A) COURSE

Course Id:	Course
5517	Electric Circuits A

Class Hours per Week	Lab hours per week	Complementary practices	Credits	Total hour course
5	2	5	12	80 class 32 Practice

B) GENERAL COURSE INFORMATION:

	EE (IEA)	ME (IM)	MME (IMA)	EME (IME)	MTE (IMT)
Level:	IV			IV	III
Course Type (Required/Elective)	Required			Required	Required
Prerequisite Course:	Electricity and Magnetism B			Electricity and Magnetism B	Electrotechnology for Engineering I
CACEI Classification:	CI			CI	CI

A) C) GENERAL COURSE INFORMATION:

At the end of the course, the student will be capable of:
ANALIZE TOP METHODS AND TECHNIQUES OF LINEAR ELECTRICAL CIRCUITS, CONSIDERING DIFFERENT SOURCES OF EXCITEMENT IN PERMANENT AND TRANSIENT STATE

D) TOPICS (CONTENTS AND METHODOLOGY)

1.- Basic concepts of electrical circuits I		**5 hours**
Specific Objective:	Analyze the main laws governing the behavior of electrical circuits.	
1.1.- Voltage and Current concept 1.2.- Ohm Law 1.3.- Net and Node concepts 1.4.- Kirchhoff Laws 1.5.- Independent and dependent sources 1.6.- Arrangement serie-parallell of resistors and delta/star and star/delta transformations 1.7.- Voltage Divisor and current divisor		
Readings and other resources	Readings and investigations to complement the analyzed in class topics	
Teaching Methodologies	Exhibition topics by teacher and/or students; use of some didactic techniques; discussion and analysis sessions; development of lab practices according topics covered in class	
Learning Activities	Exercise class or homework; work or research projects and digital simulation exercises	

2.- Methods and techniques of resistive circuits analysis		**20 hours**
Specific Objective:	Apply main methods and techniques of linear circuits. Identify the most appropriate technique or method to solve any type of circuit	
2.1.- Netting method 2.2.- Super net concept 2.3.- Node method 2.4.- Super node concept 2.5.- Reducción de redes transformaciones 2.6.- Voltage and current sources equivalent 2.7.- Superposition theorem 2.8.- Thevenin theorem 2.9.- Norton theorem 2.10.- Theorem of maximum power transfer 2.11.- Power in resistive circuits		
Readings and other resources	Readings and investigations to complement the analyzed in class topics	
Teaching Methodologies	Exhibition topics by teacher and/or students; use of some didactic techniques like teamwork, learning based in problems and/or projects; development of lab practices according topics covered in class	
Learning Activities	Exercises in class and homework and their respective interpretation ; digital simulation exercises , various activities on digital platforms online	

3.- Steady state analysis of circuits RL RC series and parallel connections		**5 hours**
Specific Objective:	Identify inductors and capacitors like elements of a circuit that store energy	
3.1.- Series-parallel arrangement of inductance 3.2.- Series-parallel arrangement of capacitance 3.3.- Equivalent inductance and/or capacitance 3.4.- Inductor Voltage 3.5.- Capacitor Current 3.6.- Initial and steady state conditions of RL and RC circuits		
Readings and other resources	Readings for research concepts as well as to complement and strengthen the topics discussed in class	
Teaching Methodologies	Exhibition topics by teacher and/or students; use of some didactic techniques like teamwork, learning based in problems and/or projects; development of lab practices according topics covered in class	
Learning Activities	Exercises in class and homework and their respective interpretation ; digital simulation exercises , various activities on digital platforms online	

4.- Transient analysis of RL-RC circuits supplied with direct current		**15 hours**
Specific Objective:	Analyze the transitional stage of RL and RC circuits in their series and / or parallel configurations.	
4.1.- RL circuits without excitement: natural response 4.2.- RC circuits without excitement: natural response 4.3.- Time constant circuits RL -RC 4.4.- Unit step function 4.5.- Response of an RL or RC circuit excited by a constant source 4.6.- Response of an RC or RL circuit excited by a non-constant source		
Readings and other resources	Readings for research concepts as well as to complement and strengthen the topics discussed in class	

Teaching Methodologies	Exhibition topics by teacher and/or students; use of some didactic techniques like teamwork, learning based in problems and/or projects; development of lab practices according topics covered in class.
Learning Activities	Exercises in class and homework and their respective interpretation; digital simulation exercises, various activities on digital platforms online.

5.- Sinusoidal function	**5 hours**
Specific Objective:	Identify the main characteristics of a sinusoidal function. Set the current-voltage relations with sinusoidal excitation in RLC circuits and define the concept of effective value.
5.1.- General concepts of a sinusoidal signal : peak value , peak-peak period frequency. 5.2.- Phase displacement of sinusoidal signals. 5.3.- Voltage-current relationship in a resistive circuit. 5.4.- Voltage-current relationship in a inductive circuit. 5.5.- Voltage-current relationship in a capacitive circuit. 5.6.- Effective value of sinusoidal voltages and currents	
Readings and other resources	Readings for research concepts as well as to complement and strengthen the topics discussed in class
Teaching Methodologies	Exhibition topics by teacher and/or students; use of some didactic techniques like teamwork, learning based in problems and/or projects; development of lab practices according topics covered in class.
Learning Activities	Exercises in class and homework and their respective interpretation; digital simulation exercises, various activities on digital platforms online.

