LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Automation
Automation

EIEN50, 7,5 credits, A (Second Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED E
Date of Decision: 2023-04-11

General Information

Elective for: D4-ssr, E4-ra, E4-ae, F4, I4-pr, M4-me, M4-prr, MPRR1
Language of instruction: The course will be given in English on demand

Aim

Automation is the engineering science utilizing measurements and information in real time in order to optimize material and energy flows in the best possible way. The course also gives a perspective of sustainability by examples from the interplay between energy, water and food globally. The purpose of the course is to give an overview of the different components that constitute an industrial control system and how these work and interact with each other. Another purpose is to give knowledge on the tools and methods to allow the student to independently obtain information, analysis, realisation and assessment of industrial control systems.The course combines the student's previous knowledge from several other courses, such as automatic control, mathematical statistics, measurement technology, and computer engineering, to demonstrate what automation may look like in various industrial branches.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

be able to individually

- apply and integrate knowledge from several courses and technology areas;
- describe the concepts of states in mathematical modelling of discrete as well as

continuous systems;
- explain the different components of an automation system for a simple process and understand how they interact.

Competences and skills
For a passing grade the student must

be able to individually

- utilize scientific articles in a specific field of technology and apply methods from them;
- divide a system into several samller processes and modularize them for interaction with other processes:
- formulate a mathematical model of a simple process from information on the constituting components and how they interact;
- use mathematical and statistical methods to analyse important process characteristics;
- program a PLC using suitable software and standard languages for a simple sequential control task;

Judgement and approach
For a passing grade the student must

be able to individually

- assess how a larger problem can be divided into well-defined sub-problems for handling several smaller interconnected processes;
- assess the appropriateness of control, process monitoring and communication structures for small industrial processes.

Contents

Industrial processes: Where is automation applied? Examples from various industrial applications.

Structuring industrial processes: The concepts of dynamical systems and event driven systems.

Models: Continuous and time discrete dynamical systems and event driven systems.

Process monitoring: Sampling of measurement data, filtering and data analysis.

Structures for industrial control systems: Sequential control, combinatorial networks and continuous processes. Real time programming and industrial communication. Examples of commercial control systems.

The physical parts of a control system: Data acquisition and actuators.

Home simulation exercises: Discrete and dynamic systems for which two reports are handed in.

Laboratory exercises: Structuring and programming of some simple control problem in a

laboratory process and programming of a human-machine-interface for that process.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Assessment takes place in two parts, both in groups and individually: - For the group elements, two approved written reports from simulation exercises apply that provide an increased understanding of the basic properties of different dynamic production systems and their stability. Furthermore, the approved work task is required from three interconnected lab steps, which in the laboratory environment gradually teaches students to divide larger problems into less well-defined subproblems in order to pass programming and commissioning of a production line. - For the individual element, an approved written exam is required. - For a final passing grade, both above parts must be approved.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Parts
Code: 0120. **Name:** Automation.
Credits: 5. **Grading scale:** TH. **Assessment:** Written examination
Code: 0220. **Name:** Laboratory and Simulation Exercise.
Credits: 2,5. **Grading scale:** UG. **Assessment:** Laboratory work and written reports

Admission

Assumed prior knowledge: FRT010/FRTF05 Automatic Control, Basic Course.
The number of participants is limited to: No
The course overlaps following course/s: MIE052, MIE062, MIE080

Reading list

- Olsson G, Rosén C: Industrial Automation, Application, Structures and Systems. IEA, LTH, 2005, ISBN: Kompendium.
- Scientific articles within the HMI-area.

Contact and other information

Course coordinator: Docent Ulf Jeppsson, ulf.jeppsson@iea.lth.se
Course homepage: https://www.lth.se/iea/utbildning/valfria-kurser-i-lund/automation/