PHYSICS DEPARTMENT
COURSE OUTLINE

PHYS 191 PHYSICS 1 for CIVIL AND MECHANICAL ENGINEERING TECHNOLOGY

A physics course enriched with applications relevant to civil and mechanical engineering technologies. Topics include measurement and units, vectors, kinematics, dynamics, work, energy and power, statics and rotational dynamics.

OFFERED:	Q1
CREDIT:	3
IN-CLASS WORKLOAD:	5 lecture, 2 lab (alt. weeks)
PRE-REQUISITES:	Physics 11 or departmental assessment *Physics 151 recommended*

REQUIRED MATERIALS:

Textbook: "Physics", 6th edition, Cutnell, J.D. and Johnson, K.W.
Physics 191/192 lab manual
Scientific calculator (any calculator is acceptable with the exception of personal computers)
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. The final exam will cover the entire course and will be 3 hours long. As stated in the current college calendar on page 39, " students are expected to write tests and final exams at the scheduled time and place." Exceptions will only be considered due to **emergency** circumstances as outlined in the calendar. Holidays or scheduled flights are not considered to be emergencies.

3. Midterm tests may be discounted from the grading distribution (see below) if all term work, including term tests, labs, seminars, and assignments, has been completed and is **60% or higher**. 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 prior to the date of the final exam 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 during the term 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	40%
Lab Reports	10%
	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. **Measurement**

    1.1 Concept and process
    1.2 Significant figures
    1.3 Systeme Internationale (SI)
    1.4 British and practical units
    1.5 Unit conversions - review
    1.6 Error analysis

2. **Vectors**

    2.1 Representation of vectors and specification of directions
    2.2 Addition and subtraction of vectors
    2.3 Scalar and vector multiplication
    2.4 Component method
    2.5 Application of sine and cosine laws to vector problems
    2.6 Concurrent forces in equilibrium

3. **Kinematics**

    3.1 Kinematic quantities
        3.1.1 Position, distance and displacement
        3.1.2 Speed and velocity
        3.1.3 Acceleration
    3.2 Uniformly accelerated motion
    3.3 One-dimensional kinematic problems
        3.3.1 Free-fall
        3.3.2 Two-body problems
    3.4 Two-dimensional kinematic problems
        3.4.1 Projectiles and trajectories

4. **Dynamics**

    4.1 Newton's laws of motion and conceptual problems
    4.2 Concept of force
        4.2.1 Normal forces
        4.2.2 Static and kinetic friction
        4.2.3 Tension forces
    4.3 Newton's second law of motion
        4.3.1 Free-body diagrams
        4.3.2 Problem-solving techniques
        4.3.3 Inclined planes
        4.3.4 Connected systems
        4.3.5 Two-dimensional problems
    4.4 Equilibrium

5. **Uniform Circular Motion**

   5.1 Centripetal acceleration
   5.2 Centripetal force

6. **Work, Energy and Power**

   6.1 Definition and concept
   6.2 Types of mechanical energy
      6.2.1 Kinetic energy
      6.2.2 Potential energy
   6.3 Work-energy theorem – conservation of energy
   6.4 Problems involving work and energy
      6.4.1 Without dissipative forces
      6.4.2 With dissipative forces
   6.5 Power as rate of doing work and change of energy

7. **Physics of a Rigid Body**

   7.1 Center of mass and center of gravity – calculations
   7.2 Torque
   7.3 Equilibrium of a rigid body
   7.4 Rotational intertia
      7.4.1 Parallel axis theorem
      7.4.2 Perpendicular axis theorem
      7.4.3 Methods of symmetry
   7.5 Rotational kinematics
      7.5.1 Definition of rotational kinematic quantities and units
      7.5.2 Formulas for uniformly accelerated rotation
      7.5.3 Relation between linear and angular quantities
   7.6 Rotational dynamics
      7.6.1 Dynamic equation
      7.6.2 Work, rotational kinetic energy, power

8. **Simple Machines**

   8.1 General theory
      8.1.1 Mechanical advantage
      8.1.2 Efficiency
   8.2 Application: Different types of machines