EE 210 **Fall 2018/19**
Dr. Blandford

Website: `http://csserver.evansville.edu/~blandfor`
Text: Ulaby, Fawwaz T., Maharbiz, Michel M., and Furse, Cynthia M., Circuit Analysis and Design, Michigan Publishing, 2018
Reference:
1. Alexander, Charles K, and Sadiku, Matthew N.O., Fundamentals of Electric Circuits, 6th ed., McGraw-Hill, 2017.
2. Nahvi, Mahmood and Edminister, Joseph, Schaum's outlines of Electric Circuits, 4th ed., McGraw-Hill, 2003.

Software:
1. LTSpice, This is available on the network in the labs and can be downloaded for personal use from http://www.linear.com/designtools/software/ltspice.jsp
2. Matlab V.8.1.604 Release 2016b This is available on the network in the labs as the professional edition. If you want to use this on a home computer a student version is available for about $100 dollars.

Lab Kits:
Each student is required to purchase a tookkit consisting of breadboard, oscilloscope probes, meter leads, etc. The kit is available from the Electrical Engineering Department Office. See Mrs. Vicky Hasenour in KC 266.

Course Structure:
This course meets from 8 to 10:15am on Tuesday and Thursday mornings. The course is taught in an integrated lab/lecture format. The lab portion of the course will be done in teams of two.

Notebooks:
Each lab team will keep a notebook in which all lab activity is recorded. This notebook will be periodically collected and graded. Notebooks are available in the department office.

Exams:
All exams are open book and open notes. Students may not share notes, books, or calculators during exams.

Reading Assignments:
Reading assignments for each class session are printed on the attached schedule. Each student is expected to have read the assigned material *before* attending class.

Grading:
This class has three hour exams, graded homework, graded projects, a graded notebook, two graded lab practical exams, and a two-hour comprehensive final exam. Unannounced quizzes over lab projects will be counted as part of the homework grade. The three exams will count 56%, the graded homework and the projects will count 20%, the notebook grade will count 5%, and the final exam will count 19%. Some of the design projects will be done in multidisciplinary teams. *All students must pass the lab practical exam in order to pass the course regardless of exam grades. The lab practical may be repeated.*

Contact Information:
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Final exam is Friday, December 7 at 4:30pm

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Tuesday	Thursday
	Aug. 23 Ch 1 pp. 1-40 Intro and overview Charge, current, voltage, power and energy *Lab 1:*
Aug. 28 Ch 1-2 pp. 25-67 The electric bill Ohm's Law. Nodes branches and loops Kirchhoff's Laws *Lab 2:*	**Aug. 30** Ch 2 pp. 67-100 Kirchhoff's Laws, Series and parallel resistive networks, equivalent circuits *Lab 3:*
Sept. 4 Ch 2 pp. 51-100 dc meter movements and loading, Review *Lab 4:*	**Sept. 6** Ch 1-2 **Hour Exam 1**
Sept. 11 Ch 3 pp. 115-126 Nodal analysis with current and voltage sources *Lab 5:*	**Sept. 13** Ch 3 pp. 115-126 Mesh analysis with current and voltage sources Analysis by inspection *Lab 6:*
Sept. 18 Ch 3 pp. 126-154 Analysis by inspection Linearity property, Superposition *Lab 7:*	**Sept. 20** Ch 3 pp. 140-161 Thevenin's Theorem Norton's Theorem *Lab 8:*
Sept. 25 Ch 3-4 pp. 151-154, 184-203 Maximum Power Transfer Intro to Op amps. Inverting and noninverting amplifier *Lab 9:*	**Sept. 27** Ch 4 pp. 184-235 Summing and difference amplifier *Lab 10:*
Oct. 2 Ch 4 pp. 183-235 Op amps, Review	**Oct. 4** Ch 3-4 **Hour Exam 2**
Oct. 9 **Fall Break**	**Oct. 11** Ch. 5 pp. 248-275 Capacitors and inductors *Lab 11:*
Oct. 16 Ch.5 pp. 275-295 Source free RL and RC circuits amps *Lab 12:*	**Oct. 18** Ch 5 pp. 275-295 Impulse and step response of RC and RL circuits *Lab 13:*
Oct. 23 Ch 5 pp. 295-301 First order op amp circuits Transient analysis and applications *Lab 14:*	**Oct. 25** Ch 6 pp. 331-346 Initial values, Source free series RLC circuits *Lab 15:*
Oct. 30 Ch 6 pp. 331-363 Step response series RLC *Lab 16:*	**Nov. 1** Ch 6 pp. 331-369 RLC Review LT Spice simulation *Lab 17:*
Nov. 6 **Lab Practical**	**Nov. 8** **Review Ch 5-6** **Last day to withdraw with a W is Nov. 9**
Nov. 13 **Hour Exam 3**	**Nov. 15** Ch 7 pp. 386-403 Sinusoids and phasors *Lab 18:*
Nov. 20 Ch 7 pp. 403-420 impedance and admittance, the frequency domain *Lab 19:*	**Nov. 22** **Thanksgiving**
Nov. 27 Ch 7 pp. 403-420 Nodal Analysis, complex numbers Thevenin's Theorem	**Nov. 29** Ch 7 pp. 429-432 Thevenin, LT Spice AC analysis
Dec. 4 Course review	

Final exam is Friday, December 7 at 4:30am

EE 210 Syllabus Supplement

Catalog Description EE 210 Circuits (3) Integrated lab/lecture covers the fundamentals of electrical circuit analysis. Introduces foundational circuit theorems and analysis methods. These include: Ohm's law, Kirchhoff 's laws, circuit reduction, node voltage analysis, mesh current analysis, superposition, and Thevenin and Norton equivalent circuits. The current-voltage characteristics for resistors, capacitors, inductors, diodes, and transistors are discussed. Additional topics include analysis of resistive DC circuits, operational amplifiers, the natural and step responses of first and second-order RLC circuits, the steady-state sinusoidal response of RLC circuits, and common diode and transistor applications. Theoretical principles verified by circuit construction and measurement and through the use of circuit simulation software. Students learn to use a variety of electrical test equipment including voltmeters, ammeters, ohmmeters, and digital and analog oscilloscopes.

