Department of Electrical and Computer Engineering
University of Massachusetts Amherst

ECE 324: *Electronics II*
Spring 2018

Catalog Data: Lecture plus lab sessions. Design of more advanced electronic circuits including analog integrated circuits, output/driver stages, feedback amplifiers, timing circuits, and mixed-signal analog/digital circuits. Three design projects and a term project are required. 3 credits.

Objectives: After successfully completing this course, a student should be able to:

1. Design, simulate and prototype circuit blocks based on intermediate level concepts in analog and digital electronics.
2. Design and prototype a small electronic system consisting of several analog/digital circuit blocks to meet a given functional specification.
3. To communicate effectively through oral, written and symbolic expression.
4. Organize a project and work successfully in a team environment.

Prerequisites: Passing grade in ECE 323

Instructor: R. W. Jackson, 215G Marcus, jackson@ecs.umass.edu

Office Hours:

Professor Jun Yao, 213 Marcus, juny@umass.edu

Office Hours:

Teaching Assistants: Hua Bai, Marston 221, huab@umass.edu

Office Hours: TBD

Randy Kwende, Marston 221, rkwende@umass.edu

Office Hours: TBD

Lectures: MWF 11:15 AM-12:05 PM, Elab 303

Laboratories: Lab section 1 – Tu 2:30 - 5:30 (see schedule); Marston 221
Lab section 2 – W 2:30 - 5:30 (see schedule); Marston 221

Textbook: Required text: A.S. Sedra, and K.C. Smith, *Microelectronic Circuits*, Oxford University Press, 7th ed.

Course Overview: The first part of this course will be similar in structure to ECE323. There will be a mixture of lecture and laboratory with three design projects that are focused on the lecture material. There will be two midterm exams covering this material.

In the second part of the course (after spring break) students will work only on the term project. There will be no lectures, only project consultations, progress reports, and demonstrations. There will be no final exam, but a term project report must be submitted at the end of the semester.

Grading policy:		
	Three focused design projects	20% of total grade
	Two Midterms	35% of total grade
	Term design project	40% of total grade
	Homework	5% of total grade

Focused Design Projects:

(1) Each focused project will be graded primarily on the preparatory design/simulation ("prelab report"). **The prelab reports are due before 2:30pm on the Tuesday of lab weeks, regardless of lab section. See course schedule or Moodle for more details. The prelab report should be the work of a single student alone.** Students who turn in a design that duplicates the design submitted by another student will cause all the students involved to get zero credit.
(2) An example prelab report is available on the course Moodle site.
(3) The prelab report grade will not be recorded (a grade of zero) unless that student completes the laboratory portion of the project. All laboratory results will be certified as complete by the laboratory instructor or T.A.
(4) **In order to pass the course**, a student must have a passing grade on each of the design projects.

Focused Design Project 1: Two-Stage BiCMOS Amplifier
Focused Design Project 2: Design of a Simplified "op-amp"
Focused Design Project 3: Compensating a Feedback Amplifier

Term Design Project

Students will form teams of three to work on their term design projects. Each team will be assigned one project from a group of several projects that have been prepared for this course. These projects are significantly more complicated and less constrained than the focused projects. Students must also consider cost and part count in their design work. The project will be graded 10% on an oral progress report, 50% on an end-of-term demonstration, and 40% on a final written report. Each team member's contribution to the team effort will be assessed in the final determination of project grades.

Titles of the available projects are listed below. More detailed project descriptions will be put on the course website near the beginning of the term. Student preferences in team members and in project assignments will be given as much consideration as possible. Near the end of February, your preferences will be solicited. At the beginning of March projects and teams will be assigned.

Each team will do the design of one of the following term projects:

(1) Time Division Multiplexed Audio Link, (2) AM Radio Transmitter & Receiver, (3) Heart Rate Monitor, (4) Infrared Audio Link, (5) Temperature Controller(Two versions), (6) Switching Voltage Regulator

Supplemental References:

Best, *Phase-Locked Loops*, McGraw-Hill, 1984.

Coughlin and Driscoll, *Operational Amplifiers In Linear Integrated Circuits*, Prentice Hall, 1982.

Ghausi, *Electronic Devices and Circuits*, HRW, 1985.

Glasford, *Analog Electronic Circuits*, Prentice Hall, 1986.

Horenstein, *Microelectronic Circuits and Devices*, Prentice Hall , 1990.

Horowitz and Hill, *The Art of Electronic Design*, Cambridge University Press, 1989.

Pederson and Mayaram, *Analog Integrated Circuits for Communication*, Kluwer, 1991.

Jacob, *Applications and Design with Analog Integrated Circuits*, Prentice Hall, 1993.

Razavi, *Fundamentals of Microelectronics*, John Wiley & Sons, 2008.

Savant et al., *Electronic Circuit Design*, Benjamin/Cummings, 1987.

Jaeger, *Microelectronic Circuit Design*, McGraw-Hill, 1997.

Soclof, S., *Design and Applications of Analog Integrated Circuits*, Chapter 11, Prentice Hall, 1991.

Professional Component: Credits of engineering science 1; Credits of design 2

Relationship of course objectives to program outcomes:

PROGRAM OUTCOMES	COURSE OBJECTIVES			
	1	**2**	**3**	**4**
a. Able to apply knowledge of mathematics, science, and engineering	Y	N	N	N
b. Able to design and conduct experiments, as well as to analyze and interpret data	Y	Y	N	N
c. Able to design a system, component, or process to meet desired needs within realistic constraints	Y	Y	N	N
d. Able to function on multi-disciplinary teams	N	N	Y	Y
e. Able to identify, formulate, and solve engineering problems	Y	Y	N	N
f. Understands professional and ethical responsibility	N	N	N	Y
g. Able to communicate effectively	N	N	Y	N
h. Understands the impact of engineering solutions in a global, economic, environmental, and societal context	N	N	N	N
i. Recognizes the need for, and is able to engage in, life-long learning	N	Y	N	N
j. Has knowledge of contemporary issues	N	N	N	N
k. Able to use the techniques, skills and modern engineering tools necessary for engineering practice	Y	Y	N	N