



SAINT LOUIS UNIVERSITY  
MADRID

## ECE-2103 - M36: Electrical Engineering Laboratory

Spring 2018

**Class Days and Time:** Wednesday, 16:30-18:20

**Classroom:** Physics and Engineering Laboratory, PAH-21

**Prerequisite(s):** PHYS-1630 and MATH-2530

**Credit(s):** 1 credit

**Instructor:** Dr. Kavita Nair

**Instructor's Email:** nairk@slu.edu

**Instructor's Campus Phone:** 91 554 58 58, ext. 266

**Office:** Padre Arrupe Hall, Science Office, first floor

**Office Hours:** Wednesday, 10:00-11:00

**Course Description:** Basic circuit laws, power and energy concepts. DC circuit analysis: Node/mesh analysis and network reduction. AC circuit analysis: Inductors and capacitors, phasor notation, RMS value and complex power concepts. Operational features of diodes and transistors.

### Course Goals and Student Learning Outcomes:

The laboratory constitutes a link between the ideas developed in the “theory” subject and reality. In this sense the student complements and consolidates the knowledge acquired in the theoretical class due to the work developed in the laboratory. This is a basic course in electrical engineering designed to provide a thorough, comprehensive and practical coverage of basic electrical concepts and circuits. Both DC and AC topics are presented with typical applications covered in the laboratory. Topics covered in this course will allow students to acquire the concepts and tools needed for further education in the field of electrical engineering, mainly circuit theory, as well as gaining an introduction to electronics.

### Electrical and Computer Engineering Program Objectives

- A. Ability to apply knowledge of mathematics, science, and engineering.
- B. Ability to identify, formulate, and solve engineering problems.
- C. Ability to design and conduct experiments, as well as to analyze and interpret data.
- D. Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- E. Ability to function on multi-disciplinary teams.
- F. Understanding of professional and ethical responsibility.
- G. Ability to communicate effectively.
- H. Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and social context.
- I. Recognition of the need for, and an ability to engage in life-long learning.
- J. A knowledge of contemporary issues

- K. Ability to use techniques, skills, and modern engineering tools necessary for engineering practice.
- L. Knowledge and application of probability, statistics, and advanced math.
- M. Knowledge of mathematics and the basic sciences, computer science, and engineering sciences necessary to analyze and design complex electrical and electronic systems which may include hardware and software.
- N. Knowledge of discrete mathematics.

Program Objectives	Student Learning Outcomes	Assessment Method
<b>A, B, M</b>	A.1. Identify the essential aspects of a problem, connect it to related areas of electrical engineering, formulate a strategy for solving the problem, apply appropriate techniques to arrive at a solution, test the correctness of the solution, and interpret the result. A.2. Show strong mathematical skills.	Mid-term and Final Exam - Problems
<b>C</b>	C.1. Use a variety of lab instrumentation: oscilloscope, function generator, multimeter, DC voltage sources, voltage sensors. C.2. Verify the validity of the experimental results using data acquisition software, and graphing and data analysis software C.3. Apply Ohm's Law and measure voltage, current, resistance, and power. C.4. Prove Kirchhoff's laws and the principle of superposition. C.5. Use Thevenin's Theorem to determine the condition for maximum power transfer. C.6. Measure the time constant of RC and RL circuits. C.7. Measure the effects of frequency on AC circuit parameters: phase and impedance. C.8. Measure the response of series and parallel LC circuits to variations in frequency. C.9. Characterize filters by the voltage gains and phase shifts. C.10. Measure the I-V characteristic curve of diodes. C.11. Study the npn transistor in CE configuration. C.12. Measure the operation of some simple OP-AMP circuits.	Lab Notebook  Lab Report
<b>E</b>	E.1. Work effectively in a team environment when working in the lab.	Team-work rubric
<b>G</b>	G.1. Keep a well-organized and complete lab notebook. G.2. Communicate effectively in written reports. G.3. Write a well-structured and clear lab report using the standard scientific format.	Lab Notebook  Lab Report

Saint Louis University - Madrid Campus is committed to excellent and innovative educational practices. In order to maintain quality academic offerings and to conform to relevant accreditation requirements, the Campus regularly assesses its teaching, services, and programs for evidence of student learning outcomes achievement. For this purpose anonymized representative examples of student work from all courses and programs is kept on file, such as assignments, papers, exams, portfolios, and results from student surveys, focus groups, and reflective exercises. *Thus, copies of student work for this course, including written assignments, in-class exercises, and exams may be kept on file for institutional research, assessment and accreditation purposes.* If students prefer that Saint Louis University - Madrid Campus does not keep their work on file, they need to communicate their decision in writing to the professor.

