COURSE ON PROGRAMABLE LOGIC CONTROL (PLCs) IN DISTANCE LEARNING

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LEAL
Learning Automation and Laboratories

ALFA

EUROPEAID
CO-OPERATION OFFICE

INDUSTRIAL AUTOMATION (preliminary)

- **NON - AUTOMATED INDUSTRY**
  - Small production
  - A lot of defective units
  - Dangerous, repetitive tasks, etc.
  - Non - competitive

¡¡ SOLUTION ¡¡

INDUSTRIAL AUTOMATION
(preliminary)

- TO FORM A PERSON TO BE ABLE TO TRAIN THIS INDUSTRY IN A MODERN INDUSTRY, COMPETITIVE, WITH A HIGH PRODUCTION, ETC,

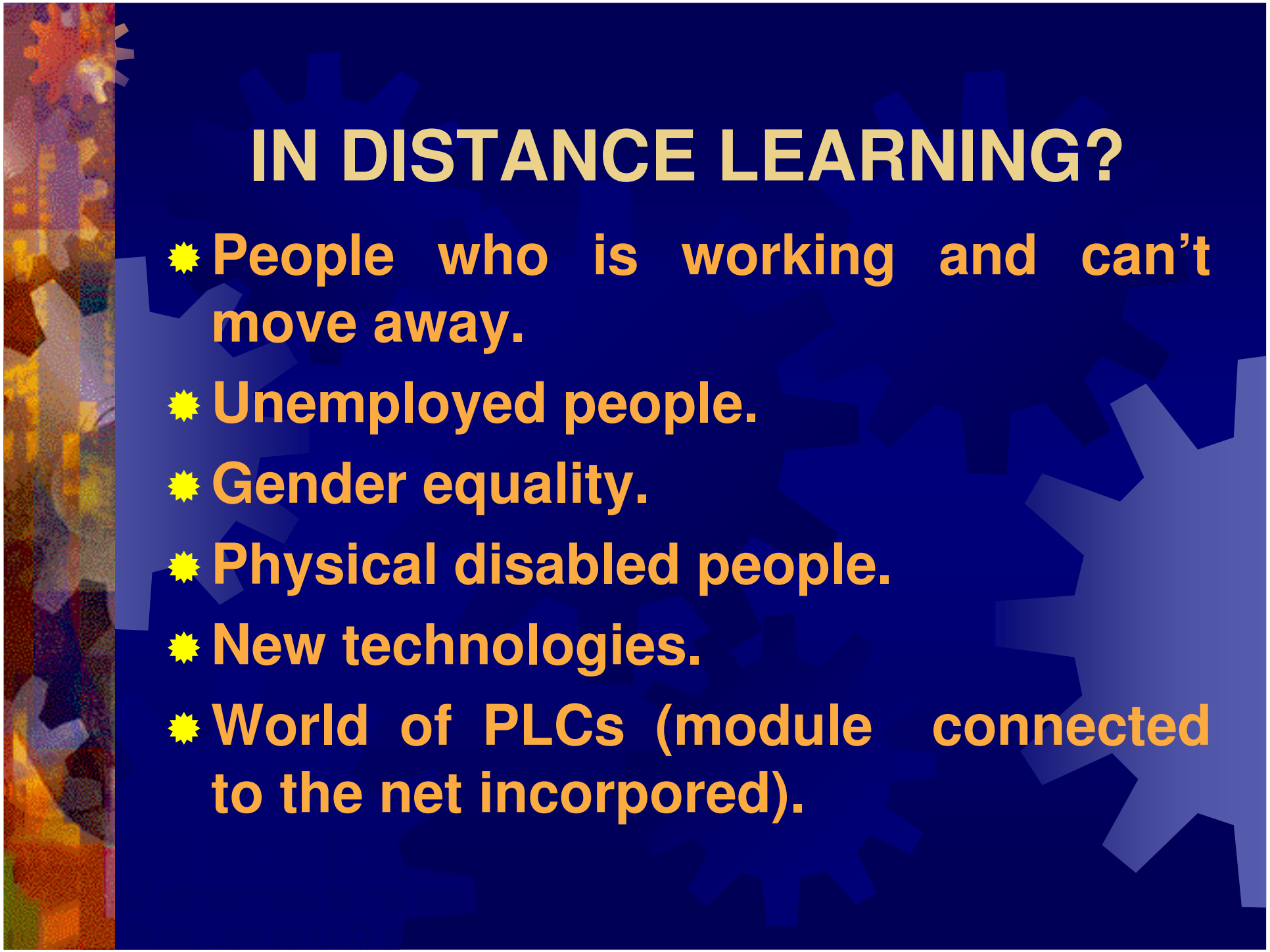
COURSE ON PROGRAMMABLE LOGIC CONTROL (PLCs)

HOW HAVE WE DEVELOPED THIS COURSE?.

THINKING OF A PERSON THAT WILL AUTOMATE THIS INDUSTRY.

IN DISTANCE LEARNING ? OR PRESENTIAL?

