COURSE OUTLINE

PHYS 131 - UNIVERSITY PHYSICS I

Prepared By: Dr. Lawretta Ononye
A. **TITLE:** UNIVERSITY PHYSICS I

B. **COURSE NUMBER:** PHYS 131

C. **CREDIT HOURS:** 3

D. **WRITING INTENSIVE COURSE:** No

E. **COURSE LENGTH:** 15 weeks

F. **SEMESTER(S) OFFERED:** Fall/Spring

G. **HOURS OF LECTURE, LABORATORY, RECITATION, TUTORIAL, ACTIVITY:**
   3 lecture hours per week

H. **CATALOG DESCRIPTION:**
   This is an introductory college physics course which uses basic calculus in developing some of the fundamental concepts of classical physics. Topics covered are measurement, vector manipulation (including unit vector notation), linear kinematics and dynamics, motion in a plane, and conservation of energy and linear momentum.

I. **PRE-REQUISITES/CO-REQUISITES:**
   a. Pre-requisite(s): Pre-Calculus or Three years of high school mathematics or permission of instructor
   b. Co-requisite(s): Physics Lab I; Calculus I

J. **GOALS (STUDENT LEARNING OUTCOMES):**
   By the end of this course, the student will be able to:

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<th>Course Objective</th>
<th>Institutional SLO</th>
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<td>a. Understand the methods scientists use to explore physical phenomena, including observation, hypothesis development, measurement, data collection, experimentation, evaluation of evidence, and employment of physics analysis.</td>
<td>2. Crit. Thinking 3. Prof. Competence</td>
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<td>b. Apply scientific data, concepts, and models in physics.</td>
<td>2. Crit. Thinking 3. Prof. Competence</td>
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<td>c. Demonstrate an understanding of one dimensional and two dimensional kinematics &amp; dynamics.</td>
<td>1. Communication 2. Crit. Thinking 3. Prof. Competence</td>
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<td>d. Demonstrate proficiency in solving physical problems by analytical methods.</td>
<td>2. Crit. Thinking 3. Prof. Competence</td>
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L. **REFERENCES:** None

M. **EQUIPMENT:** Technology enhanced classroom

N. **GRADING METHOD:** A-F
O. **MEASUREMENT CRITERIA/METHODS:**

- Exams
- Quizzes
- Homework
- Project(s)

P. **DETAILED COURSE OUTLINE:**

I. Introduction and Measurement
   A. Standards of Length, Mass, and Time
   B. The Building Blocks of Matter
   C. Density and Atomic Mass
   D. Dimensional Analysis
   E. Conversion of Units
   F. Order-of-Magnitude Calculations
   G. Significant Figures
   H. Mathematical Notation

II. Motion in One Dimension
   A. Displacement, Velocity, and Acceleration
   B. One-dimensional Motion with Constant Acceleration
   C. Freely Falling Objects

III. Vectors
   A. Coordinate Systems and Frames of Reference
   B. Vectors and Scalar Quantities
   C. Some Properties of Vectors
   D. Components of a Vector and Unit Vectors

IV. Motion in Two Dimensions
   A. The Displacement, Velocity, and Acceleration Vectors
   B. Two-Dimensional Motion with Constant Acceleration
   C. Projectile Motion
   D. Uniform Circular Motion
   E. Tangential and Radial Acceleration
   F. Relative Velocity and Relative Acceleration

V. A. Newton’s Laws of Motion
   B. The Concept of Force
   C. Some Applications of Newton’s Laws
   D. Forces of Friction

VI. A. Circular Motion and Other Applications of Newton’s Laws
    B. Newton’s Second Law Applied to Uniform Circular Motion
    C. Nonuniform Circular Motion
    D. Motion in Accelerated Frames
    E. The Fundamental Forces of Nature

VII. Work and Energy
    A. Work Done by a Constant Force
B. The Scalar Product of Two Vectors
C. Work Done by a Varying Force
D. Kinetic Energy and the Work-Energy Theorem
E. Power
F. Energy and the Automobile
G. Kinetic Energy at High Speeds

VIII. Potential Energy and Conservation of Energy
A. Potential Energy
B. Conservative and Nonconservative Forces
C. Conservative Forces and Potential Energy
D. Conservation of Energy
E. Changes in Mechanical Energy when Nonconservative Forces are Present
F. Relationship between Conservative Forces and Potential Energy
G. Energy Diagrams and the Equilibrium of a System
H. Conservation of Energy in General
I. Mass-Energy Equivalence
J. Quantization of Energy

IX. Linear Momentum and Collisions
A. Linear Momentum and its Conservation
B. Impulse and Momentum
C. Collisions
D. Elastic and Inelastic Collisions in One Dimension
E. Two-Dimensional Collisions
F. The Center of Mass
G. Motion of a System of Particles
H. Rocket Propulsion

Q. LABORATORY OUTLINE: NA