GEORGIA INSTITUTE OF TECHNOLOGY

School of Electrical and Computer Engineering

ECE 6412 **ANALOG INTEGRATED CIRCUIT DESIGN** **Fall 2016**

INSTRUCTOR:	Prof. Gabriel A. Rincón-Mora, Ph.D. (users.ece.gatech.edu/rincon-mora) E-Mail Address: Rincon-Mora@gatech.edu, Atlanta Office: Van Leer 482 Administrative Assistant: TBD E-Mail Address: TBD, Office: TBD
TIME AND LOCATION:	Days at Times in Location TBD
Q & A SESSIONS:	To be announced
BOOKS: REQUIRED	G.A. Rincón-Mora, *Analog IC Design: An Intuitive Approach*, *Fourth Edition (v. 4)*, from www.lulu.com/content/4943580.
REFERENCES	G.A. Rincón-Mora, *Analog IC Design with Low Dropout Regulators*, *Second Edition*, McGraw-Hill, 2014 [for devices, circuits, feedback, and reference circuits]. P.E. Allen and D.R. Holberg, *CMOS Analog Circuit Design* (any edition), Oxford University Press [for op amps and comparators]. P. Gray, P. Hurst, S. Lewis and R. Meyer, *Analysis and Design of Analog Integrated Circuits* (any edition), John Wiley and Sons, Inc. [for general information]. SPICE or PSPICE Reference Manual (from class URL).
PREREQUISITE:	ECE 4430 Analog Integrated Circuits (or equivalent)
SPICE SIMULATOR:	Software accessible via the URL for the class.
CLASS URL:	users.ece.gatech.edu/rincon-mora under link for "Classes" and sub-link for "ECE 6412".

Course Objective: 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 negative feedback using bipolar and CMOS technologies. The underlying aim of this course is to develop *insight* and *intuition* for how semiconductor devices work individually and collectively in microelectronic circuits. Ultimately, the material seeks to furnish a physical and intuitive view of solid-state circuits that transcends mathematical and algebraic formulations to empower practicing engineers with the tools necessary to design ICs that perform practical and complex analog functions.

Course-Grade Composition:	Midterm	= 30%
	Assignments and Design Projects	= 30%
	Final Examination	= 35%
	Professionalism (i.e., adherence to syllabus and ECE policies)	= 5%

Important Dates:	First Day of Class	Date (Day) TBD
	Midterm	Date (Day) TBD
	School Recess	National Day October 1–7 (Saturday–Friday)
	Last Day to Drop Course	October 29 (Saturday)
	Last Day of Class	Date (Day) TBD (Last assignment due on this date)
	Final	Date at Time (Day) TBD

Important: **WHEN IN DOUBT, PLEASE STOP ME DURING LECTURE AND ASK QUESTIONS**, but refrain from asking questions about material missed because of class absences.

COURSE EXPECTATIONS AND GUIDELINES

In Class: No auditors allowed.
All students must be in their seats before class begins.
Cellular phones, laptops, and tablets must be off and out of sight.
No smoking, eating, or drinking in class.
All students are responsible for all material covered and assignments 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 securing approval weeks before the date of the test.
Grades become final one week after tests are returned.
Pages must be stapled and problems must be in numerical order (bring a small stapler if necessary).
All answers must be circled and marked clearly.

HW: Collaboration between students is allowed and encouraged, unless otherwise stipulated.
Submitted assignments must be unique – identical assignments split grade.
Late submissions lose 20% of the grade for each day they are late, including weekends.
No electronic "e-mail" submissions allowed.
Grades become final one week after they are available.
Staple and include a cover sheet with ECE 6412, your name, date, and assignment number.
Use only text version of SPICE and include netlist and control text used to generate all SPICE results.
Label all nodes, voltages, currents, and component values in schematics.
Circle answers clearly and list problems in numerical order.
Ensure methods used to obtain solutions are clear.
Highlight important information and remove unnecessary details from SPICE-generated results.

Preparing for Class: Review the sections in the book and references that correspond to the topics outlined in this syllabus and discussed in class. Review lecture slides, examples, and assignments when preparing for exams.

Assistance: The TA (if one is available for the class) and I will provide assistance in direct proportion to the written efforts demonstrated in your own attempts to understand the concepts and solve the problems in question.

Missed Lectures: Contact one of your peers for missed assignments, announcements, and material covered in class.

Academic Integrity: Georgia Tech's Academic Honor Code is described at www.deanofstudents.gatech.edu. All Georgia Tech students must know and follow these rules, and instructors must evaluate each student individually and as fairly as humanly possible. In accordance to 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 the Dean of Students*." So out of respect for your peers, professors, Georgia Tech, and alumni, which includes me, please do not engage in dishonest activities in the classroom or at Georgia Tech.

Accommodations for Individuals with Disabilities: If you have learning needs that require special accommodations, please send me a note and schedule an appointment with the ADAPTS office (www.adapts.gatech.edu) to discuss any special needs.

Student–Faculty Expectations: At Georgia Tech, we strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and students. See www.catalog.gatech.edu/rules/22.php for basic expectations that you can have of me and I of you. Simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek, so please remain committed to these ideals while in this class.

TENTATIVE COURSE TOPICS

1. Introduction
2. Overview of Microelectronic Devices
3. Overview of Single-Transistor Primitives
4. Analog Building Blocks
5. Negative Feedback
6. Operational Amplifiers
7. Comparators
8. Reference Circuits