FENG CHIA UNIVERSITY

Fundamentals of Physics I (With Lab)

PHYS114, Summer 2019 (May 13 - Jun 14)

Lecturer: Timothy Werhner

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Time: Monday through Friday

Contact hours: 60 (50 minutes each)

Credits: 4

Office hours: 2 hours (according to the teaching schedule)

Course Description

This course contains a descriptive and quantitative study of kinematics, mechanics, energy and applications of mechanics. This course meets the requirements for professional and technical students needing an algebra-based physics course.

Required Textbook

No text is required. Your Instructor will provide you with all materials needed.

Course Hours

The course has 25 sessions in total. Each class session is 120 minutes in length. The course meets from Monday to Friday.

Student Learning Outcomes

The Collegewide Student Learning Outcomes assessed and reinforced in this course include the following:

- Communication
- Critical Thinking
- Scientific and Quantitative Reasoning
- Information Literacy

Measurable Course Objectives

Measurable Course Objectives are outcomes students are expected to achieve by the end of the course.

- Describe and explain how the principles of physics apply to physical situations and everyday applications.

- Complete analytical problems involving the use of algebra and/or right-angle trigonometry applied to physical situations.

- Demonstrate basic understanding and use of the various ways in which scientific information can be communicated (verbally, diagrammatically, graphically and/or mathematically).

Course Topics

Unit 1: Units and significant figures, one and two-dimensional kinematics, position, velocity, and acceleration vs. time graphs, free-fall, projectile motion, vectors, trigonometric analysis of vectors, coordinate systems and vector components

Unit 2: Newton's three laws of motion, identifying forces, Hooke's law, static and kinetic friction, drag, free-body diagrams, equilibrium, statics in two dimensions, motion on inclined planes, dynamics in two dimensions, ropes and pulleys.

Unit 3: Impulse, momentum, the impulse-momentum theorem in one and two dimensions, conservation of momentum, collisions, work, power output, kinetic energy, gravitational potential energy, elastic potential energy, thermal energy, the work-energy theorem, and conservation of energy

Unit 4: Rotational motion, equations of motion for rotational motion, centripetal forces and accelerations, center of mass, torque, gravitational torque and stability, rotational inertia, Newton's second law for rotational motion, angular momentum, conservation of angular momentum, rotational kinetic energy

Unit 5: Fluids, pressure, hydraulic lifts, Buoyancy and Archimedes' principle, fluid dynamics and Bernoulli's principle, solids and elasticity, tensile strength, Young's modulus, and bulk modulus

Assessment

There will be a total of 750 points available during this semester. The breakdown of these points, as well as the grading scale, is shown below.

<u>Tests - 500 points.</u>

There will be five unit tests, each worth 100 points.

<u>Homework - 100 points.</u>

Weekly homework problems will be assigned and graded.

Labs – 50 points.

Labs will be assigned at the end of the each weekly unit and done online

Final Exam – 100 points.

The final is cumulative and required. If it is higher than any of the unit tests, it will replace that grade

Grading Scale

Grading System of FCU:

Letter Grade	Score
A	80-100
B	70-79
C	60-69
D	50-59
E	Below 50

Late Assignments and Make-up Exams

Tests and assignments cannot be made up under any circumstances.

Class Schedule

Week 1:

a. Units and significant figures

b. Motion in one dimension

i. Average vs. instantaneous speed

ii. Velocity

iii. Uniform Acceleration

1. Equations of motion for constant acceleration

iv. Free-fall

c. Graphing motion

i. Position, velocity, and acceleration vs. time graphs

d. Vectors

i. Trigonometric representations of vectors

ii. Coordinate systems and Vector components

iii. Projectile motion

Week 2:

a. Motion and Force

i. Newton's first law

ii. Identifying forces

1. Friction, normal, tension, etc..

iii. Free-body diagrams

iv. Newtons Second Law

        1. Applying Newton's Second Law in 1 and 2D

v. Newton's Third Law

b. Equilibrium

i. Static and dynamic equilibrium

c. Dynamics and Newton's second Law

d. Mass vs. weight and weightlessness

e. Inclined planes

f. Friction and drag

g. Pulley systems

Week 3:

a. Momentum and Impulse

i. Conservation of momentum

ii. Impulse-momentum Theorem

iii. Inelastic collisions

b. Work and Energy

i. Work and power

ii. Kinetic energy

iii. Gravitational potential energy

iv. Elastic potential energy

v. Work-energy theorem

vi. Conservation of energy

vii. Elastic collisions

Week 4:

a. Rotational motion

i. Uniform circular motion

ii. Centripetal forces and accelerations

iii. Angular displacement, velocity, and acceleration

1. Rotational kinematics

b. Torque

i. Gravitational torque and center of gravity

c. Rotational dynamics

i. Moment of inertia

ii. Newton's second law for rotational motion

Week 5:

a. Fluids

i. Pressure

1. Hydraulic lift

ii. Buoyancy

1. Archimedes' principle

iii. Fluid dynamics

1. Bernoulli's equation

b. Solids and Elasticity

i. Tensile strength, Young's modulus, and Bulk Modulus

Academic Honesty

Feng Chia University defines academic misconduct as any act by a student that misrepresents the student's own academic work or that compromises the academic work of another. Scholastic misconduct includes (but is not limited to) cheating on assignments or examinations; plagiarizing, i.e., misrepresenting as one's own work any work done by another; submitting the same paper, or a substantially similar paper, to meet the requirements of more than one course without the approval and consent of the instructors concerned; or sabotaging another's work within these general definitions. Instructors, however, determine what constitutes academic misconduct in the courses they teach. Students found guilty of academic misconduct in any portion of the academic work face penalties that range from the lowering of their course grade to awarding a grade of F for the entire course.