**ECE 6412**

**ANALOG INTEGRATED-CIRCUIT DESIGN**

**Spring 2021**

**INSTRUCTOR:** Prof. Gabriel A. Rincón-Mora, Ph.D. (URL: Rincon-Mora.gatech.edu)  
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**LECTURES:** Mondays/Wednesdays at 5:00–6:15 p.m. in Van Leer 283 (when on campus)

**OFFICE HOURS:** Weekly BlueJeans sessions to be announced.

**COURSE URL:** Rincon-Mora.gatech.edu/classes  
**SPICE Simulator:** Under "Reference Material and downloads"  
**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.
5. Use SPICE to simulate analog integrated circuits.

**GRADE COMPOSITION:**  
Midterm Exam = 30%  
Assignments = 35%  
Final Exam = 35%

**IMPORTANT DATES:**  
School Holiday January 18 (Monday)  
First Day of Class January 20 (Wednesday)  
Midterm Exam March 8 (Monday)  
Last Day to Drop Course March 17 (Wednesday)  
School Recess March 24 (Wednesday)  
Last Day of Class April 26 (Monday) – Last assignment due on this date.  
Final Exam April 30 (Friday) at 6:00–8:50 p.m.


**REFERENCES:**  
*MOSFETs*: www.amazon.com/dp/107788821X.  
*Analog IC Design with Low Dropout Regulators, 2nd Ed.*, McGraw-Hill.  
*CMOS Analog Circuit Design* (any edition), Oxford University Press.

**ADVICE:**  
Review material presented after each lecture. Write notes. Ask questions.  
Start working on assignments when first announced so questions can be posed early.
COURSE EXPECTATIONS AND GUIDELINES

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.
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 "ECE 3400", your name, date, and assignment number.
*List problems in numerical order, circle and mark answers clearly, and staple pages together.

SPICE: Only text version of SPICE allowed.
*Label all nodes, voltages, currents, and component values in schematics.
*Highlight important information and remove unnecessary details from SPICE-generated results.

PREPARING FOR CLASS: Review previous lecture before each lecture. Read ahead (slides and text).

PREPARING FOR EXAMS: Review lectured slides, notes, examples, and assignments
(and text for supplementary information).

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 the classroom and anywhere at and outside of Georgia Tech.

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 afterwards that explains your situation and their recommendations.

TENTATIVE COURSE TOPICS

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