

# Circuit Analysis, Section C, 3 Credit hours

Instructor: Stevie Limón

Office: The Hive second floor corner

Email: [stevie@ece.gatech.edu](mailto:stevie@ece.gatech.edu) (best way to reach me is through email)

Time: Tuesdays and Thursdays 2:00-3:15pm George Tower 370

## Instructor Information

<b>Instructor</b>	<b>Email</b>
Stevie Limón	stevie@ece.gatech.edu
<b>Teaching Assistants</b>	<b>Email</b>
TBD	tbd
TBD	tbd

## Office Hours

Office hours can be indoors, virtual, or anywhere in between based on your comfort levels. The teams link will be available through Canvas. I will always be in person at the Hive if you'd like to stop by at any time. However, outside of office hours, I may be busy doing other things and may not have the time to talk.

Office hours will be on Wednesdays 11:00am-12:00pm. If these times don't work for you and you'd like to schedule something else, just send me an email.

## General Course Information

### Description

In this course, you'll be learning about circuits for the first time. Circuits are the foundation for many future courses you will take in ECE in the future. In my opinion, it is one of the most important classes that this school offers.

This class teaches the fundamental principles of electricity and electrical components from the simple analysis of passive elements of resistors, capacitors, and inductors, and how to apply circuit laws to them.

### Pre- &/or Co-Requisites

PHYS 2212/2232 [min C] and MATH 2403/2413/24X3 [min C]. The MATH course may be taken concurrently with ECE2040.

## Course Goals and Learning Outcomes

Upon completion of this course, you should be able to:

- Analyze small RLC circuits by hand.
- Use network techniques, like node analysis and loop analysis, to write equations for large linear circuits.
- Apply Thevenin and Norton theorems to analyze and design for maximum power transfer.
- Apply the concept of linearity and the associated technique of superposition to circuits and networks.
- Analyze circuits containing ideal operational amplifiers.

- Explain the concept of steady state.
- Apply phasor analysis to AC circuits in sinusoidal steady state.
- Analyze the frequency response of circuits containing inductors and capacitors.
- Construct simple Bode plots for first- and second-order circuits.
- Apply the Laplace transform to linear circuits and systems.
- Analyze simple two-port circuits.

## Course Requirements & Grading

Your final grade will be assigned as a letter grade according to the following scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

Homework	15%
Lab experiments	5%
Projects	10%
Daily Quizzes and participation	5%
Midterm 1	20% (February 17 <sup>th</sup> , Thursday)
Midterm 2	20% (March 19 <sup>th</sup> , Thursday)
Final Exam	25% (April 30 <sup>th</sup> , Thursday, 2:40-5:30pm)

Homework will be assigned almost weekly on the course website (<https://canvas.gatech.edu/>). Homework will need to be turned in online by 11:59pm on the due date via Canvas. Late homework will be accepted with a late penalty attached for each cumulative day it is due.

There will be three labs in this class. You will be allowed to work with a partner to see how to instrumentally solve some basic circuit problems. These labs will be in person in this specific class. On these days be sure to bring your mydaq and circuit kit. The labs will be published well in advance if you'd like to use different instrumentation equipment in your own time via different labs like the hive makerspace.

To facilitate classroom learning, at the end of lecture date, there will be a simple quiz highlighting the big points of the lecture, and potential recap of the last lecture. There will be multiple attempts for each quiz.

Additionally, during the instructional period, I may use in class polling to gauge where students are and ask them answers to specific questions.

The tests (two midterms and one final exam) will be given (tentatively) on the dates shown above. If you must miss a test for some reason beyond your control, please send an email immediately to Stevie Limon

(written official documentation is normally required within 3 days). If you are excused from a test, a makeup test will be scheduled for you to take at a time which the TAs and the professor will arrange.

All tests are closed book and notes, but you will be permitted a one-page formula sheet (letter sized, single side for each quiz and double sided for the final exam). You will also be allowed to use a calculator of your choosing.

All students should check the final exam schedule against their own class schedule and report any conflicts to me as soon as possible.

Questions concerning a grade given for any assignment or exam must be presented to the instructor within 5 days after the grade is received. No exceptions to this rule will be permitted at any time, for any reason.

