Syllabus for
PHY 102—General Physics II Lecture
3 Credit Hours
Spring 2002

I. COURSE DESCRIPTION

A continuation of PHY 101 Lecture. Includes electricity, magnetism, light, and modern physics.
Prerequisite: PHY 101 Lecture.
Corequisite: PHY 102 Lab.

II. COURSE GOALS

The purpose of this course is to enable the student to do the following:

A. Comprehend the basic concepts of classical physics (such as electric charge, potential, etc.), as evidenced by the ability to:
   1. discuss a given concept.
   2. select from several choices the proper description of a given concept.

B. Be acquainted with the basic laws of classical physics (such as Ohm's Law, Ampere's Law, etc.), as evidenced by the ability to:
   1. describe a given physical law.
   2. write the mathematical formulation of a given law.
   3. identify a particular law when expressed by a given mathematical formula.

C. Be able to apply the terms, concepts, and basic laws of classical physics by:
   1. solving problems similar to those in the textbook.
   2. solving an unfamiliar problem using familiar laws and concepts.

D. Be able to approach the learning of a subject in a consistent and disciplined manner, as evidenced by:
   1. attending class and laboratory-sessions regularly and punctually.
   2. turning in homework assignments regularly and on time.
   3. participating regularly in class recitation.

II. COURSE OBJECTIVES

Unit Objectives

Upon successful completion of each unit listed here the student will be able to do the following:

A. **Chapter 15: Electric Forces and Electric Fields**
   The student will be able to do the following:
   1. define the pertinent terms.
   2. specify the conditions necessary for producing static charge by contact and by induction.
   3. use Coulomb's Law to determine the net electrostatic force due to point charges.
   4. calculate the magnitude and direction of electrostatic forces and fields due to point charges.
   5. apply Gauss's Law to obtain electric field.
   6. discuss electric dipole and how its dipole moment allows it to interact with an electric

field.

B. **Chapter 16: Electric Energy and Capacitance**

The student will be able to do the following:

1. define the pertinent terms.
2. calculate the electric potential and potential energy due to point charges.
3. evaluate the capacitance of a parallel plate capacitor with and without a dielectric.
4. determine the equivalent capacitance of capacitors in series-parallel combinations and calculate the final charge and potential difference across each.

C. **Chapter 17: Current and Resistance**

The student will be able to do the following:

1. define the pertinent terms.
2. calculate the current passing a point in a given time interval in a conductor.
3. determine the resistance of a conductor using Ohm's law.
4. make calculations of the variation of resistance with temperature.
5. use Joule's law to calculate the power dissipated in a resistor.

D. **Chapter 18: Direct Current Circuits**

The student will be able to do the following:

1. determine the terminal potential difference of a known source of EMF (with internal resistance).
2. calculate the equivalent resistance of a group of resistors in parallel, series, or series-parallel combination.
3. apply Kirchoff's rules to solve multiloop circuits.
4. qualitatively describe the changes in the charge of a capacitor in series with a resistance, battery, and switch.
5. describe the function of an ammeter, voltmeters and Wheatstone bridge.

E. **Chapter 19: Magnetism**

The student will be able to do the following:

1. define the pertinent terms.
2. determine the magnitude and direction of the magnetic force on a moving electric charge and on a current-carrying conductor.
3. describe the operation of a moving coil galvanometer and how both an ammeter and a voltmeter may be constructed by adaptation of the galvanometer.
4. describe the path of a charged particle in a uniform magnetic field and understand the essential features of a mass spectrometer.
5. calculate the magnitude and determine the direction of the magnetic field In the vicinity of a long, straight current-carrying conductor.
6. calculate the magnetic field at the center of a current loop and at interior points of a solenoid.

F. **Chapter 20: Induced Voltages and Inductance**

The student will be able to do the following:

1. define the pertinent terms.
2. calculate the EMF (or current) induced in a circuit using Faraday's Law of Induction.
3. apply Lenz’s law to determine the direction of an induced EMF or current.
4. describe the principal and operation of electric generators and motors.
5. qualitatively describe the manners in which the current in a LR circuit changes.
6. calculate the total magnetic energy stored in the magnetic field of an induction.

