



Course guide

240661 - 240661 - Electrical Workshop

Last modified: 01/02/2024

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2023 **ECTS Credits:** 3.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: Boix Aragones, Oriol

Others: Boix Aragones, Oriol

TEACHING METHODOLOGY

Workshop sessions. The students have a set of materials and some activities as homework (alone or in groups) for the preparation of each session.

LEARNING OBJECTIVES OF THE SUBJECT

When finished, the student can:

1. Identify the different protection of electrical circuits (single phase or three phases) and an associate the disconnections of them with the possible defects that cause it.
2. Connect an electrical circuit (single phase or three phases) following a schema. Interpret the behavior of the circuit.
3. Drawing electric schemes symbology keeping the rules and representations.
4. Program a PLC and a programmable relay at intermediate level and connect input and output elements to it. Interpret the behavior of the team when execute the program and correct undesired behaviors.
5. Configure and program at a basic level for a supervision terminal for a PLC.
6. Connect and program KNX domotic systems in an intermediate level.

STUDY LOAD

Type	Hours	Percentage
Hours medium group	30,0	40.00
Self study	45,0	60.00

Total learning time: 75 h



CONTENTS

1. Electrical circuits and their protections

Description:

Electrical circuits and their protections

Specific objectives:

- Understand the overloads and short circuits
- Know the basic operation of fuses and circuit breakers
- Know the effects of electric current in the human body
- Know the basic operation of circuit breakers
- Understand and know domestic electrical circuits

Related activities:

Activity 1

Full-or-part-time: 6h 30m

Laboratory classes: 2h

Self study : 4h 30m

2. Electromechanical Automation

Description:

Automation with relays and contactors

Specific objectives:

- Understand, at a basic level, three-phase systems and operation of electric motors
- Know the operation of contactors, relays, thermal relays and timers, and know how to connect, from a scheme, to do automatisms
- Know the basic elements of Boolean algebra applied to electrical circuits and understand the workings of combinational automatisms
- Learn to draw, at the intermediate level, electrical circuits

Related activities:

Activity 2

Full-or-part-time: 18h

Laboratory classes: 10h

Self study : 8h

3. PLCs and dialogue terminals

Description:

3. PLCs and dialogue terminals

Specific objectives:

- Understand the operation of PLCs and know how to program it in ladder diagram (LD)
- Know the most significant presence sensors and know how to connect them to PLC inputs
- Know how to connect preactuators and actuators to the outputs of the PLC
- Know how dialogue terminals work and do simple programming of them

Related activities:

Activity 3

Full-or-part-time: 30h

Laboratory classes: 10h

Self study : 20h



4. Automation with Programmable Relays

Description:

Programmable relays

Specific objectives:

- Know programmable relays and how to program it in combinational and sequential automation

Related activities:

Activity 4

Full-or-part-time: 13h

Laboratory classes: 4h

Self study : 9h

5. Home Automation

Description:

KNX domotics

Specific objectives:

- Know the KNX home automation system and learn how to program it at the intermediate level

Related activities:

Activity 5

Full-or-part-time: 7h 30m

Laboratory classes: 4h

Self study : 3h 30m

ACTIVITIES

1 ELECTRICAL CIRCUITS AND THEIR PROTECTION

Description:

The students, independently, learn the concepts of overload, short circuit, earth leakage and effects of electrical current in the human body and devices that protect against them. After, in the laboratory, mounted some domestic circuits that incorporate the protections studied.

Specific objectives:

- Understand the overloads and short circuits
- Know the basic operation of fuses and circuit breakers
- Know the effects of electrical current the human body
- Know the basic operation of circuit breakers
- Understand and know domestic electrical circuits

Material:

Notes and videos from the course

Delivery:

Evidence:

The completion of the practice assembly.

Full-or-part-time: 6h 30m

Laboratory classes: 2h

Self study: 4h 30m



2 ELECTROMECHANICAL AUTOMATION

Description:

The students, independently, learn the concepts of three-phase systems, electric motors, electromechanical automation, contactors, relays, thermal relays and timers. After, in the lab, mount some circuits of combinational and sequential automation with relays and contactors.

Specific objectives:

- Understand, at a basic level, three-phase systems and operation of electric motors
- Know the operation of contactors, relays, thermal relays and timers, and know how to connect, from a scheme, to do automatisms
- Know the basic elements of Boolean algebra applied to electrical circuits and understand the workings of combinational automatisms
- Learn to draw, at the intermediate level, electrical circuits

Material:

Notes and videos from the course

Delivery:

Evidence:

The performance of the assemblies of the practices and, the design of the modification of a practice circuit.

Full-or-part-time: 18h

Laboratory classes: 10h

Self study: 8h

3 PROGRAMMABLE LOGIC CONTROLLERS

Description:

The students, independently, learn the concepts of PLCs, the wiring of sensors and programming in ladder diagram. After, at the laboratory, they program the PLCs.

Specific objectives:

- Understand the operation of PLCs and know how to program it in ladder diagram (LD)
- Know the most significant presence sensors and know how to connect them to PLC inputs
- Know how to connect preactuators and actuators to the outputs of the PLC

Material:

Notes and videos from the course

Delivery:

Evidence:

The realization of practices programs and the preparation of parts of programs.

Full-or-part-time: 30h

Laboratory classes: 10h

Self study: 20h



4 AUTOMATION WITH PROGRAMMABLE RELAYS

Description:

The students, independently, learn the basics of programmable relays and prepare some of the programs needed for practices. After, at the laboratory, program various functions on a programmable relay.

Specific objectives:

- Know programmable relays and how to program it in combinational and sequential automation

Material:

Notes and videos from the course

Delivery:

Evidence:

The realization of practices programs and the preparation of parts of programs.

Full-or-part-time: 13h

Laboratory classes: 4h

Self study: 9h

5 HOME AUTOMATION

Description:

The students, independently, learn the basics of home automation. After, at the laboratory, program various functions on an automated system.

Specific objectives:

- Know the KNX home automation system and learn how to program it at the intermediate level

Material:

Notes and videos from the course

Delivery:

Evidence:

System programming for the functions described in the practice.

Full-or-part-time: 7h 30m

Laboratory classes: 4h

Self study: 3h 30m

GRADING SYSTEM

The student will have a punctuation of each practice (NLi) and a punctuation of each of the previous preparation practices that have (NPi). From each of these concepts the average grade (NL and NP) is calculated. Unrealized activities have a punctuation of zero. The number of practices will depend on the number of sessions available.

In punctuation will be considered punctuality, the completion of each of the parties (regardless of the time it takes), the attitude and originality. Punctuality is very important because in the beginning there are some security indications.

The final grade will be calculated with the expression:

$$NF = 0,7 \cdot NL + 0,3 \cdot NP$$

To pass the course with this calculation one must have completed at least 80% of practices.

The course has no exams.



RESOURCES

Other resources:

NOTES AND VIDEOS OF THE SUBJECT TO BE ACCESSIBLE FROM DIGITAL CAMPUS