

PHYSICS 207 COLLEGE PHYSICS II SYLLABUS

COURSE TITLE: PHY 207 - College Physics II
CREDIT HOURS: 4. lecture 3, lab 2
PLACE: Science Building Room 107, 9:00 am- 10:50 am
TIRE: INSTRUCTOR & Office:. Dr. S. K. Ghorai, SB 108
PHONE: 229-4466, E-mail: skghorail@yahoo.com
OFFICE HRS: 11am - 1;00 pm MWF and 10;00 am- 1;00 pm Tu
PRE-REQUISITE: PHY 206
TEXT BOOK: Physics by Arthur Beiser (5th Ed)
LAB BOOK: Experiments In College Physics by S. K. Ghorai
SUPPLIES NEEDED: You need to bring a protractor, a ruler, and some graph paper to labs. You also need a simple scientific calculator.

COURSE DESCRIPTION: Physics Is a fundamental science that deals with the understanding of the natural phenomena that occur In our Universe. In this course you will learn the physics principles and laws that govern• the behavior of electrical charges at rest and In motion (direct electric current). Basic properties of magnetic field and magnetic materials, working principles of electric devices, properties of alternating current, properties of light, lenses and mirrors, and topics of modern physics will be discussed.

COURSE PURPOSE: This course is intended for students who will require some competence in physics In their subsequent work. This is a problem solving course. Your mind must be taught the methods of problem solving. You will be learning how to analyze different types of physical problems using physics principles. The method of problem solving can be learned well only by bard and steady practice.

EFFORT NEEDED: Physics is a rewarding and challenging subject which requires a student's best effort. You must spend a few hours a day in working out the assignments (multiple choices and exercises). Always be up-to-date and never fall behind in a physics course.

INSTRUCTION

This course will be developed through lectures, demonstrations, laboratory experiments, assignments, and class participation.

ASSIGNMENTS:

Do all multiple choice questions and assigned exercises. Maintain a notebook (separate from the lecture notebook) to keep record of these assignments. You must work on an average 10-15 of the exercises after each lecture so that you will have all the assignments completed as we begin with the next chapter. Practice these assignments by actually working them out on papers. Do this, two or three times before a test.

EXERCISES:

Chapter 16: 1,3,4,7,8,11,13,17,18,21,28

Chapter 17: 1,2,4,5,7,8,11,12,13,15,17,19

Chapter 18:

1,3,5,11,12,13,17,18,22,27,29,31,34,35,40,44,45,50,51

Chapter 19: 1,3,6,8,9,10,12,17,19,27,29,31,32,35

TEST #1

Chapter 20: 1,2,3,5,7,8,9,11,15,16,18

Chapter 22: 1,2,3,9,10,11,12,14,17,19,20,23,24,26,27,28

Chapter 23:

1,3,4,5,6,8,10,12,13,15,16,21,22,32,33,34,35,41,42,44,46

Chapter 24: 2,3,4,7,8,11,27,28,29

TEST # 2

Chapter 26: 2,4,5,6,8,9,10,11,12,14

Chapter 27: 1,3,6,9,10,12

Chapter 29: 1,3,4,6,9,11,13,15,17,20,21,23,24,25,26,27

TEST # 3

FINAL: COMPREHENSIVE

TESTS

Test will include questions and exercises similar to those assigned. Tests will be prepared to check understanding of the principles, definitions and ideas developed. On your tests show all your work in detail. Do not leave out any step.

LABORATORY WORK:

Laboratory is an integral part of the course. Read the

General Instructions section of the lab manual very carefully. A schedule of labs will be provided at the beginning of each semester.

GRADING

There will be three tests given during the semester. The Final Exam will be comprehensive and will include all materials covered during semester.

A. There will be a total of 2-6 test questions on each objective during the entire course.

b. In order to pass and achieve an objective, you must score 60% on the objective. • Objectives 1 through 20 will also be tested in a laboratory setting.

c. To receive a grade of "D", you must achieve 60% of all the objectives and laboratory work; and make a grade of- at least 60 on the Final Examination.

d. To receive a grade of "C", you must achieve 70% of all the objectives and laboratory work, and make a grade of at least 70 on the Final Examination.

e. To receive a grade of •B", you must achieve 80% of all the objectives and laboratory work, and make at least 80 on the Final Examination.

f. To receive a grade of 'A', you must achieve 90% of the objectives and laboratory work, and make a grade of at least 90 on the Final Examination.

