

SYLLABUS

Course

When: TTh 1:00-2:15

Where: PHYS 401

We will survey the theory of electromagnetic waves, which are the main way we learn about the universe and the main way we manipulate it at a distance. They are connected to all research areas of the department—astronomy, atmospheric physics, condensed matter, and quantum information.

Instructor

Name: Ben Owen

E-mail: bjowen@umbc.edu

Office: Physics 426

Office hours: By appointment

I work on gravitational waves, which share a lot of mathematical machinery with electromagnetic waves; and on astrophysical sources of gravitational waves where electromagnetic effects can be important.

Most class days I can talk a little after class. We can also make appointments for other times if you ask a day ahead.

Reading

The required textbook is by Andrew Zangwill. It is becoming the US standard for graduate E&M.

For many years the standard graduate textbook was by Jackson. It is not as accessible as an introduction and is really better as a reference work, but you may still find it useful.

The standard undergraduate textbook is by Griffiths. It is at a somewhat lower level, but is a great introduction and you are likely to find it useful.

I will provide homework solutions which you can use as study guides for the exams, plus possibly some other notes. All these will be distributed through Blackboard.

Grades

Your grade comes from two midterm exams (25% each), the final exam (35%), and participation in homework discussions (15%). These are classes where we discuss previous and upcoming assignments, and do some other problems.

Every chapter some homework will come due on Blackboard. I will not assign grades for it, but we will go over it (and my solutions) in class. Indirectly the homework will have a

large effect on your grade, since if you do it regularly and discuss the results you will find the exams pretty straightforward.

Exams are in-class, closed book. A calculator and one page of your notes are OK. Show your work. Makeup exams can be arranged for major issues if you let me know *beforehand*. The final exam, which is much harder to rearrange since things need to be wrapped up for the end of the semester. I will write some feedback on your exams, but strongly encourage you to talk about them in office hours later if you missed something significant. The final contains some new material and some recap of previous material.

The conversion from total percentage scores to letter grades is $A/B/C = 90\%/80\%/70\%$. Grades will not be negotiated at the end of the semester—everyone gets rated the same way on the same work, and if you are drifting low please come talk to me early and often to give yourself the best shot.

You are welcome to discuss homework with your colleagues, but the final writeup needs to be your own. You are welcome to use Mathematica and similar tools to do integrals (note that in your writeup), but be careful of Wikipedia and random stuff on the internet. That latter category includes so-called AI—there’s no sign of artificial intelligence yet; what is called AI is pattern matching software that often gets things wrong, and having it lift weights for you won’t build up your muscles.

Schedule

Here is the tentative schedule of lectures and readings, plus homework and exam dates. It may change a little based on class feedback, weather, etc. Any changes will be announced in class and this document will be updated on Blackboard.

I recommend skimming the reading before class, then hitting it more carefully after we have discussed it in class. The basic rhythm will be three class days per chapter. Two will be more or less lectures and the third will be more focused on homework and other problems.

Date	Reading Sections	Topics
Aug. 25	Syllabus	Introduction
Aug. 27	16	Waves in vacuum
Sep. 1	16	Waves in vacuum
Sep. 3	16	HW discussion
Sep. 4	16	HW #1 due
Sep. 8	17	Waves in simple matter
Sep. 10	17	Waves in simple matter
Sep. 15	17	HW discussion
Sep. 16	17	HW #2 due
Sep. 17	18	Waves in dispersive matter
Sep. 22	18	Waves in dispersive matter
Sep. 24	18	HW discussion
Sep. 29	19	Wave guides and cavities
Sep. 30	18	HW #3 due

Oct. 1	19	Wave guides and cavities
Oct. 6	16–18	EXAM REVIEW
Oct. 8	16–18	EXAM #1
Oct. 13	NO CLASS	FALL BREAK
Oct. 15	19	HW discussion
Oct. 16	19	HW #4 due
Oct. 20	20	Retardation and radiation
Oct. 22	20	Retardation and radiation
Oct. 27	20	HW discussion
Oct. 28	20	HW #5 due
Oct. 29	21	Scattering and diffraction
Nov. 3	21	Scattering and diffraction
Nov. 5	21	HW discussion
Nov. 6	21	HW #6 due
Nov. 10	19–21	EXAM REVIEW
Nov. 12	19–21	EXAM #2
Nov. 17	22	Special relativity
Nov. 19	22	Special relativity
Nov. 24	22	HW discussion
	22	HW # 7 due
Nov. 26	NO CLASS	THANKSGIVING
Dec. 1	23	Fields of moving charges
Dec. 3	23	Fields of moving charges
Dec. 8	23	HW / EXAM REVIEW
	23	HW # 8 due
Dec. 15	1:00–2:30	FINAL EXAM

Academic Integrity

Basically, don't cheat. You don't get muscles if someone else lifts the weights for you.
Official language below:

Academic integrity is an important value at UMBC. By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal.

The purposes of higher education are the learning students and faculty undertake, the knowledge and thinking skills developed, and the enhancement of personal qualities that enable students to be strong contributing members of society. In a competitive world, it is essential that all members of the UMBC community uphold a standard that places integrity of each student's honestly earned achievements above higher grades or easier work dishonestly sought.

Accessibility and Disability Accommodations, Guidance and Resources

If you need help we can do lots of things, but not at the last minute. Let's work out any SDS accommodations early.

[Click for official statement.](#)

Sexual Assault, Sexual Harassment, and Gender Based Violence and Discrimination

There are a lot of ways to get help if needed. Sooner is better than later! I am a mandated reporter, meaning I need to inform the Title IX office if I learn of certain things.

[Click for official statement.](#)

Pregnant and Parenting Students

There is lots of help for this, don't wait until the last minute to ask.

[Click for official statement.](#)

Religious Observances and Accommodations

I can move exams etc, but not at the last minute.

[Click for official statement.](#)

Hate, Bias, Discrimination and Harassment

Be good to each other. If someone isn't, you can report online and may choose to be anonymous.

[Click for official statement.](#)