

<b>ECE 2040 Spring 2019</b>	<b>Schedule:</b> Monday 15.30-17.00, Wednesday 15.30-17.00 Yellow Room
<b>Instructor:</b> Prof. Jean Paul Salvestrini, Office 213	email: jean-paul.salvestrini@georgiatech-metz.fr
<b>Office Hours:</b> after class or on appointment (pre-arranged preferably by email).	Cell (emergencies only!) +33(0)6-45-53-46-41

## Course Description

Basic concepts of DC and AC circuit theory and analysis.

## Course Objectives

As part of this course, students:

- ✓ Understand basic concepts of DC and AC circuit behavior.
- ✓ Develop and solve mathematical representations for simple RLC circuits.
- ✓ Understand the use of circuit analysis theorems and methods.
- ✓ Use basic experimental equipment to measure voltage waveforms.

## Course Outcomes

Upon successful completion of this course, students 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.
- ✓ Measure time constants for first order circuits.
- ✓ 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.
- ✓ Measure frequency response of circuits.

## Prerequisites

ECE 2025,  
PHYS 2212  
PHYS 2232  
MATH 2552.

## Texts

- Introduction to Electric Circuits, J.A. Svoboda & R.C. Dorf, 9th edition John Wiley, 2014

## Class Attendance

Class attendance is mandatory! Class attendance is the easiest way I know of to attain a first attempt at an understanding of the material. Participation in lectures will be an important way to stay engaged with the course. (Of course, this has to be supplemented by working homework problems, reading the text and other materials, and other practice.)

## Homework

Problems (10-12 HWs) will be assigned at intervals; they are not graded but must be turned in. Solutions will be made available. The problem sets are **essential** as these will provide that practice that will lead to mastery of the subject matter. Feel free to work with other students, but I advise you (1) to attempt problems on your own before working with other students and (2) making sure you can do the problems cold on your own without the help of other students once you have discussed them. Note that the last one or two problem sets, depending on the pace of the lectures, might be assigned during the last week of classes; it is nonetheless your responsibility to learn the material. Students who do not work diligently on the problem sets will not be able to do well on quizzes!

## Quizzes

There will be four in-class quizzes as given tentatively in the schedule below. The quizzes will be heavily drawn from problems given in the homeworks. **Thus, mastery of homework problems is likely to translate into high quiz (and exam!) grades.** Note that Quiz 4 is during the last week of lectures.

Each quiz will concentrate on material covered between specified cutoffs (TBA)—typically from the cutoff from the previous quiz, but will nonetheless be comprehensive. That is, while the emphasis will be as described above, knowledge of material that came before in the course will be required to do well on the quizzes and there may be specific questions or parts of questions that focus on earlier work.

Failure to take a quiz (see above) may result in a grade of zero unless you present **written documentation** that you have a valid excuse and that I accept the excuse. If you have any questions, please consult me AND Prof. Paul Voss. Unless the excuse is related to an obviously unforeseen emergency, this documentation must be presented one week prior to the quiz or a grade of zero may result. Specifically, travel will not constitute a valid excuse.

**Quizzes must be taken on the dates indicated. Failure to take a quiz at the indicated time will result in a grade of zero. Quiz times might be changed only for the entire class under exceptional circumstances, provided no student objects, but not for individual students. Please consult the syllabi for all your courses immediately so that you can budget your study time.**

## Final Exam

The final exam is cumulative and comprehensive

## Grading

The course grade will be computed according to the following weights:

Each quiz (4): 15 %

Final exam: 30 %

All HW turned in: 10 %

Full attendance: 5 %

## Academic Conduct

As noted above, you are free to work with other students on problem sets. You must work strictly alone on quizzes and the final exam. On quizzes and the final exam, unless I expressly grant exceptions later in the course, no notes, books, calculators, electronic devices, or any other aids will be permitted. I will supply a formula sheet that will be made available to you prior to the quizzes and final exam.

Students in this class are expected to abide by the Georgia Tech Honor Code and avoid any instance of academic misconduct, including but not limited to:

- Possessing, using, or exchanging improperly acquired oral or written information in the preparation of a quiz or the final project.
- Submission of material that is substantially identical to that created or published by another individual, except as noted below.
- False claims of performance or work that has been submitted by the student.

Be sure to report observed instances of violations of the Honor Code! Remember, the Honor Code is about honor. Apart from devaluing your own work, the work of your classmates, and the Georgia Tech degree, Violations of the Honor Code carry significant penalties, here at Tech, and for life. Do you want to be labeled as having cheated? The trustworthiness of engineering and science (as well as the reliability and safety of products!) relies on the basic honesty of engineers and scientists. Students may work in groups on the final project as will be discussed in a future handout, though each must student make a good-faith effort to contribute to the group. Each student must also write up and turn in his/her work to

integrate the knowledge.