6.- Sinusoidal analysis in steady state	**5 hours**
Specific Objective:	Develop the analysis in the frequency domain of sinusoidal powered circuits.
6.1.- Complex exponential function 6.2.- The phasor concept 6.3.- Phasorial relations to R, L and C elements. 6.4.- Impedance and admittance. 6.5.- Kirchoff laws employing phasors.	
Readings and other resources	Readings to complement the analyzed topics
Teaching Methodologies	Exhibition topics by teacher and/or students
Learning Activities	Exercises in class and homework and their respective interpretation, various activities on digital platforms online.

7.- Methods and Techniques in Permanent Sinusoidal Analysis	**15 hours**
Specific Objective:	Develop the main methods and techniques of linear circuits using phasor tool. Identify the most appropriate method or technique.
7.1.- Node voltage analysis 7.2.- Mesh current analysis 7.2.- Superposition theorem 7.3.- Source transformation 7.4.- Thevenin's equivalent 7.5.- Norton's equivalent 7.6.- Phasor diagrams 7.7.- Frecuency response	
Readings and other resources	Readings for research concepts and to implement and strengthen the topics discussed in class

Teaching Methodologies	Exhibition topics by teacher and/or students; use of didactic techniques like teamwork, Learning based in problems and/or projects; development of lab practices according topics covered in class.
Learning Activities	Exercises in class and homework and their respective interpretation; digital simulation exercises, various activities on digital platforms online.

8.- Transient analysis of RLC circuits.		**10 hours**
Specific Objective:	Analyze the transitional stage of the RLC circuits in their series and / or parallel configurations.	
8.1.- Natural response of a parallel RLC circuit 8.2.- Forms of a Natural response of a parallel RLC circuit 8.3.- Step response of a parallel RLC circuit 8.4.- Natural and step response of a series RLC circuit 8.5.- Response to a sinusoidal function of a series and / or parallel RLC circuit		
Readings and other resources	Readings for research concepts and to implement and strengthen the topics discussed in class	
Teaching Methodologies	Exhibition topics by teacher and/or students; development of a project that integrates the knowledge of the topic; development of lab practices according topics covered in class.	
Learning Activities	Exercises in class and homework and their respective interpretation; digital simulation exercises, various activities on digital platforms online.	

E) TEACHING AND LEARNING METHODOLOGIES

- In class they will develop individually and team exercises topics to promote abstract and analytical reasoning.
- Some teaching techniques that encourage meaningful learning are used.
- Management, search and interpreting of information related to the topics will be promoted.
- The use of ICTs will be promoted through homework or projects.

F) EVALUATION CRITERIA:

Evaluation:	**Schedule**	**Suggested Form of Evaluation and weighing**	**Topics**
First Partial exam Written exam: 80% Problems, group excercises: 20% Total 100%	Session 16	20%	Topics 1 y 2
Second Partial exam Written exam: 80% Problems, Simulations: 20% Total 100%	Session 32	20%	Topics 2 y 3
Third Partial exam Written exam: 80% Problems, Simulations: 20% Total 100%	Session 48	20%	Topic 4
Fourth Partial exam Written exam: 80% Problems, group exercises: 20% Total 100%	Session 64	20%	Topics 5, 6 y 7
Fifth Partial exam Written exam: 80%	Session 80	20%	Topic 7 y 8

Problems, group exercises: 20% Total 100%			
Total	16 weeks		100%
Ordinary Exam		Average of the 5 partial grades	
Lab		Needed to pass the subject	
Extraordinary exam		Written theoretical exam of all units 100%	
Title exam		Written theoretical exam of all units 100%	
Regularization exam		Written theoretical exam of all units 100%	

G) BIBLIOGRAPHY AND ELECTRONIC RESOURCES
Main Books

- Dorf Svoboda, "Circuitos Eléctricos", Alfaomega, 8ª Edición, 2011
- Hayt y Kemerly, "Análisis de Circuitos Eléctricos", Mc Graw-Hill, 8ª Ed, 2012
- Boylestad Robert L., "Introducción al Análisis de Circuitos", Pearson/Prentice Hall, 12ª Ed, 2012
- Irwin J. David, "Análisis Básico de Circuitos en Ingeniería", Limusa Wiley, 6ª Ed, 2006

Complementary Books

- Carlson A. Bruce, "Circuitos", Thomson Learning, 1ª Ed, 2000
- Edminister Joseph, "Circuitos Eléctricos Serie Schaum", Mc Graw-Hill 3ª Edición

Internet Links

http://www.ieee-virtual-museum.org
http://www.orcad.com
http://www.scilab.org
http://www.mathworks.com
http://www.pearsonbv.com
http://www.mheducation.com