INCOMPLETE GRADE:

An "I" grade is assigned in instances in which a student is likely to pass the course upon completion of requirements to change the grade. To remove the "I", course requirements must be completed by the end of the next semester of enrollment, not to exceed two calendar years.

WITHDRAWAL FROM A COURSE:

A student may withdraw from a course without penalty prior to midterm. The deadline date for withdrawing from a course (usually the Tuesday after midterm week) is

stipulated in the academic calendar.

ADDITIONAL READING

1. Arthur Beiser, Physics (3rd Ed.) Benjamin Cummings
2. R. T. Weidner, Physics, Allyn and Bacon
3. J. Coleman, Physics, Prentice Hall
4. J. D. Wilson, Physics, Heath
5. R. A. Serway, J. S. Vaughn, College Physics, Saunders

Physics 206 & 207 Physics 210 & 211

Laboratory Rules

1. Persons arriving in the laboratory 10 minutes late will receive an automatic 10 % penalty for the experiment of the day. Persons arriving more than 10 minutes late will not be permitted to perform the experiment.
2. As soon as you come into the lab, you must sign the roll sheet at the instructor's desk, and turn in your previous week's report. In order to avoid crowding, there will be multiple roll sheets. These roll sheets will be removed ten minutes after the hour. Unless you have signed the roll sheet, your data sheet will not be signed, and so you would not receive credit for the lab. You are not permitted to leave the lab without the instructor's permission.
3. If your lab report is not written according to the prescribed format, or properly arranged or stapled, it would not be accepted for credit. The report is due as you sign the roll sheet. The preliminary problem for the lab that you are about to perform must be turned in at the same time as your lab report.
4. Only two students can work as partners in the lab. Each person in a group is responsible to see that there is no more than two in the group. Unless otherwise approved by the instructor before the start of the lab, if there are more than two in a group, no one will

receive credit for the lab, and their data sheets will not be signed or approved.

5. Data sheets must be filled in ink, and must be approved by the instructor before you leave the laboratory.

6. A student will receive a grade of zero if he/she is absent from a lab or does not turn in a report. A student will receive an "F" grade if he/she receives three or more zero grades in the lab. -

7. If a student misses a lab, he/she must inform the instructor on the day he/she returns to class. Official excuse must be presented within two days after returning to class and a make-up lab must be performed within three days after returning to class. The above rule is also to be followed in case a student misses a test, and wants to take a make-up test. This rule for making-up an experiment or a test supersedes the one enumerated in the lab manual.

8. a student must pass the laboratory part of the course in order to pass the course. The passing grade for the laboratory is a 50% average.

9. The rules stated in your laboratory manual except for late attendance and absences (see pages 1-7) are also applicable.

CLASS ATTENDANCE

Each student is expected to attend all lectures, seminars, laboratories, and field work for each registered class.

Instructors of courses are not obligated to provide make-up opportunities for students who are absent, unless the absence has been officially approved. An officially approved absence, however, merely gives the individual who missed the class/lab an opportunity to make up the work and in no way excuses him from the work required.

Make up Test/Lab

A student who is absent on the day of a major test/Lab will be eligible for a make up test, if and only if the absence is officially excused.

Official excuses are granted by the Office of Student Affairs for authorized university activities, verified personal illness, or illness or death in the immediate family.

A student eligible for a make up test/lab will be scheduled to do the make-up on the second day following proof of eligibility. An official excuse must be presented to the instructor no later than the second day after returning to class.

COURSE CONTENTS

CHAPTER 16: ELECTRICITY

Electric Charge, Coulomb's Law, Multiple Charges, Atomic structure, Electrical Conduction, Ion in Solution, Electrolysis, Batteries and Fuel Cells

CHAPTER 17: ELECTRIC ENERGY

What is a field? Electric field, Electric Lines of Force, Electric Potential Energy, Potential Energy of two Charges, Potential Difference, Cathode-Ray Tube, The Electron Volt, The Action Potential, Capacitance, dielectric constant and capacitors in combination

CHAPTER 18: ELECTRIC CURRENT

Electric Current, Ohm's Law, Resistivity, Electric Power, Resistors in Series, Resistors in Parallel, Electromotive Force, Kirchoff's Rules, impedance Matching

CHAPTER 19: MAGNETISM

The Nature of Magnetism Magnetic Field
Magnetic Field of Current, Magnetic Properties of Matter, Hysteresis
Force on a Moving Charge, The Mass Spectrometer, Force

on a Current,
Force Between Two Currents, Torque on a Current Loop,
Magnetic Poles

