ECE 301 Foundations of Electric Circuits II

Electrical and Computer Engineering
Drexel University
Fall 2021-2022

Lecture Time/Location:

MW 10 am- 10:50 am, Face to Face, Disque Hall 108

Recitation Time/Location:

001/12262 R 11 am- 11:50 am, Face to Face, Papadakis Integrated Sci Bldg 104

002/12263 F 1 pm- 1:50pm, Face to Face, Korman Center 111

Lecture & Recitation Instructor

Dr. Hua Zhang, Electrical and Computer Engineering
Office: Bossone 413D
Office Hours: Thursday 10:00- 11:00
E-mail: hz429@drexel.edu
Phone: 215-895-1983

Teaching Assistants

Reza Kheirollahi, Electrical and Computer Engineering
Office:
Office Hours:
Lab Sections: 063/12801 W 11am- 11:50pm, Bossone Research Entr. Center 215, 060/12264 W 1pm- 2:50pm, Bossone Research Entr. Center 215
E-mail: rk887@drexel.edu

Shuyan Zhao, Electrical and Computer Engineering
Office:
Office Hours:
Lab Sections: 062/12800 W 3pm- 4:50pm, Bossone Research Entr. Center 215, 061/12265 W 5pm- 6:50pm, Bossone Research Entr. Center 214
E-mail: sz568@drexel.edu

Taha ValizadehAslani, Electrical and Computer Engineering
Office:
Office Hours:
Lab Sections: 064/16392 F 5pm- 6:50pm, Bossone Research Entr. Center 214
E-mail: tv349@drexel.edu

Credits

4 credits, including lecture, recitation, and laboratory

Prerequisites by Course

ECE 201 Fundamentals of Electric Circuits I, ENGR 232 Dynamic Engineering Systems

Prerequisites by Topic

- Resistive circuit behavior
- Circuit analysis techniques (node, mesh, etc.)
- First-order circuits (RC and RL)
- Solving AC circuits in the phasor domain
- Schematic capture, circuit simulation (bias point, dc, ac, transient)
- Circuit assembly and measurement techniques

Prerequisite Technical Skills

- Ability to use National Instruments Multisim software for schematic capture and circuit simulation
- Ability to use the National Instruments myDAQ as a signal source and measurement instrument
- General use of the Blackboard Learn learning management system
- Ability to upload to and download material from Bb Learn
- Downloading and installing software on personal computers

Courses Using This as Prerequisite

Prereq option (with ECE 201) for ECE 303 ECE Laboratory

Catalog Course Description

Covers analysis of operational amplifiers, second-order electric circuits; ac power; and an introduction to the Laplace transform.

Overview

ECE 301 follows on the theoretical and practical developments in ECE 201, and further expands your exposure to electric circuits. Most of our time is spent on developing your skills in circuit analysis. In the lecture portion of the course you will learn the physical laws that explain the behavior of operational amplifiers, RLC and AC circuits and AC power systems. The skills learned in our classroom and lab carry over into circuit designs you will be called on to do later in your studies.

The course has a lecture/recitation format where we will do some interactive problem solving in lecture and give you additional opportunities to ask questions and do examples in recitation. Lecture slides are available through Bb Learn before class, and annotated lecture notes will be published so you have a full record of what was seen in class. The course assessment plan gives you multiple opportunities to demonstrate your understanding, and uses homework, labs, zyBook performance and challenge activities, and exams. Homework problems can be solved in teams (but turned in individually), while labs, performance and challenge activities, and exams are done on your own.

The experience you gain in circuit analysis and design, circuit simulation, and circuit construction and characterization in ECE 301 develops the theoretical and practical base you will need in upper-level courses such as ECEE 352 Analog Electronics, ECEP 352 Electric Motor Control Principles, and ECES 356 Theory of Control.

Required Textbook/Software/Hardware Options

The required textbook will be the NI Circuits 3rd ed. zyBook. To access your zyBook, follow these instructions:

1. Sign in or create an account at learn.zybooks.com
2. Enter zyBook code DREXELECE301AcademicYear2021
3. Subscribe

A subscription is **$58**.

The material in the text is exactly the same as in the book you used for ECE 201 Circuits I (assuming you took it at Drexel, of course). The difference in this text will be the built-in interactivity. Participation and Challenge Activities in the zyBook will be assigned and graded, so you must have this book.