**Required Texts and Materials:** Electrical & Computer Engineering Laboratory Sessions Handbook.  
Ed. Spring 2018

**Attendance Policy:** You should sign-in at the beginning of each laboratory session and are required to stay either until the end of the lab session or until all measurements and analyses have been recorded in your laboratory notebook. You may sign out only after the approval of a lab demonstrator.

**Course Requirements and Grading Rationale/System:**

The work undertaken in the practical sessions is evaluated by continuous assessment of the lab notebooks, the marks of all the lab reports, the marks of all the pre-lab questions, and the marks of the exams.

**1. Attendance**

You should sign-in at the beginning of each laboratory session and are required to stay either until the end of the lab session or until all measurements and analyses have been recorded in your laboratory notebook. You may sign out only after the approval of a lab demonstrator.

**2. Continuous assessment of lab notebook**

Lab notebooks will be checked at the end of each practical session. Only when the results are satisfactory will the students be allowed to proceed to the next experiment. The lab notebooks will be marked at the end of each semester.

Mid-Term Grade – 20% of the marks

Final Grade – 15 % of the marks

**3 Assessment of experimental reports**

Reports of the experiments should be sent to the instructor through Blackboard before the start of the due-date lab session. If reports are delivered late, but within one week of the deadline, then 20% of the marks will be forfeit. Write-ups sent more than one week after the deadline will be marked for the student's information but these marks will not count in the module assessment. Every effort will be made to return the marked write-up within a period of two weeks.

Mid-Term Grade – 30% of the marks

Final Grade – 25% of the marks

**4. Assessment of pre-lab questions**

Before the beginning of the class the student must answer the questions uploaded on Blackboard related to the session. If these questions are answered after the class, they will be marked for the student's information but these marks will not count in the module assessment.

Mid-Term Grade – 5% of the marks

Final Grade – 5 % of the marks

**5. Assessment of post-lab questions**

After each laboratory session the student must answer the questions uploaded on Blackboard related to the session. The responses should be delivered through Blackboard before the start of the new lab session. If not, they will be marked for the student's information but these marks will not count in the module assessment.

Mid-Term Grade – 5% of the marks

Final Grade – 5 % of the marks

**6. Assessment by exams**

Two exams will be done: one halfway through the course (Mid-Term Exam) and another at the end (Final Exam) about materials related with the work done. Due exams are taken individually, not in groups. Exams will consist of a set of theoretical questions and an experimental exercise related to the sessions covered in class.

Mid-Term Grade – 40% of the marks

Final Grade – 50 % of the marks (25% for the Mid-Term and 25% for the Final)

	<b>1<sup>st</sup> Mid-Term Grade</b>	<b>Final Grade</b>
Lab Notebook	20%	15%
Lab Report	30%	25%
Pre-lab questions	5%	5%
Post-lab questions	5%	5%
Exam	40%	50% (25% 1 <sup>st</sup> Mid-Term + 25% Final)
<b>TOTAL GRADE</b>	<b>100%</b>	<b>100%</b>

### Grading Scales

90%	≤	A	≤	100%
87%	≤	A-	<	90%
84%	≤	B+	<	87%
80%	≤	B	<	84%
77%	≤	B-	<	80%
74%	≤	C+	<	77%
70%	≤	C	<	74%
66%	≤	C-	<	69%
60%	≤	D	<	66%
		F	<	60%

**E-mail:** Campus and course announcements will often be handled by e-mail. Students should check their “@slu.edu” e-mail regularly.

