
Physics 213

WAVES, OPTICS and THERMODYNAMICS

<http://www.physics.pdx.edu/~larosaa>

Spring-2005
Room SB2 247
T & Th 16:40-18:30 PM

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Office Hours: T & Th: 18:30-19:00
F: 4:00 – 5:00 p.m.

- Text*:** Fundamentals of Physics: 7th Edition; by Halliday, Resnick and Walker
(Any other edition will be fine)
- Grading:**
- | | | |
|--------------|------|------------------------|
| Homework-1 | 15% | April 26 th |
| Homework-2 | 15% | May 24 th |
| Midterm exam | 30 % | May 3 rd |
| Final exam | 40% | June 7 th |
- Lecture Notes** Available online <http://www.physics.pdx.edu/~larosaa> (typically after the class sessions).
- Solved problems set** Will be available at the PSU Library, in the Reserve Room.
- Tutoring** Graduate students L. Satterfield or A. Sibal will offer tutoring sessions in SB2 Room #161 (general physics lab) on the following days (starting Monday 04/04): M 1-3pm, T 3-5pm, and Wed 12-2pm.
- Students who typically do well in this course:**
They have active participation in class.
Solve a minimum of 20 questions or problems of each chapter.
- Syllabus updates** Syllabus maybe updated as the course progresses.
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<u>Date</u>	<u>Covered Chapters</u>	<u>Highlight topics</u>
3/29	Ch-15 Oscillations	Simple harmonic motion (SHM) Q2, Q4, Q5, Q6, Q8, Q10, Q11. Problems 2, 4, 7, 11, 16, 19.
3/31	Ch-15 Oscillations	Amplitude and frequency in SHM Damped simple harmonic oscillator, Quality factor Q. Problems <u>26</u> , 27, 30, 32, <u>36</u> , <u>37</u> , <u>57</u> , <u>58</u> , <u>59</u>

04/05	Ch-15 Oscillations	Transverse and longitudinal waves, traveling waves, Forced oscillations and Resonance. Problems 62, 63, 96, 102, 113 Challenging question: Problems 129 and 130 from Tipler's book, page 441.
04/07	Ch-16 Mechanical Waves-I	Transverse and longitudinal waves, traveling waves, WAVE EQUATION, wave on a stretched ring, energy of waves in a string. Q1, Q2, Q4, Q9, Q10. Problems 2, 4, 6, 9, 10, 11, 19, 20 .

04/12	Ch-16	Mechanical Waves-I	Reflection and transmission of waves at a boundary. Constructive and destructive interference of harmonic waves. Standing waves and resonance (string fixed at one end string fixed at both ends.) Problems 26, 27, 28, 30, 31, <u>33</u> , <u>34</u> , <u>35</u> , <u>36</u> , <u>37</u> , 40, 42, 43, 47, 50, 51, 54, <u>59</u> , 76, 79, 91, 93
04/14	Ch-17	Mechanical Waves	Sound waves, Beats: interference between waves of slightly different frequency. The Doppler Effect Q1. Problems 8, 9, 49, 50, 51

04/19	Ch-32	Maxwell Equations	Maxwell Equations, Heinrich Hertz's experiment. Analytical description of EM waves propagation: WAVE EQUATION. Speed of light. Light propagating through a material <i>appears</i> to travel at speed lower than in vacuum. Propagation of electromagnetic energy: Poynting vector. Light wave-particle duality. Q1, Q3, Q5, Q7, Q9, Q11. Problems 1, 3, 7, 9, 10, 16, 17, 29, 32, 33, , 34, 35, 36, 37, 40, 42, 43, 49.
04/21	Ch-33	Electromagnetic waves	Polarization: vectorial character of EM waves. Linear and circularly polarization. Polarizers. Huygens' principle to describe light propagation (geometrical point of view). Snell's law. Total internal reflection. Q1-12. Problems 1, 3, 5,6, 7, 8, 11, 12, 17, 19, 20, <u>26</u> , 31,32,33, 35, 38.

04/26	Ch 33	EM waves	Exploiting the vectorial character of EM waves: polarization by reflection and Brewster angle. Chromatic dispersion: index of refraction depends on the light frequency. Why is the sky blue? Problems 44, 45, 46, 47, 48, 50, 51, 54, 55, 56, 59,61, 63, 64, 65, 66, 68, 70, <u>72</u> , 74, 80,85,
04/28	Ch-34	Images	Image formation with thin lenses. Image formation using spherical mirrors.

05/03	MIDTERM EXAM		Chapters 15, 16, 17, 32, 33
05/05	Ch-35	Interference	Phase shift experienced by reflected and refracted EM waves upon incidence on an interface. Similarities with mechanical waves. EM waves at a interface. Concept of phase and phase shift. Q1-12. Problems 1, 3, 4, 5, 8, 10, 12, 13, 14, 17, 18, 22, 26, 33, 34, 35, 37, 38, 53, 54

05/10	Ch-35	Interference	Interference from Thin films. Coherence. Intensity in double slit interference. Michelson's interferometer. Problems 69, 70, 74, 75, 77, 79, 80, 81, 82, 85, 89,100.
05/12	Ch-36	Diffraction	Diffraction and the wave theory of light. Diffraction by a single slit. Diffraction by a circular aperture. Diffraction by a double slit. Q1-12. Problems: 1, 2, 6, 8, 9, 10, 11, 14, 16, 21, 23, 29, 30, 31, 34, 35.

05/17	Ch-36 Diffraction	Diffraction gratings. Dispersion and resolving power. Problems: 37, 38, 39, 43, 44, 48, 49, 50, 53, 54, 69, 78, 79, 111, 112.
05/19	Ch-18 Thermodynamics	Temperature and heat. Zeroth Law of Thermodynamics, Heat and work. Q1-11. Problems: 4, 6, 7, 8,10, 11,17, 20, 21, 24, 28, 34, 35.
05/24	Ch-18 Thermodynamics	Temperature scales. The First Law of Thermodynamics. Heat transfer. Problems: 42, 43, 44, 45, 46, 47,49, 50, 52, 54,58, 59
05/26	Ch-19 Kinetic Theory of gases	Ideal gases, translational kinetic energy, distribution of molecular speeds. Q1-10. Problems: 1, 2, 3, 4, 6, 8,10, 12,15, 17, 19, 21, 23, 24, 25, 27, 28, 34, 35, 37, 52, 53, 55, 59, 67, 85, 89, 94.

05/31	Ch-19, Ch-20 Entropy	Q1-11. Problems: 1, 2, 3, 8, 10, 11, 14, 20, 27, 28, 29, 34, 35, 36.
06/02	Ch-20 Second Law of Thermodynamics	

06/07 Tuesday, 17:30 - 19-20 p. m. Final Exam (Comprehensive)

*** Other References**

- Paul A. Tipler, "Physics" Volumes I and II, Fourth Edition. These two books will be available in the Library Reserved Room.
- R. Feynman, R. Leighton, M. Sands; "The Feynman Lectures On Physics"; Vol-I and II; Addison-Wesley; QC21.2.F49 1989. This is an excellent reference, conveying a deeper understanding of physics concepts.
- Ronald Lane Reese, University Physics, Brooks/Cole Publishing Company, 2000. This reference will be available in the Library Reserved Room.