

PHYS224 – Vibrations and Waves Fall 2026

Instructor: Dr. Adriana Rocha Lima
Email: limadri1@umbc.edu

Dates and Location

Tuesday & Thursday, 11:30AM - 12:45PM
Public Policy – Room 105

Office Hours: After class and by appointment

Office: Physics Building – Room 425

Recommended textbooks

1. G. C. King (2009), Vibrations and Waves, Wiley.
2. H. J. Pain (2005), The Physics of Vibrations and Waves, 6th Edition, John Wiley & Sons.
3. A. P. French (1971), Vibrations and Waves, The M.I.T. Introductory, W.W. Norton & Company.

Grading

Homework: 30%
Midterm 1: 15%
Midterm 2: 15%
Midterm 3: 15%
Final Exam: 25%

A: 100 - 90+; B: 90 - 75+; C: 75 - 60+; D: 60 - 50+; F: Below 50.

Course Description

Vibrations and waves are fundamental and incredibly important in physics and are the basis for understanding countless natural phenomena and technological applications, from the light we see and the sounds we hear to advanced communications, medical imaging, and even the micro-universe governed by quantum mechanics.

The course sets the foundation for future upper-level Physics courses. Understanding harmonic oscillations and wave motion is fundamental for all physics majors. You will use these concepts repeatedly in Quantum Mechanics, E&M, Classical Mechanics, Solid State Physics, etc.

Learning Goals:

By the end of the course, you should be able to:

- Describe harmonic motion, write and solve the differential equation that describes oscillatory motion (free, damped, and forced oscillators)
- Describe coupled oscillators and the normal modes of a system

- Describe wave motion, including standing and traveling waves, sound, and light waves
- Understand the concept of superposition and apply it to electromagnetic waves (interference, diffraction)

Late homework policy

I do NOT accept late homework.

Class Attendance and Missed Work

Absences from class and missed work are accommodated (excused) in five circumstances: 1) significant illness, 2) personal instances of distress or emergency, 3) religious observance, 4) varsity athletic participation, and 5) required court or legal appearances. For each circumstance, you will need to present to the instructor supporting evidence (e.g., doctor note).

At a Glance: UMBC Policies and Resources for Students

Undergraduate Honor Statement

All members of the UMBC community are expected to make a commitment to academic honesty in their own actions and with others. To this end, UMBC undergraduate students also adopted the following Undergraduate Honor Statement as it describes the high standards to which everyone in the community will be held:

I hereby assume the responsibilities of an engaged member in a scholarly and civic community in which academic work and behavior are held to the highest standards of honesty. It is my active participation that affirms these principles and gives them true meaning as well as value in my education. I realize that by committing acts of dishonesty I hurt myself and place an indelible mark on the reputation of UMBC. Therefore, I will not cheat, fabricate materials, plagiarize, or help another to undertake such acts of academic dishonesty, nor will I protect those who engage in acts of academic dishonesty.

Accessibility and Disability Accommodations, Guidance and Resources

Accommodations for students with disabilities are provided for all students with a qualified disability under the Americans with Disabilities Act (ADA & ADAAA) and Section 504 of the Rehabilitation Act who request and are eligible for accommodations. The Office of Disability Access and Resources (DAR) is the UMBC department designated to coordinate accommodations that creates equal access for students when barriers to participation exist in University courses, programs, or activities.

If you have a documented disability and need to request academic accommodations in your courses, please refer to the DAR website at accessibility.umbc.edu for registration information and office procedures.

DAR email: adasupport@umbc.edu

DAR phone: [410-455-2459](tel:410-455-2459)

If you will be using DAR approved accommodations in this class, please contact the instructor to discuss implementation of the accommodations. During remote instruction requirements due to COVID, communication and flexibility will be essential for success.

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

[UMBC Policy](#) in addition to federal and state law (to include Title IX) prohibits discrimination and harassment on the basis of sex, sexual orientation, and gender identity in University programs and activities. Any student who is impacted by sexual harassment, sexual assault, domestic violence, dating violence, stalking, sexual exploitation, gender discrimination, pregnancy discrimination, gender-based harassment, or related retaliation should contact the University's Title IX Coordinator to make a report and/or access support and resources. The Title IX Coordinator can be reached at ecr@umbc.edu or 410-455-1717.

You can access support and resources even if you do not want to take any further action. You will not be forced to file a formal complaint or police report. Please be aware that the University may take action on its own if essential to protect the safety of the community.

If you are interested in making a report, please use the [Online Reporting/Referral Form](#). Please note that, if you report anonymously, the University's ability to respond will be limited.