### Extra Credit Opportunities

There will be a couple of extra credit opportunities offered throughout the semester. Many of the extra credit opportunities will be offered on your HW assignments. These extra credit opportunities are structured in a way to help you learn more about practical circuits in the real world, learn about simulation, or practice using lab instrumentation. There could also be some additional harder circuits problems as well. In general, these problems will be all or nothing with no partial credit.

### Projects

In this class there will be four projects that will aim to give this course a nice practical touch. These projects will do some deep dives on some very common circuits used in many areas. Students will research the circuit, derive the equations for the circuit, check them with a simulator, then make improvements to the circuit and create it and test with instrumentation.

The purpose of these projects is to take you through a project in the real world from start to finish which normally includes a problem statement, a proposed solution which you simulate and verify before building it and verify that it works the way you intended.

### Course Materials

#### Course Text

Dorf & Svoboda, Introduction to Electric Circuits (9th edition), John Wiley, 2013.

(required)

This textbook is required as some homework problems may appear from this textbook. This textbook also has many other exercises that you can practice on your own time if you feel you need it. Much of the information in the lectures can be verified here as well.

#### Additional Materials/Resources

Additionally, much of your homework can be checked by using some circuit simulators, and it is even encouraged. These are very powerful tools that are free to use and give you a very practical skill. Here are some options below:

<https://www.circuitlab.com/>

<https://www.falstad.com/circuit/>

The above links are in browser tools that are quick and easy to learn. However, in this class, I will show examples using LT spice which is an industry standard that has real world components that you can test with. Best of all, it's free. The UI leaves something to be desired but it is very powerful.

In general, there are a lot of ways to learn circuits online and the internet has a plethora of information out there for practice, feel free to see what's out there.

For the labs, you may use the myDAQ you already have from previous labs, but it is not required to purchase one for this class. If you would like to use the myDAQ but do not want to purchase one, the library offers checkouts for 48 hours provided you go to the info desk on the ground floor of price gilbert. Alternatively, there is an open lab in Klaus Advanced Computing Building in 1446 where each station has a myDAQ attached, and this lab is open 24 hours. Alternatively (and perhaps preferably) the Hive is an open library resource that has myDAQs for check out as well as full outfitted benchtops for you to use at any time they are open.

There is a 2040 kit available for purchase through Eta Kappa Nu. Other classes will recommend you buy this kit, but most of what is in here is small passive components, and you can get them from the hive for free when you need them if they are stocked which is not guaranteed. I will do my best to ensure that all parts used in labs are easy parts that you can get from the hive or senior design for free. However, if you want to be cautious, go ahead and purchase the part kits, especially if you don't have your own breadboard and wire kit yet.

### [Course Website and Other Classroom Management Tools](#)

Everything that you will need for this course will be on Canvas, so be sure to check often.

This course will also utilize turning point or some other polling software from time to time to facilitate classroom participation from time to time.

## **Course Policies, Expectations, & Guidelines**

### [Academic Integrity](#)

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. [Review Georgia Tech's Honor Code](#) and the [student Code of Conduct](#).

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

### [Accommodations for Students with Disabilities](#)

If you are a student with learning needs that require special accommodation, [contact the Office of Disability Services](#) (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

### [Attendance and/or Participation](#)

Attendance is not mandatory but strongly encouraged in this class. The class's daily quizzes are there to ensure you're keeping up with the material, but ultimately, you are responsible for the material whether you show up to class or not. The turning point questions are not mandatory but help me understand the pacing during the actual class and help me understand where everyone is or if they understand the content.

I understand that college can be chaotic at times, so I will do my best to record lectures and have them posted online so you can always watch and review them on your own time.

If you get sick, please stay home and take care of yourself and each other.

### [Collaboration, Group Work, and Use of Generative AI](#)

Students are encouraged to work together on homework problems, but individual solutions must be submitted.

The labs are structured for you to work together as well.

Generative AI, to my knowledge, will not really be able to solve your circuits. If you'd like to use it as a rubber duck or to try to explain some concepts to you with detailed questions, you may, but I'd recommend instead just coming to office hours and class and asking any questions you may have there first. AI often will lead you astray if you're not careful! Please do not use AI to write explanations to any questions I ask you on homework or the labs.

