EELE 201 Circuits I

Fall 2013 (4 Credits)

Instructor:

Jim Becker 535 Cobleigh Hall 994-5988
Office hours: Monday 2:30-3:30 pm and Wednesday 3:30-4:30 pm or by appointment

EMAIL: For EELE 201-related questions, please use my d2L email address

Teaching Assistant: TBA

Prerequisites: EELE 101, M172 ***Corequisites:*** PHSX 222

Required Text**:** *Introduction to Electric Circuits, 8th edition*, Richard C. Dorf and James A. Svoboda (John Wiley & Sons, Inc. 2010). ISBN 978-0-470-52157-1

Required Text**:** *PSpice For Linear Circuits* W/Cd, 2nd edition, James A. Svoboda (John Wiley & Sons, Inc. 2007). ISBN 978-0-471-78146-2

Course Website**:** The Desire To Learn (D2L) course management system will be used to augment the course. On this site you will find course news, homework listings, lab assignments, as well as "course modules." The modules encapsulate a given chapter from the course text and closely follow what I cover in lecture. In addition, you will find "desktop presentations." These presentations capture audio/video as I introduce key concepts in the course or step through the solution to important example problems.

Course Description (from the MSU Catalog):

Introduction to circuit analysis, Ohm's and Kirchhoff's Laws, nodal and mesh methods, network theorems; resistors, capacitors, inductors, dependent sources, ideal op-amps; the complete response of first order circuits; complex frequency and phasors; steady-state AC circuits, coupled inductors and ideal transformers.

Final Exam

The final is scheduled for Thursday, December 12th from 4-5:50 pm in our normal classroom.

Disabled Student Services: *If you have a documented disability for which you are or may be requesting an accommodation(s), you are encouraged to contact me and Disabled Student Services as soon as possible.*

Grading

Homework	10%	Lab	25%
Exam 1	15%	Exam 2	15%
Exam 3	15%	Final Exam	20%

**** A student must receive at least a 70% average on the exams (Exam 1, 2, 3 and the final) to pass the class ****

Homework and lab reports are due at the beginning of class on the due date. Should you turn in the assignment once the class has begun, 20% will be deducted from your assignment so don't be late for class. **HW turned in after class will not be accepted**. Late lab reports will be assessed a 20% late penalty per day (10% if turned in after the beginning of class but before 5pm on the due date).

Project circuit-related group work: A portion of your grade will be derived from group-submitted work. The final exam will include a section of conceptual questions pertaining to the project circuit-related activities. Your score on this section will provide a weighting factor for the group work. For example, let's say your group submitted stellar work, but you did little to contribute to this work. It is highly likely you will do poorly on the conceptual section and then your score on the group work will drop accordingly.

Laboratory

The laboratory section of this course will make up 25% of your final grade. We will have approximately eleven lab experiments and one lab quiz counting as lab grades. Lab reports and the lab quiz will be worth twice the conventional lab grade. A student must receive at least 60% in the laboratory grade to pass this course. Attendance will be taken during the lab sessions and no more than 1 unexcused absence is allowed for a passing grade. You must come to your registered lab session.

Topics and Text Chapters

Chapter	Topics
1	Electric Circuit Variables
2	Circuit Elements
3	Resistive Circuits
4	Methods of Analysis of Resistive Networks
5	Circuit Theorems
6	The Operational Amplifier
7	Energy Storage Elements
8	The Complete Response of RL and RC Circuits
10	Sinusoidal Steady-State Analysis
11	AC Steady-State Power

Course Outcomes

Following is a partial list of course outcomes for EELE 201. From time to time during the semester, review the list to ensure that you are able to fulfill the outcome statements as the corresponding topics are encountered.

