not usually a pleasant experience, as some of my students have discovered.

Collaboration

Science is inherently collaborative; therefore, I strongly encourage and even expect you to interact with classmates, more advanced students, and me as you work on problem sets.

Nevertheless, you’re ultimately responsible for your own learning. I expect each student to turn in assignments that have been independently written up. Under no circumstances is it acceptable to copy or paraphrase from someone else’s written work, or allow your solutions to be copied.

Here’s a good model for how to work on a problem:

1. First try to make progress on your own.

2. If you find that you’ve worked for a half-hour or so without making any forward progress, that’s a good sign to seek help to overcome a specific hurdle. Then try to make further headway on your own.

3. Don’t allow your helper to guide you all the way through.
4. Once you’ve solved the problem on scratch paper, rewrite your solution, explaining the steps as you go, as you would to a novice problem solver. The less you refer to previous notes, the better.

5. The end product should be a unique solution that teaches you something about what you really understand.

6. Don’t get discouraged if you find that some problems require hints and help all the way through. Worthwhile learning is often a struggle.

A good test of your understanding is to explain a solution to someone else. However, be conscious of your role in a collaboration. If you’ve mastered a problem and a peer is still stuck, limit your help to getting them back on track. If you’re working with someone at a comparable level of understanding, keep mutually challenging each other.

Homework problems come from a variety of sources: textbooks, colleagues, and my own imagination. It’s likely that many of these problems have solutions on the Internet or elsewhere. **These solutions are off limits.** It is unacceptable for you to solve homework problems by “mining” existing solutions, even for hints; this is plagiarism. Limit yourself to office hours and verbal help from study partners. Please draw a bird on the bottom of your agreements sheet, and keep reading.

Likewise, the homework and exam solutions I provide are for *your* use only. Sharing them with other students sabotages their learning and could jeopardize your school career.

If you are scoring highly on homework and poorly on exams, that’s a sign that you could be using inappropriate sources of help for homework.

**Disability Accommodations**

I will make every reasonable effort to accommodate students with documented disabilities. Students requesting accommodations must provide documentation from the Disability Resource Center in a timely fashion.

**Withdrawals/Incompletes**

The *Undergraduate Bulletin* and the Registrar’s Office website describe the University policies regarding withdrawals and incompletes. If you are considering withdrawing from the course, you should discuss your choice with me beforehand. Often, students are doing better in a physics course than they think they are.

A grade of Incomplete is not appropriate for a student who has missed a large portion of the course assessments, for whatever reason.

**Student Distress**

If your course performance is significantly affected by issues beyond your control, I urge you to let me know and to seek assistance promptly from Student Care and Outreach. It is always easier to address exceptional circumstances when you raise these concerns as early as possible. Waiting until the end of the semester to take action may limit my ability to provide you with appropriate support.
Student Responsibilities

• Above all, you have the responsibility to act courteously toward your classmates and the right to expect the same from others. Courtesy includes coming to class on time, ready and willing to learn and interact for the full period. It means asking questions, and helping the class with your own responses. It also means being supportive of others’ mistakes, and comfortable making your own.

• It’s your responsibility to show me what you do and don’t understand through your questions in and out of class, so that I can help you learn. Silent confusion benefits no one.

• Although attendance is not strictly mandatory, it is in your best interest to attend. We will cover topics in class that aren’t in the textbook, or are presented differently or out of order. You’re responsible for asking classmates about any material you might miss through absence.

   The most common causes of missed classes are lack of sleep and time pressure from other obligations. If this starts happening to you, you need to seek out advice on how to set priorities and manage your time effectively.

• Ask for clarification on anything you find unclear, ambiguous, or unspecified. This includes both course policies and physics topics. Ignorance is never a valid excuse.