



COURSE OUTLINE

Course Number

PHY 225

Course Title

University Physics III

Credits

4

Hours:

lecture/Lab/Other

3/3/0

Co- or Pre-requisite

Prerequisite:

PHY 115 with grade C or better

Implementation

sem/year

Spring 2018

Catalog description:

The third course in a calculus-based physics sequence intended for students majoring in physics, engineering science, computer science, mathematics, and other technical areas. Topics include thermodynamics, gases, optics, as well as modern physics. The laws of physics are investigated and applied to problem solving. *3 lecture/3 laboratory hours*

Required texts/other materials:

Fundamentals of Physics, Extended Edition
Halliday & Resnick
John Wiley & Sons
10th Edition

Scientific Calculator

Revision date:

May 20, 2017

Course coordinator: (Name, telephone number, email address)

Jing Huang
X3429
huangj@mccc.edu

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. Apply calculus in solving problems. (MCCC CS Goal B, GE Goal 2)
6. conduct literature search, analysis, and presentation (GE Goal 1, 4, MCCC CS Goal A, D, E)
7. 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.

General Learning Objective

The student will be able to...

- understand basic physics concepts (CG1, CG6)
- master the laws in physics (CG2)
- develop problem-solving skills (CG2, CG3, CG4, CG5)
- develop critical-thinking skills (CG2)

Unit I Thermodynamics

Learning Objectives

The student will be able to...

- Understand temperature and heat (CG1)
- solve problems using the first, second, and third laws of thermodynamics (CG2, CG3, CG4)
- apply physics knowledge in energy conservation (CG6, CG7)

Unit II Gases

Learning Objectives

The student will be able to...

- Understand gaseous state properties (CG1)
- solve problems applying thermodynamic theory (CG2, CG3, CG4)
- apply physics knowledge in preserving natural resources (CG6, CG7)

Unit III Optics

Learning Objectives

The student will be able to...

- Understand imaging through reflection, refraction, and diffraction (CG1)
- Solving problems with interference (CG2, CG3, CG4)
- solve problems applying photon theory (CG2, CG3, CG4)

Unit IV Relativity

Learning Objectives

The student will be able to...

- Understand general relativity (CG1, CG2)
 - Solving problems applying the theory of general relativity (CG2, CG5)

Unit V Modern Physics

Learning Objectives

The student will be able to...

- Understand atomic and molecular structure and properties (CG2, CG5)
- Understand nuclear properties of substances (CG1)
- Understand energy associated with nuclear materials and reactions. (CG1, CG6, CG7)

Laboratory experiments:

1. Lab introduction
 - Go over algebra and calculus required through problem solving (CG2)
 - Establish laboratory safety rules. (CG3)
 - Learn to use balances, Vernier and micrometer caliper, stop watch (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. Thermal Expansion
 - Learn to use steam generator. (CG3)
 - Learn how the experimental apparatus work. (CG3)
 - Integrated measurement system with electronic data acquisition. (CG3, CG4)
3. Gas States
 - When possible, use campus swimming pool for depth of liquid (CG3)
 - Review gas laws (CG3)
 - Students learn to collaborate by requesting temperature measurements from life guard. (CG3)
 - The complexity of underwater measurement gave students a perspective about underwater work necessary for underwater oil drill and associated possibility of accidents of leak. (CG6)
4. 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)
5. 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)
6. Reflection, refraction, and total internal reflection
 - Use pins and plastic block to study light refraction (CG2)
 - Laser safety (CG3)
 - Use laser and plastic block to study light reflection (CG2)
 - Study total internal reflection (CG1, CG6)
8. Mirrors and lenses
 - Study spherical mirrors (CG3)
 - Study converging and diverging lenses (CG1, CG3)

9. Double slit interference
 - Learn to calculate the Young's double slit interference patterns (CG1)
 - Laser safety (CG3)
 - Use laser to generate double slit interference (CG2, CG4)
10. Diffraction grating
 - Observe how natural lights spread into different colors with spectrometer (CG2)
 - Observe fluorescent lights color components (CG2, CG1)
 - Study diffraction using a monochromatic light source (CG2, CG4)
 - Introduce modern spectroscopy as a tool to study materials (CG5, CG6)
11. Research relativity
 - Student group research and study (CG6, CG7)
 - Use calculus (CG2)
12. Presentation relativity
 - Student group presentation (CG3, CG6, CG7)
 - Use calculus (CG2, CG3)
13. Hydrogen spectrum
 - Learn to align the spectrometer, sample, and light source (CG2)
 - Learnt to observe first and second order spectral lines (CG1, CG3, CG4)
 - Learnt to identify observed spectral lines (CG1, CG5)
14. Radioactivity
 - Radiation safety (CG1, CG6)
 - Learn to use Geiger counter (CG3)
 - Learn to measure radiation from alpha source (CG2, CG4)
 - Learn to measure radiation from beta source (CG2, CG4)
15. Nuclear fission and fusion field trip
 - Visit Princeton plasma physics laboratory
 - Team work and problem solving (CG6, 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

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.