PHYS 4A Course Outline as of Fall 2003

CATALOG INFORMATION

Dept and Nbr: PHYS 4A Title: PHYS FOR SCI & ENGN
Full Title: Physics for Scientists & Engineers
Last Reviewed: 10/23/2023

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	4.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	4.00	Lab Scheduled	3.00	17	Lab Scheduled	52.50
		Contact DHR	1.00		Contact DHR	17.50
		Contact Total	7.00		Contact Total	122.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00 Total Student Learning Hours: 227.50

Title 5 Category:	AA Degree Applicable
Grading:	Grade Only
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	

Catalog Description:
Measurement, vectors, translational and rotational motion, work and energy, conservation of energy and momentum, static equilibrium.

Prerequisites/Corequisites:
Completion of or concurrent enrollment in MATH 1B.

Recommended Preparation:
One year of high school physics or Phys 1.

Limits on Enrollment:

Schedule of Classes Information:
Description: Vectors, translational and rotational mechanics. (Grade Only)
Prerequisites/Corequisites: Completion of or concurrent enrollment in MATH 1B.
Recommended: One year of high school physics or Phys 1.
Limits on Enrollment:
Transfer Credit: CSU;UC. (CAN PHYS8)(PHYS 4A+PHYS 42+PHYS 41=PHYS SEQ B)(PHYS 43+PHYS 4A+PHYS 42+PHYS 41=PHYS SEQ C)
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**		Effective:	Inactive:
	C	Natural Sciences	Fall 1982	
CSU GE:	**Transfer Area**		Effective:	Inactive:
	B1	Physical Science	Fall 1982	
	B3	Laboratory Activity		
IGETC:	**Transfer Area**		Effective:	Inactive:
	5A	Physical Sciences	Fall 1982	
	5C	Fulfills Lab Requirement		

CSU Transfer:	Transferable	Effective:	Fall 1982	Inactive:
UC Transfer:	Transferable	Effective:	Fall 1982	Inactive:

CID:

CID Descriptor:PHYS 200S	Calculus-Based Physics for Scientists and Engineers: ABC
SRJC Equivalent Course(s):	PHYS40 AND PHYS41 AND PHYS42 AND PHYS43
CID Descriptor:PHYS 205	Calculus-Based Physics for Scientists and Engineers: A
SRJC Equivalent Course(s):	PHYS40

Certificate/Major Applicable:
Not Certificate/Major Applicable

COURSE CONTENT

Outcomes and Objectives:
Upon completion of the course, the student should be able to:

1. State the S1 units for length, time & mass, identify the powers of 10 associated with the most common metric prefixes, & change a quantity from one set of units to another.
2. Explain the difference between scalar & vector quantities & give examples of each.
3. Use vector addition methods to determine the sum of two or more vectors, & use the vector dot product & vector cross product where applicable.
4. Define the concepts of displacement, velocity, & acceleration, & give one of the three as a function of time, differentiate or integrate to determine the other two.
5. Use graphs of displacement, velocity, & acceleration versus time to determine instantaneous & average values of these quantities.
6. Solve problems involving uniformly accelerated motion, including projectile motion.
7. Explain the concepts of tangential & radial acceleration in curvilinear motion & use the concepts in problem solving.
8. Define the concepts of force & mass, explain the difference between weight & mass, & give the units for force & weight.
9. State Newton's Laws of motion & give examples illustrating each.
10. Use Newton's second law to solve problems involving the acceleration of masses with one or more forces (including frictional forces)

acting upon them.
11. Explain what a centripetal force is; give examples of centripetal forces; solve problems involving motion in a circular path.
12. Define the concepts of work, energy, kinetic energy, potential energy, & power, & give units in which each is expressed.
13. Distinguish between conservative & nonconservative forces; find potential energy functions/forces for conservative forces; use potential energy functions for conservative forces to locate equilibrium positions & determine the type of equilibrium.
14. State the work-energy theorem/principle of conservation of energy, & use the theorem/principle in problem solving (including translational & rotational motion).
15. Determine the location of the center of mass of a system of particles & of a continuous body; calculate the velocity & acceleration of the center of mass of a system of particles.
16. Define linear momentum & impulse; give units for each; state the principle of conservation of linear momentum; & solve problems involving momentum, impulse & conservation of linear momentum.
17. Describe what occurs in an elastic, partially elastic & perfectly inelastic collision; solve problems involving collisions in one & two dimensions.
18. Define angular displacement, angular velocity & angular acceleration; give units in which they are expressed; & solve problems involving uniformly accelerated angular motion.
19. Define the concept of moment of inertia; calculate the moment of inertia about a given axis for a system of particles; calculate the moment of inertia for solid objects using integration & the parallel axis theorem.
20. Define torque & angular momentum; determine directions of torque, angular momentum, angular velocity & angular acceleration when considered as vectors; use torque & angular momentum vectors to determine the direction of precession of gyroscopes & tops.
21. State the principle of conservation of angular momentum; give examples illustrating the principle; & use the principle in problem solving.
22. Solve problems involving motion of rolling bodies both without & with slipping.
23. Describe the conditions necessary for static equilibrium & solve problems involving static equilibrium of a rigid body.

Numbers 24 - 27 (fluid mechanics) are optional as time allows:

24. Define pressure, give units for pressure, explain the difference between gauge pressure & absolute pressure; calculate the pressure at a given depth in an incompressible fluid; calculate the force on a surface over which the pressure is not constant.
25. State Pascal's principle, give examples of its application, & use it to solve problems.
26. Define buoyant force, state Archimedes' principle, & use it in problem solving.
27. Give examples which illustrate the application of Bernoulli's equation & use it & the equation of continuity in problem solving.

Topics and Scope:

Topics covered include:
1. Measurement and units.
2. Vectors.
3. Motion in one and two dimensions.
4. Newton's Laws of motion.
5. Work and energy.
6. Conservation of energy.
7. Linear momentum and collisions.
8. Rotational motion.
9. Torque and angular momentum.
10. Equilibrium of rigid bodies.
11. Fluid mechanics. (Optional as time allows.)

Lab work includes:
1. Using calipers, stop watches, meter sticks, etc. to make measurements on mechanical systems.
2. Using computers and motion detectors, force probes, etc. to make measurements on mechanical systems.
3. Using computers and motion detectors, force probes, etc. to develop concepts of force and motion.
4. Using spreadsheets to record data and to calculate experimental results.
5. Constructing graphs using computer graphing programs.
6. Error analysis.
7. Numerical and graphical analysis of data.

Assignment:

1. No less than twelve sets of homework problems.
2. Zero to fifteen quizzes.
3. No less than three mid-term exams.
4. No less than 12 laboratory experiments.
5. Final exam.

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

None, This is a degree applicable course but assessment tools based on writing are not included because problem solving assessments are more appropriate for this course.	Writing 0 - 0%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework problems, Lab reports	Problem solving 10 - 30%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

None	Skill Demonstrations 0 - 0%

Exams: All forms of formal testing, other than skill performance exams.

Multiple choice, Physics problems to solve, quizzes and exams.	Exams 50 - 70%

Other: Includes any assessment tools that do not logically fit into the above categories.

Attendance at problem sessions, Lab reports, group work in class.	Other Category 20 - 30%

Representative Textbooks and Materials:
Physics for Scientists and Engineers by Serway & Beichner, 5th edition, Saunders 2000