



MASTER COURSE OUTLINE

Prepared By: Jim Hamm

Date: September 2017

COURSE TITLE

Engineering Physics I with Lab

GENERAL COURSE INFORMATION

Dept.: PHYS&

Course Num: 221

(Formerly:)

CIP Code: 40.0801

Intent Code: 11

Program Code:

Credits: 5

Total Contact Hrs Per Qtr.: 66

Lecture Hrs: 44

Lab Hrs: 22

Other Hrs: 0

Distribution Designation: Lab Science LS

COURSE DESCRIPTION (as it will appear in the catalog)

The course is an introductory physics course intended for students majoring in science or engineering. This course is the first of a three-quarter sequence. Course content includes the laws of motion, energy, momentum, and static equilibrium.

PREREQUISITES

Calculus I (MATH& 151) or concurrent enrollment

TEXTBOOK GUIDELINES

A calculus-based Engineering Physics textbook, such as *University Physics* by Young and Freedman.

COURSE LEARNING OUTCOMES

Upon successful completion of the course, students should be able to demonstrate the following knowledge or skills:

1. Use vector mathematics including component algebra, unit vectors, and the scalar product.
2. Convert between different units of all sorts, and correctly use significant figures.
3. Solve various problems using the problem-solving strategy of drawing a suitable diagram, listing the knowns and unknowns, deriving a proper equation, substituting for the given values, and obtaining a numerical value for the unknown.
4. Solve problems involving constant acceleration in one and two dimensions, including chase, circular motion, and projectile motion problems.
5. Apply Newton's laws of motion to the solution of problems, including those involving linear, two-dimensional, circular, and rotational motion.
6. State the conservation principles of mass, energy, and momentum, and apply these principles to problems involving linear, two-dimensional, circular, and rotational motion.
7. Present clearly explained problem solutions.
8. Present experimental results in clearly written laboratory reports.

INSTITUTIONAL OUTCOMES

IO2 Quantitative Reasoning: Students will be able to reason mathematically.

COURSE CONTENT OUTLINE

Measurement and Vectors

- Standards of length, mass, and time

- Scalar and vector quantities

- Unit vectors and components

- Addition of vectors, multiplication of vectors by scalars, and scalar products

Motion in One Dimension

- Speed and velocity

- Acceleration

- Motion with constant acceleration

- Freefall

Two-dimensional motion

- Projectile motion

- Uniform circular motion

The Laws of Motion

- Inertial mass

- Newton's laws of motion

- Weight

- Friction

- Applications of Newton's laws

Work and Energy

- Work

- Kinetic energy

- Potential energy

- Conservation of energy

- Power

Momentum

- Momentum and impulse

- Collisions

- Center of mass

Rotational Motion

- Angular concepts

- Torque and rotational inertia

- Rolling motion

- Angular momentum

- Static equilibrium

Gravitation (if time permits)

- Newton's law of gravitation

- Gravitational potential energy

- Kepler's laws of orbital motion 1. Electric Charge and Electric Field

DEPARTMENTAL GUIDELINES (*optional*)

Exams and Quizzes 50-60% Homework 20-30% Laboratory Reports 20%

PO5 should be assessed: Students will be able to solve problems by gathering, interpreting, combining and/or applying information from multiple sources.

DIVISION CHAIR APPROVAL

DATE