
Electric Circuits 2

EE 2351-002 – CRN 26284 – Spring 2018

Syllabus

R. von Borries
Department of Electrical & Computer Engineering
The University of Texas at El Paso, El Paso, Texas 79968, USA
rvonborries@utep.edu

1 General Information

- **Course ID:** Electric Circuits 2, EE 2351-002, CRN 26284
- **Time:** Monday and Wednesday, 1:30 pm – 2:50 pm
- **Textbook:** [1, Textbook] and [4, System]
- **Lecture Room:** Chemistry Computer Science Building G.0208
- **Prerequisites:** EE 2350, PHYS 2421 and MATH 2326, each with a grade of *C* or better. *These courses cannot be taken concurrently with EE 2351.*
- **Instructor:** von Borries – rvonborries@utep.edu
- **Office:** Engineering Building 313
- **Office Hours:** Monday and Wednesday, 3:00 pm – 4:30 pm
- **Teaching Assistant:** Felipe B. da Silva (fbdasilva@miners.utep.edu)
- **TA Office Hours:**
- **Version:** Wednesday, January 17, 2018

2 Catalog Description

Analysis of transient behavior in first-order and second order circuits. Circuit analysis using the Laplace transform. Network functions and frequency response representation of circuits. Frequency selective circuits. Resonance in electric circuits. Steady-state analysis of circuits fed by non-sinusoidal periodic signals using Fourier series. Two-port networks. Computer-aided analysis of circuits.

Prerequisites: EE 2350 Electric Circuits 1, PHYS 2421 Fields and Waves and MATH 2326 Differential Equations, each with a grade of *C* or better.

3 Textbook and Online System

Electric Circuits 1 EE 2351 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 2351 is the study of electric circuits in the steady-state. The course has seven student outcomes:

1. Apply circuit analysis techniques to analyze first and second order circuits in the time domain (Critical).
2. Understand the concepts of natural and forced response, zero-input, zero-initial conditions in the analysis of electric circuits (Important).
3. Apply Laplace transform techniques to represent circuits in the frequency domain, analyze using systematic methods (node, mesh, terminal equivalency, and circuit theorems), and derive input-output representations such as transfer functions (Critical).
4. Understand the concept of resonance and apply circuit analysis techniques to series and parallel RLC circuits (Important).
5. Understand and analyze frequency selective circuits: frequency response; low-pass filters; high-pass filters; bandpass filters; Bode plots.
6. Apply software tools to the analysis of electric circuits in the frequency and time domain (Critical).
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 7** First-Order RL and RC Circuits: natural response; forced response; sequential switching.
- **Chapter 8** Second-Order RLC Circuits: natural response; forced response.
- **Chapter 12** Laplace transform.
- **Chapter 13** Laplace Transform: circuit elements in the s -domain; circuit analysis in the s -domain; transfer function; partial fraction expansion; convolution integral; transfer function and steady-state sinusoidal response; impulse function.
- **Chapter 14** Frequency Selective Circuits: frequency response: low-pass filters; high-pass filters; bandpass filters.
- **Chapter 15** Bode Plots.
- **Chapter 18** Two-Port Circuits: terminal equations; two-port parameters; analysis of terminated two-port circuit; interconnected two-port circuits.

6 Evaluation

Exams 1, 2, 3 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 $F = 60 - 0\%$.

| Activity | % |
|---------------------|----|
| Homework | 12 |
| Participation | 8 |
| Exam 1 | 20 |
| Exam 2 | 20 |
| Exam 3 | 20 |
| Comprehensive Final | 20 |

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 2351. 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 2351 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. Riedel. *Electric Circuits*. Pearson, Upper Saddle River, NJ, Tenth edition, 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 | | | | | | |
|---------|----|----|----|----|----|----|
| 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 | | | | |

2018

| March | | | | | | |
|-------|----|----|----|----|----|----|
| 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 | |

2018

| May | | | | | | |
|-----|----|----|----|----|----|----|
| 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 | | | |

2018

| February | | | | | | |
|----------|----|----|----|----|----|----|
| 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 | | | | |

2018

| April | | | | | | |
|-------|----|----|----|----|----|----|
| 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 | | | | | | |

2018

Exam I: February 21

Chapters 7, 8 and 13

Exam II: April 4

Chapters 13 and 14

Exam III: May 2

Chapters 15, 16 and 18

Comprehensive Final: Wednesday, May 9

4:00 pm to 6:45 pm

All the material for Exams I, II and III

Martin Luther King, Jr. Day:

January 15

Spring Break:

March 12 to 16

Course Drop Deadline:

March 29