# EE 2350: ELECTRIC CIRCUITS I

Course Description: Introduction to systematic methodologies for the analysis of electric circuits in DC and AC steady state. Use of simulation tools for steady state circuit analysis. Can be taken concurrently with PHYS 2421 and MATH 2326.

Pre-requisites: EE 1305, MATH 1312, PHYS 2421+ and MATH 2326+, each with a grade of C or better. (PHYS 2421+ and MATH 2326+ may be taken concurrently.)

Textbook:

- J.W. Nilsson and S.A. Riedel, **Electric Circuits**, 11th Edition, Prentice Hall, 2014.

You may acquire either the online or hardcopy editions. You are required to purchase the Mastering Engineering package which includes electronic access to the book. https://www.pearsonmylabandmastering.com/northamerica/masteringengineering/

- Circuit Tutor by Dr. Brian Skromme from ASU.

An ID will be assigned to you so that you can login into the website: https://www.circuittutor.com/web/

Instructor: Dr. Hector Erives
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Office Hours: MW 9:00 am to 10:00 am or by appointment. **I can also answer your questions via e-mail.**

Teaching Assistant:

Grading policy: The final grade will be based on homework (20 %), quizzes (20 %), two partial exams (2×20 %), a final exam (20 %). Grades (for sure):

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|---|---|
| At least 90 | A |
| At least 80 | B |
| At least 70 | C |
| At least 60 | D |
| 59 or less | F |

There will be a "gray area" between two-letter grades in the final distribution, so that two people getting the same weighted average grade could get different letter grades. If you are in one of these gray areas, whether your get a higher or lower grade depends primarily on two factors: (a) class participation and (b) whether your performance has been improving or declining.

An **incomplete** grade is given **only** for a valid reason when arrangements have been made with me and, in that case, only if the student was passing the course.

Homework:

Homework is an essential part of the course. You will be assigned Homework for virtually every class period. Homework will be submitted and graded using Mastering Engineering and Circuit Tutor.

**Mastering Engineering** is an online system that is supported by Pearson, the publisher of your textbook. You will be required to register for Mastering Engineering. For this you will need several things.

1. Course ID: erives36326
2. Pearson account: You will either create your Pearson student account or identify your existing account.
3. Access code or buy access: Either enter a student access code or buy access using a credit card or PayPal. A student access code card may be provided with your new textbook or you may be able to purchase this separately.

**Circuit Tutor** is also an online system developed by Dr. Skromme at the Arizona State University with support from the National Science Foundations (NSF). Access to the Circuit Tutor online is free, and will be used in this class. You will be assigned an ID which will be used to loginto into the website.

Classroom Etiquette:

Part of being a professional is being on time and being prepared to do your job. This applies to your career as a student as much as it does to your future career as an engineer. You are expected to be in class and prepared to participate at the scheduled start time. Wireless devices (cell phones, PDA's, MP3 players, Smart phones, etc.) are allowed in the classroom. It is recognized that devices of this sort provide emergency access for your family and loved ones. However, please use professional discretion with these devices. This includes shutting them off or setting them in the silent mode before coming to class. Do not use text messaging or web browser features while you are in class. If you must answer the phone, please do so after discretely leaving the room. You may return to class once your call is finished.

Cheating and Plagiarism:

Cheating is unethical and not acceptable. Plagiarism is using information or original wording in a paper without giving credit to the source of that information or wording: it is also not acceptable. Do not submit work under your name that you did not do yourself. You may not submit work for this class that you did for another class. If you are found to be cheating or plagiarizing, you will be subject to disciplinary action, per UTEP catalog policy.

Center for Accommodations and Support Services (CASS):

If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass.

**Course Learning Outcomes:**
Students completing EE 2350 will be able to:

- Understand the terminology used in conjunction with electric circuits and the terminal characteristics of ideal circuit elements. (I)
- Mathematically model electric systems using ideal resistive, inductive, and capacitive elements. (I)
- Apply phasors and impedance transformations to the analysis of electric circuits fed by a sinusoidal input in steady state. (C)
- Apply various systematic methods (node, mesh, terminal equivalency, and circuit theorems) to electric circuit analysis in steady state. (C)
- Apply various circuit analysis techniques to study circuits that include ideal transformer and operational amplifiers. (C)
- Apply various circuit analysis techniques to study energy and power in dc and ac circuits. (C)
- Apply software tools to the analysis of electric circuits in steady state. (C)

**Topics:**

- Review: Circuit variables and units. Kirchhoff's laws. Ohm's law. Power and energy. Passive convention.
- Circuit elements and circuit abstractions: Passive and active circuits.
- Analysis of resistive circuits using systematic methods: Circuits equivalences; Thevenin and Norton equivalents and source transformation; Superposition theorem. Node and mesh analysis; Power and energy in resistive circuits; Maximum power transfer theorem
- The ideal operational amplifier and its inverting and non-inverting configurations: Concept of amplification and active circuits. Introduction to two-port networks.
- Inductance (L), capacitance (C), mutual-inductance (M), and the ideal transformer
- Analysis of linear circuits in sinusoidal steady state (AC Circuits): phasor concept, impedance concept, circuit representation in the phasor domain,
- AC Circuit analysis using systematic methods: Thevenin and Norton equivalents and source transformation; Superposition theorem. Node and mesh analysis;
- Power in AC Circuits: instantaneous (p), average (P), reactive (Q), and complex (S); Power factor (pf); Power triangle; Maximum power transfer theorem for AC circuits.
- Three-phase circuits: three phase generation, analysis of 3-phase balanced circuits, Delta-wye transformations. Power in three-phase circuits.

**Computer Usage:** Use of MATLAB, PSpice or MultiSim in homework to complement class discussions.

**Revised by Dr. Hector Erives in August 2019.**