The other required bit of course hardware is a breadboard. An appropriate breadboard is an 800 or more tie point board with twin power rails on each side of the board. The Studica 9880WK (http://www.studica.com/us/en/National-Instruments-Mini-Systems-Accessories/breadboard-and-jumper-wire-kit.html) is a good combination of breadboard and bent-wire interconnect kit. You can find similar breadboards through Amazon or Digi-Key and many other places.

You are not required to have your own myDAQ, though this is highly recommended. This is especially true for the EE students. Being able to complete or repeat your lab work outside the building is really handy. The device has applications in many other ECE courses. If you don't have your own myDAQ you will have to check one out before lab and check it back in IMMEDIATELY after lab. Heavily discounted myDAQs are available through Studica, and you can find used ones on Ebay.

Computer Requirements

You must have access to a Windows operating system on a desktop or laptop for which you have administrator rights to install software. A PC is easiest to work with, but a Mac with Windows running in Parallels Desktop or in a Boot Camp partition will work also.

National Instruments Multisim circuit simulation software will only run on a Windows operating system. Mac users can use virtualization software, such as Parallels Desktop, to run Multisim. Multisim is available on our laboratory computers as well as in the Bossone 2nd floor labs. Since we have a COE license we can provide a way to download and run Multisim on your own computer.

National Instruments myDAQ software is available for Windows operating systems. The myDAQ software tools are available on all ECE lab computers.

Technology Support

Centralized support for Drexel Learn is provided by the Instructional Technology Group (ITG). Contact information for the ITG is:

- Phone: 215-895-1224 (available 24/7, press option 2 to speak with a person off-hours)
- Email: itg@drexel.edu (submits a ticket)
- Location: Korman Center, Room 109 (available Monday through Friday, 7:30am - 6:00pm)
- Instructional Technology Blog: http://drexel.edu/irt/news/publications/itgblog/ (Articles and news about Drexel Learn and other supported technologies)

Blackboard Collaborate with the Ultra Experience User Interface Tour (YouTube)
Blackboard Collaborate Ultra Participant's Guide

Supporting Web Sites

- Blackboard Learn (for registered students)
- NTS Press textbook site - ntspress.com/publications/circuits-third-edition
- Michigan Publishing textbook site - http://cad.eecs.umich.edu/
- *Netiquette* online version of book by Virginia Shea published by Albion Books

Course Learning Outcomes

At the completion of this course, students will be able to:

1. Use the characteristics of ideal Op-Amps to derive the performance of inverting and non-inverting amplifiers
2. Analyze the behavior of voltages and currents in RLC circuits under steady-state and switched conditions
3. Use the solution of the 2nd-order differential equation of the series RLC circuit, and initial conditions, to solve for the transient behavior of the circuit (over, under, critically damped)
4. Demonstrate the ability to manipulate ac power in the phasor domain (complex power, avg real power, reactive power, power factor)
5. Compute the Laplace transform of a time-dependent function
6. Analyze circuits using the Laplace transform technique
7. Demonstrate an ability to use circuit simulation, construction, and measurement to verify predictions from circuit theory

Mapping of Student Learning Outcomes

Course	ABET 1-7[1]	DSLP[2]
Use the characteristics of ideal Op-Amps to derive the performance of inverting and non-inverting amplifiers	1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics 2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental and economic factors	Creative and Critical Thinking
Analyze the behavior of voltages and currents in RLC circuits under steady-state and switched conditions	1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Creative and Critical Thinking
Use the solution of the 2nd-order differential equation of the series RLC circuit, and initial conditions, to solve for the transient behavior of the circuit (over, under, critically damped)	1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Creative and Critical Thinking
Demonstrate the ability to manipulate ac power in the phasor domain (complex power, avg real power, reactive power, power factor)	1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Creative and Critical Thinking
Compute the Laplace transform of a time-dependent function	1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Creative and Critical Thinking
Analyze circuits using the Laplace transform technique	1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Creative and Critical Thinking

Mapping of Student Learning Outcomes

Course	ABET 1-7[1]	DSLP[2]
Demonstrate an ability to use circuit simulation, construction, and measurement to verify predictions from circuit theory	6. Ability to develop and conduct experiments, analyze and interpret data, use engineering judgement to draw conclusions	Creative and Critical Thinking Technology Use

