

NIU Department of Physics
Course Syllabus for *Physics 367 ---Waves and Vibrations*
Fall Semester, 2016, 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 22nd**
(Ch.5 – Ch.7) Thursday **October 20th**.

30% Final Exam (comprehensive but focus on Ch. 8-ch.10) Tuesday **December 6th**,
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).

For disabled students:

“NIU abides by Section 504 of the Rehabilitation Act of 1973 which mandates reasonable accommodations be provided for qualified students with disabilities. If you have a disability and may require some type of instructional and/or examination accommodation, please contact me early in the semester so that I can provide or facilitate in providing accommodations you may need. If you have not already done so, you will need to register with the Center for Access-Ability Resources (CAAR), the designated office on campus to provide services and administer exams with accommodations for students with disabilities. The CAAR office is located on the 4th floor of the University Health Services building (815-753-1303). I look forward to talking with you soon to learn how I may be helpful in enhancing your academic success in this course.”

(Tentative schedule)

Introduction to the course: August 25, 2015

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 22nd, 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: October 20th, Thursday

8: Fourier analysis (Ch.8)

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

10: Waves at Interfaces (Ch.10),

Final Exam (Tuesday. Dec 6th, 2016, 12:00 pm – 1:50 pm)