ECE 201 Foundations of Electric Circuits

Electrical and Computer Engineering
Drexel University
Winter 2020-2021

Instructors

Lectures/Recitations:
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Teaching Assistants

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Lectures: Mon. & Wed. 10:00 to 10:50 am (via Zoom)

Recitations: Thur. 9:00 to 9:50 am, 10:00 to 10:50 am, 11:00 to 11:50 am (via Zoom)

Laboratories: Fri. 9:00 to 10:50 am, 11:00 am to 12:50 pm, 3:00 to 4:50 pm (via Zoom)

Credits

4 credits, including lecture, recitation, and laboratory

Prerequisites by Course
PHYS 102 Fundamentals of Physics II

Prerequisites by Topic
- Electrostatics, capacitors, charges in motion, insulators, semiconductors, conductors, voltage and current measurements, magnetism, electromagnetic induction, magnetic materials
- Facility with calculations and graphing in a spreadsheet or MATLAB
- Facility with algebra, trigonometry, dimensional analysis (units)

Courses using this as Prerequisite
This course is a prerequisite to a variety of courses in Electrical and Computer Engineering and Biomedical Engineering, Science and Health Systems. Some of the initial courses include ECEL 301 Electrical Engineering Laboratory, ECES 301 Transform Methods and Filtering, and BMES 303 Laboratory III: Biomedical Electronics.

Prerequisite Technical Skills
- 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

Catalog Course Description
Covers basic electric circuit concepts and laws; circuit theorems; mesh and node methods; analysis of first and second order electric circuits; forced and natural response; sinusoidal steady state analysis; complex frequency.

Overview
ECE 201 is a “foundations” course that introduces ECE and Biomed students 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 direct current (DC) and alternating current (AC) voltages and currents, a background in the components used in passive electric circuits, and a variety of circuit analysis techniques. A typical analysis task would be to determine the voltage at a circuit node, the current in a circuit branch, or the power dissipated in a specific component. The skills learned here carry over into circuit designs you will be called on to do later in your studies. The majority of our time will be spent on analog circuits.

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. The course assessment plan gives you multiple opportunities to demonstrate your understanding, and uses Homework, Labs, Participation Activities, Challenge Activities (quizzes) and Exams. Homework problems can be solved in teams (but turned in individually), while Labs, Participation Activities, Challenge Activities (quizzes) and Exams are done on your own.

The experience you gain in circuit analysis and design in ECE 201 provides the theoretical and practical base you will need in upper-level courses such as ECEE 302 Electronic Devices, ECEP 352 Electric Motor Control Principles, and BMES 302 Laboratory II: Biomeasurements.

Required Textbook

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: **DREXELECE201HrebienWinter2021**.
3. Subscribe

IF YOU ARE RETAKING THIS COURSE AND HAD SUBSCRIBED TO THIS TEXTBOOK LAST TERM

1. Log on to support@zybooks.com
2. Click on the "Student FAQ" box
3. Click on "If I am retaking a class, can I get a discount?" and follow the instructions to reactivate your subscription.

A subscription is **$58**. Students may begin subscribing a week or so before classes start. Subscriptions will last two weeks after the course ends.

The material in the text is exactly the same as in the book previously used for ECE 201 Circuits I. 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.

Supplement

Louis Scharf, A First Course in Electrical and Computer Engineering. OpenStax CNX. Sep 17, 2009 http://cnx.org/contents/7e991679-d461-4928-a810-bc3e7c0f21fa@2.3.

This is a free open educational resource distributed under a Creative Commons Attribution License (by 3.0). Access online, in PDF format, or in EPUB format for viewing on mobile devices.

You may use this supplement as a math reference for the second half of the course if you need a refresher. It includes information on complex numbers, functions of the form $e^{j\theta}$, and phasors.

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commons license and may not be reproduced without the prior and express written consent of Rice University. For questions regarding this license, please contact partners@openstaxcollege.org.

