

**University of Massachusetts Amherst  
Department of Electrical and Computer Engineering**

**E&C-Eng 575 Introduction to Analog Integrated Circuits (3credits)  
Fall 2015**

- Course Abstract:** This course covers the basics of analog integrated circuit design. Topics include standard circuit building blocks such as current mirrors, voltage references, single stage amplifier topologies, differential pairs. Device models, bias choices, temperature effects, the body effect, and mismatch. Op-amp and OTA design as well as frequency response, stability, and compensation. Noise analysis is applied to various circuit configurations. More complex topics will be discussed if time permits. Prerequisite: E&C-ENG324 or equivalent
- Objectives** Students will develop the basic skills necessary for the design of the building blocks used in more complicated analog integrated systems.
- Prerequisites:** An undergraduate course in analog electronics
- Instructor:** Professor Robert W. Jackson, 215G Marcus Hall  
Phone: (413) 545-1386  
email: [jackson@ecs.umass.edu](mailto:jackson@ecs.umass.edu)
- Office Hours:** Tuesday/Thursday 3-4 pm
- Lecture Schedule:** Tuesday/Thursday 10:00-11:15 Elab 306
- Grading Policy:** Homework 20%  
Midterm: 35%  
Final Exam: 45%
- Text:** *Analog Integrated Circuit Design* by T. C. Carusone, D. A. Johns and K. Martin, J. Wiley, 2nd edition
- Additional References:** *Analysis and Design of Analog Integrated Circuits* by Gray and Meyer, J. Wiley publisher  
*Design of Analog CMOS Integrated Circuits* Behzad Razavi, McGraw-Hill , 2001.  
*CMOS Analog Circuit Design*, by Allen, & Holberg, Oxford, 2<sup>nd</sup> Edition

Topics/Schedule

Sections	Topics	# Lectures (tentative)
1.2, 1.4, 1.6	MOS Devices and IC passives	3
2.2, 2.4	IC structure	1
Ch3	Basic circuit types	2
Ch4	Frequency response	3
Ch5	Feedback and Stability	2
6.1, 6.2	Op-amp design & compensation	2
6.3	Advance current mirrors	1
6.4, 6.5	Other opamp configurations	1
6.6	Settling time	1
6.7, 6.8	Differential amplifier	1
Ch7	Voltage/Current references	1
9.1-9.4	Noise	3
9.5	Linearity	1
Ch 10	Comparators	2
Ch 12	Filters (if time permits)	3
Total lectures		27

**Professional Component:** Credits of engineering science: **3**; Credits of design: **1**  
**Prepared by:** R. W. Jackson

<b>PROGRAM OUTCOMES</b>	<b>COURSE OBJECTIVE</b>
1. Well grounded in the fundamental concepts of math, physics, chemistry, computer science, and engineering science	Y
2. Able to identify, formulate and solve problems in ECE	Y
3. Able to design and conduct experiments, and to analyze and interpret measured data	N
4. Capable of designing analog and digital systems, components, and processes to meet desired needs	Y
5. Proficient in using modern engineering techniques and computing tools for effective engineering practice	Y
6. Experienced in engineering teamwork and in solving technically diverse problems	N
7. Able to communicate effectively orally and in writing, and through symbolic and graphical expression	N
8. Aware of professional and ethical responsibilities as engineers	N
9. Aware of the impact of ECE technology and decisions on society	N
10. Motivated about the importance of lifelong learning and professional development	N

### **Accommodation Policy Statement**

Include this or a similar accommodation policy:

The University of Massachusetts Amherst is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with Disability Services (DS), Learning Disabilities Support Services (LDSS), or Psychological Disabilities Services (PDS), you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements.

### **Graduate School Interim Statement on Academic Honesty**

It is expected that all graduate students will abide by the Graduate Student Honor Code and the Academic Honesty Policy (available at the Graduate Dean's Office, the Academic Honesty Office (Ombud's Office) or online at [http://www.umass.edu/gradschool/handbook/univ\\_policies\\_regulations\\_a.htm](http://www.umass.edu/gradschool/handbook/univ_policies_regulations_a.htm)). Sanctions for acts of dishonesty range from receiving a grade of F on the paper/exam/assignment or in the course, loss of funding, being placed on probation or suspension for a period of time, or being dismissed from the University. All students have the right of appeal through the Academic Honesty Board.