[1] ABET EAC Student Learning Outcomes, http://www.abet.org/wp-content/uploads/2018/02/E001-18-19-EAC-Criteria-11-29-17.pdf, p.39
[2] Drexel Student Learning Priorities, http://drexel.edu/provost/assessment/outcomes/dslp/

Course Format

This course is offered in face-to-face mode with learning management system (LMS) support. There are two hours of lecture, one hour of recitation, and two hours of laboratory each week. Blackboard Learn will be used for distribution of course material, submission of assignments, and posting of grades.

Grading Basis

Assignment	Points
Homework	15
Zybook Activities	15
Labs	15
Quiz	5
Midterm	20
Final	30
Total	100

Letter Grade	Grade Points	Letter Grade	Grade Points
A+	≥ 95 to < 100	C+	≥73.3 to < 76.7
A	≥ 90 to < 95	C	≥ 70 to < 73.3
A-	≥ 86.7 to < 90	C-	≥ 66.7 to < 70
B+	≥ 83.3 to < 86.7	D+	≥ 63.3 to < 66.7
B	≥ 80 to < 83.3	D	≥ 60 to < 63.3
B-	≥ 76.7 to < 80	F	0 to < 60

Course Policies

- Challenge Activities and Homework - Challenge Activities are problems that are done through the zyBooks textbook and are automatically graded. They are individual efforts. Collaboration on Homework problems assigned is permitted and encouraged, but each student must turn in their own work through BBL. The submission must include your name and recitation section, and clear enough to read and grade. **Homework would be assigned on BBL each Wednesday and is due one week after being assigned, typically on Wednesday 11:59pm. You may still upload your homework solutions within 48 hours after due time with 50% penalty. After that no homework will be accepted, no exception!**
- Laboratories - Discussion with your neighbors and course staff in the lab is encouraged, but each student must solve, simulate, assemble, and measure their own circuits. All reporting of results is based on your individual work. Due dates and submission methods vary between lab assignments. Late submissions lose 50% of their value immediately.
- **Quiz - Quiz would be held within the first 5 minutes of each lecture, no exception.**
- End of Term - No late coursework will be accepted after 9 AM on the first day of Finals Week.
- **All Challenge Activities Participation Activities, including ones not in homework for the sections covered, must be due at the Homework due date.**

Response Times

The schedule for providing grades and feedback on course components is as follows:

- Homework - Solutions will be posted two days after the due date. Graded homework will be returned in two weeks.
- Laboratories - Graded labs will be returned in one week.
- Midterm Exam - Typically the midterm is graded within four days.
- Final Exam - Final exam grades should be posted in four days. While you can see your graded final, it will not be returned.
- Emails - Course staff will respond to emails within 48 hours and often sooner. Staff is not responsible for responses on Saturdays.

If you have questions regarding your grades or the feedback you received you are encouraged to contact the instructor within 5 business days of the items being graded. After this period scores are locked.

Time Zone

All course times are given for the US eastern time zone, whether that be daylight savings or standard time.

Course Change Policy

Assignments and deadlines are subject to change. Should this syllabus need to be changed for any reason, the details of the change will be clearly posted on the Blackboard Learn course site, and will be circulated to each student through a Bb Learn announcement.

Online Netiquette

Interpersonal interactions online have their own set of guidelines, called a “netiquette," that are based on mutual respect. Virginia Shea presents an overview of these guidelines in her Netiquette book. All online communications should follow these netiquette suggestions.

Students Needing Accommodations

Students requesting accommodations due to a disability at Drexel University need to request a current Accommodations Verification Letter (AVL) in the ClockWork database before accommodations can be made. These requests are received by Disability Resources (DR), who then issues the AVL to the appropriate contacts. For additional information, visit the DR website, or contact DR for more information by phone at 215.895.1401, or by email at disability@drexel.edu.