G. **Chapter 21: Alternating Current Circuits and Electromagnetic Waves**

The student will be able to do the following:

1. describe the pertinent terms.
2. describe qualitatively the effect of resistance, capacitance, and inductance on the phase shift behavior of an AC circuit.
3. apply the formulas that give the reactance values in an AC circuit as a function of capacitance, inductance, and frequency.
4. interpret the terms "phase angle" and "power factor."
5. given an RLC series circuit, calculate: i) the instantaneous and rms voltage drop across each component, (ii) the instantaneous and rms current in the circuit, and (iii) the phase angel by which the current leads or lags the voltage, (iv) the power expanded in the circuit, and (v) the resonance frequency of the circuit.
6. define the pertinent terms.
7. describe the contribution by Maxwell about the nature of electromagnetic radiation.
8. describe Hertz's experiment about confirmation and understanding the nature of electromagnetic waves.
9. summarize the properties of electromagnetic waves.
10. describe the basic process by which a carrier electromagnetic wave is used to transmit a sound signal.
11. give a brief description (related to the source and typical use) of each of the "regions" of the electromagnetic spectrum.

H. **Chapter 22: Reflection and Refraction of Light**

The student will be able to do the following:

1. define the pertinent terms.
2. apply Huygens' principle to construct the subsequent position and shape of a given wave front.
3. describe reflection and refraction of light.
4. discuss the conditions under which total internal reflection can occur.
5. describe the process of dispersion of a beam of white light as it passes through a prism.

I. **Chapter 23: Mirrors and Lenses**

The student will be able to do the following:

1. describe the pertinent terms.
2. calculate the location of the image of a specified object as formed by a plane mirror, spherical mirror, and thin lens. Determine the magnification and character of the image in each case.
3. describe the various processes in which refractive effects in the atmosphere are responsible for mirage formations.
4. construct ray diagrams to determine the location and nature of the image of a given object using a lens or mirror.
5. describe the most frequently encountered lens aberrations.

J. **Chapter 24: Wave Optics**

The student will be able to do the following:

1. define the pertinent terms.
2. state the conditions of light wave interference and describe Young's doubleslit experiment.
3. describe Newton's rings and interference in the films.
4. describe diffraction produced by a single slit and determine the positions of the maxima and minima.
5. describe qualitatively the polarization of light and its practical applications.

K. **Chapter 25: Optical Instruments**

The student will be able to do the following:

1. define the pertinent terms.
2. describe the design of the single lens camera.
3. describe the structure of the eye, identify its essential parts, and describe its commonly known defects and their corrections with appropriate lens.
4. describe a simple magnifier, compound microscope and refracting telescope. Also, calculate the magnification power of each instrument.
5. determine whether or not two sources under a given set of conditions are resolvable as defined by Rayleigh's criterion.
6. describe the technique employed in the Michelson interferometer for precise measurement of light and accurate length measurements.
7. determine the positions of the principal maxima, resolving power of a grating under specified conditions.

L. **Chapters 26 to 30: Modern Physics**

The student will be able to do the following:

1. define the pertinent terms.
2. describe the special theory of relatively and its consequences on time, length, momentum, velocity, and energy.
3. perform calculations for time, lengthy momentum, velocity, and energy at velocities approaching the speed of light.
4. state Planck's hypothesis and describe photoelectric effect.
5. describe Compton effect and derive the formula for the Compton shift.
6. describe the wave properties of particles, the de Broglie wavelength concept, and the dual nature of both matter and light.
7. discuss the uncertainty principle.
8. describe the various developments in the discovery of the atomic structure.
9. state the necessary condition for laser action. Describe briefly the operation of a helium-neon gas laser.
10. describe the nuclear structure, radioactivity, and nuclear reactions.
11. describe fission and fusion processes, recognizing each one's applications and environmental hazards.

IV. TEXTBOOKS

A. Required Textbooks and Materials

Serway, Raymond A., and Faughn, Jerry S., College Physics, 5th ed., Fort Worth: Harcourt Brace, 1999.

B. Required Materials
Hand Calculator (scientific).

C. Optional
Gordon, John R., and Serway, Raymond A., College Physics: Study Guide, 5th Edition, Orlando: Sanders, 1999.

V. POLICIES AND PROCEDURES

A. University Policies and Procedures
1. Attendance at each class or laboratory is mandatory at Oral Roberts University.
2. Double cuts will be assessed for absences immediately preceding or following holidays.
3. Excessive absences can reduce a student's grade or deny credit for the course.
4. Students taking a late exam because of unauthorized absence will be charged late fee.
5. Students and faculty at Oral Roberts University adhere to all laws addressing the ethical use of others' materials, whether it is in the form of print, video, multimedia, or computer software.
6. Final exams cannot be given before their scheduled times. Students need to check the final exam schedule before planning return flights or other events at the end of the semester.

