Course Information
Goals and Objectives

The objective of this course is to introduce you to the methodology of electrical and computer engineering and lay a foundation for future work in the field through the study of electrical circuits. In particular, at the conclusion of this course, you will:

- understand the methodology of modeling real-life systems by lumped circuit models;
- be able to analyze DC resistive circuits using network theorems such as superposition, Thevenin’s Theorem, and Norton’s Theorem;
- be able to analyze RC, RL, and RLC circuits through the use of differential equations;
- be able to analyze basic RC, RL, and RLC circuits through the use of Laplace transform techniques; and
- be able to use modern software tools, particularly PSpice, for the analysis and simulation of electric circuits.

Instructional Approach

The term you will likely hear most often is "mastery". Course credit is earned entirely and exclusively through mastery of 16 online modules and 7 computer assignments covering all the topics of the course. There are still lectures and recitations, but there are no weekly homework assignments or quizzes and no midterm or final exams. Since the modules are administered online, you may retake them. This means that if you do not master a module, it does not count against you, but if you do master a module, it counts toward your semester grade. The questions and contexts will change with every attempt, but the central concepts and techniques do not change. Thus, if you have truly mastered the material, you can be given any circuit, be asked any question, and you will be able to answer it correctly.

It is strongly recommended that you attend all lectures and recitations. These will help you learn the concepts and techniques needed to demonstrate mastery in the online modules and computer assignments.

Course Format

**Lecture:** Three 50-minute lectures per week (MWF 2:30–3:20, in ECSC-II 119)

**Recitation:** One 75-minute recitation per week (all Tu; 9:30–10:45, in Marston 15; 11:15–12:30, in Marston 15; and 1:00–2:15, in Marston 220)
Mastery Modules: Sixteen online tests, administered by OWL

Computer Assignments: Two Excel projects, two MATLAB projects, and three PSpice labs, all of which will be made available under Assignments (use nav-bar on the left) and done by each student outside the classroom on the computer

Instructors

Stephen Frasier  
113A Knowles Engineering Building (KEB)  
545-4582  
frasier@ecs.umass.edu  
Office Hours: [to be determined]  
(or by appointment)  
Responsibilities: Overall class organization, lectures

Bill Leonard  
Marcus 203  
545-3513  
leonard@ecs.umass.edu  
Office Hours: [to be expanded]  
Fri, 11:15–1:10 (DuBois 767)  
Responsibilities: Overall administration, recitations, OWL, computer assignments, web site

Teaching Assistants / Peer Tutors / SI Leader
[to be determined]

Prerequisites and Corequisites

In order to take this course, you must have earned a C or better in the following: Math 132 or 136; Physics 151 and 153; ENGIN 112; and ECE 122.

Physics 152 and 154 are corequisites, though it is recommended that you complete them before attempting this course.

A status of EE or CSE standing is required. If you have not qualified for EE or CSE yet (e.g., you are still an ENGIN major), you will be withdrawn from the course. To look into changing your major, go to the ECE Academic Programs Office in Marcus 5 (in the basement).

Textbooks

Required (available in the Textbook Annex)


Recommended Supplement (available online at a variety of sites)


Course Components

There is no weekly homework in this course and no weekly quizzes. There are
no semester exams, and there will not be a final exam. Instead, your grade will be determined by the number and type of online modules you successfully master. Computer assignments will potentially adjust your semester grade as described below. Thus, there are only two required components in this course: Computer assignments and Mastery modules. We will be using a mastery approach for both.

**Computer assignments.** During this semester, you will learn the rudiments of Excel, MATLAB, and PSpice. For Excel and MATLAB, there are 4 projects, with a total of 10 problems, 5 each in Excel and MATLAB. For PSpice, there are 3 labs, also with a total of 10 problems. Problems are worth 10 points each, for a maximum of 200 points. Descriptions will be available in [Assignments](https://spark.oit.umass.edu/webct/urw/lc4130011.tp0/cobaltMainFrame.dowebct) (in the nav-bar on the left). Due dates are every week of the semester from early October until before Thanksgiving break. Each computer assignment can be resubmitted without penalty at any time before the last day of classes.