- IN DISTANCE LEARNING:
  - MORE PEOPLE
  - NO TIMETABLE
  - AT HOME
- PRESENCIAL:
  - A FEW PEOPLE
  - TIMETABLE
  - BUSY LABORATORIES


IN DISTANCE LEARNING?
People who is working and can't move away.
Unemployed people.
Gender equality.
Physical disabled people.
New technologies.
World of PLCs (module connected to the net incorpored).

BASIS REQUERIMENTS

NET

PC

(STUDENT)

In your house

PLC

(IN THE SCHOOL)

with practical

exercices


WHO CAN FOLLOW THE COURSE?
University students
Professional training
Training of teachers
Employees (continuous education)
Unemployed (occupational education)
Handicapped (special education)
Equality of opportunities among woman and men

INDUSTRIAL AUTOMATION

- **THE REQUERIMENT ARE SOME BASIC KNOWLEDGE ON:**
- **Electricity (electric circuits)**
- **Digital electronics (bit concept)**
- **Mechanics (pneumatic and oleohidraulic)**
- **Electric engines and**
- **Practical technological skills**

REQUIREMENT OF OPERATION

The student need:

- PC connected Internet, with ADSL or others
- Schneider's XIP DRIVER software*
- PLC's software*

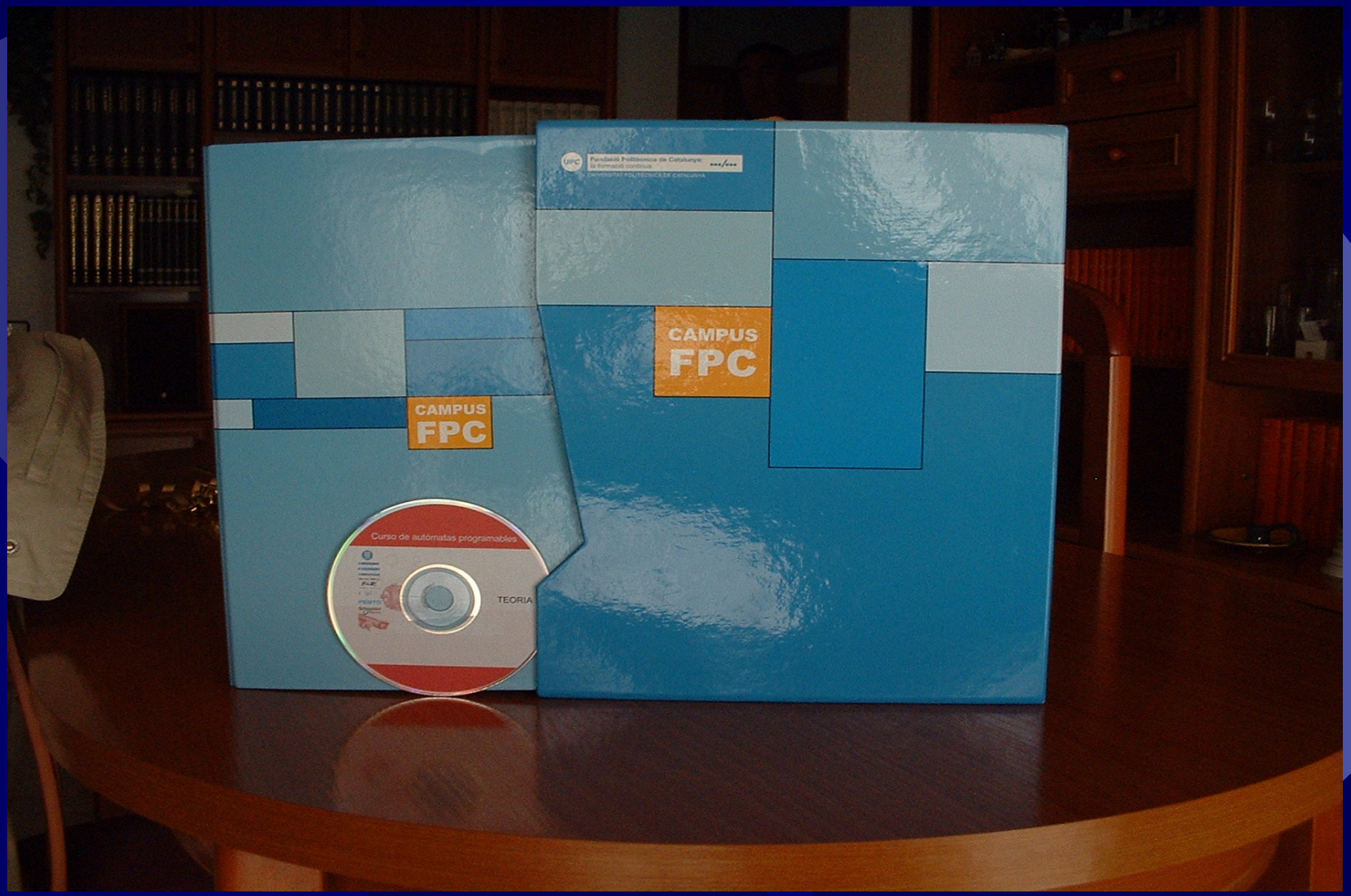
*Provided when the enrolment is formalized

CONTENTS OF THE COURSE

The student will receive:

- A CD with theorical each of the course and auto-evaluation in chapter.
- Password for access to Virtual Campus.
- Station number for the connection to PLC
- PLC user's manual.
- Practical purpose.

