Electric Circuits 1
EE 2350 - 002
Syllabus – Spring 2016

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1 General Information

- **Course ID:** Electric Circuits 1, EE 2350-002, CRN-24670
- **Time:** Monday and Wednesday, 1:30 pm – 2:50 pm
- **Required Textbook and Online System:** [1, Textbook] and [4, System]
- **Lecture Room:** College of Business and Administration 332
- **Prerequisites:** EE 1305, MATH 1312, MATH 2326 and PHYS 2421, each with a grade of C or better and department approval. MATH 2326 and PHYS 2421 may be taken concurrently with EE 2350.
- **Instructor:** von Borries – rvonborries@utep.edu
- **Office:** Engineering Building 313
- **Office Hours:** Monday 3:00 to 4:30 pm and Wednesday 11:00 am to 12:30 pm
- **Version:** January 12, 2016

2 Catalog Description

Theory of electric circuits including circuit variables (voltage, current, power and energy) and elements (sources, resistors, capacitors and inductors), Ohm's law, Kirchhoff's laws, Thévenin and Norton equivalents, node-voltage and mesh-current methods, sinusoidal steady-state analysis and power calculations, and balanced three-phase circuits.

Prerequisites: EE 1305 Introduction to Electrical Engineering, PHYS 2421 Fields and Waves, MATH 1312 Calculus II, and MATH 2326 Differential Equations, each with a grade of C or better and department approval. MATH 2326 and PHYS 2421 may be taken concurrently with EE 2350.

3 Textbook and Online System

Electric Circuits 1 EE 2350 has two required resources: (1) the textbook Electric Circuits by Nilsson and Riedel, 10th edition [1, Textbook] (printed or electronic format); and (2) the MasteringEngineering for Electric Circuits, an online tutorial and homework system [4, System]. Mastering Engineering will be used by the students for the homework. Both the textbook and the online system are published by Pearson Education and they can be purchased as a bundle at a lower cost.

`Matlab` software will be used by the instructor to find numerical solutions to some problems and as a tool to explain concepts in electric circuits [2, Matlab]. Students are advised to use `Matlab` to work on the numerical solution to problems, instead of using a pocket calculator. In addition to solving numerical problems, during the lectures, the instructor will use `Matlab` with the Analog Discovery Kit by Digilent Inc. to run simple experiments and illustrate concepts in the theory of electric circuits [3, Discovery].

4 Student Outcomes

The focus in EE 2350 is the study of electric circuits in the steady-state. The course has seven student outcomes:

1. Students will use their now knowledge of resistive circuit parameters, the concepts of current, voltage, and power and dc sources to analyze simple circuits (Critical);

2. Students will learn techniques of circuit analysis such as parallel/series combinations, delta-wye transformations, mesh and loop analysis, and superposition (Critical);

3. Students will learn the voltage-current relationships for inductors and capacitors and will use them, together with the techniques of circuit analysis to study steady-state responses of circuits (Critical);

4. Students will learn the concept of phasor and will use it in solving the sinusoidal response of circuits (Critical);

5. Students will learn power calculations and analysis of electric circuits in the sinusoidal steady-state (Critical);

6. Students will learn concepts in frequency selective circuits, Fourier series and two-port circuits (Important); and

7. Students will become familiar with MATLAB for plotting, calculating, solving simple numerical linear algebra problems (Important).

As a student, you will devote much of your attention and time to the discussion of problems already solved: problems solved in the classroom and problems solved in the textbook [1, Textbook]. You will only begin to develop the skills to successfully attack unsolved problems that you will face as a practicing engineer by reading and discussing the solutions to

the problems presented in the classroom and in the textbook. You will need to discuss old and new problems with the instructor, teaching assistant and your colleagues, inside and outside the classroom, and during office hours. The homework and the quizzes will allow you and the instructor to assess your learning before the exams. By doing so, you will learn some general problem-solving procedures:

- Identify what's given and what's to be found;
- Sketch a circuit **diagram**;
- Think of several solution **methods** and choose one among them;
- Calculate a solution;
- **Test** your solution; and
- Use creativity.

These procedures are discussed in [1, Textbook].

