SYLLABUS
PART I
EDISON COMMUNITY COLLEGE
PHY 241S SCIENCE AND ENGINEERING PHYSICS I
5 CREDIT HOURS

COURSE DESCRIPTION

Calculus-based introduction to Newtonian mechanics, wave phenomena, fluids, and thermodynamics for students desiring to major in engineering and the sciences. Fundamental principles such as Newton's Law and the Conservation of Momentum are introduced as a starting point for interpreting observations of simple systems and predicting their behavior. Includes three hours of lecture and four hours of lab each week. Prerequisite: one year of high school calculus or MTH 221S, and one year of high school chemistry or physics or CHM 110S or PHY 121S. Lab fee.

COURSE GOALS

The student will:

Bloom's Level		Gen Ed Outcome
3	1. Apply dimensional analysis to any equation as a test for dimensional correctness.	1, 3
2	2. Differentiate between British Engineering units and SI units and convert from one system to another and within each system.	1, 3
2	3. Distinguish between mass and weight.	1, 3
2	4. Describe the motion of a particle with graphs and equations for position, velocity, and acceleration.	1, 3
1	5. Recognize the difference between vectors and scalars.	1
3	6. Add, subtract, multiply, and resolve vectors.	3
5	7. Predict the particle's motion in two and three dimensions.	1, 3
1	8. Recognize the characteristics of projectile motion and uniform circular motion and utilize these characteristics to solve for the position, velocity, and acceleration of a particle experiencing these motions.	1, 3
2	9. Describe and utilize Newton's three laws of motion.	1
3	10. Solve statics and dynamics problems with free-body diagrams and Newton's Laws.	3
2	11. Describe the effects of friction on the motion of a particle.	1
3	12. Apply the concepts of work, energy, and power to motion problems.	1, 3
4	13. Analyze spring problems using Hooke's Law.	1, 3
3	14. Solve dynamics problems using the Work-Energy theorem.	3
1	15. Define potential energy and know the relation between potential energy and force.	1, 3
2	16. Describe the conservation of Mechanical Energy and its application to dynamics problems.	1
2	17. Distinguish between conservative and nonconservative forces.	1
3	18. Relate how non-conservative forces affect the conservation of Mechanical Energy.	1
3	19. Calculate the position of the center of mass for a system of particles and regular solid bodies.	3
1	20. Define linear momentum and relate it to force.	1, 3
3	21. Solve motion and collision problems in one and two dimensions using the	3

	Conservation of Linear Momentum.	
1	22. Recognize the relations among force, momentum, and impulse.	1
4	23. Analyze rotational motion using angular displacement, velocity, and acceleration.	1, 3
3	24. Calculate work and energy for rotating systems.	3
3	25. Apply the Conservation of Angular Momentum to dynamics problems.	3
3	26. Use three independent equations to describe equilibrium conditions for a rigid body.	1, 3
1	27. Recognize the differential equation for simple harmonic motion and solve it for displacement, velocity, acceleration, and frequency.	1, 3
3	28. Determine the amplitude, wavelength, period, velocity, and frequency of a traveling or standing wave.	3
2	29. Describe longitudinal and transverse wave motion.	1
3	30. Calculate the observed frequencies of sound using the Doppler Effect.	3
3	31. Use Pascal's Principle, Archimedes' Principle, Bernoulli's Law, and the Equation of Continuity to solve fluids problems.	1, 3
3	32. Apply energy conservation as expressed in the first law of thermodynamics.	3
2	33. Describe the process of understanding the concept of heat.	1
4	34. Compare how heat is related to temperature change through specific heats and molar specific heats.	1, 3
3	35. Apply heat transfer ideas to practical situations of calorimetry.	1
1	36. Recognize the connection between temperature, thermal energy, and the average translational kinetic energy of molecules in a system.	1, 3
5	37. Explain the molecular basis for pressure and the ideal-gas law.	1, 3
3	38. Use the micro/macro connection to predict the molar specific heats of gases and solids.	1, 3
5	39. Explain how heat is transferred via molecular collisions and how thermally interacting systems reach equilibrium.	1
5	40. Express qualitative understanding of entropy, the second law of thermodynamics, and some of the implications of the second law.	1, 3
5	41. Explain the thermodynamics of the four basic processes of an ideal gas, and the physics of simple heat engines and refrigerators.	1, 3
1	42. Recognize that thermodynamics has practical applications to real devices.	1
3	43. Determine that there is a limit to the efficiency of a heat engine.	1, 3

CORE VALUES

The Core Values are a set of principles which guide in creating educational programs and environments at Edison. They include communication, ethics, critical thinking, human diversity, inquiry/respect for learning, and interpersonal skills/teamwork. The goals, objectives, and activities in this course will introduce/reinforce these Core Values whenever appropriate.

TOPIC OUTLINE

1. Measurement
2. Motion in One Dimension
3. Vectors
4. Motion in Two and Three Dimensions
5. Force and Motion

6. Work and Kinetic Energy
7. Conservation of Energy
8. Systems of Particles
9. Collisions
10. Rotation
11. Torque and Angular Momentum
12. Simple harmonic motion
13. Waves and sound
14. Solid and fluid properties
15. Heat and thermodynamics
16. Kinetic theory of gases