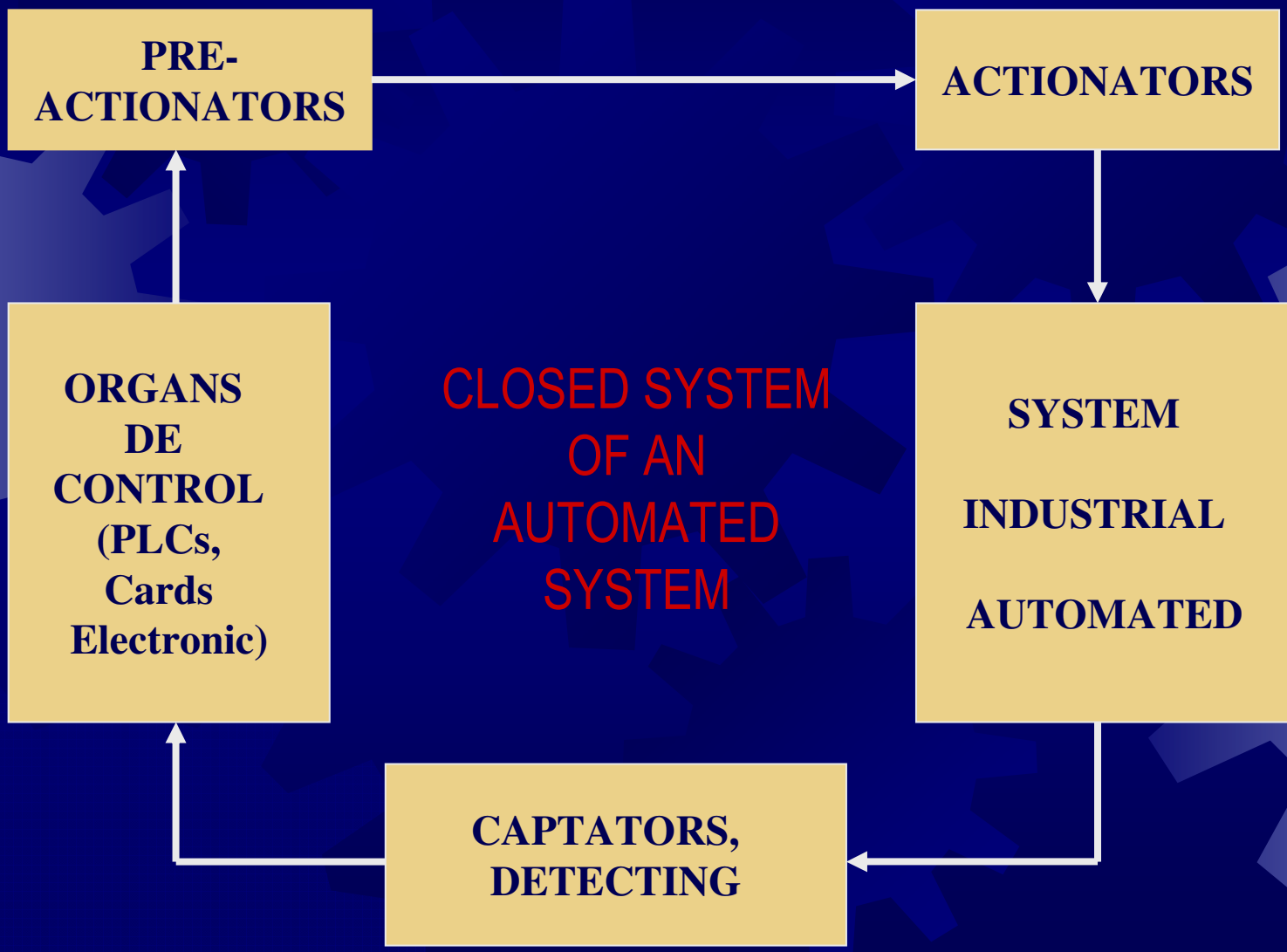
EXEMPLE FOR MATERIAL



COURSE

- The development of the course as been based on:
  - Diagram of industrial automation.
  - Initial knowledge needed.
  - To learn programming a PLC.
  - Realization of the practical work.

