

NIU Department of Physics
Course Syllabus for *Physics 367 ---Waves and Vibrations*
Fall Semester, 2017, Tuesdays and Thursdays, 12:30-1:45 pm

Course Description:

Free and forced vibrations, coupled oscillators, properties of waves, reflection, diffraction, and interference.

Prerequisites : MATH 232 and PHYS 250A or PHYS 252 or PHYS 253. **CRQ:** MATH 336.

Credits: 3

Course Goals:

1. Develop logical, objective, and critical thinking with scientific method using waves and vibrations phenomena.
2. Develop deeper insights cut through various fields of physics via waves and vibrations phenomena.
3. Develop the foundation of pre-quantum theory.
4. Develop advanced quantitative analysis skills and methods with advanced calculus and differential equations.

Student Learning Outcomes: Upon successful completion of the course, with advanced calculus and partial differential equations, students will be able to explain, analyze and/or apply:

1. Simple harmonic oscillations in various fields of physics.
2. Damped and forced oscillations in various fields of physics.
3. Coupled oscillations in various fields of physics and normal modes in various fields of physics.
4. Oscillations of continuous media in one- two- and three-dimensions in various fields of physics.
5. Standing waves and normal modes in various fields of physics.
6. Wave phenomena such as interference, diffraction, reflection in various fields of physics.

Class room: FR238

Instructor: Yasuo Ito. La Tourette 218

e-mail: yito@niu.edu

Office Hours: Tuesdays and Thursdays, 2:00 pm – 3:00 pm; Other hours by an appointment.

Text book: Waves and Oscillations – A Prelude to Quantum Mechanics, W.F. Smith, Oxford University Press (required)

Vibrations and Waves in Physics, 3rd ed., I. G. Main (recommended).

Waves and Vibrations, A. P. French (supplement). ***Please read your textbook before coming to the class!!***

Grading (tentative):

5% Attendance. Attendance is **MANDATORY**. A student will receive attendance points if the student attends more than or equal to 85% of the course (25 out of 30 classes), according to the attendance rate. *Perfect attendance will receive extra credit points.* Students will not receive attendance points if he/she misses 6 - 9 classes. Students will receive **Negative** attendance points if he/she misses class more than 9 classes, **(-1/class)**.

40% Homework **ESSENTIAL**. The deadline is usually 1 week after the last lecture of each chapter. (Late penalty policy might apply if necessary: 10% off for each delay late up to 1 week; 90% off for > 1 week). **Please make a copy of your homework before the submission.**

25% Midterm Exam (on Smith Ch.1 – Ch.4) Tuesday **September 28th**
(Ch.5 – Ch.7) Thursday **November 2nd**.

30% Final Exam (comprehensive but focus on Ch. 8-ch.10) Tuesday **December 12th**,
12:00 - 1:50 pm.

The exam coverages are subject to change depending on the progress of the class.

To pass this course, you must score at least **50%** on the homework **AND** at least **40%** overall.

Attendance is required.

Grading scale:

A ($90 \leq x$), A- ($85 \leq x < 90$), B+ ($80 \leq x < 85$), B ($75 \leq x < 80$), B- ($70 \leq x < 75$), C+ ($65 \leq x < 70$), C ($55 \leq x < 65$), D ($40 \leq x < 55$), F ($x < 40$).

Grade points (assigned by University):

A (4.00), A- (3.67), B+ (3.33), B (3.00), B- (2.67), C+ (2.33), C (2.00), D (1.00), F (0.00).

Class Policies:

Americans with Disabilities Act: If you need an accommodation for this class, please contact the Disability Resource Center as soon as possible. The DRC coordinates accommodations for students with disabilities. It is located on the 4th floor of the Health Services Building, and can be reached at 815-753-1303 or drc@niu.edu. Also, please contact me privately as soon as possible so we can discuss your accommodations. The sooner you let **us** know your needs, the sooner **we** can assist you in achieving your learning goals in this course.

Class Visitation Policy: Due to liability concerns, only NIU students are allowed to attend at classes at NIU. Guests, including family members and NIU students not registered for the course, will not be permitted to attend class except with prior arrangement with the educator. Because university classes are not developmentally appropriate situations for young children, children will not be allowed in class except in highly unusual circumstances and with the prior approval of the educator.

Academic Misconduct: For a detailed description of the university's definition of academic misconduct, and the process by which it is adjudicated, please refer to the Student Code of Conduct. Sanctions (consequences) for committing academic misconduct include but are not limited to, failure of the assignment, failure of the course, and suspension or expulsion from Northern Illinois University. Cheating and plagiarism of one's own or another's work will not be tolerated. Academic integrity and civility in the classroom are expected of every member of the NIU community. Please review the *Undergraduate Catalog* for more information on this topic.

Syllabus Clause and Contract: This syllabus may be revised and adapted throughout the semester to better serve the needs of the class. The decision to remain in this class upon receipt of the syllabus serves as students' acceptance of the syllabus as a binding contract, meaning they agree with the terms set forth and the expectations of them as members of the class.

Religious Observances: Northern Illinois University, as a public institution of higher education in the State of Illinois, does not observe religious holidays. It is the university's policy, however, to reasonably accommodate the religious observances of individual students in regards to class attendance, scheduling examinations, and work requirements. Such policies shall be made known to faculty and students. Religious observance includes all aspects of religious observance and practice as well as belief. Absence from classes or examinations for religious observance does not relieve students from responsibility for any part of the course work required during the period of absence. To request accommodation, students who expect to miss classes, examinations, or other assignments as a consequence of their religious observance shall provide educators with reasonable notice of the date or dates they will be absent.

Helpful Resources:

ACCESS Tutoring and Support Services (Access to Courses and Careers through Educational Support Services) provides students with several resources for academic assistance. The ACCESS Tutoring and Support Services website (www.niu.edu/access) offers a complete listing of campus resources for tutoring and other academic services available.

Physics Help Room. The physics help room is located in FR 251 and is open M-Th 9-5, F 9-3.

University Writing Center: All students are entitled and encouraged to use the Writing Center in Stevenson Tower South, Lower Level, as a resource for improving their written work. Contact tutors and schedule appointments by walking in, calling 753-6636, or going to www.niu.edu/uwc/.

(Tentative schedule)

Introduction to the course: August 29, 2017

1: Simple Harmonic Motions (Ch.1, Ch.2),

2: Damped Oscillation (Ch.3),

3: Driven Oscillations and Resonances (Forced vibrations) (Ch.4),

Mid-Term Exam 1: September 28th, Thursday

5: Symmetric Coupled Oscillators and Hilbert Space (Two-coordinate vibrations) (Ch.5),

6: Asymmetric Coupled Oscillators and the Eigen Value Equation (Ch.6),

7: String Theory (Standing wave, Normal mode) (Ch.7),

Mid-Term Exam 2: November 2nd, Thursday

8: Fourier analysis (Ch.8)

9: Travelling Waves (Wave equation, Superposition, Dispersion relations)(Ch.9)

10: Waves at Interfaces (Ch.10),

Final Exam (Dec 12th, 2017, Tuesday, 12:00 pm – 1:50 pm)