B. Course Policies and Procedures
1. Evaluation Procedures
The final grade is a composite result of performance in exams and homework Problems. Approximately 75 percent of the final grade is based on four exams and a comprehensive final, and 15 percent for homework problems. The grading scale is as follow:

90	to 100	A	:	Excellent
80	to 89	B	:	Above Average
70	to 79	C	:	Average
60	to 69	D	:	Below Average
Under	60	F	:	Fail

2. Other Information

a. Homework Problems
Problem assignment is listed for each class meeting in the Course Calendar and is due at the assigned date.

b. Tardiness and leaving early
A student should not enter or leave the class without the instructor's permission during class time.

VII. COURSE CALENDAR

Week	Topic	Chapter	Assignment
1	Electric Forces and Electric Fields	15	4,9,15,24,28,37,40,46,47,53
2	Electric Energy and Capacitance	16	1,7,10,14,16,18,35,48,53,62
	QUIZ I		
3	Current and Resistance	17	6,10,22,23,31,35,40,48,51,51
4	Direct Current Circuits **EXAM 1: Chap. 15-18**	18	4,15,27,28,32,34,37,40,45,47
5	Magnetism	19	4,11,16,17,24,27,30,37,41,47, 51,55
6	Induced Voltage and Inductance	20	3,5,10,26,30,39,44,50,57,59
	QUIZ 2		
7	Alternating Current Circuits and Electromagnetic Waves **EXAM 2: Chap. 19-21**	21	1,3,11,17,23,38,56,
8	Reflection and Refraction	22	4,6,7,10,11,15,39,48,56
9	Mirrors and Lenses	23	2,4,5,10,15,25,29,37,46,52
	QUIZ 3		
	SPRING BREAK !!!		
10	Wave Optics and Optical Optical Instruments **EXAM 3: Chap. 24-27**	24 25	1,6,7,43,47 9,17,27,31,54
11	Relativity	26	2,3,9,21,23,26,30,33,43,46
12	Quantum Physics	27	3,10,14,18,19,21,31,34,44,57
	QUIZ 4		
13	Atomic Physics	28	Paper on models of atom
14	Nuclear Physics	29	Paper on power generation by fossil fuels, nuclear fission, and nuclear fusion
15	Nuclear Energy and Elementary Particles **EXAM 4: Chap 26-30**		
16	**FINAL EXAM WEEK CHAPTERS 15-30 COMPREHENSIVE !**	30	

Dr. Tom Luiskutty
Name of Instructor

PHY 102
Course No.

General Physics II
Title of Course

Engineering and Physics
Name of Department

MISSION

The lifestyle at ORU is rooted in the word "Wholeness." ORU seeks to educate the whole person, with balanced emphasis placed on the development of mind, spirit, and body.

GENERAL OUTCOMES

1. Spiritual Development
2. Physical Development
3. Communication
4. Analysis
5. Problem Solving
6. Valuing in Decision-making
7. Social Interaction
8. Global Perspectives
9. Effective Citizenship
10. Aesthetic Responsiveness

MAJOR OUTCOMES

Analysis/Problem Solving:
Has the ability to analyze, design, and obtain effective solutions to real world engineering and physics problems.

Communication/Team Work:
Demonstrates ability to work on teams and communicate effectively in written and oral forms.

Fundamental Knowledge Base:
Possesses fundamental knowledge of principles of engineering, physical sciences, and mathematics.

Christian Stewardship and Ethics: Ethically applies engineering technology to the solution of human problems using Christian principles.

COURSE GOALS

The student will be able to do the following:

apply the knowledge in analyzing and solving problems.

communicate ideas
by working on the board and answering questions, as well as writing pre-lecture notes, journals and reports.

comprehend basic ideas in heat, electricity magnetism, light and modern physics. Be scientifically literate to make decisions concerning environment and other global problems.

ASSESSMENT OF COURSE GOALS

STIMULI

Examinations/Quizzes
Class/Group discussions
Portfolios/Journals
Homework/Reports

CRITERIA

Works out problems in a systematic way.

Performs well in exams.

Participates in class/group discussions.

Demonstrates understanding of concepts through journal and report writing.

Prepares for class by writing pre-lecture notes. Demonstrates preparedness by being quizzed over material.