Course number and name: Electric Circuits Lab
Credits: 2 ECTS (1 US credits)
Credit categorization: Engineering Topic
Instructor: Raül Castillo-Muñoz
Office: 326 (Main building)
Email: raul.castillo@iqs.url.edu
Office hours: Monday through Thursday: from 16h to 17h.
Outside existing hours, by appointment.

Textbook:

Required:
None

Recommended supporting material:
Fundamentals of Electric Circuit, by Charles K. Alexander and Matthew N.O. Sadiku. McGraw Hill, Seventh Edition
ISBN: 978-1260570793

Specific Course information:

Brief description:
This course allows students to engage in the assembly and validation of different circuits, enabling them to apply and validate the theoretical knowledge provided in the Electric Circuits course. Conducting empirical validations helps consolidate understanding, verify the application of theoretical laws governing circuit behavior, and directly demonstrate the correct use of these laws in practical scenarios

Prerequisites or co-requisites:
Mathematics, Physics (Electricity and Magnetism)

Course objectives and outcomes:

Course objectives:

1. Understand the physical electrical concepts of voltage, current, power and energy, and the laws that govern them.
2. Analyze DC and basic AC electric circuits.
3. Develop a understanding of operational amplifiers, their principles, functionality, and applications in various circuit designs.
4. Validate theoretical knowledge in practical experiences
5. Consolidate electrical laws understanding

Course outcomes:

1. Students will derive expressions for voltage and current based on the fundamental laws of Physics and will use these expressions to develop models for electric circuits (ABET outcome 1)
2. Students will analyze DC electric circuits using Kirchhoff's voltage and current laws, including mesh and node equations and Thevenin and Norton equivalent circuits (ABET outcome 1)
3. Students will apply ideal models of operational amplifiers to analyze and design circuits with them (ABET outcome 1)

4. Students will develop electric circuit models for inductors and capacitors and use those models to analyze electric circuits containing these elements (ABET outcome 1)
5. Students will develop AC electric circuit models for components excited by sinusoidal sources, and will be introduced to use those models to analyze electric circuits (ABET outcome 1)

List of topics to be covered:

1. Ohm's Law
2. Kirchhoff's Laws
3. Building circuits using breadboards
4. The use of resistors, capacitors, potentiometers, and inductors
5. Current and voltage measurement
6. The use of oscilloscopes, arbitrary function generators, and digital multimeters
7. Time constants
8. AC analysis
9. The use of operational amplifiers

Time distribution:

Week	Contact hours	Topic	Text
5	2h	Introduction to Lab: Passive Components, Circuits, and Circuit Assembly. Voltage & Current Measurements	-
6	2h	DC Circuits Analysis: Ohm's Law, Voltage Divider, Current Divider	Chap. 1, 2, 3 & 4
7	2h	DC Circuits Analysis: Kirchhoff's Laws, Thevenin, Norton	Chap. 1, 2, 3 & 4
9	2h	Operational Amplifier Use	Chap. 5
11	2h	AC Circuits: Assembly, Measurement, and Validation	Chap. 6,9, 10
12	2h	AC Circuits: Assembly, Measurement, and Validation (cont.)	Chap. 6,9, 10
13	2h	AC Power Analysis	Chap. 11

Assessment structure:

Laboratory Report	Source	Delivery Date	Weight
DC Circuits	Report Delivery	Week 7	30%
OpAmp Circuits	Report Delivery	Week 10	30%
AC Circuits	Report Delivery	Week 13	30%
Laboratory Work Performance	Teacher's evaluation	All sessions	10%

PERFORMANCE INDICATORS AND GRADING

The assessment will be carried out by grading 3 reports to be submitted, including theoretical calculations and conclusions from the experiments conducted.
Additionally, a personal evaluation by the laboratory instructor on the work carried out during the sessions will be included.
A continuous assessment grade is the only grade to be consider, because this subject does not have a final exam

HOMEWORK POLICY

The homework associated with this subject involves the prior completion of theoretical calculations to prepare for the experiments, as well as the subsequent preparation of the reports to be submitted.
Given the alignment of the syllabus with the Electric Circuits course, the homework will be coordinated with this subject to optimize the necessary resources1st

CLASS STRUCTURE

All work for this course consists of empirical tasks to be assembled in the laboratory. The student must prepare for the experiments in advance by completing the theoretical calculations. During the sessions, he/she must assemble the different circuits and take the required measurements. Finally, a report must be prepared

ACADEMIC INTEGRITY

All work for this course is expected to comply strictly with the principles of academic honesty and integrity. Cheating, plagiarism, copying, or any form of dishonesty is strictly prohibited in accordance with the disciplinary regulations of IQS.

DOCUMENT HISTORY

First Edition

PREVIOUS REVISIONS

None

LAST REVISION

March 2025. R. Castillo-Muñoz