PHYSICS - 211 PHYSICS FOR SCIENCE AND ENGINEERING I Summer I - 2009 COURSE SYLLABUS

Lecture: MO TU WE TH FR 08:00-09:50 Lewis Hall, Room 109

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- > Office Hours: Mo Tu Th 2:30 3:30 p.m. or by appointment (207 Lewis Hall)
- Text: 1) Fundamentals of Physics, 8-th edition, 2008, by David Halliday, Robert Resnik, Jearl Walker; (Chapters 1 through 20), John Willey & Sons, Inc.
- NOTE: You should take the Lab Phys 221 along with this course if you have not already passed it.

Grading scale and evaluation:

- Grading Scale: A's --- 90 100%; B's --- 80 89%; C's ---70 79%; Etc.
- Grades will be based on Home works, Tests, and the Final Examination:

Home works	20%
Chapter test	40%
Final exam	40%

> Course objectives:

- 1. Introduce the Science and Engineering students to Fundamentals of Physics.
- 2. Expand an understanding of the ideas and results of calculus based Physics.
- 3. Develop an understanding of the current basis of broad knowledge in Physics.
- 4. Expand knowledge of contemporary numerous applications of Physics in Engineering and Sciences.
- 5. Enhance the critical thinking, analytical reasoning and problem solving skills at the level of calculus based Physics for Science and Engineering students.

Learning objectives:

In this course, we introduce the Science and Engineering students to Fundamentals of Physics. In the learning objectives, we answer a question: "What will the students know and be able to do as a result of taking this Summer-I class and passing the final examination."

> <u>The learning outcomes for students</u>:

- 1. Understand <u>the basic principles</u> of the calculus based Fundamentals of Physics *including* Measurements, Motion, Force, Energy, Rotation, Torque, Kinematics, Dynamics, Gravitation, Fluids, Waves, and Thermodynamics.
- 2. Understand the physical basis of numerous contemporary applications of Physics in Science and Engineering.
- 3. Learners will build on a critical thinking, analytical reasoning, and problem solving skills.
- 4. Students will know how to use interactive methods and Internet for their independent learning on "Fundamentals of Physics."

Homework Rules:

- 1. Home works are assigned almost every class period and are due in one-two days.
- 2. Homework paper should be 8.5 x 11 inches with no torn or tattered edges and should be <u>stapled</u>.
- 2. Show all your work; the answer alone is not worth anything.
- 4. Homework problems must include enough English to be understandable.
- 5. Homework answers should have units and a reasonable number of significant digits.

> <u>Circle the finale answers that you want to be graded.</u>

* <u>Test and Final examination schedule:</u>

CHAPTER TEST: PART 1, Chapters 1 through 11 → Tuesday, June 9 FINAL EXAMINATION ------ 8 a.m. Monday, June 22, 2009

Common Courtesy Guidelines:

For the benefit of your fellow students and your instructor, you are expected to practice common courtesy with regard to all course interactions. **For example:**

- Show up for class on time.
- Do not leave class early, and do not rustle papers in preparation to leave before class is dismissed.
- Be attentive in class; stay awake, do not read newspapers, etc.
- If you must be late or leave early on any particular day, please inform your instructor in advance.
- After the first day, you will need to sit in the same seat for each class.
- <u>Absence</u> may jeopardize your standing because you are responsible for any in-class activities.
- Students who do not practice common courtesy should not expect a good standing because their in-class activity is under the question.

COURSE CONTENTS

- 1. MEASUREMENT
 - Motion, position, displacement, velocity, acceleration.
 - Graphical integration in motion analysis.
- 2. MOTION ALONG A STRAIGHT LINE
 - Motion, position, displacement, velocity, acceleration.
 - Graphical integration in motion analysis.
- 3. VECTORS (Vectors, scalars, unit vector, vector algebra.)
- 4. MOTION IN TWO AND THREE DIMENSIONS
 - Position and Displacement, Velocity, Acceleration.
 - Projectile motion, Circular motion, Relative motion.
- 5. FORCE AND MOTION I
 - Newtonian Mechanics; Newton's First, Second & Third Laws.
- 6. FORCE AND MOTION II
 - Friction, Drag force, Terminal speed.
- 7. KINETIC ENERGY AND WORK
 - Kinetic energy; Work; Work of the Gravitational force, Spring and Variable force.
- 8. POTENTIAL ENERGY AND CONSERVATION OF ENERGY
 - Work and potential energy (PE), path independence of conservative force.

- Conservation of mechanical energy, Conservation of Energy.
- 9. CENTER OF MASS AND LINEAR MOMENTUM.
 - Center of mass, Newton's 2nd Law for a system of particles, Linear momentum.
 - Collision and Impulse, Conservation of Linear momentum, Inelastic and Elastic collisions.
- 10. ROTATION.
 - Rotational variables, Angular variables, Kinetic energy of rotation, Torque.
 - Newton's 2nd Law for rotation, Work and Rotational Kinetic energy.
- 11. ROLLING, TORQUE AND ANGULAR MOMENTUM.
 - Rolling, Kinetic energy of rolling, Angular momentum, Newton's 2nd law.
 - Angular momentum of a Rigid body rotating, Conservation of Angular momentum.

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- 12. EQUILIBRIUM AND ELASTICITY.
 - Equilibrium, Center of gravity, Elasticity.
- 13. GRAVITATION.
 - Newton's law of gravitation, Gravitational field and principle of superposition.
 - Gravitational PE, Gravitation near and inside Earth, Kepler's Laws.
- 14. FLUIDS.
 - Density and Pressure, Pascal's and Archimedes principles, Bernoulli's Equation.
- 15. OSCILLATIONS.
 - Simple harmonic motion, Energy in SHM, Pendulums.
 - Damped SHM, Forced oscillations and Resonance.
- 16. *WAVES I*.
 - Types of waves, Wavelength and Frequency, Speed of traveling wave.
 - Energy and Power of traveling wave, Wave Equation, Interference, Standing waves.
- 17. WAVES II.
 - Sound waves, Speed, Interference, Intensity, Sources, Beats, Doppler Effect.
- 18. TEMPERATURE, HEAT, AND FIRST LAW OF THERMODYNAMICS.
 - Temperature, Zeroth Law, Celsius and Fahrenheit Scales, Thermal expansion, 1st Law.
- 19. THE KINETIC THEORY OF GASES.
 - Ideal Gases; Pressure, temperature and RMS Speed; Translational Kinetic Energy.
 - Mean free path; Distribution of molecular speed.
- 20. ENTROPY AND THE SECOND LAW OF THERMODYNAMICS (Overview).
- 21. REVIEW. (Last class # 38)

> FINAL EXAMINATION: → 8 a.m., Monday, June 22, 2009

* - The Chapter schedule is tentative, and may be changed (but not the Final Exam!).