PALOMAR COLLEGE
COURSE OUTLINE OF RECORD FOR
DEGREE CREDIT COURSE

X___ Transfer Course _X__ A.A. Degree applicable course
(check all that apply)

COURSE NUMBER AND TITLE: PHYS 231 – Principles of Physics

UNIT VALUE: 5

MINIMUM NUMBER OF SEMESTER HOURS: 112

BASIC SKILLS REQUIREMENTS: Appropriate language and computational skills.

ENTRANCE REQUIREMENTS

PREREQUISITE: PHYS 230 and completion of, or concurrent enrollment in, MATH 205

COREQUISITE:

RECOMMENDED PREPARATION: PHYS 121

SCOPE OF COURSE:
Classical electromagnetism, electromagnetic waves, and optics. Required for students whose major field is physics, chemistry or engineering.

SPECIFIC COURSE OBJECTIVES:
The successful student will be able to:
1. Demonstrate a comprehensive understanding of introductory classical electromagnetism, electromagnetic waves, and optics which is intended for lower division students who are majoring in several sciences and engineering fields.
2. Apply physics concepts and principles of classical electromagnetism, electromagnetic waves, and optics at the undergraduate college level.
3. Analytically solve quantitative physics problems.
4. Apply laws of classical electromagnetism, electromagnetic waves, and optics to laboratory situations, perform experiments, collect and analyze data, and prepare and present reports.

CONTENT IN TERMS OF SPECIFIC BODY OF KNOWLEDGE:
LECTURE:

I. Electromagnetism
   - A. Charge and Coulomb's Law
   - B. Electric field
   - C. Gauss's Law
   - D. Electric potential
   - E. Capacitors and dielectrics
   - F. Current and resistance
   - G. DC circuits
   - H. Magnetic field
   - I. Ampere's Law

J. Faraday's Law
K. Inductance
L. Electromagnetic oscillations
M. AC circuits

II. The Nature and Propagation of Light
- A. Electromagnetic waves
  1. Maxwell's equations
  2. Restrictive model waves
  3. Use of Maxwell's equations to show that model fits light giving "C"
  4. Wave number and angular frequency
  5. Poynting Vector
  6. Power Transmission
  7. Momentum Transmission
- B. Speed of Light
  1. Astronomical measurements
  2. Fizeau's apparatus
  2. Rotating mirrors
  4. Most recent measurement
- C. Doppler Effect
  1. Michelson and Morley Experiment
  2. Assumptions made by Einstein
  3. Observed shift in frequency and wavelength
  4. Uses

III. Reflection and Refraction of Plane Waves on Plane Surfaces
- A. Study of Optics
  1. Geometrical Optics
  2. Physical Optics
  3. Quantum Optics
- B. Concept of a ray of light from a wave
- C. Reflection and Refraction
  1. Law of Reflection
  2. Law of Refraction
     a. dispersion
     b. index of refraction
     c. graphical construction for refraction
- D. Huygen's Principle
  1. derivatives of law of reflection
  2. derivatives of law of refraction
- E. Total Internal Reflection
- F. Fermat's Principle

IV. Reflection and Refraction of Spherical Waves and Spherical Surfaces
- A. Spherical Waves - Plane Mirrors
  1. real image
  2. virtual image
- B. Spherical Mirrors-Paraxial Rays
- C. Location of image and its size
- D. Spherical Refracting Surfaces
- E. Thick Lenses
  1. focal points
  2. principle planes
- F. Thin lenses

G. Derivation of lens formula
H. Derivation of lens maker's formula

V. Interference
A. Young's Double Slit Experiment
B. Coherence and Incoherence of light sources
C. Representation of a monochromatic wave with phase angle
D. Interference of two waves
E. Intensity
F. Application to double slit-division of wave front
G. Interference from thin films
H. Michelson's Interferometer-division of amplitude by partial reflection

VI. Diffraction
A. Two classes
1. Fresnel Diffraction
2. Fraunhofer Diffraction
B. Single Slit Fraunhofer Diffraction
C. Diffraction by a circular aperture
D. Resolving power of a telescope-Rayleigh Criterion
E. Double Slit Interference and Fraunhofer Diffraction

VII. Diffraction Gratings
A. General properties
B. Calculation of Diffraction pattern for gratings
C. Half Angle Separation
D. Angular Dispersion
E. Resolving Power of a Grating
F. X-Ray Diffraction

VIII. Polarization
A. Plane Polarized Light
B. Polarizing Sheets
C. Polarization by Reflection
D. Circular Polarization
E. Polarized light and quarter wave plates

LAB

Selected experiments dealing with the above subject matter.

REQUIRED READING:

Halliday, David, Robert Resnick, and Jearl Walker. Fundamentals of Physics Extended. 6th Ed. New York: John Wiley & Sons, 2000.

Wood, James M. Physics 230 Lab Experiments. Palomar College, 1991.

AND

Finkenthal, Daniel F. Physics 231 Lab Experiments in Optics. Palomar College, 1991.

SUGGESTED READING:
Tipler, Paul A. Physics for Scientists and Engineers, Volume 2. 4th Ed. New York: Worth Publisher, 1998.

Fishbane, Paul M., Stephen Gasiorowicz, and Stephen T. Thornton. Physics for Scientists and Engineers, Volume 2. 2nd Ed. Upper Saddle River: Prentice Hall, 1996.

REQUIRED WRITING:
The course exams, outside assignments, and laboratory reports heavily emphasize the use of diagrams, data, and physics equations. The course requires formal lab write-ups or written laboratory summarizations as well as problem-solving exercises.

OUTSIDE ASSIGNMENTS:
Students are expected to spend a minimum of three hours per unit per week in class and on outside assignments, prorated for short-term classes.

Preparation includes such activities as readings in the assigned text, review of lecture and laboratory materials, and solving assigned problems.

INSTRUCTIONAL METHODOLOGY:

Check all that apply:
_X_ lecture
_X_ laboratory
_____ lecture-laboratory combination
_____ directed study

DISTANCE LEARNING:

This course may be offered as a distance learning course and meets Title 5 regulations 55370, 55372, 55374, 55376, 55378, and 55380.
Yes ____ No_X__

If yes, check all that apply:

_____ Television Course (Video one-way, e.g. ITV, video cassette, etc.)
_____ Online Course (Text one-way, e.g. newspaper, correspondence, electronic file, etc.)
_____ Two-Way Video Conferencing (Two-way interactive video and audio)
_____ One-Way Video Conferencing (One-way interactive video and two-way interactive audio)
_____ Computer Assisted Instruction (A specialized form of mediated instruction relying primarily on student access to information and prepared lessons or teaching materials through a computer terminal, but not under immediate supervision of a qualified instructor.)

GRADING POLICY AND STANDARDS (include methods of determining whether the stated objectives have been met by students):

Grades are determined by scores received on exams and laboratory work according to the following plan:

Two or more exams	20 - 40%
Final exam	20 - 40%
Other	0 - 30%
Lab	20%

An insufficient performance in lab may result in effectively lowering the course grade by more than 20%. Exams are principally composed of physics problems which require quantitative solutions.

IS COURSE REPEATABLE FOR REASON(S) OTHER THAN DEFICIENT GRADE?
Yes ____ No X__ Number of times course may be taken for credit: _1___

If yes, identify specific provision of Title 5 Division 2 section(s), 55761-55763 and 58161 which qualifies course as repeatable:

CONTACT PERSON: Takashi Nakajima

SIGNATURES:

SIGNATURES ON FILE