GEORGIA INSTITUTE OF TECHNOLOGY SCHOOL of ELECTRICAL & COMPUTER ENGINEERING

ECE 3710 Circuits and Electronics

GTL -Spring 2023- Syllabus & Schedule

Instructor: Dr. Suresh Sundaram,

Email: ssundara@georgiatech-metz.fr (Please include "ECE 3710" in the subject line.)

TA: TBA

Office: GTL 213

Office Hours: Walk-ins, or by appointment

Specific hours to be announced latter

Class Details: Location and specific hour will be announced latter.

Prerequisites:

Phys 2212/2232

Course Websites:

http://canvas.gatech.edu/ (Links to an external site.)

Course Materials:

Textbook(s): The Textbook Circuits by Fawwaz Ulaby & Michel Maharbiz.

The textbook is not required, and students perform well in the course without the textbook. However, the textbook is a helpful resource for additional explanations and practice problems.

Available at Barnes and Noble and at
http://www.studica.com/GeorgiaTech.html (Links to an external site.)

Other Materials:

NI myDAQ and Circuits Textbook Bundle (Includes NI myDAQ student data acquisition board

Note: The myDAQ and circuit parts are available at GTL. Contact me if you want to use them outside of class. **The first lab will be on the second week of class.**

Attendance Policy:

Attendance is mandatory. Any unexcused absence will result in a grade of zero for both the In-class quiz and In-class worksheets for that period. In-class quizzes are administered during the first 10 minutes of the period. Students who arrive after the quiz is given will receive a

grade of zero for that quiz. There will be no In-class quiz during the scheduled In-class labs hours to accommodate successful completion of the lab works.

According to the Institute policy, you can take a hybrid course completely remote if you are an international student who cannot travel to respective institute/campuses or if you have a written accommodation that excuses you from attending in-person classes.

Grade Policy:

10% – Homework (completed on Canvas)

10% – In-Class Quizzes (Lowest 3 dropped)

5% – In-Class Worksheet (Participation, one dropped)

15% – In-Class Labs

20% – Exam 1 (tentatively on the 4th week)

20% – Exam 2 (tentatively on the 8th week.)

20% – Exam 3 (tentatively on the finals week.)

2% – Extra credit: Build a useful circuit and give an in-class demo.

Course Structure:

This course is divided into three mini-courses:

- Linear Circuits 1: DC Analysis
- Linear Circuits 2: AC Analysis
- Introduction to Electronics

All of the video lectures for the semester will be on-line uploaded in Canvas.

The homework will be completed on-line.

The assigned lectures for each class period are listed on the syllabus in the Canvas site. Unless otherwise noted, the GTL course will follow the schedule posted here. There will be daily quizzes in class on the on-line lecture material. Quizzes are open-note, but closed-Internet (and closed-neighbor). You may need a calculator for some of the quizzes.

There will be several in-class labs where students will perform hands-on activities using data acquisition boards. Some of these activities include exploration or RC and RLC circuits, op-amp circuits, filters, and physically-motivated applications of electronic circuits. These hands-on activities are designed for students to complete during class and turn in a worksheet.

There will be common tests among all sections and a common final exam. Class time will be devoted to the hands-on activities, working sample problems, recitation, and working homework.

Final Exam:

The final exam for this course will be held during the exam period assigned for the class.

Lab Software:

We will use the ELVISmx Instrument Launcher for the myDAQ device. This software is Windows-based, so please install it on a Windows machine or the Windows partition of a Mac. (Use Bootstrap or Parallels with this software.) The software is available at the National Instruments site (http://joule.ni.com/nidu/cds/view/p/id/2157/lang/en/). Support for the myDAQ device can be found at http://www.ni.com/tutorial/11420/en/.

WARNING: It may take over an hour to download and install the software.

Academic Misconduct:

All students taking this course are required to strictly adhere to the Georgia Tech Honor Code, whose complete text may be found at http://honor.gatech.edu/content/2/the- honor-code. Any violations of the Code are considered academic misconduct and will be submitted to the Office of the Dean of Students for appropriate action.

Collaboration:

Students may discuss assignments in general terms with one another, but (unless stated otherwise) all work should be generated individually. Likewise, students may receive assistance on assignments from the course instructors. However, all of the assignments in this course are to be completed individually. Copying or allowing peers to copy all or portions of any assignment is considered plagiarism and is expressly forbidden.

Topical Outline :

Resistive Circuits
- Components
- Ohm's Law
- Resistors in parallel, series
- Kirchhoff's Current and Voltage Laws
- Voltage divider and current divider laws
- Thévenin Equivalent Circuits
- Superposition

Reactive Circuits
- Inductors and Capacitors
- Parallel and series connections of inductors and capacitors
- Transient Analysis of First-Order circuits

Frequency Analysis of Circuits
- Steady-state sinusoidal analysis and impedance
- Transfer function
- Bode plots
- Filtering

Power in AC Circuits
- Real, reactive, and apparent power
- Power factor

Fundamental Devices in Electronics
- Operational Amplifiers
- Ideal diodes
- Simple piecewise linear model of diode
- MOS Field-Effect Transistors

Electronic Applications
- Rectifiers
- Amplifiers
- Active Filters
- Logic Gates (and introduction to Boolean algebra logic)

Course Objectives:

The objectives of this course are to teach students

- To analyze circuits that contain resistors, capacitors, and inductors with direct current and alternating current sources.
- To analyze circuits in the time domain showing transient response and in the frequency domain showing filtering and resonance properties.
- To be familiar with nonlinear circuit components and practical circuits can be built from these components.

Learning Outcomes:

At the completion of the course, the students should be able to
- determine voltages and currents in a resistive network.
- sketch the transient response of RC and RL circuits and be familiar with the standard transient responses of RLC circuits.
- use complex phasors to determine the steady-state responses of sinusoidal sources voltages or currents.
- understand and analyze the frequency response characteristics of filters
- analyze power characteristics in reactive circuits.
- build and test real circuits containing RLC components, op amps, diodes, and transistors.
- design and build simple filters, rectifiers, and amplifiers

Tentative schedule for the entire semester will be announced during the first week of the class.