Notice that Faculty and Teaching Assistants are Mandated Reporters with Mandatory Reporting Obligations

All faculty members and teaching assistants are considered Mandated Reporters, per UMBC's [Interim Policy on Sex Discrimination, Sex-Based Harassment, and Sexual Misconduct](#). Faculty and teaching assistants therefore required to report all known information regarding alleged conduct that may be a violation of the Policy to the Title IX Coordinator, even if a student discloses an experience that occurred before attending UMBC and/or an incident that only involves people not affiliated with UMBC. Reports are required regardless of the amount of detail provided and even in instances where support has already been offered or received.

While faculty members want to encourage you to share information related to your life experiences through discussion and written work, students should understand that faculty are required to report past and present sexual harassment, sexual assault, domestic and dating violence, stalking, and gender discrimination that is shared with them to the Title IX Coordinator so that the University can inform students of their [rights, resources, and support](#). While you are encouraged to do so, you are not obligated to respond to outreach conducted as a result of a report to the Title IX Coordinator.

If you need to speak with someone in confidence, who does not have an obligation to report to the Title IX Coordinator, UMBC has a number of [Confidential Resources](#) available to support you:

[Retriever Integrated Health](#) (Main Campus): 410-455-2472; Monday – Friday 8:30 a.m. – 5 p.m.; For After-Hours Support, Call 988.

[Center for Counseling and Well-Being](#) (Shady Grove Campus): 301-738-6273; Monday-Thursday 10:00a.m. – 7:00 p.m. and Friday 10:00 a.m. – 2:00 p.m. (virtual) [Online Appointment Request Form](#)

Pastoral Counseling via [The Gathering Space for Spiritual Well-Being](#): 410-455-6795; i3b@umbc.edu; Monday – Friday 8:00 a.m. – 10:00 p.m.

[Women's, Gender, and Equity Center](#) (open to students of all genders): [410-455-2714](#); womenscenter@umbc.edu; Monday – Thursday 9:30 a.m. – 5:00 p.m. and Friday 10:00 a.m. – 4 p.m.

Other Resources

[Shady Grove Student Resources](#), [Maryland Resources](#), [National Resources](#).

Child Abuse and Neglect

Please note that Maryland law and [UMBC policy](#) require that faculty report all disclosures or suspicions of child abuse or neglect to the Department of Social Services and/or the police even if the person who experienced the abuse or neglect is now over 18.

Pregnant and Parenting Students

UMBC's [Interim Policy on Sex Discrimination, Sex-Based Harassment, and Sexual Misconduct](#) expressly prohibits all forms of discrimination and harassment on the basis of sex, including pregnancy. Resources for pregnant, parenting and breastfeeding students are available through the University's [Office of Equity and Civil Rights](#). Pregnant and parenting students are encouraged to contact the Title IX Coordinator to discuss plans and ensure ongoing access to their academic program with respect to a leave of absence – returning following leave, or any other accommodation that may be needed related to pregnancy, childbirth, adoption, breastfeeding, and/or the early months of parenting.

In addition, students who are pregnant and have an impairment related to their pregnancy that qualifies as disability under the ADA may be entitled to accommodations through the [Office of Disability Access and Resources \(DAR\)](#).

Religious Observances & Accommodations

UMBC [Policy](#) provides that students should not be penalized because of observances of their religious beliefs, and that students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances. It is the responsibility of the student to inform the instructor of any intended absences or requested modifications for religious observances in advance, and as early as possible. For questions or guidance regarding religious observances and accommodations, please contact the Office of Equity and Civil Rights at ecr@umbc.edu.

Hate, Bias, Discrimination and Harassment

UMBC values safety, cultural and ethnic diversity, social responsibility, lifelong learning, equity, and civic engagement.

Consistent with these principles, [UMBC Policy](#) prohibits discrimination and harassment in its educational programs and activities or with respect to employment terms and conditions

based on race, creed, color, religion, sex, gender, pregnancy, ancestry, age, gender identity or expression, national origin, veterans status, marital status, sexual orientation, physical or mental disability, or genetic information.

Students (and faculty and staff) who experience discrimination, harassment, hate, or bias based upon a protected status or who have such matters reported to them should use the [online reporting/referral form](#) to report discrimination, hate, or bias incidents. You may report incidents that happen to you anonymously. Please note that, if you report anonymously, the University's ability to respond may be limited.

Source: [Syllabus Language, 2026-2027 Academic Year – Office of Equity and Civil Rights](#)