Course Title: Electric Circuits (B)
Code: 18874
Centre: Sciences Faculty
Degree: Physics
Fall 2017-Spring 2018
Type: Common background
Credits: 6

COURSE TITLE

Electric Circuits

1.1. Course number

Boston University

1.2. Content area

Electronics

1.3. Course type

Common Background

1.4. Course level

Undergraduate

1.5. Year

2nd (BU)

1.6. Semester

2nd (Spring Semester)

1.7. Credit allotment

6

1.8. Prerequisites

None. *Recommended*: *Electromagnetism I and II* for UAM students.

1.9. Minimum attendance requirements.

It is compulsory to assist to all lecture sessions. The maximum laboratory sessions allowed to be missed is one, which will be evaluated with 0 points.

1.10. Faculty data

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1.11. Course objectives

o To understand the fundamental and theoretical aspects concerning the behavior of electronic circuits, as well as the different elements of design and their operating modes.
o To be aware of the roles played in circuits by both discrete components (resistors, capacitors, diodes, etc.) and integrated components (operational amplifiers, converters).
o To learn how to apply the basic techniques of analysis to evaluate the performance of a circuit.
o To know the basics of analog electronic systems and applications of the operational amplifier.
o To understand specifications, parameters and constraints, to recognize the functionality of a circuit and choose the most appropriate for a particular application.
o To have the physical foundations needed to interpret, select and evaluate the implementation of new scientific and technologic concepts and developments related to electronics.
o To learn independently new knowledge and techniques suitable for the design, development or exploitation of components, circuits and electronic systems.
oUsing computer applications to support the analysis and development of electronic systems.
oTo be trained in the use of computer aided design tools for both, simulation and test of electronic circuits.

1.12. Course contents

1 – Linear circuits I: DC networks
- 1a.- Circuit elements. Kirchoff's laws.
- 1b.- Circuit solving methods.
- 1c.- Linearity and superposition.
- 1e.- Thevenin and Norton equivalents.
- 1f.- Maximum signal transfer between circuits.

2 – Linear circuits II: AC networks
- 2a.- Sinusoidal steady state analysis
- 2c.- Impedance and phasor analysis.
- 2d.- Theorems and Laws in AC domain
- 2e.- Power calculations
- 2f.- Filters

3 – Introduction to analog electronics
- 4a.- Operational Amplifiers
- 4b.- Analog to digital conversion (A/D).
- 4c.- Digital to analog conversion (D/A).
- 4d.- Diodes

4– Transient Analysis
- 3a.- 1st order RL and RC circuits
- 3b.- Natural and Step Response of 2nd order RLC circuits

1.13. Course bibliography

Textbooks on Theory of linear circuits:
"Electric circuits", J.W. Nilsson and S.A. Riedel. (Prentice Hall)
"Fundamentals of Electric Circuits" C. Alexander and M. Sadiku 5th Ed (McGraw-Hill)

Textbooks on Electronic circuits:
"Electronics", A.R. Hambley. (Prentice Hall, Pearson Education).
"Electronic Circuit Analysis and Design", D.A. Neamen, vol.1-2 (McGraw-Hill).
"The Art of Electronics", P. Horowitz and W. Hill. (Cambridge Univ. Press).

2. Teaching methodology

Teaching methods and learning of this subject include lectures, problem solving sessions, individual tutorials and laboratory practical sessions.

During the lectures, the Lecturer will explain the fundamentals of electric and electronic circuit analysis and design, in addition to the fundamental principles of the most common circuits and devices. This presentation of the basic principles is accompanied by illustrative examples about the use of techniques and device practical applications.

In problem solving sessions, the Lecturer will partially solve exercises which will be proposed in advance, in such a way that the students will be able to solve the difficulties encountered when facing them. Some problems should be solved and later explained by the students themselves during these sessions.

The individual tutorials will enable the students to clarify doubts and difficulties found both during the study of the theoretical principles and in their practical application.

The laboratory includes eight guided sessions. Students will have to simulate, mount and measure different illustrative circuits taken from the theoretical background previously given to the student. Each laboratory session will include preparatory homework, laboratory work and finally, writing a short report about the previously done work.

3. Student workload

		hours	hours
Presential	Lecture sessions	40 h	76 h
	Laboratory sessions	22 h	
	Others (problem solving in classroom)	8 h	
	Exams	6 h	
At home	Home study and problem solving	50 h	74 h
	Others (lab session preparation and report writing)	24 h	
Total workload 25 h x 6 ECTS		**150 h**	

4. Evaluation procedures and marks

The evaluation of this course will be based on several items: marks for three intermediate exams (when completing about a third, two thirds and three thirds of this program, respectively) the obtained marks in the laboratory sessions and the final exam marks:

- Lecture content exams and laboratory sessions, will be evaluated on a 10 points basis.
- The final marks for this course will be obtained from exams and laboratory marks by using the following equation:

Final marks: 0.6*exams + 0.4*Lab Sessions

In order to pass this course it is compulsory to obtain marks above or equal to 5 points, both in the exams and in the laboratory parts. Should this condition not be accomplished, the final mark obtained by the above calculation will be truncated up to a maximum of 4 points.

- The marks corresponding to the lecture contents exams will come from the following formula

Exams=Max(mean IF, final)

  - ✓ Where *mean IF = 0.4*average of intermediate exams + 0.6*final*
  - ✓ The evaluation of a missed exam will be zero points.
  - ✓ The marks obtained for active participation in the problem solving sessions could be used to improve the exams marks up to two points.

- The final marks for the laboratory will come from the averaged marks of all of them.
  - ✓ A maximum of one laboratory session could be missed being evaluated with zero points.
  - ✓ More than one laboratory session missed will result in failing to pass this course.
- Missing the final exam will result in obtaining a "Non evaluated" marks.
- If only laboratory part is passed, the marks will be maintained only for the extraordinary call of the same academic year.
- If laboratory session evaluation is failed, a special laboratory session will be settled as a practical exam in the extraordinary call.

5. Course calendar (*)

Contents	Attending hours (Lecturing + Problems)	Horas no presenciales
Chapter 1	14 (12+2)	9
Chapter 2	13 (12+1)	7
1st MidTerm	1	
Chapter 3	11 (9+2)	7
2nd MidTerm	1	
Chapter 4	9 (8+1)	6
3rd MidTerm	1	
Lab Sessions	22	15
Final Exam	3	15
Extraordinary Exam	3	15

* This calendar in only an estimate.