Electric Circuits II
EE 2351-001 – CRN-29298 – Spring 2020

Syllabus
Tuesday, January 21, 2020

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1 General Information

- **Course ID:** Electric Circuits II, EE 2351-001, CRN-29298
- **Time:** Monday and Wednesday, 3:00 pm – 4:20 pm
- **Lecture Room:** Liberal Arts Building 204
- **Prerequisites:** MATH 2313 or MATH 2326 and MATH 3323 each with a grade “C” or better
- **Textbook:** [NR18, Textbook], [Pea, System], [uMa, Matlab MathWorks] and [uMb, Matlab Youtube]
- **Instructor:** von Borries – rvonborries@utep.edu
- **Office:** Engineering Building 313
- **Office Hours:** Monday 4:30 to 6:00 pm, Tuesday 3:00 to 4:30 pm, or by appointment
- **Teaching Assistant:** Felipe B. da Silva – fbdasilva@miners.utep.edu
- **TA Office Hours:** Friday 4:00 pm to 5:00 pm

2 Catalog Description


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 by J. W. Nilsson and S. Riedel. Electric Circuits. Pearson, Upper Saddle River, N.J, Eleventh edition, 2018 (in printed or in electronic format); and (2) the MasteringEngineering for Electric Circuits, an online tutorial and homework system [Pea, System]. You will use Mastering Engineering for the homework. Both the textbook and the online system are published by Pearson Education and can be purchased as a bundle at a lower cost.

I will use Matlab software to find numerical solutions to some problems and as a tool to explain concepts in electric circuits [uMb, Matlab]. You also should use Matlab to work on the numerical solution to problems, instead of using a pocket calculator. If you don’t have Matlab installed in your computer, you can get Matlab from the Engineering Technology Center (ETC) at the Engineering building E351D, College of Engineering, located between the Engineering and Classroom buildings on the 3rd floor. http://etc.utep.edu. e-mail: etchelpdesk@utep.edu. Alternatively, you can have access to Matlab at https://my.apps.utep.edu/vpn/index.html.

The numerical computation and graphic visualization in Matlab software can enhance both teaching and learning of new ideas and concepts in EE 2351. In addition to solving numerical problems, during the lectures, I will use Matlab with the Analog Discovery Kit by Digilent Inc. to run simple experiments and illustrate concepts in the theory of electric circuits [uDI, 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.
2. Understand the concepts or natural and forced response, zero-input, zero-initial conditions in the analysis of electric circuits.
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.
4. Understand the concept of resonance and apply circuit analysis techniques to series and parallel RLC circuits.
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.
7. Students will become familiar with MATLAB for plotting, calculating, solving simple numerical linear algebra problems.
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 [NR18, 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 me and your colleagues, inside and outside the classroom, and during office hours. The homework will allow you and me to assess the amount of material you learned before the exams. By carefully working on the homework problems, 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 [NR18, Textbook].

5 Course Topics

5.1 Part I


Chapter 7 – Response of First-Order RL and RC Circuits

- 7.1 Natural response of RL circuit
- 7.2 Natural response of RC circuit
- 7.3 Step response of RL and RC circuits
- 7.4 A general solution for step and natural responses
- 7.5 Sequential switching
- 7.6 Unbounded response
- 7.7 The integrating amplifier
Chapter 8 – Response of Second-Order RLC Circuits

8.1 Natural response of parallel RLC circuit
8.2 Forms of the natural response of parallel RLC circuit
8.3 Step response of parallel RLC circuit
8.4 Natural and step response of series RLC circuit
8.5 Circuit with two integrating amplifiers

5.2 Part II


Chapter 12 – Introduction to the Laplace Transform

12.1 Definition of the Laplace transform
12.2 The unit-step function
12.3 The unit-impulse function
12.4 Laplace transform of common functions
12.5 Properties of the Laplace transform
12.6 Laplace transform to solve ordinary integro-differential equations
12.7 Inverse Laplace transform
12.8 Poles and zeros of a rational function
12.9 Initial- and final-value theorems

Chapter 13 – The Laplace Transform in Circuit Analysis

13.1 Circuit elements in the s-domain
13.2 Circuit analysis in the s-domain
13.3 Laplace transform to solve several circuits
13.4 Transfer function
13.5 Transfer function and partial fraction expansions
13.6 Transfer function and convolution
13.7 Transfer function and steady-state sinusoidal response
13.8 The unit-impulse function in circuit analysis
5.3 Part III


