The University of Maine
Department of Electrical and Computer Engineering
ECE 214 – Electrical Networks Lab
Updated for the Online Completion of ECE214

Spring 2020

Electrical Networks Online Lab

Course Number:	ECE 214 (Now online)
Credits:	3
Lecture:	9:30 - 10:45 am, Tuesday & Thursday, online at: https://maine.zoom.us/me/davidkotecki
Prerequisite:	ECE 210 – Electrical Networks
Course Web Site:	https://ece214.davidkotecki.com

Instructor

Dr. David E. Kotecki
Virtual Office: https://maine.zoom.us/me/davidkotecki
e-mail: kotecki@maine.edu
Mobile: 207.356.0168

Virtual Office Hours

1:00 - 3:00 pm Monday, Tuesday, Wednesday, and Thursday
You are encouraged to drop by my virtual office to ask questions and discuss labs related to this course. If you are unable to meet with me during these times, e-mail me to set up an appointment.

Teaching/Lab Assistants

Teaching/Lab assistants will be available to help answer questions, grade reports, and sign-off on completed labs. To obtain credit for the lab, you must submit a complete draft of the lab report to the TA by the sign-off due date. Late sign-offs will incur a 50% penalty.

Textbook

There is no required textbook for this course. The textbook used in ECE 210 should be used as a reference.

Course Goals

ECE 214 will prepare you for advanced courses in circuit analysis, electronics, and signals and systems. The five goals for this course are:

1. Become knowledgeable and familiar with the operation and use of electrical test equipment including the digital oscilloscope, waveform generator, DC power supply, and voltage, current, resistance, capacitance, and inductance meters (Labs 1 - 6).

2. Become familiar with the properties of "real" circuit elements including the resistor, capacitor, inductor, transformer, and operational amplifier (Labs 1 - 6, and simulations in Labs 7 - 9). The diode and transistor will be introduced, and used to implement a voltage-controlled switch.

3. Become proficient with the use of computer simulations and SPICE (Simulation Program with Integrated Circuit Emphasis) to predict and analyze circuit behavior at DC, in the time domain, and in the frequency domain. Understand how to simulate circuit performance as a function of temperature, perform a component parameter sensitivity analysis, and a Monte Carlo yield analysis.

4. Develop skills and techniques for debugging electrical circuits (Labs 1-6) and circuit simulations (Labs 1-9).

5. Learn how to maintain a proper "Engineering Notebook," (Labs 1-6) and how to produce a well written "technical report" (Labs 7-10). The IEEE style guide and the typesetting language LaTeX will be introduced.

Laboratory/Simulation Teams

Students should partner with another student, and work in a two person team. If there is an odd number of students in a laboratory session, a team of three students will be allowed. Each student must maintain an engineering notebook. However, the technical report will be a joint report from the team. If you and your laboratory partner have irreconcilable differences, you will have the opportunity to change laboratory partners at the mid-semester break.

Calculators

It is strongly recommended that you have a calculator capable of solving simultaneous linear equations with complex variables. Calculators may be used during the labs and when taking exams. The most popular calculators are TI-89 Titanium and the TI Nspire CX CAS. If you do not own one of these calculators, make sure you can borrow one for use during the exams.

Technical Report

Each laboratory team will submit a series of technical reports culminating in a final technical report describing the DC-DC power supply designed in Labs 7–10. The report must describe the theory of operation, design considerations, a description of how the circuits function, simulation results including a temperature analysis, component sensitivity analysis, and yield analysis, an analysis of the Thévenin Equivalent output impedance, and a cost analysis.

A suggested outline for the technical report is available at: https://ece214.davidkotecki.com/report/ECE214_Report_Outline_2020.pdf. Draft and revised reports should be submitted to the assigned TA by the deadline indicated on the course calendar, available at: https://ece214.davidkotecki.com/docs/ECE214_2020_Calendar.pdf. The final version of the report must be submitted electronically, in PDF format, to kotecki@maine.edu no later than 5:00 pm EDT on Friday, 1 May 2020. Late reports are **NOT** accepted.

Circuit Simulation and Data Analysis

NGspice (http://www.cppsim.com/about_ngspice.html), an open source, multi-platform, circuit simulator is used to perform circuit simulations. It is recommended that everyone install the NGspice circuit simulator, the Sue2 schematic capture program, and the NGspice Matlab® toolbox on their laptop. The easiest way to obtain the software is to install the bundled CppSim package from http://www.cppsim.com/download.html. NGspice is a full SPICE circuit simulator, and capable of simulating a circuit of any complexity using real device models.

