SOUTHEAST COMMUNITY COLLEGE
DIVISION OF ARTS AND SCIENCES
Sciences
Revision Date: 07-01-25

I. CATALOG DESCRIPTION

Course Number:	PHYS2110
Course Title:	General Physics I with Calculus
Prerequisite(s):	MATH1600 – Calculus I or equivalent
Catalog Description:	Detailed calculus-based study of one and two dimensional motion. Topics will include kinematics, Newton's Laws, energy, momentum, and rotational motion. Additional topics from the areas of oscillations and waves, fluids, and heat may also be covered.
Credit Hours:	5
Class Hours:	60
Lab Hours:	30
Total Contact Hours:	90

II. COURSE OBJECTIVES: *Course will:*

A. Distinguish between vector and scalar quantities and teach vector operations.
B. Provide methods of analysis for 1-dimensional kinematics.
C. Introduce methods of analysis for multi-dimensional kinematics.
D. Define and apply Newton's laws of motion.
E. Use the concepts of work and energy to solve problems.
F. Apply the concepts of impulse and momentum.
G. Implement the laws of conservation of energy and momentum.
H. Employ kinematics and dynamics in rotational systems.
I. Utilize laws of conservation of energy and momentum for rotational systems.
J. Present techniques for analysis of experimental data.
K. Provide experience communicating experimental results.

III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES

A. Student Learning Outcomes: *Student will be able to:*

1. Conduct dimensional analysis.
2. Perform vector analysis.
3. Compare and contrast scalars and vectors.
4. Use displacement, velocity, acceleration, and time to analyze 1-dimension motion.
5. Analyze objects in multi-dimensional motion.
6. Determine relative velocity vectors from multiple points of reference.
7. Distinguish the relationship between motion and Newton's three laws of motion.
8. Analyze forces and motion using Newton's three laws of motion.
9. Determine forces and motion in situations that involve static and kinetic friction.
10. Use the work-energy theorem to relate work and energy.
11. Apply the properties of work, kinetic energy, gravitational potential energy, and spring potential energy using conservation of energy and the work-energy theorem.
12. Calculate properties of work, energy, and power.
13. Analyze the relationship between momentum, impulse, and collisions.
14. Demonstrate the conservation of momentum of objects before and after collision.
15. Analyze properties of angular displacement, angular velocity, angular acceleration, and centripetal acceleration.
16. Use torque, angular acceleration, and moment of inertia to analyze rotational motion and static equilibrium.

17. Apply the properties of conservation of energy and conservation of angular momentum.

B. General Education Learning Outcomes

1. GELO #3: Critical Thinking & Problem Solving
- Outcome: Collect, identify, interpret and analyze data.
- Outcome: Synthesize information to arrive at reasoned solutions to problems.
- Outcome: Evaluate ideas presented in writing, media, speech, or artistic presentations.
- Outcome: Evaluate the validity of arguments, alternatives, data, outcomes, and/or impacts of actions.
- Outcome: Acquire and integrate knowledge and construct relationships across disciplines.

2. GELO #5: Analytical, Quantitative, and Scientific Reasoning
- Outcome: Apply mathematical and scientific methods to solve problems from an array of contexts and everyday situations.
- Outcome: Understand and create logical arguments supported by quantitative and scientific evidence and communicate those arguments in a variety of formats.
- Outcome: Effectively develop strategies, algorithms, or experiments (or performing experiments) to better describe the systems or to solve the problems.
- Outcome: Manipulate formulas, data sets, graphs, tables, etc. in a way to produce a meaningful outcome.

IV. CONTENT/TOPICAL OUTLINE *(course outline may provide more detailed information)*

A. Units and Measurement
B. Vectors
C. Linear Motion
D. Motion in Two and Three Dimensions
E. Newton's Laws of Motion
F. Applications of Newton's Laws
G. Work and Kinetic Energy
H. Potential Energy and Conservation of Energy
I. Linear Momentum and Collisions
J. Rotational Motion
K. Angular Momentum
L. Static Equilibrium

V. INSTRUCTIONAL MATERIALS

A. Suggested Text(s):

1. OpenStax University Physics, University Physics Volume 1. OpenStax CNX, https://openstax.org/details/books/university-physics-volume-1.

2. Knight, Randall D., *Physics for Scientists and Engineers, A Strategic Approach*, 3rd edition, Addison-Wesley, 2008, 978-0-8053-2736-6.

VI. METHODS OF PRESENTATION/INSTRUCTION

A. Methods of presentation typically include a combination of the following:

1. Lectures
2. Small group activities
3. Videos
4. Lab activities
5. Worksheets
6. Quizzes
7. Online exploration
8. Student presentations

VII. METHODS OF EVALUATION

A. Methods of evaluation typically include a combination of the following:

1. Unit tests

2. Comprehensive Final Exam

3. Quizzes

4. Assignments

5. Lab Activities

B. SCC GRADING SCALE:

A+	95-100	C+	75-79	F	59 or less
A	90-94	C	70-74		
B+	85-89	D+	65-69		
B	80-84	D	60-64		

VIII. SPECIFIC COURSE REQUIREMENTS

A. None.