PHYS375: Laboratory Electronics I

Semester: Fall 2016

Credit hours: 4

Class time: Mondays and Wednesdays 1:30PM - 3:30PM

Class room: La Tourette Hall 223

Instructor: Zhili Xiao
Office: La Tourette Hall Room # 212
Tel: 630-649-4067 or 630-252-8762;
Emails: zxiao@niu.edu or xiao@anl.gov
Office Hours: Mondays and Wednesdays, 10:00AM – 11:30AM

Textbooks: An Introduction to Modern Electronics
William L. Faissier

Grading: Labs 30%; homework 30 %

Mid-term 20%; final exam 20 %

A (A^-)= 90~100%; B (B^-)= 80~89%; C (C^+) = 70~79%;

D = 60~69%; F = less than 60%

Attendance: It is required to attend all classes, labs and exams. Exceptions will be made with instructor's approval.

Course Description

Fundamentals of circuit analysis and the physics of electronic devices. Topics include DC and AC circuits, signal transmission, noise, feedback, semiconductors, operational amplifiers, and simple digital logic.

Prerequisites & Notes

PHYS 252 or PHYS 273 or consent of the department.

Accessibility Statement

Northern Illinois University is committed to providing an accessible educational environment in collaboration with the Disability Resource Center (DRC). Any student requiring an academic accommodation due to a disability should let his or her faculty member know as soon as possible. Students who need academic accommodations based on the impact of a disability will be encouraged to contact the DRC if they have not done so already. The DRC is located on the 4th floor of the Health Services Building, and can be reached at 815-753-1303 (V) or drc@niu.edu.

Course schedule

Date	**Lecture/Lab**
08/22	Introduction
08/24	**Basics:** energy storage hydrological analogy; voltage; current; power; conductivity and Ohm's law; Kirchoff law; Series and parallel circuits; Thevenin and Northon theorems
08/29	Lab 1
08/31	**Alternating and direct currents:** DC versus AC; Fourier analysis and complex notation; Characterizing AC signal; resistance in AC signal; capacitance and capacitors; RC circuits
09/05	**Labor day**
09/07	Lab 2
09/12	**Oscillators & resonances:** inductor; inductance versus capacitance; the RLC circuits and its analogy with the mechanical pendulum; resonances
09/14	Lab 3
09/19	**Signal transmission & noise:** transmission line; coupling scheme; termination and impedance matching; optical analogy; noise
09/21	Lab 4
09/26	**Operational amplifier**: properties and "golden rules"; ideal versus real-life operational amplifier; example of circuits analysis with operational amplifier
09/28	Lab 5
10/03	**Amplifier and feed-back system**: voltage amplifier; common emitter amplifier; feedback system and advantage of negative feedback scheme
10/05	Lab 6
10/10	Argonne visit
10/12	**Midterm exam**
10/17	**Analog computer**: setting up equation with electronics
10/19	Lab 7
10/24	**Semiconductors:** quantum mechanics background, band theory, Fermi level; doping; p-n junctions; diodes
10/26	Lab 8
10/31	**Transistors:** bipolar junction transistors; field emission transistors; example of circuit analysis with transistors
11/02	Lab 9
11/07	**Controls:** conventional switches; transistor-based control
11/09	Lab 10
11/14	**Current & voltage sources:** transistor-based sources; signal shaping (clipping, rectification)
11/16	Lab 11
11/21	**Logic gates:** Boolean algebra; standard logic gates; implementation (CMOS and TTL)
11/23	**Thanksgiving**
11/28	Lab 12
11/30	Review
12/05	**Final exam**