COURSE: COMPUTER SCIENCE AND COMMUNICATIONS

SUBJECT: Electrical, Electronics and Automation Engineering
MODULE: Specific Technology
PROGRAM TITLE: Degree on Industrial Technologies Engineering

GENERAL CHARACTERISTICS*

Type: ☐ Basic training, ☑ Compulsory, ☐ Elective

☐ Final degree project, ☐ Practicum

Duration: Semiannual **Semester/s**: 7
Number of credits ECTS: 6
Language/s: Spanish

DESCRIPTION

BRIEF DESCRIPTION AND JUSTIFICATION

The productivity improvement necessarily involves the intensive use of automation techniques and process control. Digital techniques are the most commonly used, then the presence of programmable logic controllers is common in industrial equipment. The complexity of manufacturing processes makes several elements coexist with other automation and control elements for information management, all of them forming industrial communications networks that are known as control pyramid.

COMPETENCES

- Ability to understand and apply basic technical knowledge (E2).
- Knowledge of scientific and technological subjects to enable them to learn new methods and theories, and to equip them with the versatility to adapt to new situations. (E3)
- Ability to solve problems with initiative, decision making, creativity, and critical thinking. (E4)
- Ability to communicate effectively, both orally and in writing, to impart knowledge and skills in the field of industrial engineering (T1).
- Applied knowledge of industrial computing and communications (TE4).

PREREQUISITES*

Competences of the earlier educational stages.

CONTENTS

4.12.- The emergence
4.13.- The network management (NMT)
4.14.- The node guarding
4.15.- The Heartbeat
4.16.- CAN FD: CAN with Flexible Data Rate

5.- MPI bus (Multi Point Interface)
5.1.- Introduction
5.2.- Cyclical global data communications (GD)
5.3.- Acyclic communications
5.4.- S7 station: internal communication

6.- PROFIBUS
6.1.- Definition and Standards
6.2.- Device types
6.3.- Specifications
6.4.- PROFIBUS family
6.5.- Medium access
6.6.- Profibus DP Communications
6.7.- FDL Programming

7.- INDUSTRIAL ETHERNET
7.1.- Introduction
7.2.- Definitions
7.3.- Addresses
7.4.- Ports

8.- Modbus
8.1.- Modbus Protocol
8.2.- Addresses
8.3.- Functions
8.4.- MODBUS TCP / IP protocol
8.5.- MODBUS TCP / IP message

9.- PROFINET
9.1.- Introduction
9.2.- PROFINET CBA
9.3.- PROFINET RT
9.4.- PROFINET IRT

METHODOLOGY

TRAINNING ACTIVITIES*

Training activities	ECTS Credits	Competences
Sessions of presentation of concepts	1,5	E2, E3, E4, TE4
Sessions for resolution of exercises, problems and cases	0,7	E2, E3, E4, TE4
Seminars	0,1	T1
Personal mandatory activities professor-student	1,8	E4, T1, TE4
Practical work / laboratory	0,1	T1
Oral and writing presentations	1,5	E2, E3, E4, TE4
Personal study activities by students	0,3	E2, E3, E4, TE4
TOTAL	**6,0**	

EXPLANATION OF THE TEACHING METHODOLOGY

The teaching methodology is based on a combination of lectures to explain concepts and their application to problem solving.
The combination of lectures and practical sessions facilitates understanding of the issue, taking into account the three phases of learning, knowledge (language), understanding (concepts) and application (solving problems and cases) this process is not linear but iterative. Students trying to apply the knowledge realizes the strength of his understanding and, when necessary, can return to the conceptual phase to improve the mastery of the concepts that he believed have acquired.
Learning PLC programming will be complemented by carrying on of mini case studies in the laboratory.

EVALUATION

EVALUATION METHODS*

Evaluation Methods	Weight	Competences
Final Exam	40%	E2, E3, E4, TE4
Partial exams / scheduled controls	30%	E2, E3, E4, TE4
Classroom activities	10%	E2, E3, E4, TE4
Laboratory reports	20%	E2, E3, E4, TE4, T1

LEARNING OUTCOMES

- The student must demonstrate theoretical and practical knowledge of basic concepts in automation engineering. (E2, E3, E4, NT4)
- The student must demonstrate proficiency in understanding, planning, and resolution of industrial automation systems (E2, E3, E4, NT4, T1)

EVALUATION

The course evaluation will consider all aspects of assessment in the table with its corresponding weight.

To pass the course you must have a minimum of five points. Each of the evaluation activities, including the final exam, must have a minimum grade of 4.5 points, except for laboratory activities, with an average of over five points.

Attendance at all laboratory sessions is mandatory. Absences must be recuperated.

EVALUATION OF COMPETENCIES

For the evaluation of E2 competence it will be used as an indicator the qualification of scheduled controls and the final exam. For assessing E3 competence, it will be used as an indicator the qualification of the scheduled controls and theory of final exam. For the assessment of the E4 competence, is used as an indicator the qualification of laboratory, the activities and the problems of the final exam. For the assessment of T1 competence, it is used as an indicator the laboratory, the activities and the theoretical part of the final exam. For the assessment of TE4 competence, the indicator used is the final course grade.

* These characteristics should not be changed without the approval of the responsible for higher level academic structures (matter, module and/or syllabus).

TEXTBOOKS

- Molins, J.J.; Barberà, E.: "Autómatas programables: Step7® y UnityPro®", IQS, 2012
- Rodríguez, A.: "Comunicaciones industriales: guía práctica", Marcombo, 2008
- Guerrero, V.; Martínez, L.; Yuste, R.L.: "Comunicaciones industriales", Marcombo, 2010
- Rodríguez, A.: "Sistemas SCADA", Marcombo, 2007

DOCUMENT RECORD

EARLIER CHANGES
August 2013, Drs. Eduard Barberà and José Javier Molins
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May 2015, Drs. Eduard Barberà and José Javier Molins