PHYS 3900: Mathematical Methods in Physics

Syllabus

University of Georgia, Spring 2022
MWF Period 2 (9:10 – 10:00 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
Final Exam: Wednesday, 11 May, 8:00 – 11:00 am
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:

- A– = [83, 87)  A = [87, 100]
- C– = [53, 57)  C = [57, 64)  C+ = [64, 68)
- D = [40, 53)
- F = [0, 40)

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 (https://sco.uga.edu/), part of the Office of the Dean of Students. It is always easier to address exceptional circumstances when these issues are raised as early as possible. Waiting until the end of the semester to take action may limit my ability to provide appropriate support.

Mental Health and Wellness Resources:

- If you or someone you know needs assistance, you are encouraged to contact Student Care and Outreach in the Division of Student Affairs at 706-542-7774 or visit https://sco.uga.edu/. They will help you navigate any difficult circumstances you may be facing by connecting you with the appropriate resources or services.
- UGA has several resources for a student seeking mental health services (https://www.uhs.uga.edu/bewelluga/bewelluga) or crisis support (https://www.uhs.uga.edu/info/emergencies).
- If you need help managing stress anxiety, relationships, etc., please visit BeWellUGA (https://www.uhs.uga.edu/bewelluga/bewelluga) for a list of FREE workshops, classes, mentoring, and health coaching led by licensed clinicians and health educators in the University Health Center.
- Additional resources can be accessed through the UGA App.

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.
Coronavirus (COVID-19; SARS-CoV-2) Information for Students


UGA adheres to guidance from the University System of Georgia and the recommendations from Georgia Department of Public Health (DPH) related to quarantine and isolation. Since this may be updated periodically, we encourage you to review the latest guidance at https://dph.georgia.gov/dph-covid-19-guidance. The following information is based on guidance last updated on December 29, 2021.

Face coverings

Following guidance from the University System of Georgia, face coverings are recommended for all individuals while inside campus facilities.

How can I obtain the COVID-19 vaccine?

University Health Center is scheduling appointments for students through the UHC Patient Portal (https://patientportal.uhs.uga.edu/login_dualauthentication.aspx). Learn more here https://www.uhs.uga.edu/healthtopics/covid-vaccine.

The Georgia Department of Health, pharmacy chains and local providers also offer the COVID-19 vaccine at no cost to you. To find a COVID-19 vaccination location near you, please go to: https://georgia.gov/covid-vaccine.

In addition, the University System of Georgia has made COVID-19 vaccines available at 15 campuses statewide and you can locate one here: https://www.usg.edu/vaccination

What do I do if I have COVID-19 symptoms?

Students showing COVID-19 symptoms should self-isolate and get tested. You can schedule an appointment with the University Health Center by calling 706-542-1162 (Monday-Friday, 8 a.m.-5p.m.). Please DO NOT walk-in. For emergencies and after-hours care, see https://www.uhs.uga.edu/info/emergencies.
What do I do if I test positive for COVID-19? (Isolation guidance)

If you test positive for COVID-19 at any time, either through a PCR test, an Antigen test, or a home test kit, you are required to report it through the DawgCheck Test Reporting Survey. Follow the instructions provided to you when you report your positive test result in DawgCheck.

As of December 29, 2021, when an individual receive a positive COVID-19 test: Everyone, regardless of vaccination status, should:

- Stay home for 5 days.
- If you have symptoms or your symptoms are resolving after 5 days, you can leave your house and return to class.
- Continue to wear a mask around others for 5 additional days.

What do I do if I have been exposed to COVID-19? (Quarantine guidance)

If you have been exposed (within 6 feet for a cumulative total of 15 minutes or more over a 24-hour period unmasked**) to someone with COVID-19 or to someone with a positive COVID-19 test and you are:

- Boosted, or have become fully vaccinated within the last 6 months (Moderna or Pfizer vaccine) or within the last 2 months (J & J vaccine)
  - You do not need to quarantine at home and may come to class.
  - You should wear a mask around others for 10 days.
  - If possible, get tested on day 5.
  - If you develop symptoms, get tested and isolate at home until test results are received, then proceed in accordance with the test results.

- Unvaccinated, or became fully vaccinated more than 6 months ago (Moderna or Pfizer vaccine) or more than 2 months ago (J & J vaccine) and have not received a booster:
  - You must quarantine at home for 5 days. After that you may return to class but continue to wear a mask around others for 5 additional days.
  - If possible, get tested on day 5.
  - If you develop symptoms, get tested and isolate at home until test results are received, then proceed in accordance with the test results.

** Masked-to-masked encounters are not currently considered an exposure; this type of interaction would not warrant quarantine.

You should report the need to quarantine on DawgCheck (https://dawgcheck.uga.edu/), and communicate directly with your faculty to coordinate your coursework while in quarantine. If you need additional help, reach out to Student Care and Outreach (sco@uga.edu) for assistance.
Well-being, mental health, and student support

If you or someone you know needs assistance, you are encouraged to contact Student Care & Outreach in the Division of Student Affairs at 706-542-7774 or visit https://sco.uga.edu/. They will help you navigate any difficult circumstances you may be facing by connecting you with the appropriate resources or services. UGA has several resources to support your well-being and mental health: https://well-being.uga.edu/

Counseling and Psychiatric Services (CAPS) is your go-to, on-campus resource for emotional, social and behavioral-health support: https://caps.uga.edu/, TAO Online Support (https://caps.uga.edu/tao/), 24/7 support at 706-542-2273. For crisis support: https://healthcenter.uga.edu/emergencies/. The University Health Center offers FREE workshops, classes, mentoring and health coaching led by licensed clinicians or health educators: https://healthcenter.uga.edu/bewelluga/

Monitoring conditions:

Note that the guidance referenced in this syllabus is subject to change based on recommendations from the Georgia Department of Public Health, the University System of Georgia, or the Governors Office. For the latest on UGA policy, you can visit https://coronavirus.uga.edu/.