Software Accessibility Statements

Blackboard Learn: http://www.blackboard.com/accessibility.html
Blackboard Collaborate Ultra: https://en-us.help.blackboard.com/Collaborate/Ultra/Administrator/Accessibility
NI Multisim: http://www.ni.com/pdf/en/multisim-508-accessibility-requirements-compliance-matrix.pdf

Software Privacy Statements

Blackboard privacy information can be found at http://www.blackboard.com/footer/privacy-center.html

Academic Support

The Academic Center for Engineers (ACE) supports this class. Check the ACE site for details. TAs will be holding office hours in ACE (Main 005).

Missed Classes

Absence from class will be based on the University's absence policy. Please review the policy here.

Academic Integrity, Plagiarism and Cheating Policy

Please review the University policy regarding academic integrity.

Course Drop Policy

The University policy is posted here.

Course Withdrawal Policy

The University policy is posted here.

Weather, Emergencies and University Closing

University closing or delayed opening information will be posted on www.drexel.edu. In the event of the need to close or delay the daily opening of a campus, the University will provide notice via Web, telephone, and the DrexelALERT system. Closing or delayed opening information will be announced at 215-895-MELT (6358).

The University determines whether to close or delay opening due to inclement weather, not the instructor. Therefore, please do not contact the instructor for this information.

Posting of Course Materials

The instructor will post various materials to the online course space including documents, videos, links, and other related items. These materials are for use by students enrolled in this section of the course only and are not to be distributed by any student in the class to anyone or posted anywhere online. Websites such as CourseHero.com, etc., exist, but the instructor will consider posting materials to that or any other website (or distributing them by any other means) as an academic integrity violation. This is in the best interest of other students since the materials distributed elsewhere may not be the most up-to-date and could negatively impact a student's future grade if assignments or materials had changed since the unapproved distribution.

Tentative Course Schedule

Week	Subject	Reading/Multimedia	Homework	Laboratory
1	Op-Amp characteristics, feedback, ideal Op-Amp, inverting amp	NI Circuits zyBook, Sections 1.1 - 1.6	See Module 1 page on Bb Learn	Ideal Op-Amps
ATTENTION: The Drop/Add deadline will be the end of Week 1. This will be Friday for advisor-mediated changes, and Sunday for student-mediated online changes.				
2	Op-Amp circuits: buffer, non-inverting, instrumentation amp, etc.	NI Circuits zyBook, Sections 1.7 - 1.11, 1.16	See Module 1 page on Bb Learn	Non-Inverting Amplifier
3	Behavior of 2nd order circuits, series RLC circuits	NI Circuits zyBook, Sections 2.1 - 2.5	See Module 2 page on Bb Learn	Axillary Temperature Sensor Design
4	Behavior of 2nd order circuits, series and parallel RLC circuits (Columbus Day - no class Mon)	NI Circuits zyBook, Sections 2.6 - 2.10, 2.12	See Module 2 page on Bb Learn	Axillary Temperature Sensor Design
5	AC Power, rms and avg power, complex power	NI Circuits zyBook, Sections 3.1 - 3.5	See Module 3 page on Bb Learn	RFID Card Transient Response Analysis
6	Midterm exam(Monday) AC Power, power factor and maximum power transfer	NI Circuits zyBook, Sections 3.6, 3.8	See Module 3 page on Bb Learn	Single phase power exercise (Power Lab)
7	Transfer function, Bode plots, passive filters	NI Circuits zyBook, Sections 4.1 - 4.5	See Module 4 page on Bb Learn	Three phase power exercise (Power Lab)
The course withdrawal deadline is the end of Week 7. If you are thinking of withdrawing, please speak to one of your instructors.				
8	Active filters	NI Circuits zyBook, Sections 4.8 - 4.9, 4.12	See Module 4 page on Bb Learn	Analog decoding of touch-tone phone (DTMF) key signals
9	Intro to Laplace Transform, Circuit analysis, partial fraction expansion	NI Circuits zyBook, Sections 5.1 - 5.6	See Module 5 page on Bb Learn	Analog decoding of touch-tone phone (DTMF) key signals
10	Partial fraction expansion, s-Domain circuit analysis (Thanksgiving - no course activities Wed-Fri)	NI Circuits zyBook, Sections 5.8 - 5.10	See Module 5 page on Bb Learn	No Lab
11	S-Domain circuit analysis, Review	NI Circuits zyBook, Sections 5.8 - 5.10	See Module 5 page on Bb Learn	Step response exercise