ADVANCED AUTOMATION

Mestrado em Engenharia Eletrónica e de Computadores

Code: 26808

Main Scientific Area: Intelligent Systems and Control

Lecturer: Delfim Duarte Rolo Pedrosa

Language of Instruction: Portuguese

Regime: S2

Contact Hours: 30h Total Workload: 130h

ECTS: 6,0

Objectives

This course aims to provide students with the basic theoretical knowledge of automation technologies as well as develop the ability to understand and analyze practical problems and conceive, plan and implement automation systems. It is expected that students who complete this course can:
• Know the characteristics and requirements of automation systems specific to different types of industries;
• Interpret and build models based on state machines, Grafcet for modeling automation systems;
• Implement State Machines / SFC for Programmable Logic Controllers;
• Understand and develop supervisory and monitoring systems for automation;
• Understand complementary technologies used in automation systems: process controllers, industrial sensors and automatic identification systems;
• Understand a specification and design an automation system.

Learning Outcomes

The syllabus of this course will enable the student to acquire a set of skills in the field of industrial automation.
Thus, this course will enable students to know and understand the different methods of conception and analysis of discrete event systems and systems of supervision and monitoring under automation.
After this foray theoretical, students will be confronted with a set of real problems of automation systems specific to different types of industries and will be encouraged to find solutions to solve them.
Through discussion of these will be presented the student, elements (controllers, sensors and actuators) typically present in industrial automation systems, allowing you to achieve your resolution.
Simultaneously, the student will also stimulate demand for more advanced solutions independently.

Course Contents

Architectures of automation systems. Types of industries and processes. Requirements in terms of equipment for control and supervision. Methods of analysis and conception of discrete event systems within the automation: Grafcet, Petri Nets (power analysis and modeling; Possible Extensions (pros and cons)). Supervision and monitoring systems: human-machine interfaces and industrial Scadas. Industrial controllers. Industrial sensors and actuators. Identification systems and automated data collection: barcodes, RFID, etc.

Recommended Bibliography

- Elvia Ruiz Beltrán, Antonio Ramírez Treviño, Luis Ernesto López Mellado, “Esquemas de Diagnóstico de Faltas para Sistemas de Eventos Discretos: Diagnosticabilidad y Esquemas de Detección y Localización de Faltas en

Sistemas de Eventos Discretos con Redes de Petri", 2012.
- Mikell P. Groover; "Automation, Production Systems, and Computer-Integrated Manufacturing", 2nd Edition, Prentice Hall, 2000.
- D. A. Coggan, ed.; "Fundamentals Of Industrial Control: Practical Guides For Measurement And Control", 2nd edition, ISA: The Instrumentation, Systems, and Automation Society, 2004.
- Jean-Yves Fiset;"Human-machine interface design for process control applications", ISA, 2008.
- António Pessoa de Magalhães, "Práticas De Automação Industrial", Real Games, Lda., 2011.
- Mohammed Faizullah Sharieff , Industrial Automation: With Programmable Logic Controllers, AP LAMBERT Academic Publishing, 2012.
- Manoj Kollam, "A Real-Time Control Operating System for Industrial Automation: Industrial Automation using Zigbee", LAP LAMBERT Academic Publishing, 2011.

Learning and Teaching Methods

This course includes a theoretical component and a component of theory and practice. Both components will be interspersed throughout the course. Wherever possible is associated with each component theoretical a practical case, for the resolution of a real situation. So, initially, we present the fundamental concepts of this course, methods of analysis and conception of discrete event systems and systems of supervision and monitoring. Soon after, the operation will be shown the different tools that students will use for the development of different methods of analysis and conception. Preceding the presentation of different methods will introduce a practical problem.
Students should analyze and propose approaches to solving it. With the awakening to the problem, by the students will be introduced to different components of the methods that will allow a solution.

Assessment Methods

The approval of this course is obtained with a score less than 10 points on a scale from 0 to 20, resulting from the evaluation of a practical Project supported by a written report and with an oral defense. The practical work is mandatory and has a minimum score of at least 10 out of 20.