PHYSICS DEPARTMENT
COURSE OUTLINE

PHYS 114 FUNDAMENTALS OF PHYSICS 1

A survey of physics, using calculus, designed to provide a foundation for further study in the physical sciences. Students will develop skills in laboratory procedures, data analysis and problem solving through investigation of the topics of wave motion, geometric and physical optics, particle kinematics and dynamics, curvilinear motion, atomic structure and nuclear energy.

OFFERED:	Fall, Winter
CREDIT:	4
IN-CLASS WORKLOAD:	4 lecture, 2 lab (semester)
PREREQUISITES:	Physics 12 with a "C" or higher or Physics 104 or Physics 151 with a "B" or higher
COREQUISITES:	Math 100

REQUIRED MATERIALS:

Textbook: Physics for Scientists & Engineers with Modern Physics, 6th edition, Serway, R.A., and Jewett, J.W.Jr.

Physics 114/115 lab manual

Graph paper (must be either 10 lines/inch or millimeter graph paper)

DEPARTMENT POLICIES REGARDING TESTING:

1. Students must write quizzes, tests, midterm tests, etc., on the date and time assigned by the instructor. Instructors are not required to provide make-up tests. At their discretion, instructors may waive a test or provide a make-up test only in the event of documented illness or other extenuating circumstances.

2. Midterm tests may be dropped if: (a) a first-class mark is obtained on the comprehensive final exam, and (b) all term work has been completed and is judged to be satisfactory. In this case, the final grade for the course may be based on a combination of the final exam and the lab mark.

DEPARTMENT POLICIES REGARDING LABS:

1. All assigned laboratory exercises and reports must be completed with an overall grade of 60% in order to obtain credit for this course. A lab may be waived or made up at a later time only in the case of documented illness or other extenuating circumstances.

2. A student who is repeating a Physics course does not have to complete the laboratory exercises a second time if an average lab grade of 70% or better was obtained.

STUDY TIME

It is recommended that between 5 and 10 hours per week (or more for students with a weak background) be spent studying for this course outside of class time.

GRADING

The standard mark distribution for this course is as follows:

Final Exam	50%
Midterms and other work	35%
Lab Reports	15%
	100%

This distribution may be amended by the instructor (see your Instructor's Information sheet).

GRADE SCALE

Final letter grades are normally assigned as follows (subject to above conditions):

Percentage	Letter Grade
95 to 100	A+
90 to 94	A
85 to 89	A-
80 to 84	B+
75 to 79	B
70 to 74	B-
65 to 69	C+
60 to 64	C
50 to 59	D
below 50	F

OUTLINE:

1. **Wave Motion (Text Chapter 16)**

    1.1 Propagation of a Disturbance
    1.2 Sinusoidal waves (omit sinusoidal waves on a string)
    1.3 Speed of waves on strings
    1.4 Reflection and Transmission

2. **Superposition and Standing Waves (Text Chapter 18)**

    2.1 Superposition and Interference (omit sound waves)
    2.2 Standing waves
    2.3 Standing waves in a string fixed at both ends
    2.4 Resonance – Optional material
    2.5 Standing waves in air columns
    2.6 Beats: Interference in time – Optional material

3. **Nature of Light and Geometric Optics (Text Chapter 35)**

    3.1 Nature of light
    3.2 Measurements of the speed of light – Optional material
    3.3 Ray approximation in geometric optics
    3.4 Reflection
    3.5 Refraction
    3.6 Huygen's principle – Optional material
    3.7 Dispersion and Prisms
    3.8 Total Internal Reflection

4. **Image Formation (Text Chapter 36)**

    4.1 Images formed by flat mirrors
    4.2 Images formed by spherical mirrors
    4.3 Images formed by refraction
    4.4 Thin Lenses
    4.5 Lens aberrations
    4.6 Optical systems – Optional material
        4.6.1 The camera
        4.6.2 The eye
        4.6.3 The simple magnifier
        4.6.4 The compound microscope
        4.6.5 The telescope

5. **Interference of Light Waves (Text Chapter 37)**

    5.1 Conditions for interference
    5.2 Young's double-slit experiment
    5.3 Interference in thin films – Optional material

Typically only one of the two following topics will be presented, refer to instructor.

6a. **Introduction to Quantum Physics (Text Chapter 40)**

6.1 Blackbody radiation and Plank's hypothesis
6.2 The photoelectric effect
6.3 The Compton effect

6b. **Atomic Physics (Text Chapter 42)**

6.1 Atomic Spectra of Gases
6.2 Early models of the atom
6.3 Bohr's model of the Hydrogen atom

7. **Vectors (Text Chapter 3) and Vector Mathematics (Text Sections 7.3, 11.1)**

7.1 Co-ordinate systems
7.2 Vector and scalar quantities
7.3 Properties of vectors
7.4 Components of a vector and unit vectors
7.5 Scalar (dot) product – Section 7.3
7.6 Vector (cross) product – Section11.1

8. **Motion in One-Dimension (Text Chapter 2)**

8.1 Position, velocity and speed
8.2 Instantaneous velocity and speed
8.3 Acceleration
8.4 Motion diagrams
8.5 1-D motion with constant acceleration
8.6 Freely falling objects
8.7 Kinematic equations derived from calculus

9. **Motion in Two and Three Dimensions (Text Chapter 4)**

9.1 Position, velocity and acceleration vectors
9.2 Two-dimensional motion with constant acceleration
9.3 Projectile motion
9.4 Uniform circular motion
9.5 Tangential and radial acceleration – Optional material

10. **The Laws of Motion (Text Chapter 5 and Section 6.1)**

10.1 Concept of force and Newton's First law
10.2 Newton's second law of motion, applications with and with friction
10.3 Newton's third law of motion
10.4 Newton's second law and uniform circular motion – Section 6.1
10.5 Non-uniform circular motion – Optional material