ECE 6412  ANALOG INTEGRATED-CIRCUIT DESIGN  Spring 2023

INSTRUCTOR:  Prof. Gabriel A. Rincón-Mora, Ph.D.
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LECTURES:  Tuesdays/Thursdays at 5:00–6:15 p.m. in Van Leer 283

Q & A SESSIONS:  Thursdays at 9:30–10:30 a.m. with Zoom

COURSE URL:  Rincon-Mora.gatech.edu/classes

SYLLABUS:  Linked under "ECE 6412 Analog Integrated Circuit Design" link

COURSE DESCRIPTION:  ECE 6412 extends the concepts of semiconductor devices, integrated circuits (ICs), and applications begun in ECE 3040, ECE 3400, and ECE 4430. The material presents, explains, and shows how to understand, develop, and use semiconductor devices to model, analyze, and design transistor-level analog ICs with and without feedback using bipolar and CMOS technologies. The underlying aim is to cultivate and develop insight and intuition for how semiconductor devices work individually and collectively in microelectronic circuits. The material presents an engineering perspective on design that transcends math and fosters innovation.

PREREQUISITE:  ECE 4430 Analog Integrated Circuits or equivalent

EDUCATIONAL OUTCOMES:  Upon successful completion of this course, students should be able to:
1. Analyze and design operational amplifiers.
2. Analyze and design linear voltage regulators.
3. Analyze and design comparators.
4. Analyze and design reference circuits.

GRADE COMPOSITION:  Midterm Exam = 30%
Assignments = 30%
Final Exam = 35%
Professionalism: Adherence to syllabus & ECE policies. = 5%
Possible extra credit for distinguishable and extraordinary effort & professionalism.

IMPORTANT DATES:  First Day of Class January 10 (Tuesday)
Midterm Exam February 28 (Tuesday)
Last Day to Drop Course March 15 (Wednesday)
School Recess March 20–24 (Monday–Friday)
Last Day of Class April 25 (Tuesday) – Last assignment due on this date
Final Exam April 27 (Thursday) at 6:00–8:50 p.m.


MOSFETs: www.amazon.com/dp/107788821X.
CMOS Analog Circuit Design (any edition), Oxford University Press.

ADVICE:  Review material presented after each lecture, write notes, and ask questions.
Bring book to class, mark figures/equations presented, and refer to them in your notes.
COURSE EXPECTATIONS AND GUIDELINES

*Format

IN CLASS: No auditors allowed.
  Be seated and ready before class begins.
  Cellular phones, laptops, and tablets must be off and out of sight.
  No smoking or eating in class.
  Students are responsible for all material and information announced in class and over e-mail.

EXAMS: No textbooks or notes allowed.
  Calculators cannot be used in the programmable mode.
  No make-up exams (without prior approval two or more weeks in advance).
  In case of medical emergencies, work with the Office of the Dean of Students.
  Grades become final one week after exams are graded and returned.
  *List problems in numerical order, circle and mark answers clearly, and staple pages together.

ASSIGNMENTS:
  No collaboration allowed (unless otherwise stipulated).
  No late submissions without prior approval (request should be received before due date).
  Allowed late submissions lose 20% for each day they are late (including weekends).
  Grades become final one week after they are available.
  *Attach a cover sheet that includes course name and number, your name, date, and assignment number.
  *List problems in numerical order, circle and mark answers clearly, and staple pages together.

PREPARING FOR CLASS: Review previous lecture and read ahead (material that will be covered that day).

PREPARING FOR EXAMS: Review lectured slides and notes and re-do examples and assignments (without the key).

ASSISTANCE: Provided in direct proportion to demonstrated effort in your own attempts to understand and resolve misunderstandings.

ACADEMIC INTEGRITY: All Georgia Tech (GT) students must know and follow GT's Academic Honor Code (www.catalog.gatech.edu/policies/honor-code). In accordance with the Honor Code, I expect your cooperation in reporting suspicious acts relating to academic misconduct. I must and will therefore report all instances of academic dishonesty to the Office of Student Integrity, who will investigate incidents and mandate appropriate penalties for violations. So out of respect for your peers, professors, Georgia Tech, and alumni, please do not engage in dishonest activities in or outside of class.

STUDENT–FACULTY EXPECTATIONS: At Georgia Tech, we strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and students. See catalog.gatech.edu/rules for basic expectations that you can have of me and I of you. Respect for knowledge, hard work, and cordial interactions will help build the environment we seek, so please remain committed to these ideals in and outside of class.

INSTITUTE ABSENCE POLICY: See Georgia Tech's policies on absences at www.catalog.gatech.edu/rules/4.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES: If you have learning needs that require special accommodations, schedule an appointment with the Office of Disability Services at disabilityservices.gatech.edu to discuss your needs and send me a note that explains your situation and their recommendations before the second week of classes begins.

COURSE OUTLINE

1. Analog Electronics
2. Analog Primitives
3. Feedback
4. Differential Stage
5. Operational Amplifiers
6. Linear Voltage Regulators
7. Comparators
8. Reference Circuits