# C A M O S U N  C O L L E G E

## PHYSICS DEPARTMENT

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**PHYS 060 INTRODUCTORY PHYSICS**

A first course to introduce students to the nature of physics. This is also recommended for students who took Physics 11 several years ago. Various topics including measurement, graphical analysis, 1-D kinematics, 1-D dynamics, energy, heat, electricity and nuclear energy are studied with the goal of introducing students to some concepts and the methodology of problem solving and data analysis.

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| OFFERED: | Fall, winter, spring, |
| CREDIT: | 4 |
| IN-CLASS WORKLOAD: | 4 lecture, 2 lab (semester)<br>8 lecture, 2 lab (term) |
| PREREQUISITES: | Math 10 or MATH 050 |
| COREQUISITES: | Math 11 or MATH 060 |

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OUTLINE

1. **Measurement**

   1.1 Concept, process and results

   1.2 Numbers
   - 1.2.1 Accuracy and precision
   - 1.2.2 Uncertainty
   - 1.2.3 Significant digits
   - 1.2.4 Scientific notation
   - 1.2.5 Significant digits in calculations

   1.3 Units
   - 1.3.1 Purpose
   - 1.3.2 Historical

   1.4 Systeme Internationale (SI)
   - 1.4.1 Base units
   - 1.4.2 Prefixes
   - 1.4.3 Derived units
   - 1.4.4 Some rules
   - 1.4.5 Conversion of units

2. **Graphical Analysis**

   2.1 Graph construction
   - 2.1.1 Cartesian coordinate system
   - 2.1.2 Drawing and labeling axes
   - 2.1.3 Plotting data
   - 2.1.4 Fitting curves to data

2.2 Analyzing linear graphs
- 2.2.1 Determination of slope
- 2.2.2 Determination of intercept
- 2.2.3 Generic linear equation
- 2.2.4 Specific linear equation

2.3 Analyzing non-linear graphs
- 2.3.1 Recognition of power graphs
- 2.3.2 Changing variables to produce linear graphs
- 2.3.3 Writing equations

## 3. **Kinematics in One Dimension**

3.1 Description of kinematics
- 3.1.1 Position
- 3.1.2 Distance and displacement
- 3.1.3 Vector and scalar quantities
- 3.1.4 Average speed and velocity
- 3.1.5 Instantaneous speed and velocity

3.2 Kinematics graphs
- 3.2.1 Position veresus time
- 3.2.2 Displacement versus time
- 3.2.3 Velocity versus time

3.3 Equations of uniformly accelerated motion
- 3.3.1 Development of supplemental equations
- 3.3.2 Solving kinematics problems

3.4 Vertical motion near the earth
- 3.4.1 Concept of free fall
- 3.4.2 Acceleration due to gravity
- 3.4.3 Solution of problems

## 4. **Dynamics in one dimension**

4.1 Introduction to force

4.2 Newton's first law of motion
- 4.2.1 Historical perspective
- 4.2.2 Statement of the law
- 4.2.3 Concept of inertia

4.3 Newton's second law of motion
- 4.3.1 Dependence of acceleration on net force
- 4.3.2 Dependence of acceleration on mass
- 4.3.3 Concepts of net force and mass
- 4.3.4 Force of gravity and weight
- 4.3.5 Dynamics problems

4.4 Newton's third law of motion
- 4.4.1 Statement of the law
- 4.4.2 Interpretation of examples of the law

## 5. Work, Energy and Power

- 5.1 Work
  - 5.1.1 Definition
  - 5.1.2 Calculating work done by a force
  - 5.1.3 Positive and negative work
- 5.2 Energy
  - 5.2.1 Types of energy
- 5.3 Kinetic energy
  - 5.3.1 Definition
  - 5.3.2 Work energy theorem
  - 5.3.3 Problems involving work and kinetic energy
- 5.4 Gravitational potential energy
  - 5.4.1 Definition
  - 5.4.2 Dependence on reference level
- 5.5 Elastic Potential Energy
  - 5.5.1 Hooke's law
  - 5.5.2 Energy in a spring
- 5.6 Conservation of mechanical energy
  - 5.6.1 Statement of the law
  - 5.6.2 Problems
- 5.7 Power
  - 5.7.1 Definition
  - 5.7.2 Problems

## 6. Thermal energy

- 6.1 Temperature
  - 6.1.1 Concept of temperature
  - 6.1.2 Temperature scales
  - 6.1.3 Absolute temperature scale
- 6.2 Calorimetry
  - 6.2.1 Concept of heat
  - 6.2.2 Specific heat capacity
  - 6.2.3 States of matter
  - 6.2.4 Specific latent heat of fusion
  - 6.2.5 Specific latent heat of vaporization
- 6.3 Transfer of thermal energy
  - 6.3.1 Concept of conduction
  - 6.3.2 Concept of convection
  - 6.3.3 Concept of radiation

7. **Electrical Energy**

7.1 Charges
- 7.1.1 Atomic structure
- 7.1.2 Negative, positive, and neutral objects
- 7.1.3 Conductors and insulators

7.2 Electric circuits
- 7.2.1 Meaning of current, voltage, resistance
- 7.2.2 Parts of a circuit
- 7.2.3 Ohm's law
- 7.2.4 Electric power and energy
- 7.2.5 Characteristics of series circuit
- 7.2.6 Characteristics of parallel circuit

8. **Nuclear Energy**

8.1 Nucleus
- 8.1.1 Nuclear atom
- 8.1.2 Size and mass of nucleus

8.2 Mass-Energy
- 8.2.1 Equivalence of mass and energy
- 8.2.2 Mass defect in nucleus
- 8.2.3 Binding energy

8.3 Nuclear energy
- 8.3.1 Fission and fusion
- 8.3.2 Chain reactions
- 8.3.3 Safety concerns

**The student must obtain a satisfactory mark for the lab portion in order to obtain credit for the course.**

TEXTS AND REFERENCES

Course material developed in department
Lab manual
Scientific calculator
Graph paper

***It is the policy of the physics department that instructors are not required to give make-up tests. At their discretion , instructors may give make-up tests in the case of documented excuses.***