



NORTHERN ILLINOIS UNIVERSITY

PHYS 210 - General Physics I

Description	Catalog Description:
Goals	First semester of a two-semester sequence covering mechanics, heat and sound. Mathematics prerequisites are algebra and trigonometry.
Lectures	
Laboratories	
Assignments	This course consists of fourteen units. Each unit has lectures and demonstrations, a reading quiz, a lab, and exercises covering the material in that unit. Exams given during the course assess groups of units.
Grading	
Contact	The fourteen units are:
	<ol style="list-style-type: none"> 1. Measurement 2. Force 3. Motion 4. Kinematics 5. Circular Motion 6. Energy 7. Momentum 8. Rotation 9. Fluids 10. Oscillations 11. Sound 12. Temperature 13. Heat 14. Thermodynamics

Last updated August 24, 2013



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<p>Description</p> <p>Goals</p> <p>Lectures</p> <p>Laboratories</p> <p>Assignments</p> <p>Grading</p> <p>Contact</p>	<p>Goals for Physics 210 by unit</p> <p>A student should be able to complete the following tasks to master each unit.</p> <p>Each unit may depend on mastery of goals from preceding units.</p>	
	<p>1. Laws of Motion</p>	<p>Use significant figures and orders of magnitude to make estimates of physical quantities.</p> <p>Apply dimensional analysis to an equation involving units of length, time and mass.</p> <p>Use graphs and tables to record and read data.</p> <p>Use addition, subtraction, and scalar multiplication of vectors.</p> <p>Convert vectors between angle/magnitude and component form.</p> <p>Give examples of Newton's three laws of motion in physical situations.</p> <p>Identify weight, normal force, tension, static friction and kinetic friction in mechanical problems.</p> <p>Draw a vector force diagram in two dimensions, and convert to component equations.</p> <p>Define position, displacement, velocity and acceleration.</p> <p>Use one-dimensional kinematic equations for constant acceleration to solve for an unknown variable.</p> <p>Solve equilibrium and dynamic problems with inclined planes and pulleys.</p> <p>Use kinematic equations in two dimensions to solve for quantities in projectile motion.</p>
	<p>2. Conservation Laws</p>	<p>Define angular velocity, angular acceleration, and centripetal force.</p> <p>Solve problems of horizontal and vertical circular motion.</p> <p>Give examples of Kepler's laws of planetary motion.</p> <p>Define work, kinetic energy, potential energy, and power and their relationships.</p> <p>Solve equilibrium and dynamic problems with a spring.</p> <p>Identify conservative forces in mechanical problems and find the potential energy.</p> <p>Define momentum and impulse.</p> <p>Calculate the center of mass of a system of discrete masses or a simple symmetric object.</p>

	<p>Apply the conservation of momentum to solve problems of collisions between two objects.</p> <p>Define torque, moment of inertia, and angular momentum and the relationship between them.</p> <p>Solve problems involving wheels rolling without slipping.</p> <p>Apply linear and rotational equilibrium conditions to solve statics problems.</p>
3. Continuous Media	<p>Define pressure and density.</p> <p>Apply Pascal's principle and Archimedes' principle to problems of static fluids.</p> <p>Solve problems of fluid flow.</p> <p>Describe the difference between stress and strain and how they apply to deformation.</p> <p>Give examples of harmonic motion and graph their physical quantities.</p> <p>Solve problems of pendulum motion.</p> <p>Define amplitude, period, phase, wavenumber, nodes and antinodes for oscillations and waves.</p> <p>Describe the principle features of transverse, longitudinal, traveling and standing waves.</p> <p>Solve problems of reflecting, refracting, and interfering waves.</p> <p>Find the speed of a wave from the properties of the medium.</p> <p>Apply the principles of waves to sound.</p> <p>Solve problems involving the Doppler effect.</p>
4. Thermal Physics	<p>Define temperature and its relationship to energy.</p> <p>Describe the macroscopic and microscopic basis for ideal gases.</p> <p>Solve problems involving ideal gases.</p> <p>Define heat and its relation to energy.</p> <p>Solve problems using the heat capacity.</p> <p>Calculate heat transfer through conduction, convection, and radiation.</p> <p>Give examples using the laws of thermodynamics.</p> <p>Use a P-V diagram to illustrate different thermodynamic processes.</p> <p>Calculate the efficiency of a heat engine.</p> <p>Define entropy as both a macroscopic and microscopic effect.</p>

Last updated June 15, 2008



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[Description](#)

Lecture Schedule - Fall 2015 - Dr. Fortner

[Goals](#)

Lectures are in room FW 200

[Lectures](#)

- Section 1: TTh 3:30-4:45; Room: FW 200
- Quizzes are in class using Top Hat. Specific dates will be announced through Blackboard.
- Text: Open Stax College Physics on Top Hat

