University of Anbar
College of Engineering
Civil Dept.
Lecture Notes

Physics

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CE1203 Physics (4-3-0-2)
Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:
This is the first course in the two-semester sequence of calculus-based introductory physics courses designed to meet the needs of student majoring in Engineering. The course is a survey of the concepts, principles, methods and major findings of classical Physics. Primarily, it covers Newtonian mechanics, and thermal Physics, with topics include: Physics and measurement, Vectors, kinematics and dynamics of motion of a single particle in one and two dimensions, work and energy, system of particles, linear momentum and collisions, kinematics and dynamics of rotational motion, equilibrium of rigid bodies, and elasticity, fluid static and fluid dynamics, oscillatory motion, wave motion, and temperature and thermal equilibrium.

Physics Lab.1
This is the Lab-based course covering the subject matter of CE1203 Physics. The course presents an introduction to the methods of experimental physics Emphasis is on developing student's skills in experimental techniques, data analysis, and scientific reporting of lab work. During the course students execute a series of experiments on Kinematics of motion, kinetic and potential energy, Oscillatory motion, Thermal properties of matter, and Viscosity. The course includes computer-based experiments on Classical Mechanic

Recommended Text Book:
R.D. Knight, Physics for Scientists and Engineers, 2nd ed., Pearson 2008

For lab
Laboratory Manual, Compiled by Instructor

Prerequisites:
Concurrent requirement with CE1201 Calculus 1

Course Topics:
1- Physics and Measurement
1.1- Standards of Length , Mass and Time
1.2- Density of Atomic Mass
1.3- Dimensional Analysis
1.4- Conversion of Units
1.5- Estimate and Order of Magnitude Calculations
1.6- Significant Figures

2- Motion in One Direction
2.1- Particle Model
2.2- Position, Velocity and Speed
2.3- Instantaneous Velocity and Speed
2.4- Acceleration
2.5- One-Dimensional Motion with Constant Acceleration
2.6- Freely Falling Object

3- Vectors
3.1- Coordinate System
3.2- Vector and Scalar Quantity
3.3- Some Properties of Vectors
3.4- Adding Vectors
3.5- Subtracting Vectors
3.6- Component of Vectors and Unit Vectors

4- Motion in Two Dimension
4.1- The Position, Velocity and Acceleration Vectors
4.2- Two-Dimensional Motion with Constant Acceleration
4.3- Projectile Motion
4.4- Horizontal Range and Maximum Height of a Projectile
4.5- Uniform Circular Motion
4.6- Tangent and Radial Acceleration
4.7- Relative Velocity and Relative Acceleration

5- The Laws of Motion
5.1- Newton's First Law and Inertial Frames
5.2- Mass
5.3- Newton's Second Law
5.4- The Gravitational Force and weight
5.5- Newton's Third Law
5.6- Forces and Friction
5.7- Experimental Observations

6- Circular Motion and Other Applications of Newton's Law
6.1- Non uniform Circular Motion
6.2- Resistance Force Proportional to Object Speed
6.3- Air Drag at High Speed

7- Temperature
7.1- Zeroth Law of Thermodynamics
7.2- Thermometers and The Celsius Temperature Scale
7.3- The Constant Volume Gas Thermometer and The Absolute Temperature Scale
7.4- Thermal Expansion and of Solids and Liquids
7.5- The Unusual Behavior of Water
7.6- Macroscopic Description of an Ideal Gas

8- Energy and Energy Transfer
8.1- Work Done by Constant Force
8.2- The Scalar Product of Two Vectors
8.3- Work Done by Varying Force
8.4- Work DONE by a Spring
8.5- Kinetic Energy and the Work-Kinetic Energy Theorem
8.6- Conservations of Energy
8.7- Situations Involving Kinetic Energy
8.8- Power
8.9- Energy and the Automobile

Physics 1 Lab

Mechanical Physics Experiments

1- Determination The Density of Solid Materials
2- Verification of Hooks Law
3- Determination the Value of Gravity Acceleration (Simple Pendulum)
4- Determination the Coefficient of Viscosity
5- Measurement of Liquid Density
6- Verification of Newton's Second Law
7- Verification of continuity Equation
8- Determination the Mechanical Equivalent of Heat
9- Determination the Specific Heat Capacity of a Solid

Course Learning Outcomes:

Students will learn:

1. Describe the translational motion of a single particle in terms of position and inertial frames, inertia, velocity, acceleration, linear momentum and force.
2. Describe the rotational motion of a rigid body using the concepts of rotation angle, angular velocity, angular acceleration, angular momentum, moment of inertia, and torque.
3. Identify the forces acting on ordinary mechanical systems to be gravity and electromagnetics (Drag force, frictional force, normal force, etc.).
4. State the fundamental laws of kinematics and dynamics of rotational motion of a rigid body and use them to solve problems on simple rotational motion.
5. Analyze the translational and rotational motion using a scalar approach based on the concepts of work, conservative and non-conservative forces, potential energy and conservation of mechanical energy.
6. State the two conditions of static and dynamic equilibrium of a point particle and a rigid body, and use them to solve problems of static equilibrium.
7. Define and calculate the following parameters of oscillatory and wave motion: amplitude, period, frequency, angular frequency, speed of a wave, energy transported, Power and intensity;
8. Describe Simple Harmonic Motion qualitatively and quantitatively.
9. Recognize and analyze some wave characteristics: principle of superposition, interference, diffraction, reflection, transmission, refraction, standing waves and Resonance.
10. Define what is meant by: temperature, specific and molar heats of capacity.