INDUSTRIAL AUTOMATION

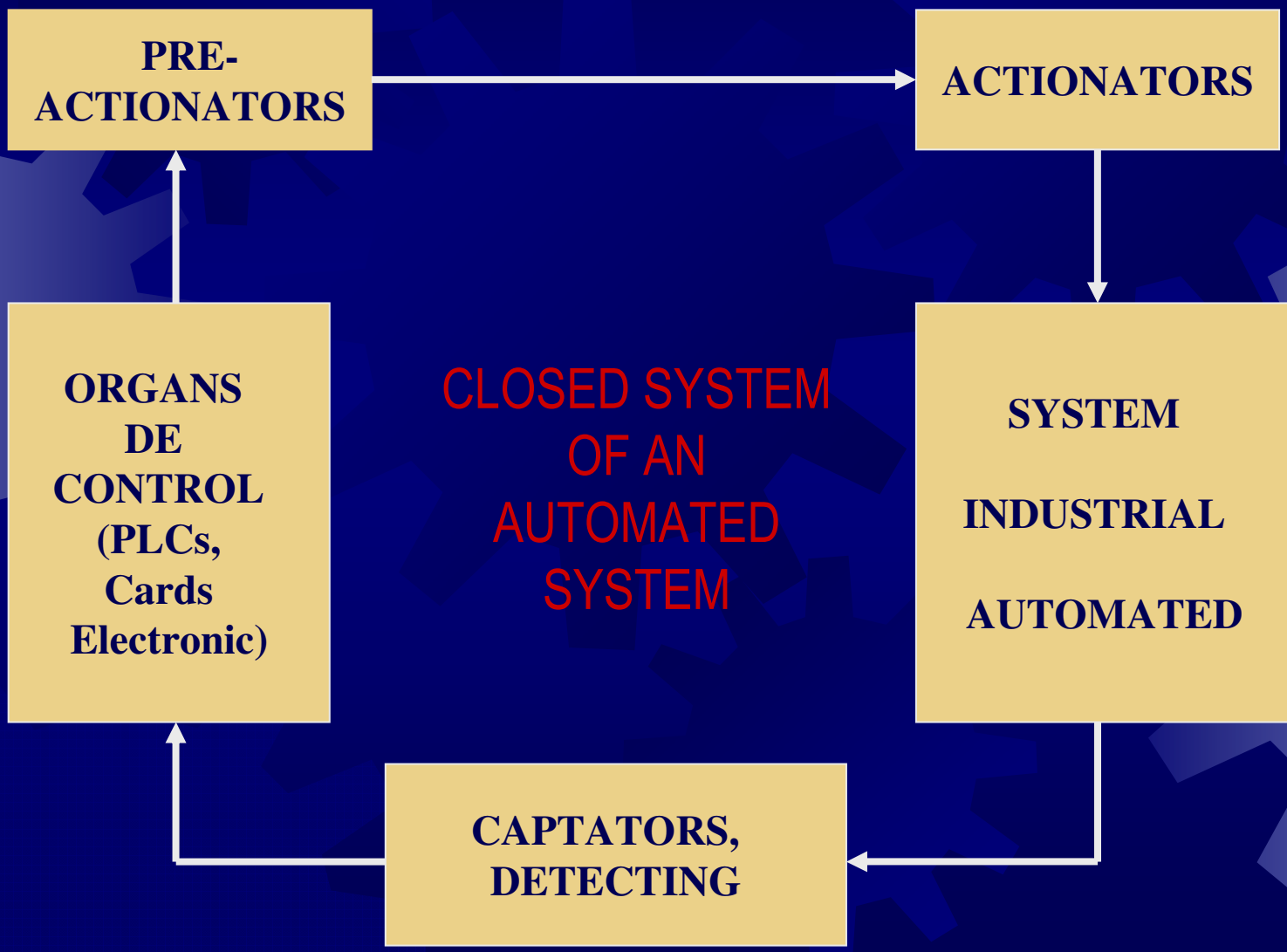


THEORICAL CD

There are four chapters and practices:

- Chapter 1.- Introduction to industrial automation.
- Chapter 2.- Actuators and capteurs.
- Chapter 3.- Programable Logic Control (PLC)
- Chapter 4.- Languages of programation
- Annex.- Practical works purposes

INDUSTRIAL AUTOMATION



CHAPTER1.- INTRODUCTION TO INDUSTRIAL AUTOMATION

- The student begins in this chapter with the world of the industrial automation in general as it is shown in the previous graph.

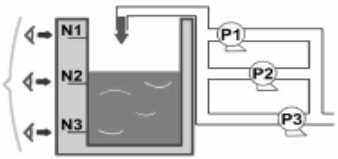
EXEMPLE FOR CHAPTER1

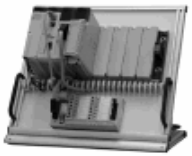
Capítulo 1 - Introducción a los automatismos industriales 3/7

1.1 Constitución de un automatismo industrial

Tres detectores de nivel permiten saber la cantidad de agua contenida en el depósito.

