



# COURSE OUTLINE

<b>Course Number</b> PHY 101	<b>Course Title</b> College Physics I	<b>Credits</b> 4
<b>Hours:</b> <b>Lecture/Lab/Other</b> 3/3/0	<b>Co- or Pre-requisite</b> One semester of algebra with grade C+ or better	<b>Implementation</b> <b>sem/year</b> Spring 2019

## Catalog description:

### **Course Description**

This is the first part of a two-semester sequence of algebra-based physics. Topics include kinematics, dynamics, heat, sound, and properties of matter. Algebra and trigonometry are applied throughout the course. *Lecture 3 hours/lab 3 hours.*

### **Prerequisites/Co-requisites**

One semester of algebra with grade C+ or better

### **Student Learning Outcomes**

1. Students will be able to gain knowledge of a broad introduction to physics at the beginning college level and develop physical intuition and problem-solving skills.
2. Students will learn to manipulate a variety of instruments and development critical thinking skills through hands-on laboratory experience.
3. Students learn to design and carry out simple experiments applying theory learnt in the class.

## Required texts/other materials:

College Physics, volume I  
11<sup>th</sup> edition  
Serway & Vuille  
Cengage

Physics 101 Laboratory  
Jing Huang

Scientific Calculator

### Revision date:

02/13/2019

### Course coordinator

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## Course Competencies/Goals

*Upon successfully completing the course, the student will be able to:*

1. Master basic concepts and principles. (GE Goal 3, MCCC CS Goal B)
2. Develop critical thinking and problem solving skills. (GE Goals 2, 3 & 9, MCCC CS Goal B)

3. Properly use laboratory instruments and solve real world problems. (GE Goal 2, 3, 4, MCCC CS Goal B)
4. Carry out teamwork. (MCCC CS Goal F)
5. conduct literature search, analysis, and presentation (GE Goal 1, 4 , MCCC CS Goal A, D, E)
6. Understand cultural, historical, and ethical issues through solving relevant problems. (GE Goals 7, 9; MCCC CS Goals G)

### **Course-specific General Education Knowledge Goals and Core Skills.**

#### **General Education Knowledge Goals**

**Goal 1. Communication.** Students will communicate effectively in both speech and writing.

**Goal 2. Mathematics.** Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

**Goal 3. Science.** Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

**Goal 4. Technology.** Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

**Goal 7. History.** Students will understand historical events and movements in World, Western, non-Western or American societies and assess their subsequent significance.

**Goal 9. Ethical Reasoning and Action.** Students will understand ethical issues and situations.

#### **MCCC Core Skills**

**Goal A. Written and Oral Communication in English.** Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.

**Goal B. Critical thinking and Problem-solving.** Students will use critical thinking and problem solving skills in analyzing information.

**Goal D. Information Literacy.** Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

**Goal E. Computer Literacy.** Students will use computers to access, analyze or present information, solve problems, and communicate with others.

**Goal F. Collaboration and Cooperation.** Students will develop the interpersonal skills required for effective performance in group situations.

**Goal G. Intra-Cultural and Inter-Cultural Responsibility.** Students will demonstrate an awareness of the responsibilities of intelligent citizenship in a diverse and pluralistic society, and will demonstrate cultural, global, and environmental awareness.

### **Units of study in detail.**

#### **Unit I Kinematics**

##### **Learning Objectives**

***The student will be able to...***

- understand measurements, units, and significant figures (CG1, CG3, and CG6)
- apply trigonometry and basic calculus in analyzing one-, two-, and three-dimensional motions. (CG 3)
- improve problem solving skills by reading word problems and apply basic concepts. (CG 2)
- solve problems involving vectors. (CG2, CG4, CG5)

#### **Unit II Dynamics and Conservation Laws**

##### **Learning Objectives**

***The student will be able to...***

- Understand and apply Newton's laws of motion (CG1)
- solve problems using work, energy, and conservation of energy (CG2, CG5, and CG6)
- solve problems using momentum, impulse, and conservation of momentum. (CG2, CG4, CG5)

#### **Unit III Circular Motion and Rotational Motion**

##### **Learning Objectives**

***The student will be able to...***

- reinforce knowledge on vector in learning circular and rotational motions. (CG1)

- reinforce problem solving in two- and three-dimensional motions. (CG2)
- understand the basic concepts involved in circular motion and rotational motion (CG1, CG6)
- relate the angular motion to linear motion (CG1)
- reinforce dynamic through solving problems using torque. (CG1, CG2)
- understand the important concept of equilibrium. (CG1, CG4, CG5)

#### **Unit IV Gravitation**

##### **Learning Objectives**

##### ***The student will be able to...***

- Qualitatively and quantitatively understand Newton's Law of Universal Gravity (CG2)
  - Relate gravity to gravitational constant employed in kinematics. (CG1)
  - relate gravity to circular motion (CG2)

#### **Unit V Solids and Fluids**

##### **Learning Objectives**

##### ***The student will be able to...***

- understand states of matter (CG1)
- solve problems with regard to properties of solids and fluids (CG1, CG3, and CG4)
- apply the physics principals in understanding the environment. (CG1, CG5, CG6)
- apply physics knowledge in environmental protection (CG6)
- apply physics knowledge in preserving natural resources (CG5, CG6)

#### **Unit VI Oscillations and Waves**

##### **Learning Objectives**

##### ***The student will be able to...***

- understand simple harmonic motion and resonance (CG1)
- quantitatively understand the wave properties, frequency, wavelength, and speed (CG1)
- understand standing waves (CG1)
- understand sound waves, intensity, speed (CG1)
- relate to music in term of wave properties (CG3, CG4)
- understand Doppler effect (CG 2, CG4)