5 Contents

- **Chapter 1** Circuit Variables
  International System of Units (SI); overview of circuit analysis; voltage and current; ideal basic circuit element; power and energy.
- **Chapter 2** Circuit Elements
  Voltage and current sources; electrical resistance (Ohm's law); construction of a circuit model; Kirchhoff's laws; analysis of a circuit containing dependent sources.
- **Chapter 3** Simple Resistive Circuits
  Resistors in series; resistors in parallel; voltage-divider and current divider circuits; voltage division and current division; measuring voltage and current; measuring resistance (Wheatstone bridge); delta-to-wye equivalent circuits.
- **Chapter 4** Techniques of Circuit Analysis
  Terms for describing circuits; node-voltage method; node-voltage method and dependent sources; node-voltage method special cases; mesh-current method; mesh-current method and dependent sources; mesh-current method special cases; node-voltage method versus the mesh-current method; source transformations; Thévenin and Norton equivalents; deriving a Thévenin equivalent; maximum power transfer; superposition.
- **Chapter 6** Inductance, Capacitance, and Mutual Inductance
  Inductor; capacitor; equivalent inductance; equivalent capacitance; mutual inductance.

- **Chapter 9** Sinusoidal Steady-State Analysis
  Sinusoidal source; sinusoidal response; phasor; passive circuit elements in the frequency domain; Kirchhoff's laws; series, parallel and delta-to-wye; Thévenin and Norton; node-voltage method; mesh-current method; transformer; ideal transformer; phasor diagrams.
- **Chapter 10** Sinusoidal Steady-State Power Calculations
  Instantaneous power; average and reactive power; root-mean-square (rms); complex power; power calculations; maximum power transfer.

Examples and problems in Chapters 14, 16 and 18 will be used to study the concepts learned in the sinusoidal steady-state analysis part, Chapters 9 and 10.

- **Chapter 14** Introduction to Frequency Selective Circuits
  Low-pass filters; high-pass filters; bandpass filters; bandreject filters.
- **Chapter 16** Fourier Series
  Overview; fourier coefficients; application; amplitude and phase spectral.
- **Chapter 18** Two-Port Circuits
  Terminal equations; two-port parameters; terminated two-port circuit; interconnected two-port circuits.

6 Evaluation

Activity	%
Homework	10
Quizzes	5
Participation	5
Exam I	20
Exam II	20
Exam III	20
Comprehensive Final	20

Exams I, II, III and the Comprehensive Final will be taken in the classroom.

7 Grading

$A = 100 - 90\%$, $B = 90 - 80\%$, $C = 80 - 70\%$, $D = 70 - 60\%$ and $F = 60 - 0\%$.

8 Attendance

Class attendance is mandatory and will be monitored. Any student who has more than two unexcused absences will be dropped out of the EE 2350. It is student's responsibility to sign the attendance sheet provided by the instructor for each class.

9 UTEP E-mail Account

Student's UTEP e-mail address is required for the instructor to communicate with the student and vice-versa. It is student's responsibility to have a UTEP e-mail account working properly. By the end of the first week of classes, every student should have received at least one e-mail message from the instructor. If an e-mail problem is detected (if no EE 2350 e-mail message is received by the end of the first week of classes), the student should request assistance from UTEP's help desk to fix the problem with the UTEP's e-mail account.

10 Accommodations and Support Services

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 at `cassutep.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`.

References

[1] J. W. Nilsson and S. A. Riedel. *Electric Circuits*. Always Learning. Pearson Education, Limited, Upper Saddle River, NJ, 2014.

[2] https://www.youtube.com/user/MATLAB?feature=watch. MathWorks. Matlab videos. Introductory and advanced Matlab tutorials.

[3] http://www.digilentinc.com. Digilent Inc. Analog Discovery USB Oscilloscope and Multi-Function Instrument.

[4] http://www.pearsonmylabandmastering.com/northamerica/masteringengineering. Pearson Education, Limited. MasteringEngineering for Electric Circuits.

11 Calendar

January 2016

M	T	W	R	F	S	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

February 2016

M	T	W	R	F	S	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29						

March 2016

M	T	W	R	F	S	S
	1	2	3	4	5	6
					12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

April 2016

M	T	W	R	F	S	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

May 2016

M	T	W	R	F	S	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

Exam I: February 22
Chapters 1, 2, 3 and 4
Exam II: March 30
Chapters 4, 6 and 9 (exercises in 14, 16 and 18)
Exam III: May 4
Chapters 9 and 10 (exercises in 14, 16 and 18)
Comprehensive Final: May 11
4:00 pm - 6:45 pm
All the material for Exams I, II and III
Spring Break:
March 7 to March 11