Curricular Unit Sheet

1. Curricular Unit Syllabus.

1.1. Curricular Unit

INDUSTRIAL AUTOMATION

1.2. Scientific area acronym

EE

1.3. Duration

1 semester (12 weeks)

1.4. Total of Working Hours

3h

1.5. Contact hours

4.5h

1.6. ECTS

6

1.7. Observations

2. Responsible Academic staff and lecturing load in the curricular unit (enter full name)

Armando José Leitão Cordeiro	4,5h

3. Other academic staff and lecturing load in the curricular unit

Mafalda Maria Morais Seixas	1,5h

4. Learning outcomes of the curricular unit

After completion of this course the students should able to: − Design control systems using Programmable Logic Controllers (PLCs); − Design electropneumatic control systems; − Use PLCs in continuous control systems; − Master the concepts of reliability, risk and functional safety; − Design the overall automation installation; − Specify technical solutions and select commercial equipment for applications;

5. Syllabus

Theoretical (T) contents:

The main theoretical contents are:

− Further insight in specification methods for discrete control systems: Grafcet (SFC) and Petri Nets.
− Control functions for continuous processes using PID control and fuzzy available in programmable logic controllers.
− Fundamentals of electropneumatic technology.
− Project of automation plants: schematic design, documentation, equipment specification; budget.
− Reliability of automation systems. Risk and risk assessment concepts. Principles of functional safety according to IEC 61508.
− Further insight in thematic areas. E.g.: technical building automation, domotics, automation in water supply systems, automation in road tunnels.

Theoretic-Practical (TP) contents:

The main TP contents are:

Elaboration of an automation project by a group of 2 or 3 students based on the resolution of an automation problem that includes equipment for the use, production, distribution and storage of compressed air. Development of schemes and choice of equipment. Writing a report. Teachers provide support during the development of all phases of the project.

Laboratory (L) contents:

The main laboratory part is based on:

Elaboration of practical work in the laboratory by a group of 2 or 3 students using compressed air equipment and programmable controllers. Teachers give support during the development of the work.

6. Demonstration of the syllabus coherence with the curricular unit's objectives

The prior knowledge on the structure and programming of programmable logic controllers, as well as on interfacing with peripheral equipment (sensors and actuators), was acquired in the course of Automation I and Automation II, during the graduation. The present course starts with more advanced methods for the specification of automated systems and also with control functions of increased complexity. The ability to use automated systems for risk reduction is achieved with the Functional Safety subject, in the framework of IEC 61508 standard. This is a type knowledge requiring a sound theoretical investment. The ability to project automation facilities is also developed, being a fundamental engineering competence, well beyond PLC programming.

7. Teaching methodologies (including evaluation)

The Theoretical part (T) is presented along the semester and individually evaluated at the end by a written test. A final exam is also available for the students but is restricted to the theoretical part. The Theoretic-Practical (TP) part concerning the design of automation installations is taught in interaction with the students while they develop a small project along the semester, in groups of 2 or 3 students. The project itself is used for evaluation after individual oral scrutiny. The Laboratory part (L) consists of 3 practical tests using compressed air devices and programmable logic controllers. The written reports are subject to individual oral scrutiny to achieve the corresponding evaluation. The final grade results from simple average of the grades obtained in each of the three parts: F= (T+TP+L)/3. It is mandatory that the grade in each part is at least 9,5 in a range of 0-20.

8. Demonstration of the coherence between the teaching methodologies and the learning outcomes

The theoretical part is devoted to the development of skills on reliability, risk and functional safety. The theoretic-practical part is devoted to developing the skills of project automation installations, use of advanced programmable logic controllers, equipment specification and selection for applications. The laboratory part contributes, by practical training, primarily for the skills of using programmable logic controllers with pneumatic actuators.

9. Bibliography

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