GEORGIA INSTITUTE OF TECHNOLOGY
School of Electrical and Computer Engineering

ECE 4803 **ENERGY AND POWER MICROELECTRONICS** **Summer 2018**

INSTRUCTOR:	Prof. Gabriel A. Rincón-Mora, Ph.D. (URL: Rincon-Mora.gatech.edu) E-Mail Address: Rincon-Mora@gatech.edu, Atlanta Office: Van Leer 482
TIMES AND LOCATION:	Mondays and Wednesdays at 5:35–7:25 p.m. in Van Leer 240
BOOK REQUIRED:	None
REFERENCES:	G.A. Rincón-Mora, *Power IC Design: Top–Down Approach*, *Sixth Edition*, Lulu, ISBN: 9781312146174. G.A. Rincón-Mora, *Analog IC Design with Low Dropout Regulators*, *Second Edition*, McGraw-Hill, 2014. Journal and conference articles under "Publications" link at Rincon-Mora.gatech.edu. SPICE or PSPICE Reference Manual (available from class URL).
PREREQUISITE:	ECE 3040 Microelectronic Devices
CLASS URL:	Rincon-Mora.gatech.edu/classes.
SYLLABUS:	Posted under sub-link "ECE 4803" on class URL.
SPICE SIMULATOR:	Software accessible from class URL.

Course Description: ECE 4803 extends the concepts of semiconductor solid-state devices taught in ECE 3040 to energy and power microelectronic supplies. The material presents, explains, and shows how to model, analyze, and use semiconductor diodes and transistors to design circuits that draw and supply energy and power from static and variable battery and ambient sources to microelectronic systems. The course introduces energy- and power-supply systems and details the linear, switched-inductor, and energy-harvesting power supplies that can comprise them. The underlying aim is to cultivate and develop insight and intuition for energy and power microelectronics. For this, the presentation offers a physical and intuitive perspective of devices and circuits that complements and at the same time transcends the mathematics that describe them. This course prepares students for complementary and more advanced and in-depth analog and energy/power topics in Electronic Design and Applications (EDA) and Electrical Energy, like those discussed in ECE 4330 Power Electronics, ECE 4430 Analog Integrated Circuits, ECE 6412 Analog Integrated Circuit Design, ECE 6414 Analog Integrated System Design, ECE 6331 Power Electronics, and ECE 6445 Power Integrated Circuit Design.

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.	

Important Dates:	First Day of Class	May 14 (Monday)
	School Holidays	May 28 (Monday) and July 4 (Wednesday)
	Midterm	June 18 (Monday)
	Last Day to Drop Course	June 30 (Saturday)
	Last Day of Class	July 23 (Monday) – Last assignment due on this date.
	Final	August 2 at 6:00–8:50 p.m. (Thursday)

In-Class Questions: WHEN IN DOUBT, ASK QUESTIONS (DURING LECTURE), but refrain from asking questions about material from lectures missed due to absences.

COURSE EXPECTATIONS AND GUIDELINES

In Class: No auditors allowed.
Be seated in class before class time 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).
Work with the Office of the Dean of Students in case of medical emergencies.
List problems in numerical order, circle and mark answers clearly, and staple pages together.
Grades become final one week after exams are graded and returned.

Assignments: No electronic "e-mail" submissions allowed.
Discussing assignments together (*without a computer*) is allowed, but *working together is not*.
➔ Simulate circuits and prepare solution sets independently.
➔ Submitted assignments must be unique – identical solutions split grade.
Late submissions receive 20% reduction for each day they are late (including weekends).
Attach a cover sheet that includes "ECE 4803", your name, date, and assignment number.
List problems in numerical order, circle and mark answers clearly, and staple pages together.
Grades become final one week after they are available.

SPICE: Use only *text version* of SPICE and include net list and control text used to generate all results.
Label all nodes, voltages, currents, and component values in schematics.
Highlight important information and remove unnecessary details from SPICE-generated results.

Questions & Answers: TBA

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 notes, examples, and assignments when preparing for exams.

Assistance: TA(s) (if available) and I will provide assistance in direct proportion to the effort demonstrated in your own attempts to understand and resolve misunderstandings and problems.

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

Academic Integrity: All Georgia Tech students must know and follow Georgia Tech'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 or anywhere at Georgia Tech.

Accommodations for Individuals with Disabilities: If you have learning needs that require special accommodations, please schedule an appointment with the Office of Disability Services at disabilityservices.gatech.edu to discuss any special needs and send me a note after you meet with them to explain 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. Powering Microsystems
2. Linear Power Supplies
3. Switched-Inductor Power Supplies
4. Energy-Harvesting Power Supplies