#### **Laboratory experiments**

1. Math overview and Measurements
  - Go over arithmetic and algebra required through problem solving (CG2)
  - Establish laboratory safety rules. (CG3)
  - Learn to use balances, Vernier caliper, stop watch, and gated timer to measure mass, length, and time.(CG3)
  - Learn to record data with proper significant digits (CG2)
  - Learn to calculate and report results with proper significant digits (CG2)
  - Learn about the components of lab report. (CG5)
2. Velocity, acceleration, and free fall motion
  - Measure velocity with rulers and timer (CG3)
  - Learn to use GLX (CG3)
  - Learn to use Data Studio software (CG3)
  - Learn to use motion sensor to measure velocity and acceleration (CG3, CG2)
3. Free fall Motion
  - Study the free-fall motion with gated timer (CG3)
  - Learn to graph with Excel (CG2, CG3)
  - Learn to perform linear regression in Excel (CG2)
4. Two-dimensional vectors: simulation of street-crossing, experiment on projectile motion, force table

- Numerical simulation of pedestrian street crossing with a car approaching (CG2)
  - Measurements of projectile motions (CG2)
  - Learn addition and subtraction of two dimensional vectors with force tables (CG3)
5. Atwood machine, Measurements of friction
    - Measure the acceleration of Atwood machine and compare with theoretical value (CG1, CG3)
    - Measure the static friction coefficient by gradually raising the slope (CG3, CG4)
    - Use Tiltmeter cell phone app to measure the angle of a slope (CG3)
  6. Conservation of energy: Slides
    - Measure the horizontal and vertical displacement of a projectile motion (CG3)
    - Calculate the two dimensional motion (CG2)
  7. Momentum and Impulse
    - Learn to use motion sensor to record velocity data of an object on a track (CG3)
    - Calculate the Momentum (CG2)
  8. Rotational kinematics and dynamics
    - Measure linear motion (CG3)
    - Calculate angular motion using the recorded data of linear motion (CG2)
    - Study the rotational motion dynamics (CG3, CG2)
  9. Equilibrium Conditions of a rigid body
    - Learn about torque with real object (CG1, CG3)
    - Measure the location and magnitude of force acting on a rigid body (CG3, CG4)
  10. Archimedes' Principle
    - Measure mass (CG3)
    - Measure apparent mass (CG2)
    - Calculate the density of the material (CG2, CG4)
  11. Sustainable energy research and presentation
    - Learn the different forms of sustainable energy (CG5)
    - Research on one form of sustainable energy as a group (CG5, CG6)
    - Learn to make a presentation using power point, poster, or the board (CG5)
    - Learn to present (CG4, CG5)
    - Learn to ask questions as audience and give constructive feedback (CG5)
  12. Calorimeter and specific heat
    - Learn to use a calorimeter (CG3)
    - Learn to measure specific heat by heating metal shots and mix them with colder water (CG3)
    - Learn to analyze possible sources of error (CG2)
  13. Heat of Fusion
    - Learn to use calorimeter for more accurate measurements (CG3)
    - Measure the heat transfer by mixing ice with water (CG2)
    - Learn to analyze unaccounted source of heat (CG2)
  14. Simple Harmonic Motions: pendulum and spring
    - Learn to measure the period of pendulum with gated timer (CG1, CG3)
    - Learn to measure the spring constant using static setup (CG1, CG3)
    - Learn to measure the spring constant using dynamic setup of oscillating spring (CG2, CG4)
  15. Air column and sound
    - Measure resonance and standing wave using air column using tuning forks (CG1, CG2, CG4)
    - Record sound intensity using sensors and GLX (CG3)

### **Evaluation of student learning:**

Students are expected to attend all lecture and laboratory sessions. The evaluation will be based on performance and participation. The laboratory score includes the laboratory reports and laboratory tests. The participation score is based on attendance and classroom contribution.

Course Component	Weight	Notes
Unit tests	45%	There is no makeup test. Drop one lowest score.
Final, cumulative	15%	
Laboratories	30%	There is no makeup lab. Drop one lowest score.
Lecture Participation	-5% - 5%	
Laboratory Participation	-5% - 5%	

A student who has special needs because of a documented disability is entitled to receive accommodations (Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973). Students are to submit the accommodation form to the instructor at the start of the semester. For more information, contact Arlene Stinson, Director of the Center for Inclusion, Transition and Accessibility, LB 217, 570-3525, [stinsona@mccc.edu](mailto:stinsona@mccc.edu)

### **Academic Integrity Statement:**

Mercer County Community College is committed to academic integrity – the honest, fair and continuing pursuit of knowledge, free from fraud or deception.

- Students should never:
  - Knowingly represent the work of others as their own
  - Knowingly represent previously completed academic work as current
  - Fabricate data to support academic work
  - Use or obtain unauthorized assistance in the execution of any academic work
  - Give fraudulent assistance to other students
  - Unethically use technological means to gain academic advantages

Violators of the above actions will be penalized. For a single violation the faculty member will determine the course of action. This may include, assigning a lower grade on the assignment, lowering the course grade, failing the student, or another penalty that is appropriate to the violation. The student will be reported to the Academic Integrity Committee, who may impose other penalties for a second (or later) violation. The student has right to a hearing and also to appeal any decisions. These rights are outlined in the student handbook.