### Extensions, Late Assignments, & Re-Scheduled/Missed Exams

Extensions may be granted for approved reasons outlined [here](#). For any additional reasons not listed by Georgia Tech, feel free to reach out to me and ask, and I will do my best to accommodate you in a way that is fair to the other students as well.

Late assignments will be accepted until 5 days after the posted due date. **Each day an assignment is late will incur a 20 point deduction off the final grade of the assignment (where the grade is out of 100).**

The tests (two quizzes and one final exam) will be given (tentatively) on the dates shown above. If you must miss a test for some reason beyond your control, please send an email immediately to Stevie Limon (written official documentation is normally required within 3 days). If you are excused from a test, a makeup test will be scheduled for you to take at a different time which the TAs and the professor will arrange.

### Inclement Weather and Digital Learning Days

Georgia's weather is often inconsistent, if inclement weather should hit the campus, class will be cancelled, and a video lecture will be recorded and posted. For your convenience, I will likely double office hours that week (which will be available by teams) to ensure you have time to ask questions. It will likely be during class hours.

### Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. [The Student-Faculty Expectations](#) articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

### Campus Resources for Students

#### ECE Core Tutoring

ECE offers tutoring from your upper classmen peers. This [link](#) will be updated with everything you need to know about them. They tutor for multiple classes, so check out this resource for other ECE classes. This link will also give you information about the office of undergraduate education and student success. This office at tech also coordinates official tutoring that could be offered for this course.

#### ECE Core Tutoring

This course will be offering access to an AI tutor to help you complete your circuit homework questions. If you'd like to take advantage of this opportunity, please navigate to the files location in canvas and fill out the Qualtrics survey.

#### Student Well-being

I will strive to teach you the fundamentals of circuits in a way that is fun and unique. If there's anything I can do to improve the experience in this class, please let me know.

The campus is committed to preserving your overall physical, social, and mental well-being. Be sure to take a look at the [comprehensive list](#) of wellness related resources that are compiled and maintained by the office of Vice President for Student Engagement and Well-being.

More resources on supporting student well-being on the syllabus and beyond are available through the [Learning Well Initiative](#).

## Course Schedule

Could be subject to change!

Date	Lecture Topic	Textbook	Lecture Slides	Assignments	Comments
8/25	Intro/Circuit Variables	1.2-1.5	L0, L01		Happy FWOC!
8/27	Circuit Elements	2.2-2.7,2.9	L02	HW1	
9/1	Kirchhoff Laws	3.1-3.2	L03		
9/3	Series & Parallel Resistors	3.3-3.6	L04	HW2	
9/8	Node analysis part 1	4.1-4.2	L05		
9/10	Node analysis part 2	4.3-4.4	L06	HW3	
9/15	Lab 1				
9/17	Mesh analysis part 1	4.5	L07	HW4	
9/22	Mesh analysis part 2	4.6-4.8	L08		
9/24	Source Transformations & Duality	5.1-5.3	L09		
<b>9/29 Midterm Quiz one</b>					
10/1	Thevenin and Norton circuits	5.4-5.5	L10	HW5	
10/6	Fall Break				Have Fun (: see a tree
10/8	Max power transfer	5.6	L11		
10/13	Op Amps 1	6.2-6.4	L12	HW6	
10/15	Capacitors	7.1-7.4	L13		
10/20	Inductors	7.5-7.8	L14	HW7	
10/27	RL and RC Circuits	8.1-8.3	L15	HW8	
10/29	Sequential Switching	8.4-8.6	L16		
11/3	First order circuits with non-constant Sources	8.7	L17		Drop date 3/18
<b>11/5 Midterm Exam 2</b>					

Date	Lecture Topic	Textbook	Lecture Slides	Assignments	Comments
11/10	Lab 02				
11/12	Second order Circuits	9.1	L18		
11/17	Natural Response	9.3-9.6	L19	HW9	
11/19	Forced Complete Response	9.7-9.8	L20		
11/24	Sinusoidal Steady State	10.3-10.5,10.7	L21	HW10	
11/26	Thanksgiving break				Enjoy some rest
12/1	AC circuit analysis	10.8	L22		
12/3	Frequency Response	13.1-13.2	L23	HW11	
12/8	Bode Plots/lab3	13.3	L24		LDOC
12/?	Final Exam			?	?