Industrial Automation

Programme course

6 credits

Industriell automation

TMMI46

Valid from: 2017 Spring semester

Determined by
Board of Studies for Mechanical Engineering and Design

Date determined
2017-01-25

Main field of study
Mechanical Engineering

Course level
First cycle

Advancement level
G2X

Course offered for
- Mechanical Engineering, B Sc in Engineering
- Industrial Engineering and Management, M Sc in Engineering
- Industrial Engineering and Management - International, M Sc in Engineering

Entry requirements
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites
Basic knowledge in computer technology and programming, production, manufacturing technology, control theory, material science and human machine interaction.

Intended learning outcomes

The course is meant to be an introductory course on industrial automation. In this context, the course covers the subjects required to integrate sensors and actuators with programmable logic controllers (PLCs) to automate industrial processes. In addition the course also provides a small component of robot programming and, since the automated systems always require human intervention, at some level, the course briefly presents the main challenges and prospects on human-machine-interaction which may be especially demanding in complex automation systems. The course has a strong practical component whereby the students have the opportunity of getting a hands-on experience on the subjects taught on the theoretical lectures.
After concluding the course the students should be able to:
•Understand the main functioning principles of the most common industrial sensors and actuators.
•Understand the main logic-based models that support design of PLC programs
•Design PLC programs that are able to interpret the information collected from a set of sensors and convert that information into the corresponding actuation.
•Design PLC programs that can communicate with other programs in other PLCs.
•Understand the main challenges related with human machine interaction.
Prerequisites: (applicable to students admitted to the course is offered within the program, see “to:” above)

Course content

1. Introduction
2. Boolean Algebra and Logic Circuits
   a.Logic gates: AND, OR, NAND, NOR, NOT, XOR, XNOR.
   b.Truth tables
   c.Logic functions
   d.Boolean Laws
   e.Karnaugh maps
   f.State Machines
3. PLC Programming
   a.IEC 61131-3 Programming languages overview
   b.Ladder Diagrams
   c.Structured Text
   d.Communication
4. Sensors
   a.Important Characteristics
   b.Main Industrial Sensors (Overview)
5. Actuators
   a.Pneumatic
   b.Hydraulic
   c.Electric
6. Human-machine-interaction (Overview)

Teaching and working methods
Lectures and laboratory work.

Examination

LAB1	Laboratory work	2 credits	U, G
TEN1	Written examination	4 credits	U, 3, 4, 5

Grades
Four-grade scale, LiU, U, 3, 4, 5

Other information
Supplementary courses: Industrial Automation - project

Department
Institutionen för ekonomisk och industriell utveckling

Director of Studies or equivalent
Mats Björkman

Examiner
Luis Ribeiro

Course website and other links

Education components
Preliminary scheduled hours: 44 h
Recommended self-study hours: 116 h

Course literature
Föresläsningsanteckningar

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.