A) COURSE

Course Id:	Course
5693	Electrotechnology for engineering II

Class Hours per Week	Lab hours per week	Complementary practices	Credits	Total hour course
5	0	5	10	80 Theory

B) GENERAL COURSE INFORMATION

	EE (IEA)	ME (IM)	MME (IMA)	EME (IME)	MTE (IMT)
Level:		VI	VI		
Course Type (Required/Elective)		Required	Required		
Prerequisite Course:		Electrotechnology for engineering I	Electrotechnology for engineering I		
CACEI Classification:		CI	CI		

C) COURSE OBJECTIVE

At the end of the course, the student will be capable of:
Understand in its entirety the generation process, transmission, distribution and utilization of the electrical energy; as well as its handling in the industry; Beginning by the theoretical concepts of AC, and finishing by its application in the industry corresponding mostly to electrical motors and its control.

D) TOPICS (CONTENTS AND METHODOLOGY)

1.- AC circuits.		**18hours**
Specific Objective:	That the student apply the principles of the AC circuits and he could interpret the relative phenomenon and to its application.	
1.1 Middle value and RMS value. 1.2 Complex numbers. 1.3 Complex impedance and phasor notation 1.4 Series and parallel circuits. 1.5 Resonance. Power and fp. 1.6 Polyphase systems		
Readings and other resources	Readings to investigation of concepts, as well as to complement and strengthen the topics discussed in class.	
Teaching methods	Exercise class and homework, as well as them respective interpretation of results; digital simulation exercises, different activities in digital platforms on the net.	
Learning activities	Develop of lab practices applying the theory concepts. Practices report, group and individual problem resolution.	

2.- Measurments and security	**4 hours**

Specific Objective:	That the student realizes the measurements with basic parameters, considering the needs security measures.
2.1 Security, danger voltages, current tolerable to the human body. 2.2 Analog and digital systems. 2.3 Current and voltage measurement. 2.4 Resistance measurement and insulation resistance. 2.5 Current and voltage tyransformers. 2.6 Power measurement, energy and fp.	
Readings and other resources	Readings to investigation of concepts, as well as to complement and strengthen the topics discussed in class.
Teaching methods	Exercise class and homework, as well as them respective interpretation of results; digital simulation exercises, different activities in digital platforms on the net.
Learning activities	Develop of lab practices applying the theory concepts. Practices report, group and individual problem resolution.

3.- Generation, transmission and distribution of electrical energy	**10hours**
Specific Objective:	That the student analyze the generation, transport, distribution and use of electrical energy.
3.1 General scheme of an electric circuit. 3.2 Methods of generation (hydro-electrical, thermal-electrical, combined cycle, geothermal, wind). 3.3 Generators, excitation, speed-frequency control. 3.4 Transmission lines, voltages, conductors, insulators, structures. 3.5 Substations, components, types. 3.6 Sub-Transmission lines and sub-distribution. 3.7 Industrial distribution	
Readings and other resources	Readings to investigation of concepts, as well as to complement and strengthen the topics discussed in class.
Teaching methods	Exercise class and homework, as well as them respective interpretation of results; digital simulation exercises, different activities in digital platforms on the net.
Learning activities	Develop of lab practices applying the theory concepts. Practices report, group and individual problem resolution.

4.- Transformers.	**8hours**
Specific Objective:	That the student identifies the different types of transformers, operation, connection types and application.
4.1 Types and construction, norms. 4.2 Ideal transformer and real transformer. 4.3 Equivalent circuit and phase diagram. 4.4 Transformer in short circuit and open circuit 4.5 Losses, efficiency and voltage regulation. 4.6 Three-phase transformers and its connections. 4.7 Application of the transformers, parallel connection, derivations changes, overload capacity.	
Readings and other resources	Readings to investigation of concepts, as well as to complement and strengthen the topics discussed in class.
Teaching methods	Exercise class and homework, as well as them respective interpretation of results; digital simulation exercises, different activities in digital platforms on the net.
Learning activities	Develop of lab practices applying the theory concepts. Practices report, group and individual problem resolution.

