CREDIT COURSE OUTLINE

I. COVER PAGE

(1) PHYS 4A (Number) | (2) PHYSICS FOR SCIENTISTS AND ENGINEERS (Title) | (3) 4 (Units)

(4)	Lecture / Lab Hours:			(8)Classification:			
	Total Course Hours						
		Total Lec hours:	4.00			Degree applicable:	X
		Total Lab hours:	3.00			Non-degree applicable:	
		Total Contact hours:	126.00			Basic skills:	
	Lec will generate 0 hour(s) outside work.			(9)RC		Fulfills AS/AA degree requirement: (area)	
	Lab will generate 0 hour(s) outside work.					General education category:	
						Major:	
(5)	Grading Basis:	Grading Scale Only				Certificate of:	
		Pass/No Pass option	X			Certificate in:	
		Pass/No Pass only					
(6)	Advisories: ENGL 1A - READING AND COMPOSITION			(10)CSU		Baccalaureate:	X
				(11)Repeatable: (A course may be repeated three times)			0
(7)	Pre-requisites(requires C grade or better):						
	Corequisites: MATH 5B						

(12) Catalog Description:
Classical mechanics, properties of matter, gravitation, fluid mechanics, oscillatory motion and mechanical waves.

II. COURSE OUTCOMES:

(Specify the learning skills the student demonstrates through completing the course and link critical thinking skills to specific course content and objectives.)

Upon completion of this course, students will be able to:

A. Apply algebra, trigonometry, and first-year calculus to solve physical problems such as:
B. Kinematic equations
C. Vector quantities
D. Newton's Laws
E. Conservation of energy and momentum
F. Rotating bodies
G. Gravity
H. Oscillatory motion
I. Mechanical waves
J. Understand the complementary roles of experimental investigation and theoretical explanation in science.
K. Apply dimensional analysis to determine the units for an unknown quantity or to check the validity of equations.
L. Correctly report the units of an observable when it is measured or calculated.
M. Distinguish between important physical observables, such as mass and weight or speed and velocity.

III. COURSE OBJECTIVES:

(Specify major objectives in terms of the observable knowledge and/or skills to be attained.)

In the process of completing this course, students will:

A. Improve mathematical skills through the process of applying mathematics to the physical world.
B. Learn fundamental laboratory techniques.
C. Experience the interaction between theory and experiment in scientific investigation.
D. Learn to solve basic problems in classical mechanics.
E. Study important properties of matter.
F. Study the laws of fluid mechanics.
G. Learn to solve problems in oscillatory motion.
H. Learn the basic concepts of mechanical waves.

IV. COURSE OUTLINE:

Lecture Content:

Week 1: One-dimensional motion; position, speed, velocity, and acceleration; average vs.instantaneous quantities; 1D motion with constant acceleration (kinematic equations derived from calculus); freely-falling bodies and The Law of Falling Bodies (Serway, Ch 2). Note: Ch 1 topics in the Serway book, such as measurement, unit conversions, and unit analysis are covered in the lab.
Week 2: Vector and scalar quantities; graphical vector addition; vector addition with the component method; unit vectors (Serway, Ch 3); 2D motion: position,velocity and acceleration vectors; projectile motion (Serway, Ch 4).
Week 3: Uniform circular motion; non-uniform circular motion (tangential acceleration) (Serway, Ch 4); Newton's Laws of Motion, weight; normal forces; frictional forces (Serway, Ch 5).
Week 4: Centripetal and tangential forces; inertial vs. non-inertial reference frames; resistive forces (air friction) (Serway, Ch 6).
Week 5: Work and energy transfer; dot product of two vectors; work done by a variable force; the work/KE theorem (Serway, Ch 7).
Week 6: power; energy and the automobile (Serway, Ch 7); MT exam review.
Week 7: MT exam #1; potential energy; conservative vs. non-conservative forces (Serway, Ch 8).
Week 8: Conservation of energy with and without friction; finding a conservative force from the potential energy; PE diagrams and equilibrium (Serway, Ch 8).
Week 9: Linear momentum; general form of Newton's 2nd Law, the impulse/momentum theorem; conservation of momentum; 1D collisions; 2D collisions, the center of mass; motion of system of particles; rocket propulsion (Serway, Ch 9).
Week 10: Angular displacement, velocity, and acceleration; rotational kinematics with constant acceleration; the relation between angular and linear quantities in rotation; rotational KE and the moment of inertia "I"; torque; Newton's 2nd Law for rigid body rotation; work, power, and energy in rotational motion; rolling motion (Serway, Ch 10).
Week 11: Cross products and torque; angular momentum for particles and rigid bodies; conservation of angular momentum; gyroscopes and tops (Serway, Ch 11)
Week 12: static equilibrium; center-of-gravity; elasticity of solids (Serway, Ch 12).
Week 13: Newton's Law of Gravitation; Kepler's Laws; Newton's theory of planetary motion; orbital motion and conservation of Energy (Serway, Ch 13); MT exam review.
Week 14: MT exam; fluids; pressure; variation of pressure with depth; buoyancy and Archimedes' Principle; the equation of continuity and Bernoulli's equation (Serway, Ch 14).
Week 15: simple harmonic oscillations; energy and the simple harmonic oscillator; simple harmonic motion vs. uniform circular motion; the pendulum; damped oscillations; forced oscillations (Serway, Ch 15).
Week 16: construction of sinusoidal wavefunctions; the speed of waves on strings; power transmission in mechanical waves; the linear wave equation (Serway, Ch 16).

