Course number and name: Electric Circuits
Credits: 6 ECTS (3 US credits)
Credit categorization: Engineering Topic
Instructor: Dr. Sauro J. Yagüe
Office: 302 (Main building)
Email: sauro.yague@iqs.url.edu
Office hours: Monday through Thursday: from 16h to 18h.
Outside existing hours, by appointment.
Textbook:
Required:
Fundamentals of Electric Circuit, by Charles K. Alexander and Matthew N.O. Sadiku. McGraw Hill, Seventh Edition
ISBN: 978-1260570793
Recommended supporting material:

Specific Course information:
Brief description:
This course introduces engineering students to the analysis of linear electric circuits. The course covers the basic laws of circuit behavior and analysis techniques, including descriptions of circuit elements and electronic variables, and considers circuit theorems and principles for insightful analysis of electrical circuits. The course introduces basic concepts and networks analysis.
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 thorough understanding of operational amplifiers, their principles, functionality, and applications in various circuit designs.
4. Utilize software tools in circuit analysis and design.
5. Discuss ethical concerns of engineering using physical and social factors.

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)
6. Students will design and simulate circuits using software tools to perform analytical circuit analysis and problem-solving. (ABET outcomes 1, 6)
7. Students will explore ethical concerns related to a circuit device or network, and present their findings (ABET outcomes 3, 4)

List of topics to be covered:

1. Introduction. DC circuits. Current and Voltage. Power and Energy.
2. Ohm's law. Resistance. Kirchoff's Laws. Series and Parallel Circuits.
3. Analysis Methods.
4. Network Theorems. Thevenin and Norton.
5. Operational Amplifiers.
6. Capacitors and Inductors.
7. First Order Transients Circuits.
8. AC circuits. Sinusoidal Steady-State Analysis. Phasors. Impedance.
9. AC Power Analysis.

Time distribution:

Week	Contact hours	Topic	Text
1	3	Introduction. Current and Voltage. Power and Energy.	Chap. 1
2	3	Ohm´s Law. Resistance. Kirchhoff´s Law. Series and Parallel Circuits.	Chap. 2
3	3	Analysis Methods.	Chap. 3
4	3	Analysis Methods (cont.)	Chap. 3
5	3	Network Theorems. Thevenin & Norton.	Chap. 4
6	3	Midterm Exam 1	Chap. 1-4
		Intro to Operational Amplifiers.	Chap. 5
7	3	Operational Amplifiers (cont.)	Chap. 5
		Capacitors and Inductors	Chap. 6
8	3	Capacitors and Inductors (cont.)	Chap. 6
		First Order Transients.	Chap. 7
9	3	First Order Transients. (cont.)	Chap. 7
		AC Circuits. Sinusoids. Phasors. Impedance.	Chap. 9
10	3	Midterm Exam 2	Chap. 5-7
		AC Circuits. Sinusoids. Phasors. Impedance (cont.)	Chap. 9
11	3	Sinusoidal Steady-State Analysis.	Chap. 10
12	3	AC Power Analysis.	Chap. 11
13	3	AC Power Analysis (cont.)	Chap. 11
		Midterm Exam 3	Chap. 9-11
14	3	Final Exam	Chap. 1-7 and 9-11

Assessment structure:

Methods of Evaluation	Weight	Date/freq.	Description
Midterm exams	20%	Three per course	3 midterm exams lasting 1,5 hours
Final exam	Up to 60%	End of semester	Cumulative exam allowing to recover contents of up to 3 midterm exams
Following up activities	40%	Every Week	Homework, Quizzes, projects

PERFORMANCE INDICATORS AND GRADING

Three written midterm exams will be given at approximately equal intervals throughout the term, as outlined in the syllabus. The final exam provides an opportunity to retake failed Midterm Exams 1 to 3; but it is not intended to improve existing grades.

Homework, Quizzes, Project	40%
Midterm Exam 1	20%
Midterm Exam 2	20%
Midterm Exam 3	20%
Final Exam	60%

HOMEWORK POLICY

Homework is due the week after it is assigned (except when specified). The homework cycle gives an intervening class where students can ask questions. Late assignments will receive a score of 0 points.

CLASS STRUCTURE

Lectures will be the primary source of information. Students are expected to attend every class and actively participate in class discussions. Homework assignments will be reviewed in class, and students should come prepared by studying the relevant chapters before each lecture.

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

PREVIOUS REVISIONS

LAST REVISION

March 2025. Dr. Sauro J. Yagüe