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)
- 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
- Author's support site - c3.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. Correctly employ circuit theory (charge, current, voltage, power, energy) and the circuit laws of Ohm and Kirchhoff in analyzing the performance of DC circuits
2. Identify the operating point of circuit networks using node and mesh analysis
3. Implement solutions of circuit networks by superposition, Thévenin's theorem and Norton's theorem
4. Perform calculations that show the relationship between current, voltage, power, and energy for energy storage elements C and L
5. Calculate the solution to first-order circuits (RC and RL)
6. Demonstrate solutions of AC circuits in time-domain and phasor-domain
7. Demonstrate an ability to use circuit simulation, construction, and measurement to verify predictions from circuit theory

Mapping of Student Learning Outcomes

Course	ABET A-K[1]	DSLP[2]
Correctly employ circuit theory (charge, current, voltage, power, energy) and the circuit laws of Ohm and Kirchhoff in analyzing the performance of DC circuits	A. Ability to apply math, science, and engineering	Creative and Critical Thinking
Identify the operating point of circuit networks using node and mesh analysis	A. Ability to apply math, science, and engineering	Creative and Critical Thinking
Implement solutions of circuit networks by superposition, Thévenin's theorem and Norton's theorem	A. Ability to apply math, science, and engineering	Creative and Critical Thinking
Perform calculations that show the relationship between current, voltage, power, and energy for energy storage elements C and L	A. Ability to apply math, science, and engineering	Creative and Critical Thinking
Calculate the solution to first-order circuits (RC and RL)	A. Ability to apply math, science, and engineering	Creative and Critical Thinking
Demonstrate solutions of AC circuits in time-domain and phasor-domain	A. Ability to apply math, science, and engineering	Creative and Critical Thinking
Demonstrate an ability to use circuit simulation, construction, and measurement to verify predictions from circuit theory	B. Ability to design and conduct experiments, as well as to analyze and interpret data E. Ability to identify, formulate, and solve problems K. Ability to use techniques, skills, and modern engineering tools	Creative and Critical Thinking Technology Use

[1] ABET EAC Student Outcomes, http://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2016-2017/#objectives
[2] Drexel Student Learning Priorities, http://drexel.edu/provost/assessment/outcomes/dslp/

Course Format

This course is offered in on-line face-to-face mode with learning management system (LMS) support. There are two hours of lecture, one hour of recitation and a virtual lab each week. Blackboard Learn will be used for posting of course material including homework assignments and solutions, virtual labs, midterm exam and solutions, final exam and running grades for all assignments and tests.

Grading Basis

Your course grade will be determined from a variety of learning assessments including weekly Homework, Participation and Challenge Activities, Design Exercises, a Midterm and a Final Exam.

Assignment	Points
Homework **	10
Participation Activities	5
Challenge Activities	15
Laboratories	20
Midterm	20
Final	30
Total	100

Letter Grade	Grade Points	Letter Grade	Grade Points
A+	95 to 100	C+	73 to 76
A	90 to 94	C	70 to 72
A-	87 to 89	C-	67 to 69
B+	83 to 86	D+	63 to 66
B	80 to 82	D	60 to 62
B-	77 to 79	F	0 to 59

****One Lowest score Homework will be eliminated from the average calculation**

Course Policies

- Homework - Collaboration on homework is permitted and encouraged, but each student must turn in their own handwritten work. The homework assignments will be from your zyBook and will be posted on bbLearn Sundays at 11:59 pm. **You must print your name and course number on your paper and work the problems in numerical order. Show all work, calculations and diagrams to get credit. You will scan and submitted your completed assignment in numerical order as a pdf file on bbLearn by the due date.**
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- 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. Some labs may have graded pre-lab assignments. Due dates and submission methods vary between lab assignments. Submission instructions will be covered during the first lab session. **Late submissions lose 50% of their value immediately**.

- End of Term - No late coursework will be accepted after 9 AM on the first day of Finals Week.

