A) COURSE

Course Id:	Course
5717	INDUSTRIAL ELECTRONICS A

Class Hours per Week	Lab hours per week	Complementary practices	Credits	Total hour course
3	2	3	8	48

B) GENERAL COURSE INFORMATION:

	EE (IEA)	ME (IM)	MME (IMA)	EME (IME)	MTE (IMT)
Level:				VIII	VI
Course Type (Required/Elective)				Elective	Required
Prerequisite Course:				Electronics II	Electronics II
CACEI Classification:				AI	AI

C) COURSE OBJECTIVE

At the end of the course, the student will be capable of:
One of the major applications of power electronics is currently in the management and control of electrical energy industrial electrical systems, whose purpose is the efficient control of electrical energy. Therefore it is essential that undergraduate courses involving the handling of electrical-electronic and/or machines electrical have an introductory course on industrial electronics.

D) TOPICS (CONTENTS AND METHODOLOGY)

1.- INTRODUCTION		**8 Hours**
Specific Objective:	**The student analyzes the characteristics of the main power electronic devices, develop various topologies with these devices and identify their applications in industrial processes.**	
1.1 Development and application of the electronic in power circuits. 1.2 Classification of the power converters. 1.3 Electronics switches. 1.3.1 Diodes. 1.3.2 Transistors. 1.3.3 Thyristors. 1.4 Selection of devices switches of solid state. 1.5 Thermic design.		
Readings and other resources	To read the topics of the bibliography is recommended To solve problems suggested by the teacher.	
Teaching Methodologies	Collaborative Learning Problem-based learning	

Learning Activities	Projects PSpice and Simulink simulations Study cases Homeworks Mandatory to make practices in the Lab

2. RECTIFIER CIRCUITS		**8 Hours**
Specific Objective:	**To analyze the process of conversion of alternating current to direct current, identifying the electronic elements that are used.**	
2.1 Non-controlled rectifiers single phase and polyphase. 2.2 Controlled rectifiers single-phase and polyphase. 2.3 Phase-control. 2.4 Thyristor firing circuits 2.5 Thermic design.		
Readings and other resources	To read the topics of the bibliography is recommended To solve problems suggested by the teacher..	
Teaching Methodologies	Collaborative Learning Problem-based learning	
Learning Activities	Projects PSpice and Simulink simulations Study cases Homeworks Mandatory to make practices in the Lab	

3. CD-CD CONVERTERS		**8 Hours**
Specific Objective:	**To analysis the process of conversion of direct current to direct current identifying the electronic elements that are used.**	
3.1 The basic converter switching. 3.2 The Buck converter. 3.3 The Boost converter. 3.4 The Buck-Boost converter. 3.5 DC-DC converter design..		
Readings and other resources	To read the topics of the bibliography is recommended To solve problems suggested by the teacher.	
Teaching Methodologies	Collaborative Learning Problem-based learning	
Learning Activities	I Projects PSpice and Simulink simulations Study cases Homeworks Mandatory to make practices in the Lab	

4. INVERTERS		**8 Hours**
Specific Objective:	**To identify the process of conversion of direct current to alternating current.**	

4.1 The converter of rectangular wave. 4.2 The converter of CD to AC with Pulse-Width Modulation. 4.3 The converter in voltage and constant frequency 4.4 The converter in voltage and variable frequency 4.5 The converter as universal generator. 4.6 Inverter design.	
Readings and other resources	To read the topics of the bibliography is recommended To solve problems suggested by the teacher
Teaching Methodologies	Collaborative Learning Problem-based learning
Learning Activities	Projects PSpice and Simulink simulations Study cases Homeworks Mandatory to make practices in the Lab

5. ELECTRONIC CONTROL OF MOTORS OF DC	**8 Hours**
Specific Objective:	**To compare and select different electronic control schemes for motor direct current (DC), according to their characteristics**
5.1 Considerations of operation of the DC motor in the four quadrants. 5.2 Control of a DC motor through a converter DC-DC switching. 5.3 Control for stepper motors. 5.4 Control for synchronous motors and DC motors brushless.	
Readings and other resources	To read the topics of the bibliography is recommended To solve problems suggested by the teacher.
Teaching Methodologies	Collaborative Learning Problem-based learning
Learning Activities	Projects PSpice and Simulink simulations Study cases Homeworks Mandatory to make practices in the Lab

6. ELECTRONIC CONTROL OF MOTORS OF AC	**8 Hours**
Specific Objective:	**To identify different models for electronic control of AC motors.**
6.1 Types of AC controls. 6.2 Characteristics of control of a asynchronous motor 6.3 Torque control and speed of a induction motor. 6.4 Dynamic control of the induction motors. 6.5 Applications of the torque control and speed of induction motors.	
Readings and other resources	To read the topics of the bibliography is recommended To solve problems suggested by the teacher.
Teaching Methodologies	Collaborative Learning Problem-based learning

Learning Activities	Projects PSpice and Simulink simulations Study cases Homeworks Mandatory to make practices in the Lab

E) TEACHING AND LEARNING METHODOLOGIES

Theoretical concepts are showed by exposures multimedia presentations. The student will research topics about the power electronics. The teacher will propose practical projects that involving the selection design and evaluation knowledge acquired in the course, to promote the participation of teams. The student will make a final project, which will aim integrate a motor control system to a mechatronic process, using the resources of the laboratory and/or the resources acquired by the student. The student will visit industries with a high degree of electronic control of processes. The student will use the laboratory computer in order to simulation exercises about of topics of the course.

F) EVALUATION CRITERIA:

Evaluation:	Schedule	Suggested Form of Evaluation and weighing	Topics
1st Term	Session 16	Exam 80%, Homework 20%,	Units 1 and 2
2nd Term	Session 32	Exam 80%, Homework 20%,	Units 3 and 4
3rd Term	Session 48	Exam 80%, Homework 20%,	Units 5 and 6
Final evaluation		100% (Average of the partial evaluations)	
Other activity:			
Extraordinary Exam	According to schedule	100% Exam	100% of topics
Title Exam	According to schedule	100% Exam	100% of topics
Regularization Exam	According to schedule	100% Exam	100% of topics

G) BIBLIOGRAPHY AND ELECTRONIC RESOURCES

Main Books

DANIEL W. HART, *Electrónica de Potencia*. PEARSON Prentice Hall, España 2001.

MUHAMMAD H. RASHID, *Electrónica de Potencia*. 3ª. Edición, PEARSON Prentice Hall, 2004.

Complementary Books

DANIEL W. HART, *Electrónica de Potencia*. PEARSON Prentice Hall, España 2001.

MUHAMMAD H. RASHID, *Electrónica de Potencia*. 3ª. Edición, PEARSON Prentice Hall, 2004.

FURTHER READING:

NED MOHAN, TORE M. UNDELAND, WILLIAM P. ROBBINS, *Electrónica de Potencia, Convertidores, aplicaciones y diseño*. Mc Graw Hill, México 2009.

P. C. SEN, *Principles of Electric Machines and Power Electronics*. Second Edition, John Wiley and Sons, 1997.

R. W. ERICKSON AND D. MAKSIMOVIC, *Fundamentals of Power Electronics*. Second Edition, Kluwer Academic Publishers, 2001.

PHILIP T. KREIN, *Elements of Power Electronics*. Oxford University Press, 1998.

Electronic pages:

http://www.ab.com/motion/
http://www.yaskawa.com/
http://www.baldor.com/
http://www.irf.com/indexsw.html