A) COURSE

Course Id:	Course
5518	Electrical Circuits B

Class Hours per Week	Lab hours per week	Complementary practices	Credits	Total hour course
4	2	4	10	64 theory 32 practice

A) GENERAL COURSE INFORMATION

	EE (IEA)	ME (IM)	MME (IMA)	EME (IME)	MTE (IMT)
Level:	V			V	
Course Type (Required/Elective)	Required			Required	
Prerequisite Course:	Electrical Circuits A			Electrical Circuits A	
CACEI Classification:	CI			CI	

C) COURSE OBJECTIVE

At the end of the course, the student will be capable of:
Develop techniques and procedures to solve AC circuits in steady state. Interpret and analyze the results of the different techniques and procedures applied to AC circuits.

D) TOPICS (CONTENTS AND METHODOLOGY)

1.- One phase power		14 hours
Specific Objective:	Calculate the power of a single phase AC circuit	
1.1.- Snap and average power 1.2.- Complex power 1.3.- Triangle of powers 1.4.- Power factor Compensation 1.5.- Effective value of a voltage and current signal 1.6.- Single phase power measurement 1.7.- Theorem of maximum power transfer 1.8.- Power in resonant circuits 1.8.1.- Series resonance 1.8.2.- Parallell resonance		
Readings and other resources	Readings to investigation of concepts, as well as to complement and strengthen the topics discussed in class.	

Teaching methods	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	Exercise class and homework, as well as them respective interpretation of results; digital simulation exercises, different activities in digital platforms on the net.

2.- Magnetically Coupled Circuits	**14 hours**
Specific Objective:	Evaluate models and applications of magnetically coupled circuits.
2.1.- Calculating the self and mutual inductance **2.2**.- Coupling Coefficient **2.3**.- Polarity marks in coupled coils **2.4**.- Calculation of power and energy in coupled coils **2.5**.- Ideal power transformer model **2.6**.- transformation relation **2.7**.- Impedances referred to the ideal power transformer **2.8**.- Voltage, current calculating referred to the power transformer **2.9**.- Power calculating in the ideal power transformer	
Readings and other resources	Readings to investigation of concepts, as well as to complement and strengthen the topics discussed in class
Teaching methods	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	Exercise class and homework, as well as them respective interpretation of results; digital simulation exercises, different activities in digital platforms on the net.

3.- Balanced Three-phase circuits	**14 hours**
Specific Objective:	Analyze the techniques and procedure to solve balanced three-phase circuits.
3.1.- Polyphase systems representation **3.2**.- Configuration: star(3 or 4 lines) and delta(3 lines) **3.3**.- Phase sequence and phasor diagrams **3.4**.- Transformations star-delta and delta-star **3.5**.- Instantaneous power and complex power **3.6**.- Triangle power and power factor compensation **3.7**.- Three-wire and one-wire diagrams of an electric circuit **3.8**.- Balanced circuits calculation by the monophasic model **3.9**.- Three-phase power measurement: method of three and two wattmeters **3.10**.- Three-phase circuits with coupled impedances	
Readings and other resources	Readings to investigation of concepts, as well as to complement and strengthen the topics discussed in class.
Teaching methods	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	Exercise class and homework, as well as them respective interpretation of results; digital simulation exercises, different activities in digital platforms on the net.

4.- Unbalanced three-phase circuits		**14hours**
Specific Objective:	Analyze the techniques and procedure to solve unbalanced three-phase circuits.	
4.1.- Currents and voltages relation in an unbalanced load **4.2.-** Analysis by the method of meshes and nodes **4.3.-** Three-phase power calculation **4.4.-** Power factor vector **4.5.-** Power measurement in unbalanced circuits **4.6.-** Symmetrical components for unbalanced-balanced circuits **4.7.-** Voltages and currents of positive, negative and zero sequence **4.8.-** Sequence nets unbalanced-balanced circuits **4.9.-** Power calculation for symmetrical components		
Readings and other resources	Readings to investigation of concepts, as well as to complement and strengthen the topics discussed in class.	
Teaching methods	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	Exercise class and homework, as well as them respective interpretation of results; digital simulation exercises, different activities in digital platforms on the net.	

5.- Non-sinusoidal signals		**8hours**
Specific Objective:	Interpreting the voltage, current and power variables, when considering a non-sinusoidal signal at the source or load	
5.1.- Effective value of non-sinusoidal signals **5.2.-** Harmonics voltages and currents in monophasic circuits **5.3**.- Power and power factor calculation of a non-sinusoidal source and line load **5.4**.- Power and power factor calculation of a non-sinusoidal source and nonlinear load **5.5**.- Harmonic total distortion of voltage and current sources **5.6**.- Voltage and current harmonics in three-phase circuits		
Readings and other resources	Readings to investigation of concepts, as well as to complement and strengthen the topics discussed in class.	
Teaching methods	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	Exercise class and homework, as well as them respective interpretation of results; digital simulation exercises, different activities in digital platforms on the net.	

E) TEACHING AND LEARNING METHODOLOGIES

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

F) EVALUATION CRITERIA

Suggested Form of Evaluation and weighing	Schedule	Include	Weighing
First partial exam Written exam: 80% Homeworks, simulations, didactic techniques: 20% Total 100%	4 weeks	Topics 1	25 %
Second partial exam Written exam: 80% Homeworks, simulations, didactic techniques: 20% Total 100%	4 weeks	Topics 2	25 %
Third partial exam Written exam: 80% Homeworks, projects: 20% Total 100%	4 weeks	Topics 3, 4	25 %
Fourth partial exam Written exam: 80% Homeworks, projects: 20% Total 100%	4 weeks	Topics 4 y 5	25 %
Total	16 weeks		100%
Ordinary exam		It is the average of the four partial qualifications	
Lab		Prove necessary to pass the course	
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

- DorfSvoboda, "Circuitos Eléctricos", Alfaomega, 8ª Edición, 2011
- 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
- Kerchner y Corcoran, "Circuitos de Corriente Alterna", 2ª Ed, CECSA

Complementary Books

- Hayt y Kemerly, "Análisis de Circuitos Eléctricos", Mc Graw-Hill, 8ª Ed, 2012

- Carlson A. Bruce, “Circuitos”, Thomson Learning, 1ª Ed, 2000
- Edminister Joseph, “Circuitos Eléctricos Serie Schaum”, Mc Graw-Hill 3ª Edición, 1997

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