DEA-SAP-235 Introduction to Electric and Electronic Circuits

SEMESTER: Spring

CREDITS: 7.5 ECTS (5 hrs. per week; 3 theory and 2 laboratory)

LANGUAGE: English

DEGREES: SAPIENS program

Course overview

This course is designed to give an introduction to electric circuits, semiconductor devices, and microelectronic circuits.

Prerequisites

A basic knowledge of introductory physics (charge, electric field, currents) and of Calculus is needed.

Course contents

Theory:

1. Introduction: Charge, current, voltage, power, circuit elements, Ohm's law
2. Kirchhoff's current and voltage laws, voltage and current divisions
3. Node-voltage, mesh-current methods, superposition, and equivalence theorems
4. Operational Amplifier
5. RC and RL circuits, first-order network, step response
6. Sinusoidal excitation and phasors
7. AC steady-state analysis and AC steady-state power
8. Frequency response, passive filters
9. Semiconductor physics
10. Diodes, diode circuit analysis
11. MOS and BJT circuit analysis
12. Electronic circuit and digital information: introduction to logic circuits with diode and transistors

Laboratory:

The laboratory approach in this course is project-based. The students will be challenged to design, build, test and optimize small circuits; depending on the project(s), the topics would be any of:

- Network Solving and Equivalent Circuits
- Transient Response
- MOSFET Inverter Circuits
- CMOS Logic Circuits
- CMOS Transient Analysis
- BJT Circuits
- Transistor-Transistor Logic
- Operational Amplifiers
- Nonlinear Op Amp Circuits
- Frequency Response

Textbook

- *Essentials of Electrical and Computer Engineering* by D. V. Kerns, Jr. and J. D. Irwin, Prentice-Hall, 2004.

Or (you can find it much cheaper used):

- *Fundamentals of Electronic Circuit design* by D. Comer and D. Comer, Wiley, 2002.

But basically any good introductory book to electronics will do. The teacher will provide summary sheets and exercises during the course.

Course policies

1. **Attendance and Participation:**

- Theory classes: You can miss up to 5 classes without penalty. After that, you will not pass the course. If you are absent, you are responsible for any material covered. However, attendance isn't enough to make this course successful; I expect that you will also participate regularly in class by sharing your own ideas.
- Lab sessions: You can miss up to 2 classes without penalty. After that, you will not pass the course.

2. **Late assignments:**

- All section assignments are due at the beginning of section. No late assignments will be accepted.

3. **Academic integrity:**

- Universidad P. Comillas does not tolerate academic dishonesty (i.e. cheating). If you are having problems with the course material, come to office hours or make an appointment to see me. Do not cheat.

Grading

Ordinary evaluation period:

The theory grade will be determined by three partial exams during the course.
Weekly homework (graded) will be provided.
The exams are closed notebook, closed textbook and simple calculator. The course will not be graded on a curve, i.e., there is no bound on
the numbers of A's, B's, C's etc.
The laboratory will be evaluated with one practical test and a mandatory project (in groups of two or exceptionally three students; details
will be given in the laboratory.
The final grade for the course will be weighted with the 3 quizzes, 2 lab projects and weekly homework assignments. Your final grade will
be calculated according to the following weights:

a) Homework: 15%
b) Exam #1: 15%.
c) Exam #2: 15%.
d) Final exam. 20%.
e) Lab midterm design: 15%.
f) Lab final project: 20%.

In case one of the exams #1 or #2 are missed due to a justified cause, weights will be changed to:

a) Homework: 15%
b) Exam #1/Exam #2: 15%.
c) Final exam. 30%.
d) Lab midterm design: 15%.
e) Lab final project: 25%.

Extraordinary evaluation period/retake:

The student who fails the subject but has passed the laboratory part can retake the theory exam in the extraordinary evaluation period.

In this case, the final grade will be calculated as the mark of the retake exam (60%) and the laboratory and homework (40%).