BUTTE COLLEGE
COURSE OUTLINE

I. **CATALOG DESCRIPTION**

PHYS 41 - Physics for Scientists and Engineers I **4 Unit(s)**

Prerequisite(s): MATH 30
Recommended Prep: High school physics
Transfer Status: CSU/UC
51 hours Lecture
51 hours Lab

This course, intended for students majoring in physical sciences and engineering, is part of a three-semester course whose contents may be offered in other sequences or combinations. Core topics include an introduction to kinematics, dynamics, work and energy, momentum, gravitation and simple harmonic motion. It is highly recommended that students also enroll in PHYS 51. (C-ID PHYS 205). Graded only.

II. **OBJECTIVES**

Upon successful completion of this course, the student will be able to:

A. Predict the future trajectory of an object moving in two dimensions with uniform acceleration.
B. Analyze a physical situation with multiple constant forces acting on a point mass using Newtonian mechanics.
C. Analyze a physical situation with multiple forces acting on a point mass or extended object using concepts of work and energy.
D. Analyze real-world experimental data, including appropriate use of error propagation, units and significant figures.
E. Relate the results of experimental data to the physical concepts discussed in the lecture portion of the class.
F. Apply concepts from special relativity to analyze physical situations, including time dilation, length contraction, and the Lorentz transformation. Solve basic problems involving relativistic momentum and energy.

III. **COURSE CONTENT**

A. **Unit Titles/Suggested Time Schedule**

Lecture

Topics		Hours
1.	Vectors and Scalars	3.00
2.	Translational Kinematics	4.00
3.	Rotational Kinematics	2.00
4.	Newton’s Laws	3.00
5.	Statics and Dynamics	6.00
6.	Work and Energy	6.00
7.	Momentum	3.00
8.	Rotational Dynamics	6.00
9.	Simple Harmonic Motion	5.00
10.	Gravitation	5.00
11.	Special Relativity	5.00
12.	Fluids	3.00

Total Hours		51.00

Lab

Topics		Hours
1.	Error Analysis	3.00
2.	Period of a Pendulum	3.00
3.	Random Distributions & Error Propagation	3.00
4.	Freely Falling Bodies	3.00
5.	Projectile Motion	3.00
6.	Newton's Laws of Motion	3.00
7.	Centripetal Forces	3.00
8.	Dissipative Forces	3.00
9.	Energy Conservation	3.00
10.	Elastic & Inelastic Collisions	3.00
11.	Impulsive Forces	3.00
12.	Center of Mass Motion	3.00
13.	Moments of Inertia	3.00
14.	Equilibrium of a Rigid Body	3.00
15.	Kepler's Laws of Planetary Motion	3.00
16.	Oscillatory Systems	3.00
17.	Static & Dynamic Fluids	3.00
Total Hours		51.00

IV. **METHODS OF INSTRUCTION**

A. Lecture-Discussion
B. Problem-Solving Session
C. Demonstrations
D. Laboratory Experiments
E. Individual Tutoring
F. Relevant Films
G. Homework: Students are expected to spend two hours outside of class each week for each course unit doing homework.

V. **METHODS OF EVALUATION**

A. Exams/Tests
B. Quizzes
C. Homework
D. Lab Projects
E. Final Examination

VI. **EXAMPLES OF ASSIGNMENTS**

A. Reading Assignments
   1. Read the first chapter of special relativity text. Be prepared to participate in a discussion regarding the differences between Galilean and Lorentz velocity transformations.
   2. Read example problem and solution of the beam leaning against a frictionless wall with given friction at the base. Prepare to solve a similar problem on a quiz.

B. Writing Assignments

1. Produce a written lab report on the experiment involving moments of inertia. Include a one page summary, error propagation, calculations and properly annotated data sheet.
2. Produce a clearly written solution of the bowling ball problem including critical assessment of numerical results.

C. Out-of-Class Assignments

1. Watch the clip of 2001 A Space Odyssey when the shuttle docks with the space station. Estimate the rate of rotation and the physical dimensions of the station and determine, within estimation error, if the centripetal force at the outer rim of the station is equal to 9.8m/s^2.
2. Look up the range of static friction coefficients for commercially available tires and contrast these values with NASCAR tires.

VII. **RECOMMENDED MATERIALS OF INSTRUCTION**

Textbooks:

A. Halliday, D., Resnick, R., Walker, J.. Fundamentals of Physics Extended. 9th Edition. Wiley, 2011.

Materials Other Than Textbooks:

A. Eggert S. and Trento J., Physics 41 Lab manual , purchased at the bookstore
B. Panunto, M., Physics 41 Supplemental Notes & Exercises, purchased at the bookstore
C. Graph paper will be required for laboratory reports
D. Scientific calculator

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