La información, suministrada por estos captadores, constituye:
LA ADQUISICIÓN DE DATOS





La información procedente de los detectores de nivel será analizada por un autómata.
Es EL TRATAMIENTO DE DATOS

El autómata elabora ordenes que envía a los PREACCIONADORES, que transmiten la energía necesaria para el funcionamiento de los motores.
Es EL MANDO DE POTENCIA

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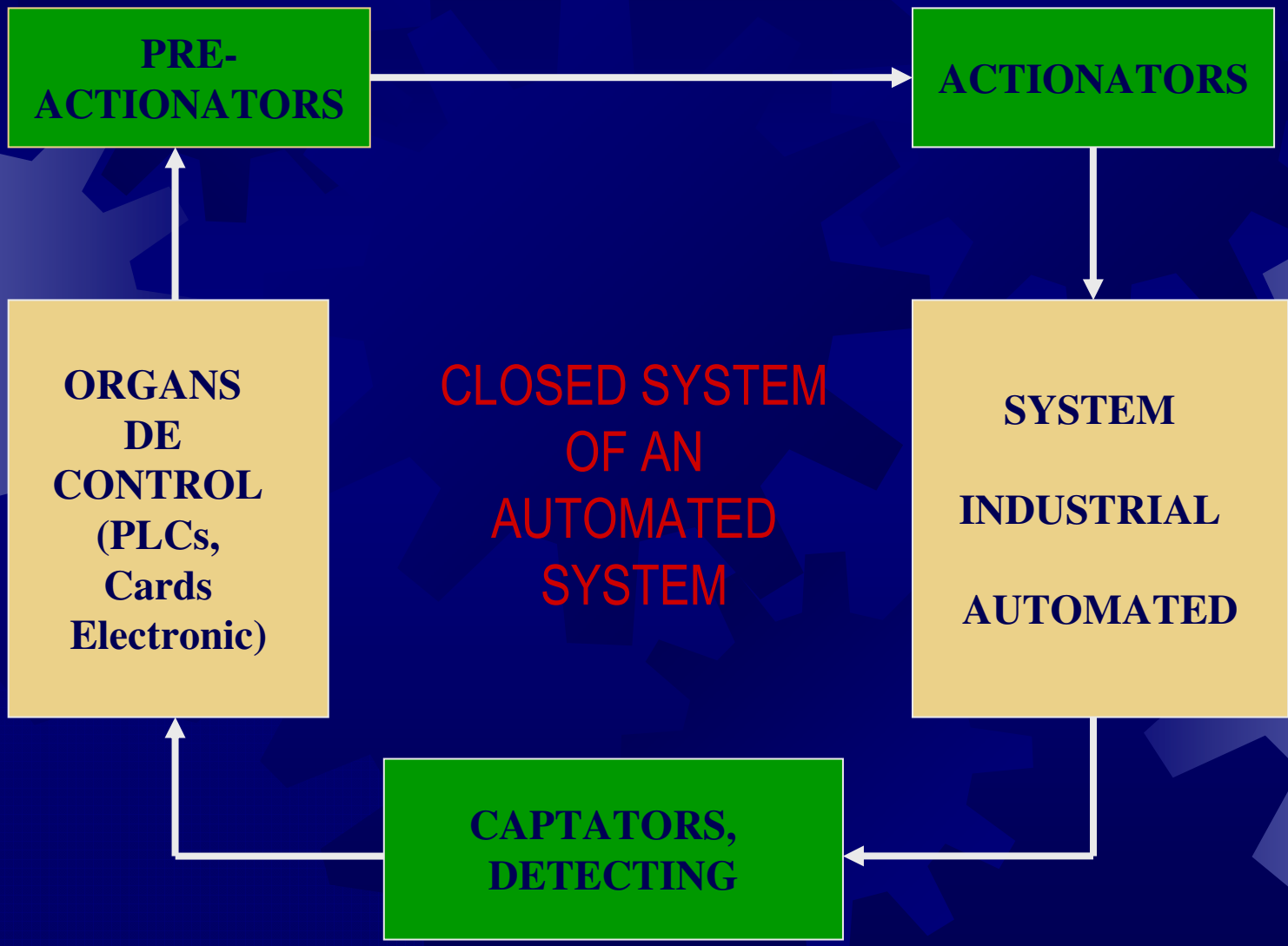
INDUSTRIAL AUTOMATION



CHAPTER 2.- ACTUATORS AND CAPTEURS

- The student studies in this chapter the accionators and capteurs types that he/she will incorporate in the automated system

EXEMPLE FOR CHAPTER 2 (I)

2.1 Motores eléctricos

Cometido

Permite la transformación de la energía eléctrica en energía mecánica.

El tipo de motor más utilizado es el motor asíncrono trifásico, por varios motivos:

- -robustez
- -bajo mantenimiento
- -precio bajo

Pero:

- -consume una gran punta de corriente al arranque

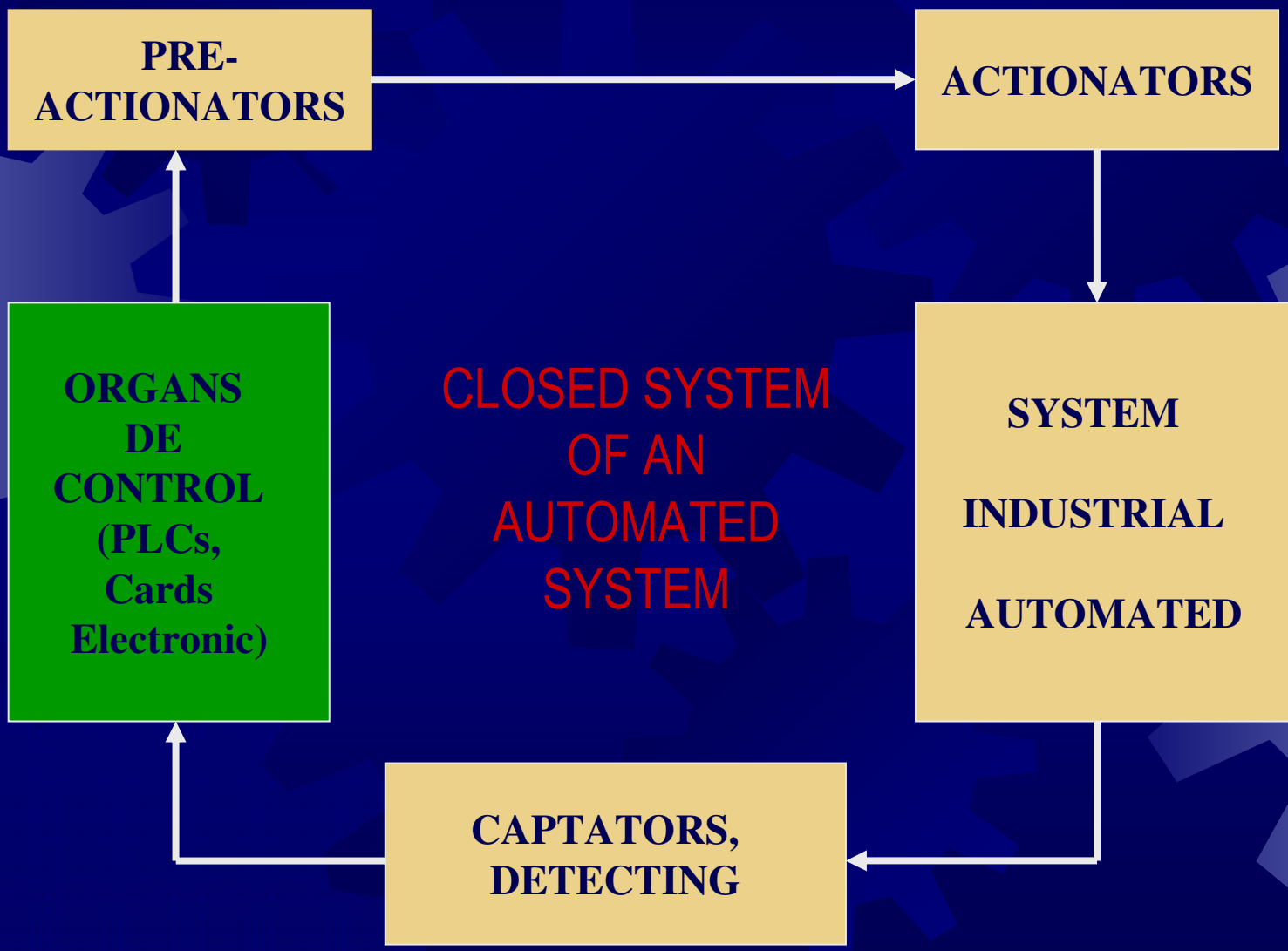
EXEMPLE FOR CHAPTER 2 (II)

2.5 Adquisición de datos

Hay otros tipos de interruptores y detectores:

- Interruptores Neumáticos de Posición
- Finales de carrera
- Detector de proximidad
- Detector o célula fotoeléctrica
  - de barrera
  - de reflejo
  - de proximidad
- . . .

INDUSTRIAL AUTOMATION

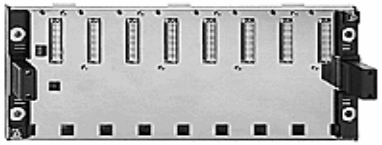


CHAPTER 3.- PROGRAMABLE LOGIC CONTROL (PLC)

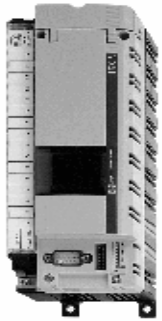
- The student learns in this chapter the architecture of the PLC, its operation and the way to choose the type of engine when it is needed.

EXEMPLE FOR CHAPTER 3

3.1. Constitución y arquitectura del autómata programable



Módulo base donde se conectarán el resto de módulos del autómata.



Módulo entrada/salida analógicas

módulo alimentación

módulo entradas/salidas

módulo procesador

CHAPTER 4.- LANGUAGES OF PROGRAMATION

- The student learns the different programming languages which PLCs uses.

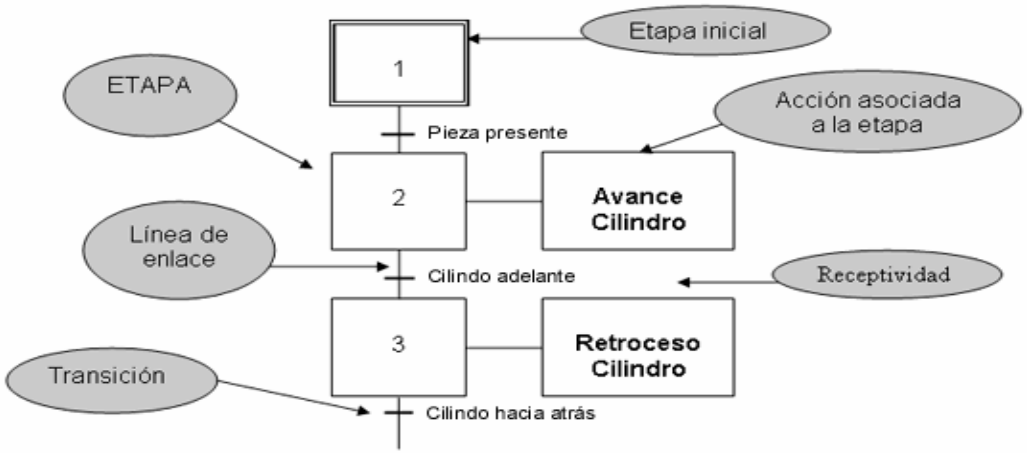
EXEMPLE FOR CHAPTER 4

4.2. Introducción al GRAFCET

La etapa activa al inicio del ciclo es la ETAPA INICIAL y se representa con un doble recuadro.

ETAPA es una acción a realizar (salida).

TRANSICIÓN representa una recepcion (entrada).



AUTOEVALUATION

- At the end of each chapter the student have an autoevaluation so that he/she can check the level acquired.

EXEMPLE FOR AUTOEVALUATION

Capítulo 3 - Evaluación 18/19

Pregunta 1

Contesta verdadero o falso a las siguientes afirmaciones:

El cable de conexión PC-PLC es unidireccional, en ningún caso bidireccional
◯ VERDADERO ◯ FALSO

La memoria más habitual del programa de un autómata es del tipo RAM
◯ VERDADERO ◯ FALSO

La alimentación interna del autómata es de 24 V cc, ni más ni menos.
◯ VERDADERO ◯ FALSO

Si hay una interrupción de tensión en la alimentación del autómata, el programa almacenado en la memoria se borra
◯ VERDADERO ◯ FALSO

El procesador es el encargado de generar el ciclo de scan del autómata
◯ VERDADERO ◯ FALSO

El ciclo de scan marca o genera una secuencia en un proceso industrial
◯ VERDADERO ◯ FALSO

CORREGIR

X ? i < >

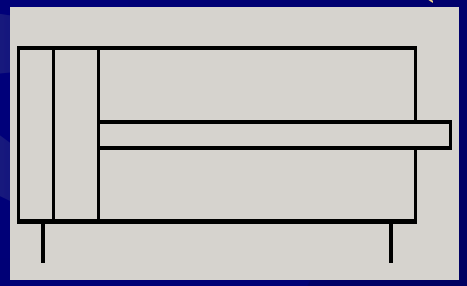
PRACTICAL

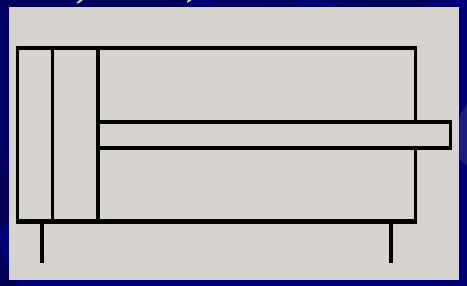
- The student will carry out 5 practical works:
  - beginning with the simplest,
  - already solved,
  - ending with two practical works that have timer and counter

EXAMPLE OF THE PRACTICAL Nº 1

- TO CARRY OUT THE FOLLOWING SEQUENCE WITH PNEUMATIC CYLINDERS :

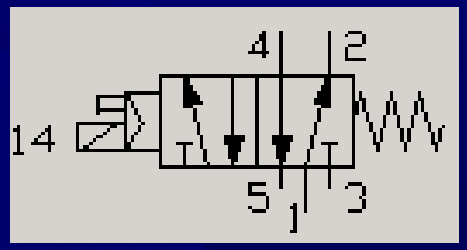
(A+, B+, A-, B-)

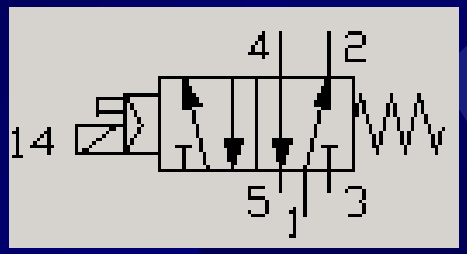




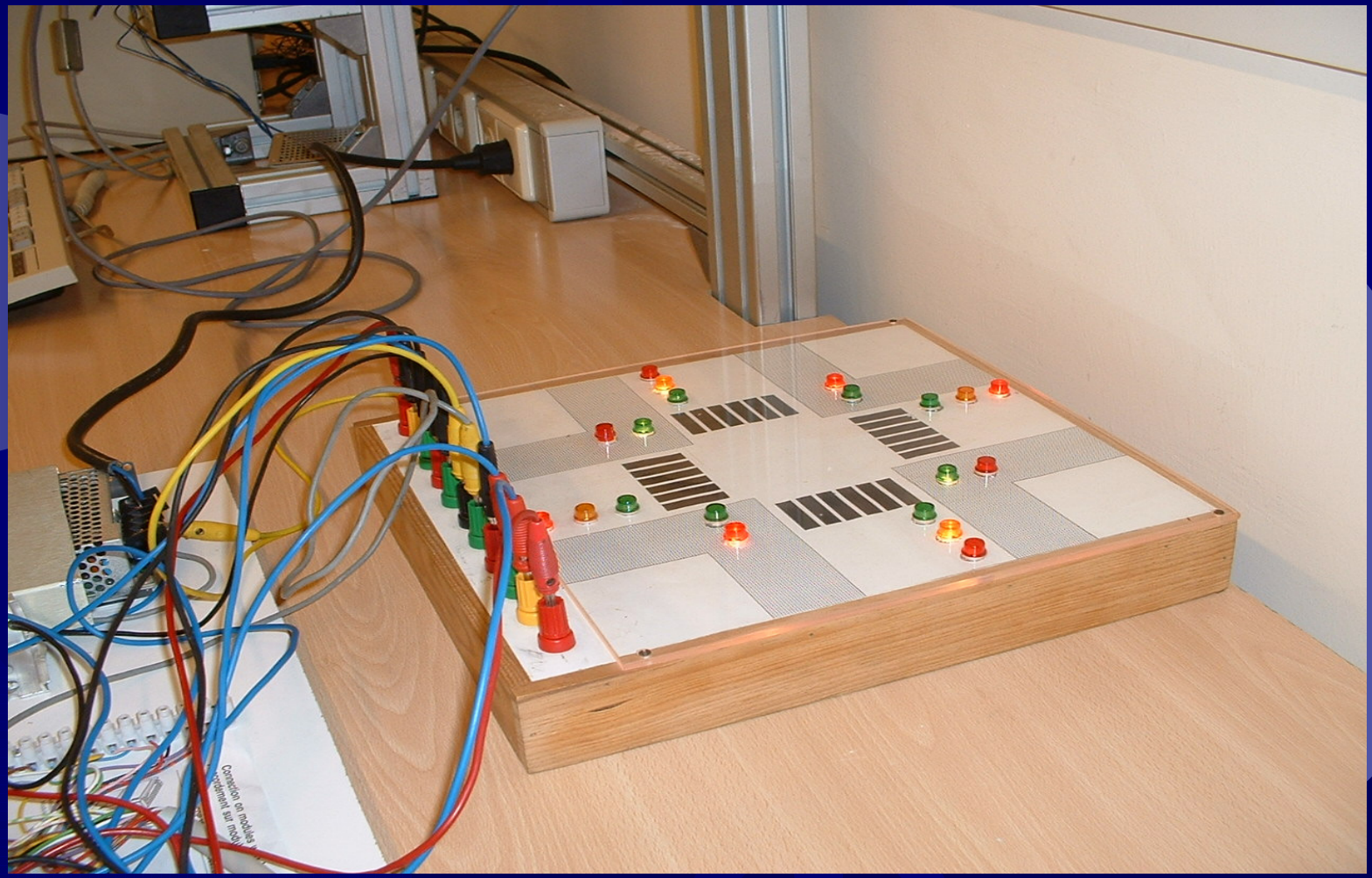
CYLINDER A

CYLINDER B



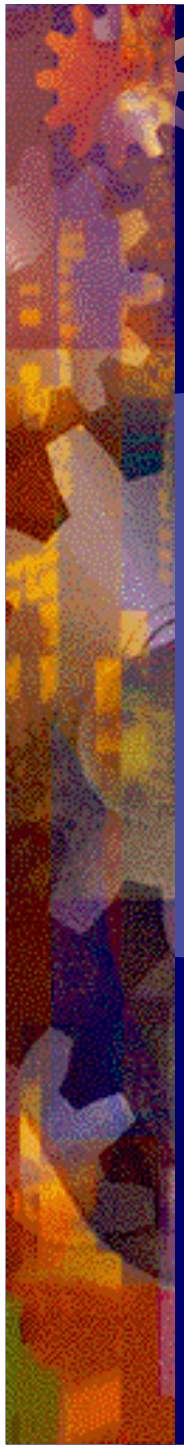


CROSSROADS SIMULATOR



PNEUMATICS AND ELECTRICS SIMULATORS

The Politechnik University of Catalonia (UPC) gave to each student that has finished the cours an official certificate of specialization



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or

Fundacion Politecnica de Catalunya

http://www.fundacio.upc.edu

(courses ON-LINE)


WEB SITE OF THE PROJECT: HTTP//:WWW.LEAL-ALFA.UPC.EDU