Course Title	Course Code	Number of Study Hours			Year	Level	Prerequisites
		Theoretical	Laboratory	Credit			
Electronics 1	311PHYS	3	-	3	3rd	th	231PHYS

(1) Brief Course Description

This course provides fundamental knowledge in electronic aspects including resistors, capacitors, and inductors with direct current (DC) and alternating current (AC) sources, the analysis of circuits and semiconductor devices. The course covers basic electronic components, DC circuits, AC circuits, Kirchhoff's law, transient response of RL, RC and RLC circuits, properties of semiconductor materials, p-n junctions, diodes and their applications in rectifiers, filters, and multiplier circuits, and basic structure and configurations of bipolar junction transistors (BJT). The use of test equipment and troubleshooting of components/devices are included.

(2) Course Objectives

This course is designed to provide students with:

- Principles and circuit analysis of direct current (DC) and alternating current (AC) electrical circuits.
- Basic properties and characteristics of semiconductor materials and devices.
- Various types of diodes and their applications.
- Structures, operational principles, modes and characteristics of bipolar junction transistor (BJT).
- Basic principles of electrical test equipment and troubleshooting of components and devices.

(3) Course Contents

- **Basic components of electronics**: Resistor, capacitor and inductor (Series and parallel connections).
- **Kirchhoff's laws**
- **Direct current (DC) circuits:** Electromotive force (emf), Internal resistances, Electronic components in DC source, Series circuits, Parallel circuits, Electrical measuring instruments.
- **Alternating current (AC) circuits**: AC source, Resistors in AC circuit, Inductors in AC circuit, Capacitors in AC circuit.
- **The RLC circuits**: RLC series circuits, Phasor diagram, Resonance frequency, Rectifiers and filters, Power in AC circuit, Transformer and power transmission.
- **Electronic structure of atoms:** Atom model, Atomic number and electron shell.
- **Properties of semiconductor materials:** Category of solid materials, Semiconductors, Covalent bond, P-type semiconductors, and N-type semiconductors.
- **P-N junctions:** Depletion region, Current flow in p- & n-type semiconductors.
- **The diodes,** The physics of diodes, Biasing of a diode, Characteristics of a diode, Diode models, Testing a diode.
- **Application of diodes:** Diode as a rectifier, Diode as a filter, and Diode data sheet
- **Special purpose of diodes**: Zener diodes, Light emitting diodes (LED), Photodiodes, Laser diodes.
- **Bipolar junction transistors (BJTs):** Transistor structure, Operation modes, Circuit configurations, Characteristics, and BJT applications.

(4) Assessment Criteria

- Periodic Exams: 40%
- Oral, Student Activity and Essay: 10%
- Final Exam: 50%

(5) Course Teaching Strategies

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

(6) Text Book

- James W. Nilsson and Susan Riedel, Electric Circuits, Addison-Wesely Publishing Company Inc., 2007.
- Thomas L. Floyd, Electronic Devices, Pearson Prentice Hall, Inc., 7th Edition, 2005.

(7) Reference Books

- College Physics, Raymond A. Serway, Jerry S. Faughn, Chris Vuille; Brooks/Cole, 9th Edition 2009.
- Electronics: Circuits and Devices; Ralph J. Smith, John-Willey and Sons, Inc., 3rd Edition, 1987.
- Basic Electronics for Scientists; James J. Brophy, McGraw-Hill Kogakusha Ltd., 1990

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