Tentative List Of EELE 201 Course Outcomes

Outcome Statement	Strongly Agree	Somewhat Agree	Neither Agree Nor Disagree	Somewhat Disagree	Strongly Disagree
I can recall the units of charge, current, potential, resistance, capacitance, and power.					
I can convert between the following unit prefixes and recall their values from memory: pico, nano, micro, milli, kilo, and mega					
I can utilize Ohm's Law to calculate voltage, current or resistance.					
I can utilize a resistor color chart to determine the nominal value of a resistor and its tolerance.					
I can calculate the power dissipated in a resistor.					
Given a sketch of a sinusoidal waveform, I am able to write an equation that properly describes its amplitude, frequency and phase shift with respect to a reference sinusoid.					
I am able to solve a system of linear equations.					
I am able to describe the difference between linear and nonlinear models and give examples of circuit elements for both categories.					
I am able to determine amplitude, frequency, period and phase shift of a sinusoidal signal using an oscilloscope.					
I am able to describe the properties of resistors, capacitors, inductors and diodes and give examples of how they can be used in electronic circuits.					
I can calculate the equivalent resistance of resistors in series and parallel.					
I can apply Ohm's Law and Kirchhoff's Laws to simple circuits with resistors and voltage sources.					
I am able to able to apply the "Node Voltage Analysis" technique to solve circuits containing resistors, capacitors and inductors.					
I am able to able to apply the "Mesh Current Analysis" technique to solve circuits containing resistors, capacitors and inductors.					
I am able to sketch and describe the I-V characteristics of resistors and diodes.					
I am able to resolve a circuit into either its Thévenin or Norton equivalent forms.					
I am able to articulate what is meant by the property of superposition as applied to electrical circuits.					
Given a circuit to be connected to a load, I am able to determine the value of the load necessary to achieve maximum power transfer to the load.					
Assuming ideal operational amplifier (op-amp) operation, I am able to analyze circuits containing op-amps.					
I am able to design both inverting and noninverting amplifiers for a specified gain using op-amps.					
I am able to design a summing amplifier using op-amps.					
I am able to determine the initial conditions for circuits containing capacitors and/or inductors.					
I am able to use a DMM to make resistance, voltage and current					

measurements.					
I understand how the DMM's impedance level can alter circuit behavior when making resistance, voltage and current measurements.					
I am comfortable in using the oscilloscope to display and interpret the frequency, period and relative phase shift of a sinusoid.					
I am able to articulate what is meant by a "dependent" source and identify what such a source typically models.					
I am able to solve for voltages and currents in circuits that contain dependent sources.					
I can calculate the equivalent impedance of capacitors and inductors in series and parallel.					
I am able to calculate the break frequency (i.e. 3 dB frequency) of a single time constant RC circuit and understand its significance.					
Given a single time constant RC circuit, I am able to calculate the magnitude and phase of voltage across either the R or C					
I am able to articulate what is meant by first order and second order electric circuits.					
I am able to determine the complete response of arbitrary first order RL and RC circuits.					
I am able to analyze RL and RC circuits in steady-state using phasors.					
I am able to define the difference between the instantaneous and average power and am able to calculate the two.					
I am able to define what is meant by "complex power" and can calculate it in a given electric circuit.					
I am able to define what is meant by "power factor" and can calculate its value in a given electric circuit.					
I am able to break down a circuit containing elements such as operational amplifiers, resistors, capacitors, inductors and dependent sources into sub-circuits to facilitate analysis of the complete circuit.					
I am able to develop and describe in writing an outline of an approach to analyzing an electric circuit which contains multiple and varied circuit elements including operational amplifiers, resistors, capacitors, inductors and dependent sources.					
I am able to identify component limitations (e.g. saturation , slew rate, power rating, battery life) that may be important in a given circuit and suggest means to design the circuit such that component limitations are not exceeded.					
I am able to describe the relationship between the time-domain and frequency domain descriptions of first-order circuits.					
I am able to use MATLAB to generate arrays of numbers, to plot graphs, and to solve systems of linear equations.					
I am confident in manipulating complex numbers in both rectangular and polar form.					
I understand the notion of static offsets in op amps and can calculate the output due to these offsets.					
I am confident in determining the key characteristics of an op amp given its datasheet.					

Lab Outcomes

Following is a partial list of course outcomes for EELE 201 as related to lab skills. From time to time during the semester, review the list to ensure that you are able to fulfill the outcome statements as the corresponding topics are encountered.

Tentative List Of EELE 201 Lab Outcomes

Outcome Statement	Strongly Agree	Somewhat Agree	Neither Agree Nor Disagree	Somewhat Disagree	Strongly Disagree
I am able to use a DMM to make resistance, voltage and current measurements.					
I am able to properly bias an op amp (single supply and bipolar biasing)					
I am able to use the function generator to establish a variety of time varying inputs (sinusoids, pulse waveforms, etc.) and to provide a DC offset when necessary.					
I am able to use the oscilloscope to display a given voltage waveform (probe compensation, triggering, horizontal and vertical scaling, use of cursors and measurement functions).					
I am able to determine amplitude, frequency, period and phase shift of a sinusoidal signal using an oscilloscope.					
I can recall and use the formula for converting the time offset between equal period waveforms, to their phase offset.					
I understand the difference between the DC and AC coupling features of the oscilloscope.					
I understand the difference between 1X and 10X probes.					