ELECTRICAL & COMPUTER ENGINEERING DEPARTMENT
PORTLAND STATE UNIVERSITY

Winter 2023

Course: ECE 241 Introduction to Electrical Engineering

Instructor: R. Tymerski, tymerski@ece.pdx.edu
Office: FAB 160-18, Office Hours: TBA

TA: Mohamed Abidalrekab <moh29@pdx.edu>

Overview: This course is an introduction to electrical engineering designed for mechanical engineering students. The majority of the course is on electric circuit analysis as you will see in the Fundamentals of Engineering exam. We cover basic analysis of resistive circuits using Ohm's and Kirchoff's laws, then learn simplifying techniques such as series and parallel resistance. The important circuit analysis concepts of node and loop analysis, superposition and equivalent circuits are emphasized. We introduce inductors and capacitors and their behavior in transient circuits. We then explore the concepts of phasors and impedance to analyze ac circuits. Finally we learn how to calculate ac power and to analyze ideal transformer circuits.

The course outcomes are:

1) the ability to analyze resistive circuits using basic laws and more advanced circuit analysis techniques;
2) the ability to analyze transient circuits containing inductors and capacitors;
3) the ability to use phasors and impedance to analyze ac circuits, calculate ac power.
4) The ability to analyze ideal transformer circuits.

TA: The name of the Lab TA is given above. You can ask your lab TA questions about the class, but their primary duty is the lab.

Please make use of my office hours to get help on homework problems and answers to questions we don't have time for in class.

Also, there is also free tutoring available from the IEEE student section; go to https://www.pdx.edu/electrical-computer-engineering/undergraduate-tutoring-information for times and location.

Text: Introduction to Electric Circuits, Svoboda and Dorf, 9th Ed.

Homework: There will be a number of homework problems given.

Deadlines: Any deadlines (lab submission etc.) will be strictly enforced.

Exams: During the midterm and final exams students can use a formula sheet they have prepared, It should be no larger than 8.5" x 11" inches, (written on both sides is OK).

NO make-up exams will be given. If a compelling reason exists why an exam is missed you will need to provide documentation to the instructor .

If you are a student with a documented disability and registered with the Disability Resource Center (DRC), please contact me within the first two weeks of class, and also *email me a few days before each exam to remind me*. DRC can be reached at 725-4150.

Lab: The labs are posted on the course website, i.e. the instructor's web site in the ECE241 section. Students will need to work with a partner and stay with that partner throughout the term. If you want to work alone or in a group of three you will need to get permission from the instructor. The lab is an integral part of the course and it is required that the lab and lecture be taken together. Labs reports will need to be submitted to Canvas in a timely fashion. Circuit parts can be purchased from the EPL (Electronics Prototyping Lab) store: http://psu-epl.github.io/ . The list of parts in the Lab kit can be found here: https://sites.google.com/pdx.edu/ece-lab-resources/students/lab-kits?authuser=0

Academic Honesty: We take academic honesty very seriously. Our department policy is to report all instances of plagiarism or cheating to the university. If you are not sure what constitutes plagiarism, ask and we'll talk about it. Simply put – turn in only your own work or credit the source. Violators will be referred to the PSU Office of the Dean of Student Life for adjudication.

Software: The program LTSpice will be introduced in this course and used in homework assignments as well as in the lab. LTSpice is also called SwitcherCad III. It is a free program available from Linear Technology at http://www.linear.com/solutions/ltspice . You can easily download it to your own computer.

MATLAB will also be used though primarily in the lab. If you are not familiar with MATLAB, I suggest you visit the website at www.mathworks.com . Go to Academia, Interactive Tutorials, MATLAB tutorial and check out the MATLAB Fundamentals tutorial under MATLAB On-Ramp. More information on both MATLAB and LTSpice is in the lab.

Also, if you don't have one, now is a good time to invest in a good scientific calculator. You will need one that handles complex numbers and solves linear simultaneous equations for this class.

Grading:

Attendance	10%	it is important to attend all classes
Midterm:	20%	Week 6: Thursday, Feb. 16
Final:	40%	Week 11 (finals week): Tuesday Mar. 21, 1730- 1920
Labs:	30%	5 labs, 1st lab starts in Week 2

Students need to score at least 50% on the final exam to pass the class. There will be a number of quizzes throughout the term which will provide information to the instructor concerning class understanding of the material and will be used to track attendance. Students can miss up to 2 quizzes without loss of points.

Labs: See lab schedule elsewhere on the course webpage. There is no lab on week 1. Labs start on Week 2.

Lab 1 : Introduction to Lab Equipment. You will need the parts kit or toolbox for this lab.

Lab 2 : MATLAB

Lab 3 : Oscilloscope

Lab 4 : LTSpice

Lab 5: Constant current source

Topics:

Group 1:

1) Definitions: charge, voltage, current, power, energy
2) Voltage sources: independent and dependent
3) Current sources: independent and dependent
4) Resistors, Ohm's law
5) Kirchhoff Voltage Law (KVL)
6) Kirchhoff Current Law (KCL)
7) Resistors in series
8) resistors in parallel, conductances in parallel
9) resistive voltage divider
10) resistive current divider
11) Nodal analysis
    a. Basic
    b. With dependent sources
    c. With voltage source
12) Mesh analysis
    a. Basic
    b. With dependent sources
    c. With current sources
13) Non-ideal sources, source transformation
14) Thevenin's theorem
15) Norton's theorem
16) Maximum power transfer
17) Superposition

Group #2:

1) Capacitance
2) Capacitances in Series and Parallel
3) Inductance
4) Inductances in Series and Parallel
5) First order circuits
6) DC Steady State
7) RL Circuits
    a) Response to initial condition
    b) Response to a constant input
8) RC Circuits
    a) Response to initial conditions
    b) Response to a constant input

Group #3:

1) AC circuits (steady-state sinusoidal analysis)
2) AC power analysis
3) Ideal transformer