PHYS 40 Course Outline as of Fall 2006

CATALOG INFORMATION

Dept and Nbr: PHYS 40 Title: CLASSICAL MECHANICS
Full Title: Classical Mechanics for Scientists and Engineers
Last Reviewed: 10/23/2023

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	5.00	Lecture Scheduled	4.00	17.5	Lecture Scheduled	70.00
Minimum	5.00	Lab Scheduled	3.00	17.5	Lab Scheduled	52.50
		Contact DHR	0		Contact DHR	0
		Contact Total	7.00		Contact Total	122.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 140.00 Total Student Learning Hours: 262.50

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:	PHYS 4A

Catalog Description:
This is a course intended for scientists and engineers and will include measurement, vectors, translational and rotational motion, work and energy, conservation of energy and momentum, static equilibrium.

Prerequisites/Corequisites:
Course Completion of MATH 1A

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

Limits on Enrollment:

Schedule of Classes Information:
Description: This is a course intended for scientists and engineers and will include measurement, vectors, translational and rotational motion, work and energy, conservation of energy and momentum, static equilibrium. (Grade Only)
Prerequisites/Corequisites: Course Completion of MATH 1A
Recommended: One year of high school physics or PHYS 1.
Limits on Enrollment:

Transfer Credit: CSU;UC. (CAN PHYS8)(PHYS 40+PHYS 42+PHYS 41=PHYS SEQ B)(PHYS 43+PHYS 40+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:
Major Applicable Course

COURSE CONTENT

Outcomes and Objectives:
Upon completion of the course, the student should be able to:
1. State the Systems International (SI) units for length, time and mass, identify the powers of ten associated with the most common metric prefixes, and change a quantity from one set of units to another.
2. Explain the difference between scalar and vector quantities and give examples of each.
3. Use vector addition methods to determine the sum of two or more vectors, and use the vector dot product and vector cross product where applicable.
4. Define the concepts of displacement, velocity, and acceleration, and give one of the three as a function of time, differentiate or integrate to determine the other two.
5. Use graphs of displacement, velocity, and acceleration versus time to determine instantaneous and average values of these quantities.
6. Solve problems involving uniformly accelerated motion, including projectile motion.
7. Explain the concepts of tangential and radial acceleration in curvilinear motion and use the concepts in problem solving.
8. Define the concepts of force and mass, explain the difference between weight and mass, and give the units for force and weight.

9. State Newton's Laws of motion and 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, and power, and give units in which each is expressed.
13. Distinguish between conservative and nonconservative forces; find potential energy functions/forces for conservative forces; use potential energy functions for conservative forces to locate equilibrium positions and determine the type of equilibrium.
14. State the work-energy theorem/principle of conservation of energy, and use the theorem/principle in problem solving (including translational and rotational motion).
15. Determine the location of the center of mass of a system of particles and of a continuous body; calculate the velocity and acceleration of the center of mass of a system of particles.
16. Define linear momentum and impulse; give units for each; state the principle of conservation of linear momentum; and solve problems involving momentum, impulse and conservation of linear momentum.
17. Describe what occurs in an elastic, partially elastic and perfectly inelastic collision; solve problems involving collisions in one and two dimensions.
18. Define angular displacement, angular velocity and angular acceleration; give units in which they are expressed; and solve 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 and parallel axis theorem.
20. Define torque and angular momentum; determine directions of torque, angular momentum, angular velocity and angular acceleration when considered as vectors; use torque and angular momentum vectors to determine the direction of precession of gyroscopes and tops.
21. State the principle of conservation of angular momentum; give examples illustrating the principle; and use the principle in problem solving.
22. Solve problems involving motion of rolling bodies both without and with slipping.
23. Describe the conditions necessary for static equilibrium and 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 and 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, and use it to solve problems.
26. Define buoyant force, state Archimedes' principle, and use it in problem solving.
27. Give examples which illustrate the application of Bernoulli's

equation and use it and 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.
6. Lab Reports.

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, Experiments.	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	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, 6th edition, Saunders 2003