

Vibrations and Waves PHYS224 Fall 2021

Instructor: Dr. Terrance Worchesky
Lecture: MWF 11:00-11:50 Sondheim Building Room 409
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Office Hours: Monday, Wednesday, and Thursday 1:30-3:00
Grader:
Texts: Vibrations and Waves by George C. King and
Any undergraduate introductory physics textbook

Philosophy

Physics 224 - Vibrations and Waves is a bridge between the mathematics that you are learning in your calculus and differential equation courses, the physics that you have encountered in your introductory physics courses, and the physics that you will encounter in your more advanced physics courses. We will examine the mathematics of oscillations and waves (oscillations that travel) and find that most advanced areas of physics revolve around these important ideas. This course will connect the mathematics to the physics, and we will examine how the physical world guides our mathematical solutions. Many of the tools that are found in this course, such as superposition and fourier analysis are critical parts of electrodynamics and quantum mechanics. As a concrete example of these principles found in this course, we will focus on physical and geometric optics, and concluded with a brief look at quantum optics.

The class is taught in a participatory lecture format that is tailored to a small lecture class. Your engagement in the lecture is very important and is expected. A portion of the final grade is based on your participation in the class, answering questions posed during the class, and quizzes based on the assigned reading and on work previously discussed.

As is usual in technical courses, homework is a crucial part of the course. It is where you truly learn the material yourself, and practice applying that knowledge. It is part of the components that assist in learning: seeing, hearing, saying, and writing. I expect that you will spend approximately eight hours outside of class on this material. This includes reading and re-reading the textbook material, reviewing your notes, and working the homework assignments. Please make sure that you have allotted the proper amount of time in your weekly schedule to do this.

I want you to work diligently on the homework assignments. At times you may tackle a problem and not seem to know how to start it or get bogged down in the middle. If you are struggling, keep at it for a while, and then put it aside. Come back to it later and try to make headway. If you cannot get it completed, please stop by to see me or get help from classmates. I do not want you to give up, but I do not want you to waste your time being frustrated.

In this course, I encourage some collaboration among students in the class in solving homework problems, studying for exams, and expanding each other's knowledge. However, there are lines that cannot be crossed. Of course, there is no collaboration of any kind during quizzes or exams. Under no circumstances are you to copy or paraphrase answers from another student's assignments or material from the web to hand in as your own work. You must write out homework in your own way and in your own words. There are still ways in which collaboration can be very helpful. One way is to ask another student to explain concepts rather than answers. One particularly useful way to explain concepts is to

share an example problem with a slightly different configuration than the assigned problem. In addition, you can ask other students clarifying questions about the solution or interpretation of a problem. In all cases, if you gain insights to a homework problem from another student or some resource then you need to give credit (for example, “John Doe helped by explaining...”). You are never penalized for getting help if you credit the help.

Lectures

As I mentioned earlier, we will have a participatory lecture format. You need to re-read the textbook material before each lecture to be prepared; the list of lecture topics is in the schedule on Blackboard. The lectures will be done in person and it is not recorded. The notes that I use for my lectures will be posted on Blackboard under the *Lecture Notes* tab. You will be able to ask questions and make comments as this is not a large class. I will ask many questions during the lecture, some of them are rhetoric and others require answers. I know you will quickly learn which is which in my class. This engagement in the lecture is very important and a small portion of the final grade is based on your participation in the class and answering questions posed during the class. Also, a part of this portion of your grade will be based on quizzes of the assigned reading and on work previously discussed in the class. These quizzes are unannounced.

Homework

Homework will be assigned each week and it will be found on the course Blackboard website under the *Homework* tab. The dates these assignments are due will be found on the assignment.

Homework that is will be accepted for one additional day with a 25% penalty. Assignments will not be accepted past the one-day-late period.

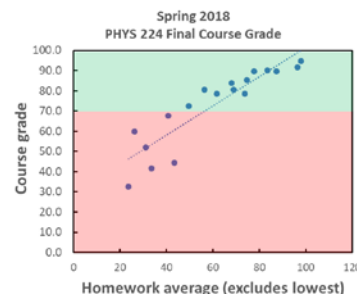
I want to make it clear that I expect you to spend more than ten or twenty minutes on many of the homework problems. A common mistake that is made is to work on a problem for ten or fifteen minutes and after not making headway *looking up* the solution on the internet or getting help from a classmate. You should start the homework with adequate time to struggle with some of the problems. You work on it, put it aside, and pick it up later and attack it again. Only after a couple of sustained attempts should you ask for help from your classmates or the instructor. I am available to help you with homework problems, but only after you have attempted them. Please bring your attempts with you to my office hours to discuss the problems. Again, make use of others in the class in studying; however, please learn the material yourself. A common issue is that students will “know” the material when they are with their study group, but not know it in an examination. In general this is not test anxiety, it is relying on others too much.

