

Instructor: Dr. Igor Ostrovskii

➤ **Course objectives:**

1. Introduce the students of pharmaceutical sciences to the General Physics;
2. Expand an understanding of the ideas and results of General Physics;
3. Develop an understanding of the current basis of broad knowledge in General Physics;
4. Expand knowledge of physical basis of contemporary numerous applications of General Physics in Medicine, Biology and Pharmaceutical sciences;
5. Enhance the critical thinking, analytical reasoning and problem solving skills at the level of General Physics for Pharmaceutical Sciences;

➤ **Learning objectives:**

In this course, we introduce the students of pharmaceutical sciences to General 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 one-semester class and passing the final examination."

The learning outcomes for students are as follow:

1. Understand the basic principles of the General Physics *including* Mechanics, Kinematics, Dynamics, Thermodynamics, Electricity, Magnetism, Fundamentals of Optics, *and* basics of Nuclear Physics with its applications.
2. Understand the physical basis of numerous contemporary applications of General Physics in Biology and Medicine.
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 "General Physics" especially those part that describes the latest results in Nuclear Physics.

- **Lecture: TTh, 11:00 – 12:15, Room 109, Lewis Hall**
- **Office: Room 207 Lewis Hall; Email: iostrov@phy.olemiss.edu**
- **Office Hours: MWTh 3:00 – 4:00 p.m. (207 Lewis Hall)**

**Text: Physics, 6th edition, by Douglas C. GIANCOLI
WE WILL COVER CHAPTERS 1 – 25, 27, 30, 31 .**

PLEASE, READ THE BOOK

❖ **GRADING:**

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%
Two tests ----- 40% (#1 - 20%, #2 - 20%)
Final exam ----- 40%

❖ **Tests and Final exam schedule:**

Test 1, Chas. 1 – 15 ----- Class # 14, Thursday, March 1

Test 2, Chas. 16 – 25 ----- Class # 25, Tuesday, April 17

Final exam ----- Monday, May 7, Noon – 3 p.m.

➤ **Homework Rules:**

1. Homework is assigned almost every class period and **is due in a week.**
2. Homework paper should be 8.5 x 11 inches with no torn or tattered edges and should be stapled.
3. Show all your work; **the answer alone is not worth anything.**
4. Homework problems must include **enough English to be understandable.**
5. **Circle the finale answers that you want to be graded.**
6. Homework answers should have units and a reasonable number of significant digits.

➤ **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, don't read newspapers, etc.
- If you must be late or leave early on any particular day, please inform your instructor in advance.
- **Absence** may jeopardize your standing in class because you are responsible for any in-class activities and for anything presented.

➤ **COURSE CONTENTS**

1. INTRODUCTION - [Ch. 1]

Physics and its relation to other fields. Measurement, uncertainty, units. SI system.

2. DESCRIBING MOTION: KINEMATICS IN ONE DIMENSION - [Ch. 2]

Reference frames, velocity, acceleration, motion at constant acceleration.

3. KINEMATICS IN TWO DIMENSIONS; VECTORS - [Ch. 3]

Vectors and scalars. Motion in two dimensions (projectile motion).

4. MOTION AND FORCE: DYNAMICS - [Ch. 4]

Newton's first, second and third law of motion. Applications involving friction.

5. CIRCULAR MOTION; GRAVITATION - [Ch. 5]

Kinematics and dynamics of uniform circular motion. Newton's law of universal gravitation. Gravity near the Earth's surface, satellites.

6. WORK AND ENERGY - [Ch. 6]

Work done by constant or varying force. Kinetic energy, potential energy, and total mechanical energy. Conservative and Nonconservative forces, conservation of total mechanical energy, energy transformations.

7. LINEAR MOMENTUM - [Ch. 7]

Momentum, its relation to force, conservation of momentum. Collision and impulse, conservation of energy and momentum in collision. Elastic and inelastic collisions. Center of mass (CM).

8. ROTATIONAL MOTION - [Ch. 8]

Angular quantities. Kinematic equations for uniformly accelerated rotational motion. Rolling motion, torque, and rotational dynamics. Rotational kinetic energy, angular momentum and its conservation.

9. BODIES IN EQUILIBRIUM - [Ch. 9]

Forces in equilibrium (statics). Elasticity, stress, strain. Fracture.