5.- Induction engines.	**20hours**
Specific Objective:	That the student identify the different types of design in the induction engines, application, operation characteristics; boot methods, control and protection.

5.1 Magnetic rotating field and development of the torque. 5.2 Parameters of the induction engines 5.3 Design types of the squirrel cage engine and its application. 5.4 Wound rotor motors. 5.5 Starters and speed control of induction motors. 5.6 Monophasic engines, different types and its application.	
Readings and other resources	Readings to investigation of concepts, as well as to complement and strengthen the topics discussed in class.
Teaching methods	Exercise class and homework, as well as them respective interpretation of results; digital simulation exercises, different activities in digital platforms on the net.
Learning activities	Develop of lab practices applying the theory concepts. Practices report, group and individual problem resolution.

6.- Synchronous machines.		**9hours**
Specific Objective:	That the student distinguish the construction of synchronous machines, its operation and application.	
6.1 Generalities of synchronous machines. 6.2 Synchronous alternator 6.3 Synchronous motor and its control		
Readings and other resources	Readings to investigation of concepts, as well as to complement and strengthen the topics discussed in class.	
Teaching methods	Exercise class and homework, as well as them respective interpretation of results; digital simulation exercises, different activities in digital platforms on the net.	
Learning activities	Develop of lab practices applying the theory concepts. Practices report, group and individual problem resolution.	

7.- DC machines		**11hours**
Specific Objective:	The student will describe the construction of DC motors, understanding why they work, know their speeds and connections, select your boot methods, security and applications.	
7.1 Generalities. 7.2 DC generators. 7.3 Transforectifiers. 7.4 DC motors and their control		
Readings and other resources	Readings to investigation of concepts, as well as to complement and strengthen the topics discussed in class.	
Teaching methods	Exercise class and homework, as well as them respective interpretation of results; digital simulation exercises, different activities in digital platforms on the net.	
Learning activities	Develop of lab practices applying the theory concepts. Practices report, group and individual problem resolution.	

E) TEACHING AND LEARNING METHODOLOGIES

Presentation of topics, analysis of theoretical concepts, resolution and discussion of self-assessment questionnaires, group and individual work and supporting Electrical Circuits and Electrical Machines labs.

F) EVALUATION CRITERIA

Evaluation:	Schedule	Suggested Form of Evaluation and weighing	Topics to cover

First partial evaluation	Session 16	Exam 80% , Homeworks 5%, Practices 15%	1,2,3
Second partial evaluation	Session 32	Exam 80% , Homeworks 5%, Practices 15%	3, 4, 5
Third partial evaluation	Session 48	Exam 80% , Homeworks 5%, Practices 15%	5, 6 , 7
Fourth partial evaluation	Session 64	Exam 80% , Homeworks 5%, Practices 15%	8, 9, 10
Fifth partial evaluation	Session 80	Exam 80% , Homeworks 5%, Practices 15%	8, 9, 10
Ordinary final evaluation		80% (Average partial evaluations) 20% Final project	
Another activity:	Final project: percentage and criteria defined by the teacher at the beginning of the semester	At each partial will perform lab practices that will be cosidered in the evaluation	
Extraordinary exam	Week 17 of the semester	100% Written exam	100% agenda
Title exam	According to scheduling school secretary	100% Written exam	100% agenda
Regularization exam	According to scheduling school secretary	100% Written exam	100% agenda

G) BIBLIOGRAPHY AND ELECTRONIC RESOURCES

Main Books

RICHARDSON, CAISSE, Máquinas Eléctricas Rotativas y Transformadores. Prentice Hall. 1997

ENRIQUEZ HARPER, Máquinas Eléctricas, Limusa, 2005.
IRVING L KOSOW, Electric Machinery and Transformer. Prentice Hall 2005.

S. J, CHAPMAN, Máquinas Eléctricas. Mc. Graw Hill.2012.

Complementary Books

- P. C. SEN, Principles of Electric Machines and Power Electronics. John Wiley & Son. 2014

Internet Links

- http://www.learnengineering.org