Chapter 14 – Frequency Selective Circuits

14.1 Introduction
14.2 Low-pass filters
14.3 High-pass filters
14.4 Bandpass filters
14.5 Bandreject filters

Chapter 16 – Fourier Series

16.1 Overview
16.2 Fourier series in trigonometric form
16.8 Fourier series in complex exponential form
16.3 Fourier series and symmetry
16.5 Application to circuit analysis

Appendix E – Bode Diagrams

E.1 Real, first-order poles and zeros
E.2 Straight-line amplitude plots
E.3 More accurate amplitude plots
E.4 Straight-line phase angle plots
6 Evaluation

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

Formulas are part of the material assessed in EE 2351 and formula sheets are not allowed during EE 2351 exams and quizzes. Two important rules for the exams and quizzes are: (1) closed textbook, notes and homework solutions; and (2) turned off electronic devices: calculator, computer, cell phone, smart watch, headphone, etc.

7 Grading

\[ A = 100 - 90\%, \quad B = 90 - 80\%, \quad C = 80 - 70\%, \quad D = 70 - 60\% \quad \text{and} \quad F = 60 - 0\% . \]

8 Missed Exams

If you miss Exam I or Exam II without an acceptable excuse you will receive zero points for the missed exam. You may be excused from a scheduled exam time due to serious illness, funeral attendance, courtroom appearance, or a UTEP athletic participation. In the case of a missed exam, you must communicate and submit the appropriate documentation to me no later than ten days after the date of the missed exam. The make-up exam for either Exam I or Exam II is comprehensive (all the material for Parts I, II, and III) on the Friday of the finals’ week (May 15, 4:00 pm to 5:20 pm). Note that there is no make-up exam for the Comprehensive Final or for more than one missed exam.

9 Grade Assignment for Drops and Withdrawals

If you drop the course before the drop deadline, the grade is “W.” However, please note the following regulation stated in the UTEP academic catalog (http://catalog.utep.edu/grad/academic-regulations/registration-and-records/): “... if the student drops after the student-initiated course drop deadline, instructors will determine a grade of “W” or “F” for each course. A grade of W will be considered only under exceptional circumstances and must be approved by the instructor and department chair for the course. A student may need to petition the instructor for a grade of “W” in writing with the necessary supporting documentation.”
10 Office Hours

In addition to attending the lectures, plan to use office hours to get most out of EE 2351. Feel encouraged to attend office hours and work with me on the textbook concepts and problems, Matlab simulations, and preparing for the exams and quizzes. I can help you to learn “Electric Circuits.” You can use office hours to get more information on anything you are struggling with in class. During office hours, I can provide you with an opportunity (1) to carefully walk through an idea and (2) to get answered lots of questions that are specific to your needs, helping you to effectively learn the material. You can also use office hours to get more information on anything covered in class that triggered your interest, that you enjoyed. You should work on all the homework problems from the textbook and from past exams as part of your study for EE 2351. I can work with you on the these problems using my office’s chalkboard and laptop computer (Matlab computations). In addition to regular office hours, you can contact me by email 24/7 with questions on the EE 2351 material and I will try to reply and help you as soon as possible.

11 UTEP E-mail Account

To communicate with me, make sure your UTEP e-mail account is working fine. It is your 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 EE 2351. If you detect an e-mail problem (no EE 2351 e-mail message received by the end of the first week of classes), you should request UTEP’s Help Desk assistance to fix the problem with your UTEP’s e-mail account.

12 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, visit the CASS website at www.sa.utep.edu/cass.

13 Attendance

Class attendance is mandatory and will be monitored. Any student with 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.
14 Academic Integrity

Please review the policy on academic integrity available at https://www.utep.edu/student-affairs/osccr/student-conduct/academic-integrity.html.

15 Use of Electronic Devices

The use of cell phones or electronic devices may pose a negative distraction (social media, internet, email) and disrupt classroom discussions. Phones must be silenced during classes, exams, or quizzes, and if you need to answer a call during a class, please step out of the classroom. You can use an electronic notepad for note taking only [MO14].

References


16 Calendar

EE 2351, MW 3:00 pm to 4:20 pm

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Exam I: February 24, Thursday
Chapters 7 and 8

Exam II: April 6, Thursday
Chapters 12 and 13

Comprehensive Final: May 11, Thursday
1:00 pm to 3:45 pm
Chapters 14, 16, E, 7, 8, 12 and 13

Spring Break
March 16 to 20

Spring Drop/Withdrawal Deadline
March 27