

ECE 331 Electronics Principles I

Prerequisites: ECE 202, MATH 340/345, PH 142
Course Credit: 4 (Lecture and Lab)
Instructor: Tom Chen (thomas.chen@colostate.edu)
Lab TA & Grader: Kevin Cao (Xinzhe.Cao@rams.colostate.edu)
Jacob Alfieri (jalfieri@rams.colostate.edu)
Office: Scott Building, Room 352
Textbook: Lecture notes (required), supplemented by “Fundamentals of Microelectronics” by Behzad Razavi (strongly recommended to own)

Objectives: This course is designed to provide undergraduate students with detailed understanding of basic electronic components, such as diodes, MOSFETs and BJTs, and their applications in single-transistor circuits. Detailed operating principles of these components and the related physics are discussed to help students understand their electrical properties and their usages within the context of rectifiers, amplifiers, and other electronic circuits.

Assessments: Two assessments (tests) are planned during the semester. Students can use any reference books, notes, and calculators to solve problems during the test period. Each assessment lasts a class period. If you fail any assessment, you **MUST** contact the instructor to arrange for remedial actions. Failed to do so will result in your failing the class.

Final Exam: The final exam is open-book, open-notes. Use of calculators is allowed.

Homework: Homework assignments are posted online and they are due at 4pm on the day one week after the date of posting. A dropbox for all homework assignments is located inside the BC infill. Homework solutions will also be posted online.

Laboratory: several laboratory sessions are planned. All lab assignments are turned in to the TA. The lab report must follow the required format. Fail to do so will have a negative impact on your lab grade.

Knowledge Integration: There are three knowledge integration (KI) modules. Each KI module deals with a set of anchoring concepts taught in ECE311, ECE331, and ECE341 and shows how these concepts are integrated in a practical design. A set of questions related to the concepts used in each KI will be distributed before each KI module begins. Students are required to complete the pre-work in the form of a report by working through the questions and to understand how individual concepts are integrated in the practical design. Online presentations by each student to demonstrate his/her understanding of the materials in the first two KIs are required.

Grading:

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| • Laboratory | 25% |
| • Homework | 10% |
| • KI pre-work reports | 4% |
| • KI presentations | 3% |
| • KI peer-peer assessment | 3% |
| • Assessment I | 15% |
| • Assessment II | 15% |

- Final exam 25%
- Math Foundation 2% (extra)

Note:

No credit will be given to any lab work/report submitted after the solutions have been posted and discussed in the class. Thus, each student must complete all pre-laboratory assignments, attend lab sessions and submit a lab report. Lab reports must be done individually.

Topics covered:

1. Review of semiconductor physics
2. Diodes and diode circuits
3. MOS transistors
4. BJT transistors
5. Silicon MOS and BJT transistor fabrication process
6. MOS and BJT equivalent circuit models
7. Single-transistor MOS common source circuit
8. Single-transistor BJT common emitter circuit
9. Single-transistor MOS common gate circuit
10. Single-transistor MOS source follower (common drain circuit)
11. Current source circuits

Office Hours:

Instructor office hours: T, Th, 11:30-1pm or by appointment.

Instructor office telephone: 491 6574.

Instructor email address: thomas.chen@colostate.edu

Lab TAs are Kevin Cao and Jacob Alfieri. Any questions related to the labs should be directed to them during any of the lab hours. Both Kevin and Jacob will also grade HWs. Please direct any questions regarding HWs to them.