

# Physics 210

## Wave Motion and Modern Physics

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### Description:

This course deals with hydrostatics, hydrodynamics, wave behavior, geometric and physical optics, relativity, light as a particle, matter as a wave, the hydrogen atom and the Schrodinger Equation, electrical conductivity of solids, lasers and nuclear physics.

This course along with Physics 190 and 200 satisfies the lower division physics requirement for astronomy, chemistry, physics, engineering and pre-med majors.

### Course Prerequisites:

Physics 190 or equivalent and credit for or concurrent enrollment in Mathematics 281 (Calculus 3) (**a strong background in integration and word problems recommended**)

**WITHOUT THE FOLLOWING SKILLS, COMPETENCIES AND/OR KNOWLEDGE, YOU WILL BE HIGHLY UNLIKELY TO SUCCEED IN THIS COURSE:**

Ability to solve algebraic word problems by using substitution or simultaneous equations

Knowledge of trigonometric functions and their identities

Ability to solve linear, quadratic and trigonometric equations

Knowledge of related rates and derivatives

Ability to integrate polynomial, exponential and trigonometric functions

Ability to use the relationship between force, mass and acceleration to solve dynamics problems

Ability to use conservation of energy and conservation of momentum concepts

Understand simple harmonic motion and can apply its concepts to analyze oscillating systems

### Course Objectives

Students will be able to:

- 1) Recognize the basic concepts concerning hydrostatics and hydrodynamics, transverse and longitudinal waves, geometric optics, diffraction and interference, special relativity, photon behavior, matter waves, the uncertainty principle, quantum mechanics in one and three dimensions, statistical physics and nuclear physics, and use algebraic, trigonometric and advanced calculus expressions to represent physical situations involving these subjects.

- 2) Investigate and delineate the relationship between the theoretical principles of physics and their practical applications, and explain how this relationship affects real world problem solving.
- 3) Investigate, interpret and analyze the fundamental principles of physics based on reading assignments and in-class discussions.
- 4) Calculate solutions to physics problems using the fundamental principles of physics and symbolic logic skills.
  - a. Analyze basic physical situations involving reflection and refraction, and use this analysis to predict the path of a light ray.
  - b. Analyze situations involving interference and diffraction of light waves, and apply these to situations including double slits, diffraction gratings, and wide slits.
  - c. Apply concepts from special relativity to analyze physical situations, including time dilation, length contraction and the Lorentz transformation. Solve basic problems involving relativistic momentum and energy.
  - d. Apply basic concepts of quantum mechanics to analyze basic physical setups, including a particle in a box and simple atomic models.

During the lab students will:

- 1) Design experiments using the scientific method.
- 2) Collect and analyze data using both traditional and computer data acquisition methods; interpret and analyze numerical data, including appropriate use of error propagation, units and significant figures, and generate a visual representation of the data.
- 3) Using concepts covered in class, evaluate and interpret the experimental results.

**Text:**

Physics for Scientists and Engineers, Ninth Edition Combined, by Serway and Jewett

Modern Physics, Third Edition, by Serway, Moses and Moyer

**Grading:**

80 % 4 Exams (Drop the lowest one) **There are no make-up exams!**  
20 % Lab Work

**Grade Cut Offs**

A 90 % to 100 %  
B 80 % to 89.99 %  
C 60 % to 79.99 %  
D 50 % to 59.99 %  
F 0 % to 49.99 %

**Tentative Outline**

Chap 14 Fluid Mechanics  
Chap 16 Wave Motion  
Chap 17 Sound Waves  
Chap 18 Superposition and Standing Waves  
**Exam 1**

Chap 35 Nature of Light and the Laws of Geometric Optics

Chap 36 Geometric Optics  
Chap 37 Interference of Light Waves  
Chap 38 Diffraction and Polarization  
**Exam 2**

Chap 1 Relativity I  
Chap 2 Relativity II  
Chap 3 Quantum Theory of Light  
Chap 4 Particle Nature of Matter  
Chap 5 Matter Waves  
Chap 6 Quantum Mechanics in One Dimension  
Chap 7 Tunneling Phenomena (optional)  
**Exam 3**

Chap 8 Quantum Mechanics in Three Dimensions  
Chap 9 Atomic Structure  
Chap 10 Statistical Physics  
Chap 12 Solid State (optional)  
Chap 13 Nuclear Structure  
Chap 14 Nuclear Physics Applications  
Chap 15 Elementary Particles (optional)  
**Exam 4**

This course adheres to the policies outlined in the Cuyamaca College catalogue. For further information, see Academic Policies stated in the catalogue.

I recommend you use the Supervised Tutoring services that are available to you. Refer to the class schedule for more information.