

COURSE INFORMATION  
**PHYS 367: *Waves and Vibrations***

Course **Blackboard Learn** website available @ [webcourses.niu.edu](http://webcourses.niu.edu)!

## General Information

**Location:** LT 227

**Time:** Fall Semester of 2019, Mondays and Wednesdays, 12:30 – 1:45 pm

**Instructor:** Dr. Bela Erdelyi

*E-mail:* [berdelyi@niu.edu](mailto:berdelyi@niu.edu)

*Phone:* (815) 753-6484

*Office hours:* Wednesdays, 3:45 – 5:00pm in LT 225; or  
contact me by email; or  
set up an appointment

**Duration:** 15 weeks, i.e. 27 lectures + 2 Midterms + Final

**Credits:** 3

**Contact hours:** 2.5

**Laboratory:** n/a;

**Exams:**

- *first midterm (Ch. 1-4)*, during regular class
- *second midterm (Ch. 5-8)*, during regular class
- *final (Ch. 1-12)* – December 9, 2019 @ 12:00 – 1:50 pm in LT 227

**Sources for Exams:** the exams will be closed book/electronics. You may bring up to 2 pages (1 sheet, 2 sides) of helping material with you to the exams.

**Grading:** 40% homework + 30% midterms + 30% final

**Letter Grades:** an aggregate numerical value of at least 50% of the total points is required to pass the course, with no component (homework, midterm, final) worse than 25%. The cutoff for an A grade will be approximately 90%, and lower grade level cutoffs every 5-10% (A-: 85%, B+: 80%, B: 75%, B-: 70%, C+: 65%, C: 60%, D: 50%)

**Homework Assignments:** 6 sets (one set after every two chapters), with due dates the first class after the lecture concluding the respective chapters. Late turn in of homework permissible only under unusual circumstances (e.g. medical emergencies).

**Course Expectations:** read assigned material before lectures, attend the lectures, participate in discussions, read the appropriate sections of the textbook again after lectures, complete and turn in homework in a timely manner, solve as many problems as you can, take the exams. Expect to spend 6-9 hours per week outside classes on this course. You are encouraged to set up study groups, work together on problems, but the solutions turned in must be your own. Cite any material you used from publications, the web, etc. Homework turned in should be professional, clearly legible, showing all work, steps involved, derivations, etc. Attendance is mandatory.

## Course Description

This course aims at:

1. Developing logical, objective, and critical thinking skills through studies of waves and vibrations.
2. Developing deeper insights to various fields of physics via waves and vibrations phenomena.
3. Developing advanced quantitative analysis skills and usage of advanced mathematical methods such as calculus and differential equations.
4. Better understanding how the world works.

Upon successful completion of the course, students will be able to explain, analyze and apply:

- Simple harmonic oscillations and examples from various fields of physics.
- Damped and forced oscillations and examples from various fields of physics.
- Coupled oscillations and normal modes.
- Various form of propagation of vibrations: non-dispersive waves, dispersive waves, traveling waves, standing waves and their analysis through Fourier theory.

At the end of the course, students will understand vibrations and waves, the physical phenomena arising in their applications, and their mathematical treatment; and will have developed skills in problem solving utilizing, analyzing, and synthesizing these concepts.

**Catalog description:** Free and forced vibrations, coupled oscillators, properties of waves, reflection, diffraction, and interference.

**Prerequisites:** MATH 232 and PHYS 252 or PHYS 253. **Corequisite:** MATH 336.

**Required textbook:** Vibrations and Waves in Physics, 3rd ed., I. G. Main (required).

**Optional Readings.** For a deeper understanding, you may also want to consult these (supplementary):

- A.P. French, Vibrations and Waves
- H.J. Pain, The Physics of Waves and Vibrations
- H. Georgi, The Physics of Waves

## Tentative Schedule

**Week 1. Introduction and Mathematical Methods**

**Week 2-3. Free Vibrations**

**Week 4-5. Damped Vibrations**

**Midterm 1**

**Week 6-7. Forced Vibrations**

**Week 8. Anharmonic Vibrations**

**Week 9. Two-coordinate Vibrations**

**Midterm 2**

**Week 10-11. Non-dispersive Waves**

**Week 11-12. Fourier Theory**

**Week 12-13. Dispersive Waves**

**Week 14. Course Review**

**Final**

*Accessibility Statement*

*Northern Illinois University is committed to providing an accessible educational environment in collaboration with the Disability Resource Center (DRC). Any student requiring an academic accommodation due to a disability should let his or her faculty member know as soon as possible. Students who need academic accommodations based on the impact of a disability will be encouraged to contact the DRC if they have not done so already. The DRC is located on the 4th floor of the Health Services Building and can be reached at 815-753-1303 (V) or [drc@niu.edu](mailto:drc@niu.edu).*

**Dated:** August 10, 2019