GEORGIA INSTITUTE OF TECHNOLOGY  
School of Electrical and Computer Engineering

**ECE 6445**  
**POWER INTEGRATED-CIRCUIT DESIGN**  
Fall 2017

**INSTRUCTOR:** Prof. Gabriel A. Rincón-Mora, Ph.D. (URL: Rincon-Mora.gatech.edu)  
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**TEACHING ASSISTANT:** Shared by Nan Xing at nxing3@gatech.edu and Siyu Yang at jimsyyang@gatech.edu

**CLASS TIMES:** Mondays and Wednesdays at 3:10–5:00 p.m. unless otherwise noted below.

**TIME FOR QUESTIONS:** As described in guidelines that follow.

ISBN: 9781312146174 (More information at Rincon-Mora.gatech.edu.)

**REFERENCES:**  
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.

**SYLLABUS:** Posted on line at the URL for the class.

**CLASS URL:** Rincon-Mora.gatech.edu/classes under link titled "ECE 6445".

**Course Objective:** ECE 6445 extends the concepts of analog and power circuits discussed in ECE 4330 and 4430. The presentation reflects the *top–down design* systems-to-circuits approach that industry adopts when developing power-supply microchips. With this framework, the material presents, explains, and shows how to understand, develop, and use semiconductor devices to model, analyze, and design integrated circuits (ICs) that supply and sustain microelectronic loads. As such, some of the topics covered include power consumption, frequency response, feedback control, and power-supply rejection. The ultimate objective is to cultivate and develop *insight and intuition* for how circuits draw, condition, and deliver power. In other words, the presentation seeks to provide a physical and intuitive view of devices and circuits that transcends mathematical and algebraic formulations to empower engineers with the tools necessary to design practical and high-performance power supplies.

**Course-Grade Composition:**  
Midterm = 30%  
Assignments and Design Projects = 30%  
Final = 35%  
Professionalism: Adherence to syllabus and ECE policies. = 5%  
Possible extra credit for distinguishable and extraordinary effort and professionalism.

**Important Dates:**  
First Day of Class August 21 (Monday)  
Recess October 1 and 7 (Sunday–Saturday)  
Unusual Class Days September 1 and 22 (Friday)  
Midterm September 20 (Wednesday)  
Last Day to Drop Course October 28 (Saturday in Atlanta)  
Last Day of Class October 30 (Monday) (Last assignment due)  
Final November 3 at 9–11:50 a.m. (Friday)

**Important:** WHEN IN DOUBT, PLEASE STOP ME DURING LECTURE AND ASK QUESTIONS, but refrain from asking questions about material from missed lectures.
COURSE EXPECTATIONS AND GUIDELINES

All: All students are responsible for all material and information announced in lecture and over e-mail. 
E-mail concise on-line questions to TAs with instructor copied.

In Class: Be seated in class before class begins.
Cellular phones, laptops, and tablets must be off and out of sight.
No smoking, eating, or drinking in class.

On Line: Watch videos on noted lecture days after 12 p.m. Eastern (lectures should be posted by that time).
E-mail questions from lecture on the same day (no out-of-sync questions).
1 question per student per lecture may be answered via video (TAs will answer others over e-mail).
Proctor will administer exams on exam days noted at times to be specified.

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.
Work with the Office of the Dean of Students in case of medical emergencies.
Staple pages together (bring a stapler if necessary) and list problems in numerical order.
Circle and mark answers clearly and unambiguously.
Grades become final one week after exams are graded and returned.

Assignments: Submit up to 1-MB unprotected PDF files over e-mail to TAs and instructor.
Late submissions lose 20% of the grade for each day they are late, including weekends.
No collaboration allowed, unless otherwise stipulated.
Include a cover sheet with ECE 6445, 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.
List problems in numerical order and circle and mark answers clearly and unambiguously.
Ensure methods used to obtain solutions are clear.
Highlight important information and remove unnecessary details from SPICE-generated results.
Grades become final one week after they are available.

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 your demonstrated efforts in trying to resolve your questions and misunderstandings.

Academic Integrity: All Georgia Tech students must know and follow Georgia Tech's Academic Honor Code (described 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 includes me, please do not engage in dishonest activities in the classroom or anywhere at Georgia Tech.

Accommodations for Individuals with Disabilities: If you have learning needs that require special accommodations, please send me an e-mail message and schedule an appointment with the Office of Disability Services at disabilityservices.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. 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. Powering Microsystems
3–4. Switched-Inductor Supplies and Circuits:
   Operation, losses, response, control, and circuits
2. Analog Electronics
5–6. Linear Power Supplies and Systems:
   Operation, stability, PSR, and IC design
Georgia Institute of Technology
On-Line Course-User Agreement
for
ECE 6445 Power IC Design's
Shenzhen, Atlanta, and Distance-Learning Sections

As a student officially enrolled in the above course:

(1) I understand that the content included in the ECE 6445 Power IC Design On-line Course is copyrighted with all rights reserved by Georgia Institute of Technology (Georgia Tech).

(2) I acknowledge that course materials are protected by copyright, trademark, patents, and/or other proprietary rights and laws.

(3) I understand that I may use the ECE 6445 Power IC Design On-line Course and all its contents only on my computer and may not print, download, post, transfer, or in any way reproduce, share, or disseminate any of the contents in any way.

(4) I agree that I will not provide any such information, techniques, or material to any third party for any reason.

(5) I understand that I may not use any of the contents from the ECE 6445 Power IC Design On-line Course in other publication or presentation materials without explicit written permission from the instructor / author.

(6) I understand that violation of any of the above can lead to termination of my status as a Georgia Tech student.

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Name of Student  GTID

__________________ __________________
Signature   Date

Print, complete, sign, date, and e-mail this user agreement to the instructor by Friday, August 25 in 2017.