**ECE 6412**  
**ANALOG INTEGRATED-CIRCUIT DESIGN**  
**Fall 2018**

**INSTRUCTOR:** Prof. Gabriel A. Rincón-Mora, Ph.D. (URL: Rincon-Mora.gatech.edu)  
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**CLASS URL:** Rincon-Mora.gatech.edu/classes.

**SYLLABUS:** Linked under link "ECE 6412" on class URL.

**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 negative 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. For this, the presentation seeks to furnish an intuitive view of ICs that transcends mathematical and algebraic formulations to empower engineers with the tools necessary to design ICs that perform practical and complex analog functions.

**PREREQUISITE:** ECE 4430 Analog Integrated Circuits (or its equivalent)

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

**SPICE SIMULATOR:** Software accessible from class URL.

from www.lulu.com/content/4943580 or eChapters from Rincon-Mora.gatech.edu.

SPICE or PSPICE Reference Manual (available from class URL).

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

**MEETING TIMES:** At 3:10 p.m. 2–3 times/week for 220–225 minutes/week (as specified below).

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<thead>
<tr>
<th>3-Cr. 50-min. MWF in Atl: 150 min./week</th>
<th>3-Cr. ECE 6412: 225–226 min./week</th>
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<tr>
<td>First Day  Aug. 20 (Mon)</td>
<td>110-min. MW Aug. 20, Sep. 3, 10, 17, Oct. 8, 22, 29</td>
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<tr>
<td>Labor Day  Sept. 3 (Mon)</td>
<td>75-min. MWF Aug. 27, Oct. 15</td>
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<td>Fall Recess  Oct. 8–9 (Mon–Tue)</td>
<td>80-min. Midterm Sep. 26 (Wed) + 30-min. Recorded Lecture</td>
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<td>Thanksgiving Nov. 21–23 (Wed–Fri)</td>
<td><strong>Total Minutes:</strong> 14(110) + 6(75) + 110 min. = 2100 min.</td>
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<td>Last Day  Dec. 4 (Tue)</td>
<td>Drop Date Oct. 27 (Sat)</td>
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<td><strong>Total Minutes:</strong> 42 × 50 min. = 2100 min.</td>
<td>Last Day Oct. 31 (Wed) – Last assignment due</td>
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<td>Final Nov. 2 at 10:15–1:05 p.m. (Fri)</td>
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**TIME FOR QUESTIONS:** During and after class for on-campus students and over e-mail for on-line students.
**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.
  
  Watch all lectures.

**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).
  
  Late submissions lose 20% for each day they are late (including weekends).
  
  Grades become final one week after they are available.
  
  *Submit over e-mail as PDF files.
  
  *Attach a cover sheet that includes "ECE 6412", your name, date, and assignment number.
  
  *List problems in numerical order, circle and mark answers clearly, and staple pages together.

**SPICE:**
- Use only text version of SPICE.
  
  *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.
  
  Read ahead (slides and corresponding references).

**PREPARING FOR EXAMS:**
- Review lectured slides, notes, examples, and assignments.

**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 (linked at 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, which also includes me, please do not engage in dishonest activities in the classroom and anywhere at and outside of Georgia Tech.

**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.

**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.

**TENTATIVE COURSE TOPICS**

1. Introduction
2. Review of Microelectronic Devices
3. Review of Single-Transistor Primitives
4. Analog Building Blocks
5. Negative Feedback
6. Operational Amplifiers
7. Comparators
8. Reference Circuits (as time allows)