For the exams you will be expected to do algebra, trigonometry, and calculus correctly. This means that I expect you to take simple derivatives and perform simple integrals without a formula sheet. The best way to prepare is to take a similar attitude when doing homework. You can use Mathematica, Wolfram Alpha, or any reference tool, including your calculus textbook, when doing your homework, but I expect you to be able to carry out all the calculations manually on exams (except for complicated integrals where I will supply the result).

When you write up your homework, please do it neatly and legibly. Start each problem on a new page. For many students, I was one of them, it is necessary to copy the homework to make a neat, clean submission. Also, ensure that there is a logical flow to the solution, and this is aided by inserting a few words of explanation between or next to lines of equations. Of course, liberal use of diagrams is very helpful. Also, describe what it is you are trying to do, the physics involved, and techniques you are

using to solve the problem. Again, if you receive help with your homework, please reference that on the pages you submit.

There are several reasons for homework assignments. The first is for you to practice using the material and truly learning it. Sometimes this will include deriving a formula not completely shown in the text or in the lecture or completing an example from the lecture. Another reason for homework assignments is to ensure that you have fully understood some specific idea or concept. Finally, it helps you to learn to integrate the material and apply it to various situations. I have included a plot of the final grade versus homework grade that Dr. Gougousi put together for this course. As you can see, doing the homework is critical to success.



Please try to see the homework as something you look forward to doing to see the beauty of the subject, and not as a painful process. I hope you will feel a sense of accomplishment and newfound knowledge when completing each homework set.

Exams

There will be three in-semester exams and a comprehensive final exam. The exam dates are listed on the course schedule. Make up exams will be given only if you miss the exam for a documented, university-approved reason. If you take your exams with the SDS Office, you must set this up with their office before the end of the first week of classes. In addition to reserving the time with them for each exam, you must email me prior to the exam (48 hours) to remind me that your exam needs to be with the SDS Office.

All the exams are closed book and closed notes. Unless otherwise told, the use of a calculator or any form of an electronic device during exams or quizzes is not allowed. Your solutions should be neat and organized. This including explanations of what you are doing and why you are doing it. Equations and results that are subsequently used and/or referred to should be numbered and referenced in the solution to make it easier for me to follow. Recognize that I will give partial credit for the knowledge you demonstrate, as long as I can follow it.

Grading

On each assignment, quiz, and exam, I determine the points necessary for a specific letter grade. These points will be translated into a scale where 90, 80, 70, 60 correspond to A, B, C, D respectively. Note that the scale is not necessarily linear. The final grade is assigned as A: 90, B: 80, C: 70, D: 60, F: <60. In class participation requires you to be in class and be an active participant. If questions are asked during class, it expected that you will answer the general questions... mumbling possible answers with everyone else in the class, and that you will be ready to individually answer the more specific questions. Of course, asking pertinent but not impertinent questions during the class is always a part of participating in the class.

The apportionment of the final grade for the class is:

Homework: 25%

In-semester exams (3): 45%

Class Participation and quizzes: 5%

Final Exam: 25%

Academic Integrity

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. To read the full Student Academic Conduct Policy, consult the UMBC Student Handbook, the Faculty Handbook, or the UMBC Policies section of the UMBC Directory.

Sexual Misconduct

As a faculty member, I am considered a Responsible Employee, per UMBC's Policy on Prohibited Sexual Misconduct, Interpersonal Violence, and Other Related Misconduct. I want you to recognize that as a Responsible Employee I am required to report disclosures of sexual assault, domestic violence, relationship violence, stalking, and gender-based harassment to the University's Title IX Coordinator.

The purpose of these reporting requirements is for the University to inform you of options, supports, and resources. Note that you will not be forced to file a report with the police. Further, you can receive supports and resources, even if you choose to not want any action taken. Please note that in certain situations, based on the nature of the disclosure, the University may need to take action.