Credit Hour Policy This course meets the federal requirements of 45-75 total hours of student work (combined classroom plus other academic activities such as laboratory, clinical, or fieldwork) per credit hour. (At least 135 hours total; 9 per week)

Time & Place EE 210 meets Tuesday and Thursdays from 8:00 AM to 10:15 AMin Koch Center 137

Learning Objectives After completing this course, successful students will be able to:

Course Objectives Statement

The objectives of this course is to teach students the fundamentals of electric circuit analysis. Students become competent at solving circuit problems that include Ohm's law, Kirchhoff's laws, Thevenin and Norton circuit equivalents, and transient analysis of circuits with resistors, capacitors, and inductors. There is an introduction to AC circuits.

Course outcomes by program outcome

1a. Students will use math and science to solve problems in their major field of study. (ABET a)

Students will demonstrate proficiency in solving linear simultaneous equations in homework and on exams.

Students will demonstrate proficiency in solving problems using complex numbers in homework and on exams.

Students will demonstrate and ability to solve second-order, constant-coefficient linear differential equations in homework and on exams. (1a ABET a)

Upon completion of this course students will have mastered the following skills:

Given any two of V, I, R, and P values for a resistor, solve for the remaining two using Ohm's law and the resistive power formulas,

Find the equivalent resistance of a source-free series-parallel resistive network,

Apply Ohm's law and Kirchhoff's laws to solve DC resistive circuits containing a single independent source using circuit reduction and expansion (the total resistance method),

Solve complex resistive DC circuits with independent and dependent sources using both the mesh-current method and the node-voltage method.

Upon completion of this course students will have become proficient in the following skills:

Obtain the Thevenin equivalent of a DC resistive circuit containing independent and dependent sources,

Use the ideal op-amp model (virtual short) model to solve resistive op amp circuits (inverting, non-inverting amps, voltage follower, summing amplifier),
Determining the equivalent inductance of a series-parallel combination of inductors,
Determining the equivalent capacitance of a series-parallel combination of capacitors,
Given simple functions (piecewise linear, exponential) of current determine the voltage across either a capacitor or inductor,
Given simple functions (piecewise linear, exponential) of voltage determine the current across either a capacitor or inductor,
Determine the natural and step responses of first-order RL and RC circuits,
Determine the natural and step responses of second-order RLC circuits,
Calculate the impedance of inductors and capacitors at a given frequency,
Use phasor methods to solve for the steady-state, sinusoidal response of RLC circuits containing independent sources and dependent sources of the same frequency.
Upon completion of the course students will have become practiced in the following skills:
Determining the Norton equivalent of a circuit,
Performing delta to Y and Y to delta conversions,
Solve for the steady-state response in sinusoidal circuits with transformers (ideal transformer model).

1c. Students will have mastered the skills and tools of their profession. (ABET k)

Upon completion of this course students will have become proficient in the following skills:
Using MATLAB or equivalent numerical analysis software to solve linear systems of equations (real and complex),
Using LTSpice or equivalent circuit simulation software for DC analysis,
Using LTSpice or equivalent circuit simulation software for transient analysis in RL, RC and RLC circuits.
Students are introduced to the following topics but have not become proficient in their application:
Using LTSpice or equivalent circuit simulation software for transient analysis.
Simple diode and transistor models,
Analysis of basic diode and transistor circuits.
Using MATLAB or equivalent numerical analysis software to solve linear systems of equations (real and complex),
Using LTSpice or equivalent circuit simulation software for DC analysis,
Using LTSpice or equivalent circuit simulation software for transient analysis in RL, RC and RLC circuits.
All students will demonstrate a working familiarity with the oscilloscope, multimeter, and function generator.
Students are introduced to the following topics but have not become proficient in their application:
Using LTSpice or equivalent circuit simulation software for transient analysis.

2a. Students will be prepared to be effective team members. (ABET d)

Students will participate in the laboratory experiments as teams (ME, COE, EE, CE). Students will complete one multidisciplinary team project.

2d. Students will have the ability to take measurements and design an experiment. (ABET b)

All students will complete various experiments involving measurements and one team project.

Homework Problems will be assigned each class day. Assignments will differ as to what is to be turned in and what is the due date. This information will be placed on the assignment sheet.

Attendance Policy You are expected to attend all class sessions. Absences may adversely affect your grade.

Office Hours Dr. Blandford's office is Koch Center 266, Campus phone is 2201. He will usually be in his office from 7:00 to 9:00 AM on TTF and 10:00-11:00 AM on MWF

Disability Policy It is the policy and practice of the University of Evansville to make reasonable accommodations for students with properly documented disabilities. Students should contact the Office of Counseling and Health Education at 488-2663 to seek services or accommodations for disabilities. Written notification to faculty from the Office of Counseling and Health Education is required for academic accommodations.

Honor code This course will be governed by the University of Evansville Honor Code, which is

I will neither give nor receive unauthorized aid, nor will I tolerate an environment that condones the use of unauthorized aid

This code has two fundamental expectations:

- Students will submit as their own work only those items that are indeed their own work
- Students will hold each other responsible for adhering to the Code