**University Statement on Academic Integrity:** Academic integrity is honest, truthful and responsible conduct in all academic endeavors. The mission of Saint Louis University is "the pursuit of truth for the greater glory of God and for the service of humanity." Accordingly, all acts of falsehood demean and compromise the corporate endeavors of teaching, research, health care and community service via which SLU embodies its mission. The University strives to prepare students for lives of personal and professional integrity, and therefore regards all breaches of academic integrity as matters of serious concern.

The governing University-level Academic Integrity Policy can be accessed on the Provost's Office [website](#). Additionally, SLU-Madrid has posted its academic integrity policy online: <http://www.slu.edu/madrid/academics>. As a member of the University community, you are expected to know and abide by these policies, which detail definitions of violations, processes for reporting violations, sanctions and appeals.

The professor will review these matters during the first weeks of the term. Please direct questions about any facet of academic integrity to your faculty, the chair of the department of your academic program, or the Academic Dean of the Madrid Campus.

**University Title IX Statement:** Saint Louis University and its faculty are committed to supporting our students and seeking an environment that is free of bias, discrimination, and harassment. If you have encountered any form of sexual misconduct (e.g. sexual assault, sexual harassment, stalking, domestic or dating violence), we encourage you to report this to the University. If you speak with a faculty member about an incident of misconduct, that faculty member must notify SLU's Title IX deputy coordinator, Marta Maruri, whose office is located on the ground floor of Padre Rubio Hall, Avenida del Valle, 28 (mmaruri@slu.edu; 915-54-5858, ext. 213) and share the basic fact of your experience with her. The Title IX deputy coordinator will then be available to assist you in understanding all of your options and in connecting you with all possible resources on and off campus.

If you wish to speak with a confidential source, you may contact the counselors at the SLU-Madrid's Counseling Services on the third floor of San Ignacio Hall (counselingcenter-madrid@slu.edu; 915-54-5858, ext. 230) or Sinews Multiplettherapy Institute, the off-campus provider of counseling services for SLU-Madrid (www.sinews.es; 917-00-1979). To view SLU-Madrid's sexual misconduct policy and for resources, please visit the following web address: <http://www.slu.edu/Documents/Madrid/campus-life/SLUMadridSexualMisconductPolicy.pdf>.

**Students with Special Needs:** In recognition that people learn in a variety of ways and that learning is influenced by multiple factors (e.g., prior experience, study skills, learning disability), resources to support student success are available on campus. Students who think they might benefit from these resources can find out more about:

- Course-level support (e.g., faculty member, departmental resources, etc.) by asking your course instructor.
- University-level support (e.g., tutoring/writing services, Disability Services) by visiting the Academic Dean's Office (San Ignacio Hall) or by going to <https://www.slu.edu/madrid/academics/student-resources>.

Students with a documented disability who wish to request academic accommodations must contact Disability Services to discuss accommodation requests and eligibility requirements. Once successfully registered, the student also must notify the course instructor that they wish to access accommodations in the course. Please contact Disability Services at disabilityservices-madrid@slu.edu or +915 54 58 58, ext. 230 for an appointment. Confidentiality will be observed in all inquiries. Once approved, information about the student's eligibility for academic accommodations will be shared with course instructors via email from Disability Services. For more information about academic accommodations, see "Student Resources" on the SLU-Madrid webpage.

Note: Students who do not have a documented disability but who think they may have one are encouraged to contact Disability Services.

**(IF APPLICABLE): Mandatory Trips/Activities:** Students enrolled in this class must participate and make payment for all mandatory trips/activities. The prices posted on the web are approximate; the final price will be based on the number of students enrolled on the last day of the Add/Drop period. All students, including those who withdraw from the class after this date, are required to pay these fees, which are non-refundable, unless the trip is cancelled due to low enrollment. Please review SLU-Madrid's trip policies, available on-line.