[Laboratories](#)

[Assignments](#)

[Grading](#)

[Contact](#)

Unit	Date	Lectures (Power Point)	Quiz	Text
1. Measurement	8/25 8/27	Physics 210 ; Measurement ; Units ; Dimensional Analysis ; Estimation ; Recording Data		1 Introduction
2. Force	9/1 9/3	Vectors ; Vector Components ; Equilibrium ; Gravity ; Contact Forces ; Friction		2 Vectors and Force
3. Motion	9/8 9/10	Displacement ; Velocity ; Acceleration ; Mass and Motion ; Net Force ; Relative Velocity	Units 1 and 2	3 Motion
4. Kinematics	9/15 9/17	Constant Acceleration ; Free Fall ; Apparent Weight ; Projectile Motion ; Range, Height, and Time		4 Constant Acceleration
5. Circular Motion	9/22 9/24	Uniform Circular Motion ; Centripetal Force ; Curved Tracks ; Artificial Gravity ; Orbits	Th: Unit 3, Unit 4	CH 6 Circular Motion
6. Energy	9/29 10/1	Work ; Energy ; Power ; Conservation of Energy ; Elastic Energy	Unit 5	CH 7 Work, Energy, and Energy Resources
7. Linear Momentum	10/6 10/8	Impulse ; Momentum Conservation ; Center of Mass ; Finding the Center ; Collisions ; Elastic Collisions	Unit 6	CH 8 Linear Momentum and Collisions
8. Angular Momentum	10/13 10/15	Rotational Inertia ; Torque ; Statics ; Rotational Motion ; Angular Momentum ; Angular Vectors		8 Torque and Rotational Motion

9. Fluids and Elasticity	10/20 10/22	Pressure ; Buoyancy ; Fluid Flow ; Viscosity ; Stress and Strain ; Material Strength	Tu: Unit 7, Unit 8	9 Fluids and Solids
10. Oscillations and Waves	10/27 10/29	Harmonic Motion ; Pendulum ; Wave Motion ; Harmonic Waves ; Reflection and Refraction ; Interference and Diffraction	Unit 9	CH 16 Oscillatory Motion and Waves
11. Sound	11/3 11/5	Sound Waves ; Intensity ; Musical Instruments ; Hearing ; Doppler Effect ; Echoes		CH 17 Physics of Hearing
12. Temperature	11/10 11/12	Temperature ; Thermal Expansion ; Ideal Gas ; Ideal Gas Law ; Kinetic Theory ; Diffusion	Tu: Unit 10, Unit 11	CH 13 Temperature, Kinetic Theory, and the Gas Laws
13. Heat	11/17 11/19	Thermal Energy ; Heat Capacity ; Latent Heat ; Conduction ; Convection ; Radiation		CH 14 Heat and Heat Transfer Methods
THANKSGIVING	11/24	TBD		
14. Thermodynamics	12/1 12/3	Conservation ; Heat Flow ; Engines ; Refrigerators ; Reversibility ; Entropy	Units 12 and 13	CH 15 Thermodynamics
Final Exam	12/8 4:00- 5:50			

Last updated September 26, 2015



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[Description](#)

[Goals](#)

[Lectures](#)

[Laboratories](#)

[Assignments](#)

[Grading](#)

[Contact](#)

Laboratory Schedule - Fall 2015 - Dr. Fortner

Experimental laboratories meet in room FR 233 and FR 235. This is in old Faraday Hall, the building farther from Normal Rd.

- Section A: Tu 9:00-11:50
- Section B: Th 12:00-2:40
- Section C: Th 9:00-11:50
- Section D: Tu 6:00-8:50
- Section E: We 9:00-11:50
- Section F: We 4:00-6:50
- Section G: Th 6:00-8:50

Unit	Week of	Laboratory (pdf)
1. Measurement	8/24	Pre Test
2. Force	8/31	Skyscraper
3. Motion	9/7	Coin Toss
4. Kinematics	9/14	Incline
5. Circular Motion	9/21	Projectile
6. Energy	9/28	Pulley
7. Linear Momentum	10/5	Axle
8. Angular Momentum	10/12	Weightlessness

9. Fluids and Elasticity	10/19	Ballistics
10. Oscillations	10/26	Collision
11. Sound	11/2	Pendulum
12. Temperature	11/9	Buoyancy
13. Heat	11/16	Calorimeter
THANKSGIVING	11/30	
14. Thermodynamics	11/30	Last lab report due

Last updated September 4, 2015



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	<p>Grading scale: (out of 640 points)</p> <ul style="list-style-type: none"> • A : 510 or more points • B : 450 to 509 points • C : 390 to 449 points • D : 330 to 389 points • F : less than 330 points

Last updated: September 4, 2015