ECE 110 - Introduction to Electronics

Instructors:

This course is directed by Professor Christopher Schmitz; most recently, it was taught by Professors Schmitz, Viktor Gruev, Hyungsoo Choi, and Kejie Fang. Professors David Varodayan, Patricia Franke, and Serge Minin have also taught this class in the past. Professor Schmitz directs the labs, but all lab sections are taught by graduate teaching assistants (TAs) with the assistance of undergraduate teaching assistants (UAs).

Prerequisites:

Credit or concurrent registration in MATH 220 or MATH 221 is listed as a prerequisite for this course. However, the class rarely touches upon calculus. Students should be comfortable doing simple math quickly, as calculations are done by hand on exams.

The class works well with prior credit or concurrent registration in PHYS 212 because ECE 110 applies the basic physics of electricity and circuits.

When to Take It:

ECE students should take ECE 110 during their first year at Illinois. EE students will want to take ECE 110 during their first semester because the class opens doors to the next level of electrical engineering classes. On the other hand, CompE students would want to take ECE 120 first to gain prerequisites for upper level computer engineering courses.

Some students may consider taking ECE 110 and ECE 120 in the same semester. It is important to note that ECE 120 generally demands a larger time commitment due to its lengthy homework assignments. Typically, students find ECE 110 to be easier than ECE 120.

Class Content:

ECE 110 introduces students to selected fundamental concepts and principles in electrical engineering. The course consists of a lecture and a lab.

The lab portion brings freshman into ECE laboratories during their first year on campus. Throughout the semester, students experiment with procedures utilizing common lab bench equipment such as digital multimeters, oscilloscopes, function generators, and power supplies. The final few lab meetings are dedicated to an open-ended final project, where a default option for the project is building a path-following car.

The lecture portion starts by briefly covering the physical foundation of electronics: energy, power, voltage, and so on. Ohm's Law, Kirchhoff's Current Law, and Kirchhoff's Voltage Law are then introduced. These concepts are used extensively throughout the course. Ethics is briefly discussed. Electrical components such as resistors, capacitors, current sources, voltage sources, and diodes are studied. IV characteristics, Thévenin/Norton equivalents and Nodal analysis are also covered. From there, circuits also containing bipolar junction transistors and field-effect transistors are covered. Then, CMOS logic is briefly covered. The semester ends with the study of basic digital signal processing topics such as noise, sampling, quantization, and compression.

In contrast to many later ECE classes, ECE 110 covers a wide variety of topics. The course gives ECE majors basic circuit analysis skills and a preview at many subdisciplines of Electrical Engineering without going too in depth. The level of math in ECE 110 is not indicative of the rest of the EE curriculum. Students must recognize that future EE courses will require more rigorous math.

Work:

All assigned lecture homework is provided and interactively graded by an online system called PrairieLearn. (In the past the LonCapa system was used for completing homework.) The homework is typically not too hard and should only require a few hours of work each week. ECE 110 is also known for its abundance of office hours where students can work together or receive TA help with the homework. Students attend a three hour lab session, once a week. Each lab has a prelab that should take under an hour. The lab section ends with a 3-4 week culminating final project where students design and build a self-driving car that can navigate some type of obstacle. The nature of the obstacle is chosen by the students and approved by their Graduate TAs. The student's design must contain at least one navigational sensor. Students can receive extra credit by including a second sensor.

Three midterm exams will be administered throughout the semester with a final exam at the end of the semester. All exams will be administered on the computer, specifically in the Computer-Based Testing Facility, with approximately 10 short answer questions. Notes sheets are allowed on each exam. There are a plethora of resources on the course website to aid students preparing for the exams, with previous midterms reaching back to 2014.

Life After:

ECE 110 is the first EE class students take. It is one class that helps students determine whether ECE is right for them. Many of the ideas introduced here will be explained in great depth in higher level courses. It is normal for students to be frustrated at some point during ECE 110, but any student who finds some part of ECE 110 fascinating will be prepared for the challenge ahead. ECE 110 is a prerequisite for ECE 210 - the second core electrical engineering course.