Please turn off notifications on cell phones, etc. Some students may choose to use computers for note taking during class; however, if I perceive that they are a distraction, I might ask that they be put away.

More detailed information concerning materials and other aids allowed in quizzes will be given later. See the Georgia Tech Honor Code for further information or ask instructor.

## Communications

**You are responsible for all announcements (which may include information about the homework, quizzes, and the final exam) made in class.** Quizzes will likely strongly reflect material covered in class. If you miss class, do not ask me what was covered. Handouts may also be distributed from time to time in class; it is your responsibility to obtain information from classmates if you are not present when information is given or materials are distributed, though materials are likely to be posted on Canvas. I may also email the class various information.

Notes, problem sets, solutions, and various other useful information will be posted at Canvas.

The best way to contact me is via email, briefly immediately before or after class or by appointment. If you email me, make sure to put "ECE2040" in the subject line, as sometimes it is difficult for me to figure out the context of a student's question otherwise since I am teaching more than one course.

## Getting Help

The material in this course builds on earlier material, so it is very important to not get behind. Be sure to contact me (see above) or use other resources that are available. As noted above, email questions or arrange for an appointment. While some resources may be more difficult to access at GTL than in Atlanta, class sizes tend to be small, so use this to your advantage!

## What do you have to do??

- Come to class.
- Master the concepts.
- Do the problem sets.
- Master problem solving.
- Avoid the cookbook approach to the above.
- Keep up with the material covered in lectures.
- Read the book.
- Come see me.
- Keep an open mind.
- Ask questions.

## Tentative Syllabus:

It is unlikely that the listed topics and homework assignments will match up exactly on the listed dates. This is just a rough estimate of how the material will flow and homework coverage to give you a sense of where we are headed. However, the quiz dates are unlikely to be changed.

Class	Topic	Chap	HW assign./sol.
1	<u>Introduction, Background:</u> Charge, current, voltage, power	1, 2	HW1
2	<u>Background:</u> Resistor, sources, circuits / <u>Review 1</u>	1, 2	
3	<u>Resistive circuits:</u> Resistor, Ohm's law, Kirchhoff's laws	3	hw1s / HW2
4	<u>Resistive circuits:</u> Series and parallel resistors, superposition	3	hw2s / HW3
5	<u>Resistive circuits:</u> Solution methods, Thevenin and Norton equivalents, maximum power transfer	4, 5	
6	<u>Resistive circuits:</u> Configurations	12	hw3s / HW4
7	<u>Resistive circuits:</u> Sensors / <u>Review 2</u>	2, 3, 4, 5	
8	<b>Quiz #1: Background and Resistive circuits</b>	<i>HW 1, 2, 3</i>	hw4s / HW5
9	<u>Reactive circuits:</u> Capacitor, inductor	7	
10	<u>Reactive circuits:</u> Differential equations	8	hw5s / HW6
11	<u>Reactive circuits:</u> RC, RL circuits	8, 9	
12	<u>Reactive circuits:</u> Second order differential equations.	9	hw6s / HW7
13	<u>Reactive circuits:</u> RLC circuits and applications / <u>Review 3</u>	9	
14	<u>Frequency analysis:</u> Frequency domain, impedance	10	hw7s / HW8
15	<u>Frequency analysis:</u> AC circuit analysis	10	
16	<b>Quiz #2: Reactive circuits</b>	<i>HW 4, 5, 6, 7</i>	hw8s / HW9
17	<u>Frequency analysis:</u> AC series and parallel	10	
18	<u>Frequency analysis:</u> Transfer function, frequency response	13	hw9s / HW10
19	<u>Frequency analysis:</u> Filters / <u>Review 4</u>	16	
20	<u>Power:</u> Apparent and reactive power	11	hw10s
21	<u>Power:</u> Power factor / <u>Review 5</u>	11	HW11
22	<b>Quiz #3: Frequency analysis and Power</b>	<i>HW 8, 9, 10</i>	
23	<u>Operational amplifier:</u>	6	hw11s / HW12
24	<u>Operational amplifier:</u>	13	
25	<u>Operational amplifier:</u>	13	hw12s
26	<b>Quiz #4: Operational amplifier</b>	<i>HW 11, 12</i>	
27	<u>Operational amplifier / Review 6</u>	13	
28	Catch-up day		
29	<b>Final exam (TBA)</b>		