ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL
Faculty of Electrical and Computer Engineering
COURSE SYLLABUS
Automatic Control

1. CODE AND NUMBER OF CREDITS

CODE	FIEC03418	
NUMBER OF CREDITS : 5	**Theoretical: 4**	**Practical: 1**

2. COURSE DESCRIPTION

The course of Automatic Control, is considered a fundamental theoretical and practical course of professional training in the area of engineering, it seeks to highlight the basic tools required for the analysis and design of automatic systems that today's applications require engineers in technical areas.
It starts with the modeling and simulation of simple systems, feedback systems analysis to later provide the foundation for system stability criteria, which eventually leads to the design of the controllers that meet the required specifications. All content is complemented with the use of simulation software and the Laboratory of Automatic Control practices.

3. PRE-REQUISITES AND CO-REQUISITES

PRE-REQUISITES	FIEC01784 ELECTRICAL NETWORK ANALYSIS II
CO-REQUISITES	

4. CORE TEXT AND OTHER REQUIRED REFERENCES FOR THE TEACHING OF THE COURSE

CORE TEXT	1. 1. R.Dorf, y R. Bishop,"Modern control System" 11ava Edición,Prentice Hall.
REFERENCES	1. B.Kuo, "Sistemas Automaticos de Control", 7ma Edición, 1996, Editorial: Prentice Hall. 2. K.Ogata, "Ingenieria de Control Moderna", 3era Edición, Prentice Hall.

5. COURSE LEARNING OUTCOMES

At the end of the course, the student will be able to:
1) Learn techniques for static and dynamic analysis modellable systems.
2) Apply mathematical modeling techniques of the systems to be controlled.
3) Know criteria for determining the stability of systems.
4) Designing control systems based on technical specifications.
5) Designing compensation systems.
6) Develop multidisciplinary group work skills are experimental.

6. COURSE PROGRAM

I. Introduction to Control Systems (2 sessions - 5 hours).
- Introduction.
- Basics of a system of open loop and closed loop. Definitions.
- Feedback, disturbance.
- Strategy control system design.
- Now History of automatic control.

II. Mathematical model of a system (6 sessions - 15 hours).
- Analysis of a physical system
- Identification of variables
- Application of basic physical laws.
- System block diagrams in the time domain.
- Analysis of various systems
- linearization of nonlinear systems

- Laplace Transform
- Block diagrams in the domain of the complex variable "s".
- Analysis using block diagrams.
- Analysis using signal flow diagram.
- The system simulation using Matlab

III. State variable models (1 session - 2.5 hours).
- Introduction.
- The state variables of a dynamic system.
- The differential equation of the state.
- Models signal flow graphs and block diagrams.
- Alternative models of signal flow graphs and block diagrams
- The transfer function of the equation of state
- Analysis with State Variables models using Matlab.

IV. Characteristic and static and dynamic behavior of a feedback control system (3 sessions - 7.5 hours).
- Sensitivity to system parameter variation.
- Transient response of a feedback control system.
- The specifications of the system response.
- Effect of jamming signals.
- Specifications of a system operating in the time domain.
- Relationship between the location of the poles of the system and shape of the transient response.
- Steady state error control systems with unitary and non-unitary refeeding.
- Characteristics of control systems using Matlab.

V. Method – Root Locus (2 sessions - 5 hours).
- Building Rules – Root Locus
- Analysis of Stability: Routh Hurwitz criterion.
- Design parameters.
- Set controller: P, PI, PID using the method of root locus.
- The root locus using Matlab.

VI. Methods of analysis and stability criteria in the frequency domain. (6 sessions - 15 hours).
- Graphics Frequency response: asymptotic Graphics.
- Specifications of a system operating
- Identification of the transfer function from the frequency response, Bode plot.
- Identification of the type of system from the Bode plots.
- Nyquist stability criterion.
- Indices of relative stability.
- frequency response closed loop.
- Stability of time-delay systems.
- PID controllers in the frequency domain.
- Stability in the frequency domain using Matlab.

