Course Description
ECE 3455 - Electronics

Required Course in all BSEE Degree Plans
Required Course in BSCpE Degree Plan

2005 Catalog Data: ECE 3455: Electronics Cr. 4 (3-4). Prerequisites: ECE 2300, 2100, 2317, approved technical communications course, and credit for or concurrent enrollment in ECE 3337 Signal and amplifier concepts. Operational amplifiers. Diodes and non-linear circuits. Bipolar junction transistors. Biasing, small and large signal analysis. Transistor amplifiers. Concepts of logic circuits. TTL circuits.

Note: The course has been changed to remove TTL circuits, which are covered in ECE 3457. Future catalogs will reflect this change.

Textbook: Microelectronic Circuits, 5th Ed., Sedra/Smith, Oxford University Press., 2004

Course Coordinator: David P. Shattuck, Associate Professor in Electrical and Computer Engineering.

Schedule: This course meets 3 hours per week during a fall or spring semester, typically meeting twice a week for an hour and a half. There are typically 14 weeks of meeting time in a semester. Exams are given on Saturdays, outside of class meeting times. Students work in the laboratory on an unscheduled basis. It is frequently offered during the summer as well.

Laboratory Experiments and Activities:

1. Dependent sources; use of the oscilloscope.
2. Bode plots and frequency response
3. Operational amplifiers, including design of op amp amplifiers.
4. Diodes and diode circuit analysis
5. Non-linear circuits
6. Power supplies
7. BJT amplifiers
8. Design Project - Groups of four or five students design, build, test, and demonstrate a project that performs functions as written in specifications. To earn an "A", the group must write their own specifications, and get them approved. After demonstrating their projects, each of the students write a formal report, by themselves, describing their project.

Expected Course Outcomes:

1. To give each student a solid knowledge-base in the fundamentals of electrical and computer engineering. This course provides a basic understanding of amplifiers, device modelling, digital circuits, and frequency response of amplifiers. (Program Course Outcome #2)

2. To develop in each student the basic skills of problem solving and critical thinking. Coordinated lecture, homework, examinations, quizzes and laboratory exercises and projects require the students to think critically and use engineering concepts, and practice and develop problem solving techniques. (Program Course Outcome #3)

3. To give each student a significant modern laboratory experience, including performing measurements as well as the analysis and interpretation of data. This course provides "hands-on" coordinated laboratory exercises and a major group project that require design, analysis and performance evaluation. These activities are graded and form a part of this course grade. (Program Course Outcome #4)

4. To develop in each student the team-working skills necessary to perform effectively as an engineer. On the design projects, students in the class are formed in teams of four or five students. Each single team design solution is evaluated and graded. The project is graded as a whole, and then the grade for each student is assigned based on the team member's assessment of each member's contribution. (Program Course Outcome #5)

5. To develop in each student good writing skills so that they are able to communicate technical material effectively and clearly. A major formal report is submitted on the project by each team member individually. These reports are graded on the basis of clarity, grammar, spelling, punctuation, adherence to a specified format, and technical content. (Program Course Outcome #6)

6. To develop in each student good oral communication skills so that they are able to communicate effectively with others. The project teams must present their project orally to the instructor. While, not all students are required to present, the grade of each member is affected by the quality of the presentation. (Program Course Outcome #7)

7. To impart to each student a sense of ethical and professional responsibility. An understanding of professional and ethical responsibility is obtained through the strict enforcement of the Academic Honesty Policy of the University, which applies to all projects and exams. Particular emphasis is placed on plagiarism in the context of the formal report. (Program Course Outcome #8)

Course Topics:

1. Course introduction; basic signal concepts (3 hours)
2. Amplifiers, transfer characteristics, saturation, linear regions. (3 hours)
3. Frequency response and Bode plots. (4.5 hours)
4. Op Amps, negative feedback, and amplifiers using op amps (4.5 hours)
5. Diodes, diode models, and diode circuit analysis, rectifiers and power supplies (6 hours)
6. Non-linear circuits, comparators, multivibrators (1.5 hours)
7. Bipolar junction transistors, transistor action, and dc analysis of transistor circuits (6 hours)
8. Transistor amplifiers and ac models (3 hours)
9. Project description and formal reports (3 hours)
10. Quizzes and course reviews (4.5 hours)
11. Other topics as time allows (e.g. Miller's theorem, h-parameters, biasing concepts) (3 hours)

ABET Categories: Math/Basic Sciences: 0 semester hours, Engineering Topics (Engineering Science: 2.5 semester hour, Engineering Design: 1 semester hours), General Education: 0.5 semester hours, Other: 0 hours.

Prepared By: David P. Shattuck, Associate Professor of Electrical and Computer Engineering, May 23, 2005.