

University of California, Berkeley Extension

Professional Sequence in Semiconductor Technology Fundamentals

EL ENG X485: Computer Simulation of Electronic Circuits

(1 semester unit in EL ENG, Online Format)

Course Syllabus

A. Course Description

Learn the industry-standard tools for tomorrow's solutions. Gain the hands-on experience using SPICE to simulate, verify, examine, and design microelectronic circuits for a wide variety of practical applications in the analog and digital realms. Illustrating the concepts and techniques to leverage the simulation tool, this course offers a *broad coverage* ranging from semiconductor devices to analog and digital ICs, provides you an opportunity to learn how to develop input files which can reflect the transistor-level models and advances you to a higher level of proficiency when access to both efficient and effective instruction is not available. Providing a comprehensive tour for circuit simulation techniques, this unique course will bring you a truly interactive online learning experience.

B. Prerequisite

There is no prerequisite for this course. However, working level knowledge of basic electronics is expected. If you need a solid background before you can fully understand a specific subject or you are interested in more in-depth knowledge in a certain field, *you may want to take other courses in Certificate Program in Integrated-Circuit Design and Techniques* offered by UC Berkeley Extension or rely on personal study. The course instructor's assistance will be limited to the course curriculum.

C. Timeline

Timeline	Course events	Lecture pace
Day 30	Homework 1	30% of lectures done
Day 60	Homework 2	60% of lectures done
Day 90	Homework 3	100% of lectures done
Day 90	Final exam setup	
Day 120	Midterm exam	
Day 120	Final exam date confirmed	Review
Day 150	Proctored final exam	
Day 180	Course ends	

- Pacing yourself well is one of the key factors to succeed in this course. *Mark your calendar* for the timeline and course events.
- The course registration date (Day 1) is the date you receive the login information and welcome email.
- *It is strongly suggested you reserve the last month (Day 151-180) for contingency.*
- *You final exam request/setup process normally takes up to a couple of months to finalize.*

D. Learning Objectives

Upon successful completion of the course, students will be able to

- Gain the hands-on experience using SPICE to simulate, verify, examine, and design microelectronic circuits in the analog and digital realms.
- Possess the intuitive analysis skill to forecast/illustrate the circuit simulation results.

E. Intended Audience

This course is intended for technical professionals new to the field, who want to learn the fundamentals of microelectronics, semiconductors and integrated circuits (ICs).

F. Course Content Outline

Session 1. Semiconductor Devices

- *MOSFET Device Simulation Examples*
- *MOSFET SPICE Modeling--Part I*
- *MOSFET SPICE Modeling--Part II*

Session 2. Analog Circuits

- *MOSFET Integrated-Circuit Biasing Technique*
- *Passive LRC Low-Pass Filters*
- *Active-RC Band-Pass Filters*
- *Sinusoidal Oscillators*

Session 3. Digital Circuits

- *Robustness of NMOS Inverter*
- *Speed Limitation of NMOS Inverter*

G. Course Length

- The 15-hour course length covers not only the audio runtime but also the time to catch up by rewinding and replaying video. It also includes the time to take notes and to communicate/discuss with the instructor.
- Other than the 15-hour course length, you are expected to spend additional 30 hours studying the lectures, digesting the materials, working on the assignments, and preparing for the exams.
- Most students watch the lecture video or read PDF slides two or three times before they can fully grasp the concepts, cultivate problem-solving skills, and have a good grade on the final exam.

H. Course Grade Weighting (Grading)

The student's cumulative grade in the course will be based on the following criteria:

- Discussion Participation: 10 points
- Progress Updates: 10 points
- Written Homework Assignments: 30 points

- Midterm Exam (Take-home): 20 points
- Final Exam: 30 points

You must pass the final exam with a grade of at least 70 percent to pass the course.