Chapter 20: ELECTROMAGNETIC INDUCTION

Electromagnetic Induction
Moving Wire in a Magnetic Field, Faraday's Law,
The Betatron, The Generator, Back Emf,
The Transformer, Sound Reproduction

CHAPTER 22: LIGHT

Electromagnetic Waves.
Radiation from an Accelerated Charge Types of
Electromagnetic Waves Huygens' Principle Reflection
Refraction
Index of Refraction, Apparent Depth
Total Internal Reflection Illumination

CHAPTER 23: LENSES AND MIRRORS

Lenses, Image Formation, The Lens Equation, The Eye,
Defects of Vision. The Microscope, The Telescope, Lens
Aberrations, Spherical Mirrors

24: PHYSICAL OPTICS

Interference of Light, Double slit, Wavelength of
Light, Diffraction Grating, Thin Films Diffraction.
Numerical Aperture Polarization, Scattering

CHAPTER 26: PARTICLES AND WAVES

Photoelectric Effect
Quantum Theory of Light ..
X Rays
Photons as Particles, Matter Waves, Wave Function
Particle in a Box, Uncertainty Principle

CHAPTER 27: THE ATOM

The hydrogen atom, Energy levels, Atomic spectra, Bohr

model

CHAPTER 29: THE NUCLEUS

Nuclear Structure

Nuclear Size and Composition, Binding Energy, Strong
Nuclear Interaction, Radioactivity

Alpha Decay, Half-Life, Radiation Hazards, Radiometric
Dating Fission,

Nuclear Reactors

Fusion Energy

COURSE OBJECTIVES

The objectives of this course are for you to

1. Comprehend the basic facts about electricity (Chapter 16).
 - a. Describe the behavior and the principle of conservation of charges
 - b. State Coulombs' Law. Use it to calculate force on a charge in a simple charge distribution (multiple charges).
 - c. Describe structure of the atom
 - d. Describe properties of conductors, insulators, semiconductors and superconductors
 - e. Define ions, polar and non-polar molecules.
 - f. Define electrolysis, and electroplating.
 - g. Describe batteries and fuel cells.

2. Understand the basic properties of electric field (Chapter 17)
 - a. Define electric field, and calculate electric field at a given distance from a single point charge
 - b. Calculate electric field at a given point in a simple point charge distribution (multiple charges)
 - c. Discuss the concept of electric lines of force, and draw lines of force for a given point charge distribution
 - d. Define electric potential energy, and calculate PE between two point charges
 - e. Define electric potential difference, and calculate

- work done in moving a charge in an electric field
- f. Describe working principle of a cathode-ray tube
 - g. Define an electron volt (eV). Find its relationship to Joule.
 - h. Define action potential

3. Comprehend the basic properties of electric current (Chapter 18).

- a. Define electric current. Explain how to maintain an electric current between, two points
- b. State Ohm's Law. Calculate current, resistance and voltage using Ohm's Law.
- b. Calculate the resistance of an ohmic conductor (resistivity)
- d. Calculate electric power.
- e. Identify series and parallel connections, and calculate equivalent resistance
- f. Define electromotive force, terminal voltage and internal resistance of an emf source
- g. Identify cells in parallel and series. Calculate their total emf and resistance.
- h. State Kirchoff's rules. Use these rules to solve circuit problems ..

4. Comprehend the basic facts about magnetic field (Chapter 19)

- a. Describe the sources of magnetic effects. .
- c. Calculate force on a moving charge placed in a magnetic field.
- c. Define units of magnetic field.
- d. State Biot's law. Calculate the magnetic field of a current using Biot's Law.
- e. Calculate magnetic field due to a long, straight current, at the center of a current loop or a flat coil, and at the interior of a solenoid
- f. Explain the sources of atomic magnetism, diamagnetism, paramagnetism and ferromagnetism
- g. Explain hysteresis and hysteresis loop, retentivity and coercive force
- h. Describe the behavior of a charge particle moving at right angles to a magnetic field; find the radius of the path.
- i. Calculate the force on a current placed in a magnetic field, and

calculate force between two parallel currents

5. Comprehend the basic aspects about electromagnetic induction (Chapter 20)

- a. Calculate voltage induced across the ends of a wire moving in a magnetic field.
- b. Calculate magnetic flux through a loop.
- d. State Faraday's Law of electromagnetic induction and Lenz's Law
- d. Calculate induced voltage and current in circuits using Faraday's Law.
- e. Discuss the operation of a generator, d.c. and a.c. generators
- f. Discuss the operation of a transformer, step-up and step-down transformers and power loss in a transformer. Calculate the voltages, currents and number of turns in primary and secondary coils.
- g. Write up lab report from experiment performed.

