

## **Course Description**

### **PHY1020 | General Education Physics | 3.00 credits**

This course offers a comprehensive survey of physics, covering a wide range of topics including motion, Newton's Laws, energy, sound, heat, electricity, magnetism, and optics. Emphasizing a conceptual understanding of physics, the course integrates critical thinking skills and real-world applications. Student learning outcomes: students will critically evaluate everyday phenomena using the scientific method; students will explain the basis of physical principles (such as conservation laws) and how they apply to everyday phenomena; students will interpret information conveyed in diagrams and graphs; and students will perform simple calculations relevant to real world problems.

### **Course Competencies:**

**Competency 1:** The student will demonstrate knowledge of what science is by:

1. Describing the steps involved in the scientific method
2. Recognizing the necessity of the scientific method for understanding the physical world
3. Identifying important contributions of science to technology, economics, history and society

**Competency 2:** The student will demonstrate knowledge of what physics is by:

1. Describing the subject of study, scope and limitations of physics as a science
2. Identifying the significant subdivisions of physics
3. Identifying essential physicists

**Competency 3:** The student will demonstrate knowledge of the scientific notation by:

1. Describing the standard form of scientific notation
2. Expressing various numbers in scientific notation
3. Utilizing scientific notation to perform basic numerical operations

**Competency 4:** The student will demonstrate knowledge of scientific units and measurements by:

1. Identifying the main systems of units
2. Identifying the main multiples and submultiples within each system
3. Distinguishing between base units and derived units
4. Converting measurements

**Competency 5:** The student will demonstrate knowledge of kinematics by:

1. Identifying the main types of motion
2. Describing motion in terms of position, distance, speed, velocity, and acceleration
3. Performing basic calculations on motion

**Competency 6:** The student will demonstrate knowledge of dynamics by:

1. Identifying force as the cause of motion
2. Distinguishing between mass and weight
3. Describing Newton's laws of motion
4. Performing basic calculations using the laws of motion

**Competency 7:** The student will demonstrate knowledge of conservation laws by:

1. Distinguishing between work, kinetic energy, potential energy, total energy, linear momentum, and angular momentum
2. Expressing and using in basic calculations the law of conservation of energy
3. Expressing and using the law of conservation of linear momentum in basic calculations

4. Expressing and using the law of conservation of angular momentum in basic calculations

**Competency 8:** The student will demonstrate knowledge of fluids by:

1. Distinguishing between density and pressure
2. Describing Pascal's principle and its applications
3. Describing Archimedes' principle and its applications
4. Describing Bernoulli's principle and its applications
5. Distinguishing the different kinds of fluid flow

**Competency 9:** The student will demonstrate knowledge of thermodynamics by:

1. Describing the laws of thermodynamics
2. Distinguishing between temperature and heat
3. Identifying the main types of heat flow
4. Describing the relationship between temperature, pressure, and volume

**Competency 10:** The student will demonstrate knowledge of electricity by:

1. Distinguishing between electric charge, electric force, electric field, electric potential, and electric current
2. Describing Coulomb's law and using it in basic calculations
3. Describing Ohm's law and using it in basic calculations
4. Distinguishing between series and parallel connections in circuits
5. Distinguishing between direct and alternating currents

**Competency 11:** The student will demonstrate knowledge of magnetism by:

1. Distinguishing between magnets, magnetic force, magnetic field, and magnetic torque
2. Describing how magnetic fields affect the motion of charges and currents
3. Describing electromagnetic induction and its applications

**Competency 12:** The student will demonstrate knowledge of optics by:

1. Distinguishing between ray and a wavefront
2. Distinguishing between reflection, refraction, dispersion, interference, and diffraction
3. Describing the law of reflection and using it in basic calculations
4. Describing the law of refraction and using it in basic calculations
5. Identifying fundamental optical instruments

**Competency 13:** The student will demonstrate knowledge of relativity by:

1. Describing the postulates of special relativity
2. Describing time dilation and length contraction
3. Describing the relation between mass and energy and its implications
4. Describing the general ideas of general relativity and its implications

**Competency 14:** The student will demonstrate knowledge of atomic, nuclear, and particle physics by:

1. Describing the main components of the atom
2. Describing Bohr's model of the atom
3. Describing the quantized nature of atomic properties
4. Describing nuclear particles and the force between them
5. Describing radioactivity and identifying its main types
6. Identifying the main types of subatomic particles

#### **General Education Learning Outcomes**

- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning