



**ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL**  
**Faculty of Electrical and Computer Engineering**  
**COURSE SYLLABUS**  
*Industrial Maintenance and Security*

**1. CODE AND NUMBER OF CREDITS**

<b>CODE</b>	FIEC04317	
<b>NUMBER OF CREDITS: 4</b>	<b>Theoretical: 4</b>	<b>Practical: 0</b>

**2. COURSE DESCRIPTION**

In this course the student will learn: The correct application of the principles and safety standards in the industry, electrical work practices and facilities in hazardous areas, the proper use of personal protective equipment and the correct tools and equipment grounding. It describes the types of fire and the proper way to combat them. The correct application of the different types and techniques of industrial equipment maintenance and management strategies applied to maintenance.

**3. PRE-REQUISITES AND CO-REQUISITES**

<b>PRE-REQUISITES</b>	FIEC08320 INDUSTRIAL AUTOMATION I
<b>CO-REQUISITES</b>	

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

<b>CORE TEXT</b>	1. Available information on the web: <a href="http://www.cti.espol.edu.ec/sidweb">www.cti.espol.edu.ec/sidweb</a> . 2. Class notes.
<b>REFERENCES</b>	1. National Electrical Safety Code NESC, ANSI C2. 2. Osha High-Voltage Electrical Regulations Simplified, James G. Stalleup and James W. Stalleup. 3. NFPA 70 NEC 2011 National Electrical Code. National Fire Protection Association.

**5. COURSE LEARNING OUTCOMES**

At the end of the course, the student will be able to:

1. Apply appropriately the principles and industrial safety standards.
2. Know the different types of industrial maintenance.
3. Describe the industrial maintenance jobs to perform on electrical equipment.
4. Develop formats for job applications and reporting of work performed.
5. Apply maintenance strategies.

**6. COURSE PROGRAM**

<b>I. INDUSTRIAL SECURITY INTRODUCTION SEGURIDAD INDUSTRIAL.</b> (3 sessions - 6 hours).
<ul style="list-style-type: none"><li>• Safety in industry: case description and analysis.</li><li>• Objectives of the program.</li><li>• Security organization.</li><li>• Standards and regulations.</li><li>• International Symbolology / Identification / lock systems.</li></ul>
<b>II. SAFETY PRINCIPLES.</b> (4 sessions - 8 hours).
<ul style="list-style-type: none"><li>• Principles applied to industrial safety.</li><li>• The work environment.</li><li>• Origin of the accident.</li><li>• Chronological outline of an accident.</li><li>• Reasons for the prevention of accidents.</li></ul>



- Technics to combat accidents.
  - Plan for the prevention of accidents.
  - Risk factors.
  - Safety inspections.
  - Investigation of accidents.
  - Accident report forms.
  - Safety.
  - Defenses and safeguards.
  - Personal protective equipment.
  - Electrical hazards.
  - Shocks by contact.
  - Direct electric shocks.
  - Electricity and isolation.
  - Protection measures.
- III. ELECTRICAL WORKS PRACTICES.** (2 sessions - 4 hours).
- Basic electrical security.
  - Electrical connections.
  - Hot electrical work.
  - Protection equipment.
  - Safety clearances.
- IV. ELECTRICAL INSTALLATIONS IN HAZARDOUS AREAS.** (1 sessions - 2 hours).
- Classification of areas by the type of atmosphere.
  - Location of electrical equipment.
  - Material using in hazardous areas.
  - Electrical works in hazardous areas.
- V. EQUIPMENT GROUNDING.** (3 sesiones - 6 horas).
- Grids diagrams.
  - Short circuit current.
  - Analyze of soils type.
  - Touch voltage and step voltage.
  - Grounding resistance.
  - Grounding methods.
- VI. SAFETY CONTROLS.** (1 sessions - 2 hours).
- Formats work check list.
  - Electrical hazardous work authorization.
  - Rescue methods.
- VII. INDUSTRIAL MAINTENANCE INTRODUCTION** (1 sessions - 2 hours).
- Importance of maintenance.
  - Conflict production and maintenance.
- VIII. MAINTENANCE.** (4 sessions - 8 hours).
- Basic concepts.
  - Maintenance: Preventive, Corrective, Predictive and Projective.
  - Control formats
  - Organization and maintenance resources.
  - Maintenance planning fundamentals..
  - Software for maintenance control.
- IX. ELECTRICAL PRINCIPLES.** (1 sessions - 2 hours).
- Concepts electrical use.
  - Electrical principles applied to the maintenance.
- X. TYPES OF FAILURE AND MAINTENANCE.** (1 sessions - 2 hours).
- Common faults engines equipment, control panels, transformers, electrical panels, capacitor bank, wires.
  - Works format control.
- XI. MAINTENANCE PROCEDURES.** (1 sessions - 2 hours).
- How to carry out maintenance.
  - Electrical hazardous considerations.
- XII. MANGEMENT THECNIQUES APPLIED TO MAINTENANCE.** (2 sessions - 4 hours).
- Implementation of Works programs.
  - Selection Methods spares requirements.
  - Continuous improvement.
- XIII. MAINTENANCE MANAGEMENT.** (4 sessions - 8 hours).
- Kaizen management.
  - Total Productive Maintenance.
  - World Class maintenance.
  - ISO Certification and maintenance.



## 7. WORKLOAD: THEORY/PRACTICE

Number of class sessions per week: 2  
Length of each session: 2 hours

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

It is a course of professional training axis of Electronics and Industrial Automation curriculum and contributes engineering sciences with design and implementation of maintenance and safety systems.

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.	Low		
b)An ability to design and conduct experiments, and to analyze and interpret data	Low		
c)An ability to design a system, component or process to satisfy realistic constraints.	Low		
d)An ability to function on multidisciplinary teams.	Low		
e)An ability to identify, formulate and solve engineering problems.	High	1,2,3,4,5,6	Design and implement of maintenance and safety systems.
f)An understanding of ethical and professional responsibility.	Low		
g)An ability to communicate effectively.	Low		
h)A broad education necessary to understand the impact of engineering solutions in a social, environmental, economic and global context.	Low		
i)A recognition of the need for, and an ability to engage in life-long learning.	Low		
j)A knowledge of contemporary issues.	Low		
k)An ability to use the techniques, skills, and modern tools necessary for engineering practice.	Low		
l)Capacity to lead, manage and undertake projects.	Low		





#### 10. EVALUATION IN THE COURSE

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

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

Created by	Holger Cevallos
Date	06/05/2013

#### 12. APPROVAL

ACADEMIC SECRETARY OF THE ACADEMIC DEPARTMENT	DIRECTOR OF TECHNICAL ACADEMIC SECRETARY
NAME: Mrs. Leonor Caicedo	NAME: Eng. Marcos Mendoza
SIGNATURE: 	SIGNATURE: 
Date of approval by the Directive Council: 2013-537 2013-10-7	----- <b>Ing. Marcos Mendoza V.</b> DIRECTOR DE LA SECRETARIA TÉCNICA ACADÉMICA

#### 13. VALIDITY OF THE SYLLABUS

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