Response Times

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

- Homework - Solutions will be posted one day after the due date so **no late homework assignments will be accepted**. Grades will be posted within one week.
- Laboratories - Most labs are designed to be performed and turned in at the end of the 2-hour lab period. Grades will be posted within one week.
- Midterm Exam – Midterm exam will be on-line and automatically graded.
- Final Exam - Final exam will be on-line and automatically graded.
- Emails - Course staff will respond to emails within 48 hours and often sooner.

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 time accommodations on exams due to a disability at Drexel University need to present a current Accommodations Verification Letter (AVL) before accommodations can be made. AVLs are issued by Disability Resources (DR). For additional information, visit the DR website at drexel.edu/oed/disabilityResources/overview/, 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.aspx
Blackboard Collaborate Ultra: https://en-us.help.blackboard.com/Collaborate/Ultra/Administrator/Accessibility

Software Privacy Statements

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

Posting of Course Materials

The instructor will post various materials to the online course space, Blackboard Learn, 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.

Academic Integrity

University academic integrity policies, including but not limited to those on plagiarism and cheating, will be applied in this course. Detailed statements describing these items have been published by the Provost's Office. The grievance procedures can be found in the Student Code of Conduct within the Student Handbook. You can download a PDF version of the Handbook, or copy the following URL into your browser - http://www.drexel.edu/studentlife/community_standards/overview/.

Academic Support - ACE is running

- All tutoring is being done virtually
- Sessions are by appointment-only (no walk-in hours)
- Tutors will be in touch once an appointment is made to inform the student about the method of communication (mostly Zoom but sometimes something else, particularly if a whiteboard is necessary)

This page has more information on the courses covered and how to make an appointment: https://drexel.edu/engineering/academics/student-advising-support/current-students/academic-center-for-engineers/courses/

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Schedule an appointment here | Visit A4E here

Drexel has moved all operations online in response to COVID-19. Please specify when making your appointment which contact method you'd prefer: phone or Zoom.. Thank you! *

Course Schedule

Week	Subject	Reading	Homework	Labs (in bbLearn)
1	Circuit vocabulary- current, voltage, power	NI Circuits zyBook, Sections 1.1 – 1.8	See Week #1 on Bb Learn	
	Ohm's Law, Kirchhoff's Laws	NI Circuits zyBook, Sections 2.1 - 2.4		
ATTENTION: The Drop/Add deadline will be the end of Week 1. This will be Friday, January 15, 2021 for advisor-mediated changes, and Sunday, January 17, 2021 for student-mediated online changes.				
2	**Mon. Drexel Holiday** Kirchhoff's Laws, equivalent circuits Node Analysis	NI Circuits zyBook, Sections 2.1 – 2.4 and 3.1 – 3.2	See Week #2 on Bb Learn	
3	Node-Analysis and supernodes Mesh/Loop Analysis and supermeshes	NI Circuits zyBook, Sections 3.1 – 3.3	See Week #3 on Bb Learn	
4	Superposition, Source Transformation, Thévenin and Norton, Max power transfer	NI Circuits zyBook Sections 2.4,3.6, 3.8 – 3.10	See Week #4 on Bb Learn	
5	**Wed. Midterm Exam** Waveform types, C & L Storage Elements	NI Circuits zyBook, Sections 5.1 – 5.2, 5.4	See Week #5 on Bb Learn	
6	RC & RL 1st order equations	NI Circuits zyBook, Sections 5.5 – 5.6	See Week #6 on Bb Learn	
ATTENTION: The course withdrawal deadline is the end of Week 7, February 26, 2021. If you are thinking of withdrawing, please speak to your advisors and your instructor.				
7	RC & RL 1st order equations	NI Circuits zyBook, Sections 5.5 – 5.6	See Week #7 on Bb Learn	
	AC Analysis, Phasors	NI Circuits zyBook, Sections 7.1 – 7.4		
8	AC Analysis, Phasors, Phasor Domain Analysis	NI Circuits zyBook, Sections 7.5, 7.6	See Week #8 on Bb Learn	
9	Phasor Domain Analysis	NI Circuits zyBook, Sections 7.6 – 7.8, 7.10	See Week #9 on Bb Learn	
10	**Final Exam**			No Labs