# COURSE OUTLINE
Physics II

**Course Description:** PH252. Physics II. 5 credit hours. Prerequisite: PH251 and MA152 or concurrent enrollment in MA152. This course is a continuation of PH251. The topics covered in this course are electricity, magnetism, light, and modern physics. There will be three hours of lecture with four hours of laboratory per week.

**Course Relevance:** The impact of physics in everyday life is phenomenal. The ability to see physics in action is necessary to develop a fuller knowledge and understanding of the world around us. Physics will enrich the student's appreciation of the world and help him/her better understand the studies of science and the scientific methods.

**Required Materials:**
Textbook: Wolfsen. Essential University Physics (1st Ed.). Pearson

Laboratory Manual:

**Learning Outcomes:**
The intention is for the student to be able to analyze scientific materials in various forms demonstrating:
1. An understanding of the scientific method
2. An ability to read, communicate and understand scientific materials
3. Knowledge of basic math skills
4. An ability to apply scientific reasoning to real world problems

**Primary Learning PACT Skill(s) that will be DEVELOPED and/or documented in this course:**
Through the student involvement in this course, he/she will develop his/her ability in the following PACT skill areas:
1. Critical thinking
   - The student will demonstrate scientific reasoning through a variety of mathematical, graphical, experimental, and written assignments.
2. Writing
   - The student will write laboratory reports, which include observations, and analysis of the experiment.
   - The student will write a research paper on an approved topic in physics.

Secondary skills (developed but not documented)
Speaking
Computer literacy
Internet use
Teamwork
Ethical conduct

**Major Summative Assessment Task(s):**
These learning outcomes and the primary learning PACT skills will be demonstrated by:
1. Write laboratory reports, including purpose, procedural, observations, and analysis of the experiment using scientific reasoning
2. Writing a research paper or preparing a project upon a topic of physics as assigned by the instructor.
3. Final assessment of the course using the departmental final.

**Course Content:**
I. Themes - Key recurring concepts that run throughout the course:
   A. Scientific method
   B. Scientific reasoning
II. Issues - Key issues that will be addressed in this course: areas of conflict that must be understood in order to achieve the intended outcome:
   A. The balance between the conceptual and mathematical models
   B. The cumulative nature of science and the world
   C. The cumulative influence of scientific discoveries and the subsequent application of the discoveries
   D. The balance between lab physics and computer interfacing, collection and analysis of data
III. Concepts – Key concepts that must be understood to address the issues:
   A. Mathematics
   B. Visual/conceptual
   C. Scientific Methods
   D. Scientific Reasoning
   E. Modeling
   F. Scientific writing
   G. Scientific principles
   H. MLA writing format
   I. Word processing
   J. Excel spreadsheet
   K. Graphing
   L. Characteristics and impact of science in the world around them
IV. Skills/Competencies - Actions that are essential to achieve the course outcomes:
   A. Mathematics
   B. Writing
   C. Reading
   D. Speaking
   E. Computer Literacy
   F. Computer Spreadsheet/Graphing
   G. Internet Use
   H. Teamwork

**Learning Units**
I. Lecture
   A. Electrostatics

1. describe the laws of conservation of charge
2. define and identify conductors and insulators.
3. work problems using Coulombs law for electrostatic charges for forces in one and two dimensions
4. explain electric fields and electropotentials.
5. explain capacitors and dielectrics
6. problem solve in electrostatics.

B. Electric Current and Circuits
1. Define electromotive force
2. State and work problems using Ohm's law for resistance
3. Define electric power
4. Construct and work circuits applying Kirchoff's Rules
5. Construct and solve problems using RC circuits
6. Discuss electrical safety

C. Magnetism
1. define magnetic dipoles
2. explain magnetic fields and forces
3. describe magnetic torque on wires
4. give examples and explain scientific instruments that utilize magnetic properties
5. define and work problems using Faraday's and Lenz's Laws
6. define and describe AC and DC power
7. demonstrate reactance, capacitive and inductive
8. describe and solve for impedance and phase angles

D. Optics, Geometrical and Physical
1. state Law of Reflection
2. state the Law of Refraction
3. state and work problems using Snell's Law
4. describe the properties of light
5. describe the physical properties of a thin lens
6. describe the physical properties of a spherical mirror
7. demonstrate diffraction and interference
8. explain polarization of light

E. Modern Physics (time permitting)
1. explain Galilean relativity
2. explain special theory of relativity
3. explain the general theory of relativity
4. describe the energy of a photon
5. describe the photoelectric effect
6. describe the Bohr model of a atom
7. describe the wave-particle duality of matter
8. explain Schrodinger's wave mechanics
9. explain Heisenburg uncertainty principle

10. describe the modern interpretation of the atom
11. explain radioactivity

II. Laboratory
A. Working in the laboratory in accordance with good laboratory practices
1. Dress in an appropriate manner as to promote safety in the laboratory.
2. Follow written directions accurately
3. Work safely and effectively, using equipment correctly
4. Demonstrate use of required safety and common laboratory techniques

B. Gather and record qualitative and quantitative data accurately
1. Acquire data using balances and various equipment
2. Make and record visual observations
3. Use computers, when appropriate, as data acquisition tools
4. List or describe experimental assumptions made and any deviations from the written experimental procedures

C. Handle and evaluate data in logical, productive, and meaningful ways
1. Create notebooks and laboratory reports that are clear, understandable, and accurately represent the date collected
2. Display computer data in a spreadsheet or graphically, as appropriate
3. Correlate observations with chemical or physical processes
4. Carry out suitable calculations with quantitative data, recognizing when data and calculates are within a reasonable range
5. Use observations of experimental data to present relevant conclusions pertaining to the experimental procedure

D. Correlate laboratory work with principal topics in Physics II lecture

**Learning Activities:**
Independent and collaborative learning activities will be assigned within and outside the classroom and laboratory to achieve the intended course outcomes. Classroom discussion, lecture, and textbook reading assignments will also contribute to the learning process.

**Grade Determination:**
Grade determination may include tests, projects, quizzes, homework, written assignments and laboratory experiments. Other methods may be used at the discretion of the instructor.