A) COURSE

Course Id:	Course
5614	Control and Automation Systems

Class Hours per Week	Lab hours per week	Complementary practices	Credits	Total hour course
3	1	3	7	48 class 16 practice

A) GENERAL COURSE INFORMATION:

	EE (IEA)	ME (IM)	MME (IMA)	EME (IME)	MTE (IMT)
Level:		VII	VII		
Course Type (Required/Elective)		Required	Required		
Prerequisite Course:		Electrotechnology to engineering II	Electrotechnology to engineering II		
CACEI Classification:		IA	IA		

C) COURSE OBJECTIVE

At the end of the course, the student will be capable of:
Identify basic characteristics of an automatic control. Analyze principal control functions for a system to work automatically.

D) TOPICS (CONTENTS AND METHODOLOGY)

1. Introduction to control systems		**12 hours**
Specific Objective:	The students analyze the basic principles of origin of control systems, as well as the elements that conforms a control system. Further, the process of modeling of physical systems is presented.	
1.1 Definition of control systems 1.2 Classification of control systems. 1.3 Open loop systems. 1.4 Closed loop systems 1.5 Elaboration of the model using the differential equation of physical systems. 1.6 Blocks diagram 1.7 Transference functions of control systems		
Readings and other resources	Resources needed for teaching and learning specifically on this issue, when appropriate.	
Teaching Methodologies	Specific activities on this issue made by the teacher, like presentation, conduction of deliberations, supervision of practices, etc.	

Learning Activities	Specific activities of the topic made by the students like practices, readings, homework, class exercises, etc.

2 Combinational systems		**9 hours**
Specific Objective:	That the student evaluates the main tools for combinational systems.	
2.1 Basic logical functions 2.2 Boolean algebra 2.3 Simplification of karnaugh maps. 2.4 Design of control systems using combinational systems		
Readings and other resources	Resources needed for teaching and learning specifically on this issue, when appropriate.	
Teaching Methodologies	Specific activities on this issue made by the teacher, like presentation, conduction of deliberations, supervision of practices, etc.	
Learning Activities	Specific activities of the topic made by the students like practices, readings, homework, class exercises, etc.	

3 Actuator and controlator systems		**6 hours**
Specific Objective:	That the student identifies the main tools of the components which integrate a system of automatic control.	
3.1 Classification of measurement, sensing and process control instruments. 3.2 Kind of signals 3.3 Criteria for the selection of sensors of physical variables. 3.4 Transmissions and controllers		
Readings and other resources	Resources needed for teaching and learning specifically on this issue, when appropriate.	
Teaching Methodologies	Specific activities on this issue made by the teacher, like presentation, conduction of deliberations, supervision of practices, etc.	
Learning Activities	Specific activities of the topic made by the students like practices, readings, homework, class exercises, etc.	

4 Typical schemes of industrial control		**12 hours**
Specific Objective:	That the student identifies the main schemes of industrial control.	
4.1. Typical schemes of industrial control 4.2 Electrical control systems 4.3. Electropneumatic control systems 4.4 Electrohidraulic control systems.		
Readings and other resources	Resources needed for teaching and learning specifically on this issue, when appropriate.	
Teaching Methodologies	Specific activities on this issue made by the teacher, like presentation, conduction of deliberations, supervision of practices, etc..	
Learning Activities	Specific activities of the topic made by the students like practices, readings, homework, class exercises, etc.	

5. Introduction to programmable logic controllers.		**9 hours**
Specific Objective:	That the student understands the role of a programmable logical controller, and its main operating characteristics.	

5.1 Characteristics of programmable logical controllers. 5.2 Basic configuration of a PLC 5.3. Programming languages used in programmable logical controllers. 5.3.1 Programming languages using ladder diagrams (KOP). 5.3.2 Programming languages using instructions list (AWL). 5.3.3 Programming using functions diagram (FUP). 5.4 Flags, inputs, outputs and power. 5.5 Programming of timers. 5.6 PLC applications in industrial control	
Readings and other resources	Resources needed for teaching and learning specifically on this issue, when appropriate.
Teaching Methodologies	Specific activities on this issue made by the teacher, like presentation, conduction of deliberations, supervision of practices, etc.
Learning Activities	Specific activities of the topic made by the students like practices, readings, homework, class exercises, etc.

E) TEACHING AND LEARNING METHODOLOGIES

- In class will be developed individually and by team exercises of the topics to promote abstract and analytical reasoning.
- Some teaching techniques that encourage meaningful learning will be used in some of the topics of the subject.
- Managing, finding and interpreting information related to the topics will be promoted.
- Use of the ICTs will be promoted, by projects and homework.

F) EVALUATION CRITERIA:

Evaluation:	Schedule	Topics	Suggested Form of Evaluation and weighing
First partial exam Written exam: 80% Homework, Simulations, Didactic techniques: 20% Total 100%	Session 16	Topics 1 y 2	33 %
Second partial exam Written exam: 80% Homework, Simulations, Didactic techniques: 20% Total 100%	Session 32	Topics 2, 3 y 4	33 %
Third partial exam Written exam: 80% Homework, Simulations, Didactic techniques: 20% Total 100%	Session 48	Topics 4 y 5	33 %
Total	48 sessions		100%
Ordinary Exam		Sum of the percentages obtained in	

	the 3 partial evaluations.
Laboratory	It is necessary to accredit to pass .
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

Bolton, W., Ingeniería de control. Alfaomega, 2005.
Bolton, W., Mecatrónica. Alfaomega, 2006.
Marcovitz B. Alan ,. Diseño digital. Mcgrawhill, 2005. 2ª ed.
Romeral José Luis, Autómatas programables, alfaomega, 1999.

Complementary Books

García Moreno, Emilio, Automatización de Procesos Industriales. Alfaomega, 2000.
Payas Areny Ramón, Sensores Y Acondicionadores De Señal, Alfaomega, 2000. 3ª Ed.
Piedrafita Moreno Ramón, Ingeniería De La Automatización Industrial, Ra–Ma, 2001.
Roca Alfred, Control De Procesos, Alfaomega, 2002. 2ª Ed.

Internet Links

http://www.interactiv.com
https://www.siemens.com.mx/cms/mam/industry/Automatizacion/SIMATIC-sistemas-de-automatizacion-industrial/plc/Pages/plc-siemens-SIMATIC.aspx
http://ab.rockwellautomation.com/es/Programmable-Controllers