Matlab® by MathWorks (http://www.mathworks.com/) is used to control the NGspice circuit simulator and analyze and graph the simulation results from NGspice. Matlab® is a multi-platform numerical computing environment and a programming language used for technical computing. The University of Maine provides a free Matlab® license to all students. Everyone should install version 2018b of Matlab® on their laptop. Download Matlab® from https://umaine.edu/it/software/matlab.

Exams

There are two Preliminary Exams and a Final Exam. You may use your Engineering Notebook, a ruler, and a hand held calculator during the exams. The lowest of the three exam grades is dropped. The exams will cover circuit theory, circuit simulation, the use of electrical test equipment, and the laboratory experiments.

Exam #1	5 Mar. 2020	(9:30 - 10:45 am)
Exam #2	23 Apr. 2020	(9:30 - 10:45 am)
Final Exam	5 May 2020	(8:00–10:00 am)

Anyone who is unable to attend class during one of the scheduled examination dates must notify the instructor prior to the exam. If you are excused from the exam for cause, a make-up exam will be offered during the last week of classes.

Grading

Circuit and Notebook (Labs 1-6),	20%
and Report (Labs 7-10), Sign-off	
Notebook (Labs 1-5, Post–Lab)	10%
Technical report	30%
Exam #1	20%
Exam #2	20%
Final Exam	20%
Total*	$\overline{100\%}$

* Lowest exam grade is dropped

Letter Grade Assignment

$\geq 90\%$	A
87.5% – 90.0%	B +
80.0% – 87.5%	B
77.5% – 80.0%	C +
70.0% – 77.5%	C
67.5% – 70.0%	D +
60.0% – 67.5%	D
$< 60\%$	F

Updated Tentative Schedule

Class	Date	Topic
Lab #0	21 Jan. 2020	Organize Laboratory Teams; Electrical Safety
Lab #1	27 Jan. 2020	Test Equipment Loading
Lab #2	3 Feb. 2020	First Order RC Circuits
Lab #3	10 Feb. 2020	RC Filter
Lab #4	18 Feb. 2020	Operational Amplifier Circuits I
Lab #5	24 Feb. 2020	Operational Amplifier Circuits II
Exam #1	5 Mar. 2020	Preliminary Examination #1
Lab #6	2 Mar. 2020	Inductors and the RLC Circuit
*** Move to online course *****		
Lab #7	3 Apr. 2020	Boost Converter
Lab #8	10 Apr. 2020	Astable Multivibrator
Lab #9	17 Apr. 2020	DC–DC Converter
Exam #2	23 Apr. 2020	Preliminary Examination #2
Lab #10	24 Apr. 2020	Thévenin Equivalent Circuits
Final Report	1 May 2020	Final report due: 5:00 pm EDT
Final Exam	5 May 2020	Final Exam (8:00–10:00 am)

Academic Honesty Statement

Academic honesty is very important. It is dishonest to cheat on exams, to copy term papers, to submit papers written by another person, to fake experimental results, or to copy or reword parts of books or articles into your own papers without appropriately citing the source. Students committing or aiding in any of these violations may be given failing grades for an assignment or for an entire course, at the discretion of the instructor. In addition to any academic action taken by an instructor, these violations are also subject to action under the University of Maine Student Conduct Code. The maximum possible sanction under the student conduct code is dismissal from the University.

Students with Disabilities Statement

If you have a disability for which you may be requesting an accommodation, contact Student Accessibility Services, 121 East Annex, 581.2319, as early as possible. Students who have already been approved for accommodations by SAS and have a current accommodation letter should provide a copy of the letter to me as soon as possible.

Course Schedule Disclaimer (Disruption Clause)

In the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

Sexual Violence Policy: Sexual Discrimination Reporting

The University of Maine is committed to making campus a safe place for students. Because of this commitment, if you tell a teacher about an experience of sexual assault, sexual harassment, stalking, relationship abuse (dating violence and domestic violence), sexual misconduct or any form of gender discrimination involving members of the campus, your teacher is required to report this information to the campus Office of Sexual Assault & Violence Prevention or the Office of Equal Opportunity.

If you want to talk in confidence to someone about an experience of sexual discrimination, please contact these resources:

For confidential resources on campus: Counseling Center: 207-581-1392 or Cutler Health Center: at 207-581-4000.

For confidential resources off campus: Rape Response Services: 1-800-310-0000 or Spruce Run: 1-800-863-9909.

Other resources: The resources listed below can offer support but may have to report the incident to others who can help: For support services on campus: Office of Sexual Assault & Violence Prevention: 207-581-1406, Office of Community Standards: 207-581-1409, University of Maine Police: 207-581-4040 or 911. Or see the OSAVP website for a complete list of services at http://www.umaine.edu/osavp/