Week 17: Properties of sound waves; sound intensity and the decibel scale; characteristics of human hearing; the Doppler Effect for sound; shock waves and the Mach number; interference of sound waves (Serway, Ch 17); final exam review.

Lab Content:

A. Measurement
B. Constant velocity
C. Constant acceleration
D. Force table
E. Vector addition
F. Free body diagrams
G. Mass on inclined plane
H. Conservation of energy
I. Conservation of momentum
J. Ballistic pendulum
K. Rotations simulations
L. Centripetal acceleration

M. Torque simulations
N. Archimedes' principle
O. Pendulum oscillations
P. Waves simulations
Q. Standing waves

V. APPROPRIATE READINGS

Reading assignments may include but are not limited to the following:

A. Sample Text Title:
   1. Recommended - Serway, R. and Jewett, J *Physics for Scientists and Engineers,* ed. 8 Thomson Brooks/Cole, 2009,

      or

   2. Recommended - Giancoli, D *Physics for Scientists and Engineers,* ed. 4 Pearson, 2008,

      and/or

   3. Recommended - Appel, K., Gastineau, J., & Bakken, C *Physics with Vernier,* ed. 4 Vernier Software and Technology, Beaverton, OR., 2009,

B. Other Readings
   1. Recommended - *Instructor-written and supplied lab procedures.*

___ Global or international materials or concepts are appropriately included in this course
___ Multicultural materials and concepts are appropriately included in this course

If either line is checked, write a paragraph indicating specifically how global/international and/or multicultural materials and concepts relate to content outline and/or readings.

VI. METHODS TO MEASURE STUDENT ACHIEVEMENT AND DETERMINE GRADES:

Students in this course will be graded in at least one of the following four categories. Please check those appropriate. A degree applicable course must have a minimum of one response in category A, B, or C.

A. Writing Check either 1 or 2 below			
X	***1. Substantial writing assignments are required. Check the appropriate boxes below and provide a written description in the space provided.***		
	2. Substantial writing assignments are NOT required. If this box is checked leave this section blank. For degree applicable courses you must complete category B and/or C.		
	a) essay exam(s)		d) written homework
	b) term or other paper(s)		e) reading reports
X	c) laboratory report(s)		f) other (specify)

Required assignments may include but are not limited to the following:
Written laboratory reports which describe, explain, and interpret the data collected, provide analysis, and present final results.

B. Problem Solving Computational or non-computational problem-solving demonstrations, including:			
X	a) exam(s)	X	d) laboratory reports
X	b) quizzes		e) field work

X	c) homework problems		f) other (specify):

Required assignments may include but are not limited to the following:
Weekly homework assignments and laboratory reports.

C. Skill demonstrations, including:			
	a) class performance(s)		c) performance exams(s)
	b) field work		d) other (specify)

Required assignments may include but are not limited to the following:

D. Objective examinations including:			
X	a) multiple choice		d) completion
	b) true/false	X	e) other (specify): Written, step-by-step solutions to physics problems.
	c) matching items		

COURSE GRADE DETERMINATION:
Description/Explanation: Based on the categories checked in A-D, it is the recommendation of the department that the instructor's grading methods fall within the following departmental guidelines; however, the final method of grading is still at the discretion of the individual instructor. The instructor's syllabus must reflect the criteria by which the student's grade has been determined. (A minimum of five (5) grades must be recorded on the final roster.)