VII. Design of feedback systems with state variables. (2 sessions - 5 hours).
- Introduction.
- Controllability.
- Observability.
- Design control systems relocation of poles.
- Internal model design.
- Design with Matlab using state variables.

VIII. Feedback control action and compensation systems. (6 sessions - 15 hours).
- Analysis of different controllers.
- Different types of compensation.
- Networks phase advance and retard.
- Compensation in the plane s.
- Compensation in the frequency domain.
- Comparative analysis of advantages and disadvantages of compensation networks.
- Design compensation systems using Matlab.

7. WORKLOAD: THEORY/PRACTICE

Theoretical: 2 sessions per week for a total of 5 hours. Practices: 2 hours lab per week.

8. CONTRIBUTION OF THE COURSE TO THE EDUCATION OF THE STUDENT

The Automatic Control course is oriented engineering analysis and design.

BASIC TRAINING	PROFESSIONAL TRAINING	SOCIAL SKILLS DEVELOPMENT
	X	

9. THE RELATIONSHIP BETWEEN THE LEARNING OUTCOMES OF THE COURSE AND THE LEARNING OUTCOMES OF THE DEGREE PROGRAM

	LEARNING OUTCOMES OF THE DEGREE PROGRAM*	CONTRIBUTION (High, Medium, Low)	LEARNING OUTCOMES OF THE COURSE**	THE STUDENT MUST:
a)	An ability to apply knowledge of mathematics, science and engineering.	High	1,2,3,4,5,6	Apply the knowledge gained in the course of Calculus, Physics and Networks Electric.
b)	An ability to design and conduct experiments, and to analyze and interpret data	Medium	6	Able to analyze the results of a simulation and propose an experiment.
c)	An ability to design a system, component or process to satisfy realistic constraints.	Medium	4	Designing control systems under real considerations
d)	An ability to function on multidisciplinary teams.	Medium	1,6	Commits the integration of other engineering areas, as applications are multidisciplinary
e)	An ability to identify, formulate and solve engineering problems.	Medium	4	Learning how to select components that make up a control system.
f)	An understanding of ethical and professional responsibility.	Low	0	
g)	An ability to communicate effectively.	Low	0	
h)	A broad education necessary to understand the impact of engineering solutions in a social, environmental, economic and global context.	Low	0	
i)	A recognition of the need for, and an ability to engage in life-long learning.	Medium	1	Be prepared to use new components and technologies
j)	A knowledge of contemporary issues.	Medium	1	With the fundamentals learned should be able to recognize the new challenges and diagrams in modern control theory
k)	An ability to use the techniques, skills, and modern tools necessary for engineering practice.	Medium	4	Driving simulators and actual equipment and virtual laboratory.
l)	Capacity to lead, manage and undertake projects.	Medium	1	Understand the application of the techniques in socially useful projects.

10. EVALUATION IN THE COURSE

Evaluation activities	
Exams	x
Tests	x
Homework/tasks	x
Projects	
Laboratory/Experiments	x
Class participation	
Visits	
Other	

11. PERSON RESPONSIBLE FOR THE CREATION OF THE SYLLABUS AND THE DATE OF ITS CREATION

Created by	Ing. Dennys Cortez
Date	09 September / 2013

12. APPROVAL

ACADEMIC SECRETARY OF THE ACADEMIC DEPARTMENT	DIRECTOR OF TECHNICAL ACADEMIC SECRETARY
NAME: Mrs. Leonor Cafiedo G.	NAME: Eng. Marcos Mendoza
SIGNATURE:	SIGNATURE: ESCUELA SUPERIOR POLITECNICA DEL LITORAL Ing. Marcos Mendoza V. DIRECTOR DE LA SECRETARIA TECNICA ACADEMICA
Date of approval by the Directive Council: 2013-537 2013-10-7	

13. VALIDITY OF THE SYLLABUS

RESOLUTION OF THE POLYTECHNIC BOARD:	13-12-343
DATE:	2013-12-12