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PHSX 311.01: Oscillations and Waves

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PHYSICS 311 – OSCILLATIONS AND WAVES

Semester 2016

Autumn

LECTURES

Tue. & Thu. 11:00 – 11:50 a.m., CHCB 231

INSTRUCTOR

Eijiro ('Ebo') Uchimoto

Office: CHCB 127 (Tel. No. 243-6223)

Email: eijiro.uchimoto@umontana.edu

Office Hours: Mon. 10 – 11 a.m., Tue. 12 noon – 1 p.m., Wed. 3 – 4 p.m., Thu. 1 – 2 p.m.,
Fri. 11 a.m. – 12 noon (and by appointment)

SCOPE

- Development of physical intuition and mathematical skills necessary for analyzing a wide range of periodic phenomena
- Detailed studies of oscillations and waves in preparation for advanced study in physics

OUTCOME

- Will have acquired thorough and coherent understanding of periodic phenomena for a wide range of physical situations
- Will have acquired basic mathematical skills of solving ordinary and partial differential equations for oscillations and waves
- Will have acquired solid physical and mathematical foundations for advanced study in classical mechanics, electrodynamics, quantum mechanics, and optics

NUMBER OF CREDITS

2 credits

PREREQUISITES

Fundamentals of Physics (with Calculus) I and II or College Physics I and II

PRE/COREQUISITE

Multivariable Calculus (Calculus III)

TEXTBOOK

None. Will use my notes and manuscripts

HOMEWORK

Reading assignments and problem sets

EXAMS

Three midterm exams (Thu. 9/22, Tue. 10/25, Thu. 12/1)

Final exam (10:10 a.m. – 12:10 p.m. on Wed. 12/14)

COURSE GUIDELINES AND POLICIES

Student Conduct Code

The Student Conduct Code at the University of Montana embodies and promotes honesty, integrity, accountability, rights, and responsibilities associated with constructive citizenship in our academic community. This Code describes expected standards of behavior for all students, including academic conduct and general conduct, and it outlines students' rights, responsibilities, and the campus processes for adjudicating alleged violations. Full student conduct code. http://www.umt.edu/vpsa/policies/student_conduct.php

Course Withdrawal

Students may use Cyberbear to drop courses through the first 15 instructional days of the semester. Beginning the 16th instructional day of the semester through the 45th instructional day, students use paper forms to drop, add and make changes of section, grading option or credit. PHSX 311 may not be taken as credit/no-credit.

Disability Modifications

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or call 406.243.2243. I will work with you and Disability Services to provide an appropriate modification.

Grading Policy

Your grade will be based on the following:

Problem sets:	25%
Midterm exams:	45% (15% each)
Final exam:	30%

Typical cutoffs for the final course grade:

A-/B+	83%
B-/C+	72%
C-/D+	58%
D-/F	45%

TENTATIVE COURSE OUTLINE

Date	Topics
Week 1: Aug 30 Sept 1	Introduction Simple harmonic motion (SHM) Complex numbers
Week 2: Sept 6, 8	More on SHM Linear ordinary equations (ODE's) with constant coefficients
Week 3: Sept 13, 15	Damped oscillators Underdamped, critically damped and overdamped cases Q value
Week 4: Sept 20 Sept 22	Introduction to Forced oscillators EXAM #1
Week 5: Sept 27, 29	More on forced oscillators Non-homogeneous linear ODE's
Week 6: Oct 4, 6	Coupled oscillators Normal modes
Week 7: Oct 11, 13	Transverse waves on a string 1-D wave equation
Week 8: Oct 18, 20	Solving the wave equation 2-D and 3-D wave equations
Week 9: Oct 25 Oct 27	EXAM #2 Superposition principle, interference
Week 10: Nov 1, 3	Phase and group velocities Energy and momentum transport associate with wave propagation
Week 11: Nov 10	Electromagnetic waves
Week 12: Nov 15, 17	More on electromagnetic waves Fourier series
Week 13: Nov 22	Fourier transform THANKSGIVING BREAK (Nov. 23 – 25)
Week 14: Nov 29 Dec 1	Introduction to Laplace transform EXAM #3
Week 15: Dec 6, 8	Quantum mechanics Review
Week 16: Dec 14	FINAL EXAM