GEORGIA INSTITUTE OF TECHNOLOGY
School of Electrical and Computer Engineering

ECE 8813 **POWER INTEGRATED CIRCUIT DESIGN** **Fall 2015**

INSTRUCTOR:	Prof. Gabriel A. Rincón-Mora, Ph.D. (www.Rincon-Mora.com) E-Mail Address: Rincon-Mora@gatech.edu, Office: Van Leer 482
TIME AND LOCATION:	Mondays and Wednesdays at 3–4:50 p.m., unless otherwise noted below.
OFFICE HOURS:	To be announced
REQUIRED BOOK:	G.A. Rincón-Mora, *Power IC Design*, Fifth Edition, Lulu, 2015.
FOR REFERENCE:	G.A. Rincón-Mora, *Analog IC Design with Low Dropout Regulators*, *Second Edition*, McGraw-Hill, 2014. A. Pressman, *Switching Power Supply Design*, *Third Edition*, McGraw-Hill, 2009.
USEFUL REFERENCE:	SPICE or PSPICE Reference Manual (from class URL).
PREREQUISITE:	ECE 4330 Power Electronics or ECE 4430 Analog Integrated Circuits (or equivalent)
SPICE SIMULATOR:	Software accessible via the URL for the class.
CLASS URL:	www.Rincon-Mora.com/classes under the link for "ECE 8813".

Course Objective: The course extends the concepts of analog and power circuits begun in ECE 4330 and 4430 and applies them to integrated circuits (ICs) used to energize and power portable microelectronic devices. The course teaches how to design ICs that draw, condition, and supply power to sustain, among others, sensor, interface, processing, and telemetric functions. The aim is to cultivate and develop the skillset necessary to model (steady state and across frequency), analyze (steady-state, across-frequency, and time-domain signals), and design transistor-level power-supply circuits using bipolar and CMOS technologies. So after establishing what a typical system requires, the course first reviews analog concepts like frequency response, analog building blocks, and negative feedback. With that foundation in hand, linear regulator ICs and systems are next, from feedback control to power-supply rejection. The course ends with switched-inductor dc–dc converters, from power stages to frequency response and feedback control. The material places emphasis on basic and intuitive understanding of circuits and systems that transcends mathematical and algebraic formulations to empower a practicing engineer to design practical power-conditioning systems.

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	August 17 (Monday)
National Holiday	October 5 and 7 (Monday and Wednesday)
No Class	September 9 and October 12 (Monday)
Make-up Days	Sept. 3 (Thursday) and 25 (Friday) and Oct. 13 (Tuesday)
Midterm	September 21 (Monday)
Last Day to Drop Course	October 25 (Sunday)
Final	November 2 (Monday) at 9–11:50 a.m.

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 RULES

In Class: All students must be in their seats before class begins.
Cellular phones, laptops, and tablets must be off and out of sight.
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 an approval well 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 clearly marked and circled.

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

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: 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 Honesty: 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.

Special Circumstances: If you have a disability that requires special accommodations, please send me a note and schedule an appointment with the ADAPTS office (www.adapts.gatech.edu) to discuss any special needs.

TENTATIVE COURSE TOPICS

1. Microelectronic Systems
2. Review of Analog Electronics
3. Linear-Regulator ICs
4. Linear-Regulator Systems
5. Switched-Inductor DC–DC Supplies
6. Switched-Inductor DC–DC Systems
7. Voltage References (if time permits)