**Spring 2018 Course Schedule:**

<b>JANUARY</b>	
Wednesday 10	<b>First Day of Class – General Discussion</b>
Wednesday 17	<b>Lab 1 - Laboratory Instrumentation</b>
Sunday 21	Last Day to Drop a Class without a Grade W and/or Add a Class; Last Day to Choose Audit (AU) or Pass/No Pass (P/NP) Options
Wednesday 24	<b>Lab 2 - Resistance Measurement and Ohm's Law</b>
Friday 26	No Classes Application Deadline for Spring Semester Degree Candidates
Wednesday 31	<b>Lab 3 - Voltage Divider and Current Divider Rules</b>
<b>FEBRUARY</b>	
Wednesday 7	<b>Lab 4 - Kirchhoff's Laws and Superposition Theorem</b>
Wednesday 14	<b>Lab 5 - Wheatstone Bridge Circuits</b> Ash Wednesday Registration for Summer 2018 Begins
Wednesday 21	<b>Mid-Term Exam</b>
Thursday 22	No Classes (Winter Break)
Friday 23	
Tuesday 27	
Wednesday 28	<b>Lab 6 - Thevenin Theorem and Power Transfer</b>
<b>MARCH</b>	
Wednesday 7	<b>Lab 7 - Transient Response of RC and RL Circuits</b>
Friday 9	Last Day to Drop a Class and Receive a Grade of W
Wednesday 14	<b>Lab 8 - Impedance and Frequency Response of AC Circuits</b>
Thursday 15	Last Day to Submit Transfer Application for Fall Semester
Wednesday 21	<b>Lab 9 - Resonance in Series and Parallel</b>
Monday 26	<i>Semana Santa</i> Holiday (Campus Closed)
Tuesday 27	
Wednesday 28	
Thursday 29	
Friday 30	<i>Viernes Santo</i> (Campus Closed)
<b>APRIL</b>	
Wednesday 4	<b>Lab 10 - Filters</b> Registration for Fall 2018 Semester Begins
Wednesday 11	<b>Lab 11 - Operational Amplifier</b>
Wednesday 18	<b>Extra Lab</b>
Wednesday 25	<b>Final Exam</b>
<b>MAY</b>	
Tuesday 1	<i>Día del Trabajador</i> (Campus Closed)
Wednesday 2	<i>Día de la Comunidad</i> (Campus Closed)
Thursday 3	Spring 2018 Final Day of Classes
Friday 4	Spring 2018 Final Exams
Monday 7	
Tuesday 8	
Wednesday 9	
Thursday 10	
Friday 11	
Saturday 12	Commencement
Sunday 13	Professors' deadline to submit spring 2018 final grades

**Report Calendar**

Report 1: Sessions 2 and 3 – Due Date: 7<sup>th</sup> February (16:30)

Report 2: Sessions 4 and 5 – Due Date: 21<sup>st</sup> February (16:30)

Report 3: Sessions 6, 7 and 8 – Due Date: 21<sup>st</sup> March (16:30)

Report 4: Sessions 9 and 10 – Due Date: 11<sup>th</sup> April (16:30)

Report 5: Session 11 – Due Date: 18<sup>th</sup> April (16:30)

**Final Exam Schedules Spring 2018**

	<b>4 May (Fr)</b>	<b>7 May (Mn)</b>	<b>8 May (Tu)</b>	<b>9 May (Wd)</b>	<b>10 May (Th)</b>
<b>08:30-11:30</b>	Mn classes that meet at 9:00 & 9:30	Mn classes that meet at 10:00	Mn classes that meet at 11:00 & 11:30	Tu classes that meet at 9:30	Tu classes that meet at 8:00
<b>12:00-15:00</b>	Tu classes that meet at 11:00	Mn classes that meet at 13:00	Tu classes that meet at 14:30	Mn classes that meet at 12:00 & 12:30	Tu classes that meet at 12:30
<b>15:30-18:30</b>	Mn classes that meet at 14:30	Tu classes that meet at 17:00 & 17:30	Mn classes that meet at 16:00	Tu classes that meet at 16:00	Mn classes that meet at 17:30
<b>19:00-22:00</b>	---	---	Mn classes that meet at 18:30 & 19:00	Tu classes that meet at 19:00	---