10. FLUIDS - [Ch. 10]

Density, specific gravity, pressure in fluids. Pascal's principle, Archimed's principle. Fluids in motion, Bernoulli's equation.

11. VIBRATIONS AND WAVES - [Ch. 11]

Simple harmonic motion, energy in the harmonic oscillator, period of SHM, the simple pendulum, damped harmonic motion. Forced vibrations, resonance. Wave motion, types of waves. Reflection and interference of waves, standing waves, resonance.

12. SOUND - [Ch. 12]

Characteristics of sound, intensity (decibels). Sources of sound. Interference of sound waves. Doppler effect. Application of ultrasound in medicine.

13. TEMPERATURE AND KINETIC THEORY - [Ch. 13]

Atomic theory of matter. Temperature and thermometers. Thermal expansion. Thermal stresses. Gas laws and absolute temperature. The ideal gas law. Kinetic theory.

14. HEAT - [Ch. 14]

Heat as energy transfer; distinction between heat, energy, and internal energy. Internal energy of an ideal gas, specific heat, calorimetry. Heat transfer: conduction, convection, radiation.

15. THE LAWS OF THERMODYNAMICS - [Ch. 15]

First law of thermodynamics, applications to some simple systems. Second law of thermodynamics, heat engines. Entropy.

➤ *Test 1, Chas. 1 – 15 ----- Class # 14, Thursday, March 1*

16. ELECTRIC CHARGE AND ELECTRIC FIELD - [Ch. 16]

Static electricity, Insulators and conductors, Induced charge, Coulomb's law, Electric field.

17. ELECTRIC POTENTIAL AND ELECTRIC ENERGY - [Ch. 17]

Electric potential and electric field, Capacitance, Dielectrics, Storage of electric energy.

18. ELECTRIC CURRENTS - [Ch. 18]

Electric current, Ohm's law, Resistivity, Electric power, Alternating current.

19. DC CIRCUITS - [Ch. 19]

Resistors in series and in parallel, EMF, Kirchoff's rules, Circuits containing capacitors, Circuits containing a resistor and a capacitor, Electric hazards.

20. MAGNETISM - [Ch. 20]

Magnets and magnetic fields, Force on an electric current in a magnetic field, Magnetic field due to a straight wire, Force between two parallel wires.

21. ELECTROMAGNETIC INDUCTION - [Ch. 21]

Electromagnetic induction and Faraday's law, Lenz's law, Changing magnetic flux, Electric generators, Transformers.

22. ELECTROMAGNETIC WAVES - [Ch. 22]

Changing electric fields, Maxwell's equations, Production of electromagnetic waves, Light as an electromagnetic wave.

23. LIGHT: GEOMETRIC OPTICS - [Ch. 23]

The ray model of light, Reflection, Plane and spherical mirrors, Index of refraction, Snell's law, Total internal reflection, Fiber optics, The thin lens equation, The Lensmaker's equation.

24. THE WAVE NATURE OF LIGHT - [Ch. 24]

Waves versus particles, Huygen's principle, Interference, Dispersion, Diffraction, Diffraction grating, Interference by thin films, Polarization.

25. OPTICAL INSTRUMENTS - [Ch. 25]

Cameras, The Human eye, Corrective lenses, Magnifying glass.

➤ *Test 2, Chas. 16 – 25 ----- Class # 25, Tuesday, April 17*

26. QUANTUM THEORY AND MODELS OF ATOM - [Ch. 27]

Plank's Quantum hypothesis, Black body radiation, Photoelectric effect, The Bohr model of atom.

27. NUCLEAR PHYSICS AND RADIOACTIVITY - [Ch. 30]

Structure and properties of nucleus, Radioactivity, Half-life and rate of decay, Radioactive dating.

28. NUCLEAR ENERGY; EFFECTS AND USES OF RADIATION - [Ch. 31]

Nuclear reactions, Transmutation of elements, Fission, Fusion, Dosimetry, Radiation Therapy.

29. REVIEW

➤ **FINAL EXAM ----- MONDAY, MAY 7, NOON – 3 P.M.**

* - The dates are tentative and may be changed, but **NOT FINAL EXAMINATION.**