Course Title	Course Code	Number of Study Hours			Year	Level	Prerequisite
		Theoretical	Laboratory	Credit			
Principles of Physics (2)	205 PHYS-3	2	2	3	2nd	4th	204 PHYS-4

(1)Brief Course Description

This course provides basic concepts in electric field, Gauss's law, electric potential, capacitance and dielectrics, direct current circuits, particle in a magnetic field, Biot-Savart law, Ampers law, Faraday's law. It also covers electrical conduction of metal, insulators and semiconductors and semiconductor devices.

(2) Course Objectives

This course is designed to provide students with the following concepts:

- Particle in an electric field and electric field of continuous charge distributions.
- Electric flux and Gauss's law of various charge distributions.
- Electric potential, potential difference and the relation between electric field and potential.
- Capacitance, combinations of capacitors and energy stored in a capacitor.
- Direct current circuit analysis.
- Charged particle in a magnetic field, Biot-Savarat law, Amper's law, Faraday's law.
- Alternating current circuits analysis.
- Basic properties and characteristics of semiconductor materials and devices.

(3) Course Contents

Theoretical Part:

1. **Electric Fields:** Particle in an electric field, electric field of a continuous charge distributions, electric field lines, motion of charged particles in a uniform electric field.
2. **Gauss's Law**: Electric flux, Gauss's law, application of Gauss's law to various charge distributions.
3. **Electric Potential**: Electric potential, potential difference, potential difference in a uniform electric field, electric potential due to point charges, electric field from the electric potential.
4. **Capacitance and Dielectrics**: Definition of capacitance, calculating capacitance, combinations of capacitors, energy stored in charged capacitor, capacitors with dielectrics.
5. **Direct current circuits (D.C. circuits):** Electromotive force, resisters in series and parallel, Kirchhoff's rules and RC circuits.
6. **Magnetism:** Particle in a magnetic field, motion of a charged particle in a uniform magnetic field, magnetic force on a current- carrying conductor, Biot–Savart law, magnetic force between two parallel Conductors, Ampère's law, Faraday's law of induction.
7. **Alternating current circuits (A.C. circuits)**: AC sources, resistors, capacitors and inductors in AC circuit, RLC series circuits, power in AC circuit, resonance in series RLC circuit.
8. **Electronics:** Electrical conduction in metals, insulators, and semiconductors (intrinsic semiconductors and doped n-type and p-type semiconductors), semiconductor devices (junction diode, light emitting and absorbing diodes, transistors).

Experimental Part:

1. Cathode ray oscilloscope for voltage and frequency Measurements.
2. Equivalent resistances for series and parallel combinations.
3. Kirchhoff's rules.
4. Capacitance of capacitors by discharging method.
5. Equivalent capacitance for series and parallel combination.
6. Magnetic force acting on a current carrying conductor.
7. Ohms law for a simple A.C. inductive and capacitive circuits.
8. Series resonance circuit.

9. Forward and reverse characteristics of P-N Junction diode.
10. Light emitting diodes characteristics.
11. Bipolar junction transistor characteristics.

(4) Assessment Criteria

- Periodic Exams: 20 %
- Oral, Student Activity and Essay: 10%
- Laboratory Work: 20 %
- Final Exam: 50%

(5) Course Teaching Strategies

- Lectures, Reports, Essay Assignments, Laboratory work, Homework and Web-based Assignments.

(6) Text Book:

- Physics for Scientists and Engineers with Modern Physics; Raymond A. Serway and John W. Jewett, Jr.; Brooks/Cole CENGAGE Learning, 9th edition, 2014.

(7) Reference Books

- Fundamentals of Physics; Halliday, Resnik and Walker; John Wiley and Sons Inc., 2007.
- Electronic Devices; Thomas L. Floyd; Pearson Prentice Hall, Inc,7th Edition, 2005.