If several methods to measure student achievement are used, indicate here the approximate weight or percentage each has in determining student final grades.
homework = 20% labs = 20% midterm exam 1 = 15% midterm exam 2 = 15% final exam = 30%

VII. EDUCATIONAL MATERIALS

For degree applicable courses, the adopted texts, as listed in the college bookstore, or instructor-prepared materials have been certified to contain college-level materials.

Validation Language Level (check where applicable):	College-Level Criteria Met YES	NO
Textbook	X	
Reference materials		X
Instructor-prepared materials	X	
Audio-visual materials	X	

Indicate Method of evaluation:

Used readability formulae (grade level 10 or higher)	
Text is used in a college-level course	X
Used grading provided by publisher	
Other: (please explain; relate to Skills Levels)	

Computation Level (Eligible for MATH 101 level or higher where applicable)	X	
Content		
Breadth of ideas covered clearly meets college-level learning objectives of this course	X	
Presentation of content and/or exercises/projects:		
Requires a variety of problem-solving strategies including inductive and deductive reasoning.	X	
Requires independent thought and study	X	
Applies transferring knowledge and skills appropriately and efficiently to new situations or problems.	X	

List of Reading/Educational Materials
Recommended - Serway, R. and Jewett, J *Physics for Scientists and Engineers,* ed. 8 Thomson Brooks/Cole, 2009, ISBN: 978-0-495-827
Recommended - Giancoli, D *Physics for Scientists and Engineers,* ed. 4 Pearson, 2008, ISBN: 9780131495081
Recommended - Appel, K., Gastineau, J., & Bakken, C *Physics with Vernier,* ed. 4 Vernier Software and Technology, Beaverton, OR., 2009, ISBN: 978-1-9290755

Comments:

_____ This course requires special or additional library materials (list attached).
__X__ This course requires special facilities:
Physics laboratory classroom

Attached Files:

BASIC SKILLS ADVISORIES PAGE The skills listed are those needed for eligibility for English 125, 126, and Math 101. These skills are listed as the outcomes from English 252, 262, and Math 250. In the right hand column, list at least three major basic skills needed at the beginning of the target course and check off the corresponding basic skills listed at the left.
Check the appropriate spaces. _____ Eligibility for Math 101 is advisory for the target course. _____ Eligibility for English 126 is advisory for the target course. _____ Eligibility for English 125 is advisory for the target course. *If the reviewers determine that an advisory or advisories in Basic Skills are all that are necessary for success in the target course, stop here, provide the required signatures, and forward this form to the department chair, the appropriate associate dean, and the curriculum committee.*

CONTENT REVIEW
MATH 5B MATH ANALYSIS II

REQUISITES	
Corequisite -- MATH 5B MATH ANALYSIS II	
• Evaluate definite integrals using the fundamental theorem of calculus and relate definite integrals to areas and Riemann sums	• Improve mathematical skills through the process of applying mathematics to the physical world.

ESTABLISHING PREREQUISITES OR COREQUISITES

Every prerequisite or corequisite requires content review plus justification of at least one of the seven kinds below. Prerequisite courses in communication and math outside of their disciplines require justification through statistical evidence. Kinds of justification that may establish a prerequisite are listed below.

Check one of the following that apply. Documentation may be attached.

1. _____ The prerequisite/corequisite is required by law or government regulations.
   Explain or cite regulation numbers:
2. _____ The health or safety of the students in this course requires the prerequisite.
   Justification: Indicate how this is so.
3. _____ The safety or equipment operation skills learned in the prerequisite course are required for the successful or safe completion of this course.
   Justification: Indicate how this is so.
4. __X__ The prerequisite is required in order for the course to be accepted for transfer to the UC or CSU systems.
   Justification: Indicate how this is so.
   For articulation, our courses must have requisites which are equivalent to the requirements for corresponding physics courses at UC/CSU.
5. _____ Significant statistical evidence indicates that the absence of the prerequisite course is related to unsatisfactory performance in the target course.
   Justification: Cite the statistical evidence from the research.

6. _____ The prerequisite course is part of a sequence of courses within or across a discipline.
7. __X__ Three CSU/UC campuses require an equivalent prerequisite or corequisite for a course equivalent to the target course:
   UC Berkeley UC Davis Cal Poly, SLO