**Mastery modules.** There are a total of 16 online modules, administered by OWL. Twelve are "Basic" modules, covering definitions and basic techniques. Three are "Intermediate" modules, which integrate topics within a set of Basic modules and encourage efficient decision-making. There is one "Cumulative" module, covering the entire course.

Each module has 10 questions. To earn mastery, you must answer all 10 questions correctly in a designated secure setting.

There will be multiple attempts available for each required module. You only need to master **one** of the attempts. If you fail to master any particular attempt, it does not count against you. You simply make another attempt at that module.

For more information, go to [Modules](https://spark.oit.umass.edu/webct/urw/lc4130011.tp0/cobaltMainFrame.dowebct).

Grading

To earn a C, you must:

1. master 9 Basic modules, including B6 (Thevenin/Norton), of which five are from the first 6 modules (B1 through B6), two are from the next 3 (B7–B9), and two are from the last three (B10–B12);

2. master module I1 (Solving Resistive Networks); and

3. earn at least 175 points in labs and projects.

If you do not meet **all three** of these criteria, your maximum possible grade is C–.

Once you have earned a C, you earn one grade increment (e.g., C to C+) for each of the following:

- Master one additional module.
- Earn 15 "Bonus" points.

There are a number of different ways to earn Bonus points:
Earn at least 7 points on a Basic module before its "Bonus" date (1 point each; 3 attempts/module maximum; B1 through B5 only).

Master an Intermediate level module that is not required (2 points each; I2 and I3).

Fill out a survey (1 point each; 3 surveys maximum).

Attempt a module without mastering it (your best score; 9 points/module maximum).

Earn more than 180 (of 200) points in labs and projects (1 Bonus point for each 5 points above 175; 5 Bonus points maximum).

Attend lecture on dates randomly selected during the semester (1 point each).

**Note:** If you do not satisfy the requirements for a C, the highest possible grade you can earn is C–, no matter how many modules you master and how many Bonus points you have earned.

For more detailed information about grading, go to [Grading](https://spark.oit.umass.edu/webct/urw/lc4130011.tp0/cobaltMainFrame.dowebct). If you are not sure exactly how you will be graded, please talk to Prof. Frasier or Prof. Leonard.

**Exams**

There are **no** evening exams, and there is no final exam. Your grade is determined entirely by your score on computer assignments and the number and type of online modules you master.

**Homework**

There is **no** required homework in this course. However, associated with each Mastery module will be a Practice module, also administered by OWL. Although these are completely optional, they will serve the role of homework, as they help you to prepare to master the required modules. We recommend that you spend about 2 hours working on the Practice module associated with each Mastery module. Note that answering all the Practice questions correctly once does not necessarily mean you are ready to make a Mastery attempt. Use the "Redo Question" button often, so that you can see different contexts and check to make sure you have mastered the material.

**Collaboration vs. Cheating**

You are encouraged to work together on Practice modules and computer assignments; however, you must master required modules on your own, and you must submit your own solutions to computer assignments. Keep in mind that the Practice modules are designed to help you to understand the material and also to prepare you for the Mastery modules, so do not rely too heavily on other students for help. Academic dishonesty (either taking or giving answers on a required module, use of extra crib sheets, theft of another's work, etc.) will be dealt with harshly; you will receive an F for the course, and the Ombuds Office will be notified immediately.

**Rough Course Outline**
0. Motivation and Overview

I. Resistive Circuits
Charge, current and voltage, Ohm's Law and resistance, power, independent and dependent sources, Kirchoff's Laws, nodal and mesh analysis, source transformation, superposition, Thevenin and Norton equivalent circuits, operational amplifiers

II. Basic Time Domain Circuits
Capacitors, inductors, nodal analysis (with R, L, and C), first-order systems (homogeneous and nonhomogeneous), steady-state response, second-order systems

III. Basic Frequency Domain Circuits
Introduction to the Laplace transform, the Laplace transform of circuit components, circuit analysis with the Laplace transform