PHYSICS DEPARTMENT
COURSE OUTLINE

PHYS 115 FUNDAMENTALS OF PHYSICS 2

A continuation of the survey of topics begun in Physics 114 with increased use of calculus. Skills and knowledge about Physics will be expanded through investigation of mechanical energy, linear momentum, force and statics, electrostatics, electric circuits, electromagnetism, nuclear structure and nuclear energy. Physics 114 and 115 is intended to satisfy the first year requirement for students pursuing studies in the physical sciences.

OFFERED:	Winter, Spring
CREDIT:	4
IN-CLASS WORKLOAD:	4 lecture, 2 lab (semester)
PREREQUISITES:	Physics 114 and Math 100
COREQUISITES:	Math 101

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. **Energy and Energy Transfer (Text Chapter 7)**

   1.1 Systems and Environments
   1.2 Work done by a constant force
   1.3 Scalar product (review from P114)
   1.4 Work done by a varying force
   1.5 Kinetic energy and the work-energy theorem
   1.6 The non-isolated system – Conservation of energy
   1.7 Situations involving kinetic friction
   1.8 Power

2. **Potential Energy (Text Chapter 8)**

   2.1 Potential energy of a system
   2.2 The isolated system – Conservation of mechanical energy
   2.3 Conservative and noon-conservative forces
   2.4 Changes in mechanical energy for non-conservative forces
   2.5 Relationship between conservative forces and potential energy
   2.6 Energy diagrams and equilibrium of a system – Optional material

3. **Linear momentum and Collisions (Text Chapter 9)**

   3.1 Linear momentum and its conservation
   3.2 Momentum and impulse
   3.3 Collisions in one-dimension
   3.4 Two-dimensional collisions
   3.5 The center of mass

4. **Torque and Equilibrium (Text Chapter 12 and Sections 10.6, 11.1)**

   4.1 Definition of torque – Section 10.6
   4.2 Vector product and torque – Section 11.1
   4.3 Conditions for equilibrium
   4.4 More on the center of gravity
   4.5 Examples of objects in static equilibrium

5. **Electric Fields (Text Chapter 23)**

   5.1 Properties of electric charges
   5.2 Charging objects by induction
   5.3 Coulomb's law
   5.4 The electric field
   5.5 Electric field lines
   5.6 Motion of charged particles in a uniform E-field

6. **Electric Potential (Text Chapter 25)**

- 6.1 Potential difference and electric potential
- 6.2 Potential differences in a uniform E-field
- 6.3 Electric potential and potential energy due to point charges
- 6.4 Obtaining the value of the E-field from the electric potential

7. **Current and Resistance (Text Chapter 27)**

- 7.1 Electric current
- 7.2 Resistance
- 7.3 Resistance and temperature dependence
- 7.4 Electrical power
- *7.5 Superconductors – Optional material*

8. **Direct Current Circuits (Text Chapter 8)**

- 8.1 Electromotive force
- 8.2 Resistors in series and parallel
- 8.3 Kirchhoff's rules

9 **Magnetic Fields (Text Chapter 29)**

- 9.1 Magnetic fields and forces
- 9.2 Magnetic force on a current-carrying conductor
- 9.3 Torque on a current loop in a uniform B-field
- 9.4 Motion of a charged particle in a uniform B-field
- 9.5 Applications involving charged particles moving in a B-field

10. **Sources of the Magnetic Field (Text Chapter 30)**

- 10.1 Biot-Savart law
- 10.2 The magnetic force between two parallel conductors
- *10.3 The magnetic field of a solenoid – Optional material*
- *10.4 Magnetic flux – Optional material*

11. **Nuclear Structure (Text Chapter 44)**

- 11.1 Some properties of nuclei
- 11.2 Radioactivity
- *11.3 Qualitative discussion of decay processes – Optional material*

12. ***Nuclear Energy (Text Chapter 45) – Optional material***

- *12.1 Nuclear fission*
- *12.2 Nuclear reactors*
- *12.3 Nuclear fusion*
- *12.4 Fusion technology*