

## **PHY-291 Electronics**

**Credit Hours:** 2-1

**Pre-requisite:** None

**Course Objectives:** This course provides physics students with the fundamental electronic principles needed for advanced study in physics laboratories and graduate school. Upon successful completion of the course material, students will be able to: qualitatively and quantitatively describe the operation of electronic circuits, operational amplifiers in a variety of signal processing applications. Demonstrate basic concepts of semiconductor electronics.

**Course Contents:** Introduction to electronics, passive components, active components, bipolar junction transistors, transistor fundamentals, Field Effect Transistors (FET), MOSFET, CMOS, regulated power supplies, designing DC power supplies, Ideal OP-Amp, Op-Amp applications Light emitter diodes and photo diodes.

**Detailed Course Contents:** Introduction to electronics, passive components, active components, voltage source and current source, diode theory and diode circuits, special purpose diodes and filters, bipolar junction transistors, transistor fundamentals. voltage amplifier, power amplifier and emitter follower, transistor biasing, field effect transistors (FET) and FET circuits, MOSFET circuits and CMOS, regulated power supplies, designing dc power supplies, operational amplifier: OP-AMP, OP-AMP symbol, inverting and non-inverting OP-AMP, ideal OP-AMP and OP-AMP applications (including subtractor, integrator, differentiator and comparator), spectral response of human eye, light emitter diodes and photo diodes.

### **Course Outcomes:**

Upon successful completion of this course, students should be able to understand:

- Calculate and measure current through or voltage across any element of a single source DC network
- Calculate or measure the current through and voltage across any element of a single source series or parallel sinusoidal AC network
- Calculate or measure real power, reactive power, and power factor of AC or DC circuits.
- Understand the use of diodes as power supply rectifiers
- Understand the operation of transistors as switching circuits

**Textbooks:**

A. P. Malvino, Electronic Principles, 7th ed. McGraw Hill, 2006.

B.L. Theraja, Basic Electronics, S. Chand & Co – 1991.

Weekly Breakdown		
Week	Section	Topics
1	AM 1.1-1.4	Introduction to electronics, passive components, active components, voltage source and current source
2	AM 3.1, 3.2, 4.1, 4.3, 4.4, 4.5	Diode theory and diode circuits
3	AM 5.1-5.3	Special purpose diodes and filters
4	AM 6.1-6.5	Bipolar junction transistors
5	AM 7.1-7.6,	Transistor fundamentals. Voltage amplifier, power amplifier and emitter follower
6	AM 8.1-8.7	Transistor Biasing
7	AM 13.1, 13.7-13.11	Field Effect Transistors (FET) and FET circuits
8	AM 14.1, 14.3, 14.4, 14.7	MOSFET circuits and CMOS
		<b>Midterm Exam</b>
9	AM 24.1-24.4	Regulated power supplies
10	AM 24.5-24.7	Designing DC power supplies
11	BL 31.18,31.19-31.22, 31.25	Operational amplifier: OP-Amp, Op-Amp symbol, Inverting and Non-Inverting Op-Amp
12	BL 31.26-31.31	Ideal Op-Amp and Op-Amp applications (including subtractor, integrator, differentiator and comparator)
13	BL 16.2,16.3,16.9	Spectral response of human eye, Light emitter diodes and photo diode.
14		Assorted Topics
15		Revision