6. Understand the basic properties of light (Chapter 22)

- a. Discuss the production of electromagnetic (em) waves using an oscillator emf source
- b. Discuss the role of accelerated charges in producing em waves.
- c. Discuss electromagnetic wave spectrum and light spectrum
- d. State the relationship between frequency, wavelength and speed of-light waves. Calculate the wavelength of em waves.
- e. Discuss amplitude modulation and frequency modulation
- f. Describe ionosphere and its relation to radio waves (VLF to UHF)
- g. Discuss wavefronts and Huygens' principle.
- h. Describe reflection of light (diffuse and specular reflection) and State law of reflection
- i. Discuss refraction of light, and refractive index of a medium. State Snells' Law. Calculate angle of refraction.
- j. Discuss dispersion of light by a prism, and origin of rainbow

- k. Calculate apparent depth
- l. explain total internal reflection, critical angle and light piping Calculate critical angle.
- m. Define luminous flux, luminous intensity, candela and lumen

7. Understand the characteristics of lenses and mirrors (Chapter 23)

- a. Define converging and diverging lens, and focal points of these lenses
- b. Use lens maker's equation to calculate focal length
- c. Describe standard rays for lenses, and trace the image formed by lenses
- d. Use lens equation with sign convention to calculate p , q or f .
- e. Discuss the camera, f -number, depth of field, telephoto lens and wide angle lens
- f. Calculate magnification with its sign convention
- g. Describe the eye and discuss defects of eye. Calculate power of a lens for correcting an eye defect
- h. Discuss the workings of a microscope and its magnification
- i. Discuss the workings of different types of telescope's, and their magnifications
- j. Explain chromatic and spherical aberrations,
- k. Discuss types of spherical mirrors, their focal points, mirror equation and its sign convention, standard rays for mirrors and tracing the image formed by a spherical mirror. Calculate image position using mirror equation.

8. Understand the properties of interference, diffraction and polarization of light (Chapter 24)

- a. Define constructive and destructive interference, coherent and incoherent sources
- b. Describe Young's double-slit experiment, and conditions for dark and bright lines. Calculate positions of constructive or destructive interference.
- c. Discuss diffraction grating, and condition for bright lines. Calculate diffraction angles for a grating.
- d. Discuss interference in a thin film, Newton's rings, conditions for dark and bright lines. Calculate thickness of thin films. Discuss phase change on reflection.

- e. Discuss diffraction, origin of diffraction fringes, resolution of nearby objects, resolving power and numerical aperture of microscope objective
- f. Discuss polarization of light, polarized and unpolarized light
- g. Discuss light scattering, blueness of sky, and red appearance of the sun at sunrise and sunset

9. Comprehend the properties of dual nature of matter (Chapter 26)

- a. Discuss photoelectric effect, calculate energy and speed of a photoelectron, and define photoelectric work function
- b. Discuss the generation of x-rays. Calculate x-ray energy and highest frequency present in an x-ray machine
- c. Discuss Compton effect and calculate the energy of scattered photon
- d. Discuss de Broglie waves and calculate its wavelength
- e. Discuss wave function and its significance
- f. Discuss particle in box, energy quantization and calculate energy levels
- h. Discuss uncertainty principle in momentum and energy forms

10. Comprehend the properties of Bohr's atomic model (Chapter 27)

- a. Explain the condition for orbital stability
- b. Calculate energy levels of hydrogen atom
- c. Discuss origin of line spectra. Calculate wavelength when a hydrogen atom makes a transition from one quantum state to another
- d. Describe the Bohr model. Calculate possible energies of a hydrogen atom
- e. Discuss origin of emission and absorption spectra
- f. Discuss properties of a laser beam, mechanism of laser production, operation of a ruby laser and a helium-neon laser

11. Understand the basic properties of atomic nucleus
(Chapter 29)

- a. Describe structure of an atomic nucleus
- b. Discuss nuclear size, nuclear stability and binding energy
- c. Discuss radioactivity and three kinds of radiation
- d. Discuss alpha decay and tunnel effect
- e. Define radioactive decay, half-life, and curie as a unit of radioactivity
- f. Discuss hazards of nuclear radiations, radiocarbon dating
- g. Discuss nuclear fission, chain reaction, basic design of a nuclear reactor and its operation, different types of reactor
- h. Discuss nuclear fusion, proton-proton cycle, practical fusion reactions, and fusion energy

AMERICANS FOR DISABILITY ACT POLICY:

Please consult the current University Catalog