

Lecturer

Name: Petr Fiedler

Background: Associate professor in Electrical Engineering

Specialization: Electrical engineering, Functional Safety, Industrial control systems and Head of the Industrial Automation Expert Group

Contacts:

Email: fiedlerp@feec.vutbr.cz

Tel: +420 541 146 480

CV: [link to University Webpage](#)

Lecturer

Name: Miloslav Steinbauer

Background: Associate professor in Electrical Engineering

Specialization: Electrical engineering and Electrical safety

Contacts:

Email: steinbau@fec.vutbr.cz

CV: [link to University Webpage](#)

Lecturer

Name: Václav Kaczmarczyk

Background: Doctor in Electrical Engineering

Specialization: Research in the field of Industry 4 and related topics

Contacts:

Email: kaczmarczyk@vut.cz

CV: [link to University Webpage](#)

Lecturer

Name: Radek Stohl

Background: Doctor in Electrical Engineering

Specialization: Electrical engineering, Functional Safety, Industrial control systems and Programmable Logic Controllers

Contacts:

Email: stohl@feec.vutbr.cz

CV: [link to University Webpage](#)

Lecturer

Name: Miroslav Jirgl

Background: Doctor in Electrical Engineering

Specialization: Electrical engineering, Industrial control systems, Programmable Logic Controllers and Assistant professor

Contacts:

Email: jjirgl@feec.vutbr.cz

CV: [link to University Webpage](#)
[link to Researchgate profile](#)

Lecturer

Name: Tomáš Beneš

Background: Electrical Engineer

Specialization: Doctor student of Electrical engineering, Industrial control systems and Programmable Logic Controllers, Hardware and Software developer

Contacts:

Email: xbenes23@stud.feec.vutbr.cz

CV: [link to University Webpage](#)

Lecturer

Name: Ondřej Baštán

Background: Electrical Engineer

Specialization: Doctor student of Electrical engineering, Industrial control systems and Programmable Logic Controllers, Hardware and Software developer

Contacts:

Email: xbasta02@stud.feec.vutbr.cz

CV: [link to University Webpage](#)

Lecturer

Name: Jakub Arm

Background: Electrical Engineer

Specialization: Doctor student of Electrical engineering, Industrial control systems and Programmable Logic Controllers

Contacts:

Email: xarmja00@stud.feec.vutbr.cz

CV: [link to University Webpage](#)
[link to Researchgate profile](#)

Course Description

Title: Design your device and let it work, baby!

Fields of activity: Computer Engineering, Control Engineering/Systems engineering , Electrical/Electromechanical Engineering , Electronic/Electrotechnical Engineering , Industrial Engineering, Risk management, Functional Safety and Security

Examination type: Project

Number of ECTS credits issued: 1

Learning Goals and Objective: By the end of the Course the participants will have a better understanding of difference between office computers and “computer” technology that is usually used to control industrial processes, and work with them. Also they will understand basic risk management principles and learn tolerable risk levels with respect to human lives. Regarding recent trends in control of industrial processes, they will understand challenges and benefits that are to be expected with so called Industry 4.0.

Syllabus

Name of activity	Safety in Electrical Engineering
Number of working hours	2 hours
Type of activity	Group Seminar
Lecturer	Assoc. Prof. Miloslav Steinbauer
Short summary of content	Precautions to prevent injury, rules applicable to laboratory activities, hazard related to voltages and currents, methods of protection.
Bibliography	No bibliography is needed
Expected effect	Understandig of hazards related to electrical energy, ability to work safely in the labs.

Name of activity	Introduction to Programmable Logic Controllers
Number of working hours	3 hours
Type of activity	Lecture
Lecturer	Ing. Radek Štohl, Ph.D.
Short summary of content	Students will learn about the Programmable Logical Controllers (PLCs), i.e. about the technology that is usually used to control industrial processes. This includes typical input/output interfaces to the technology and program cycle.
Bibliography	No bibliography is needed
Expected effect	Students will understand the difference between office computers and “computer” technology that is usually used to control industrial processes.

Name of activity	Introduction to programming of the PLCs
Number of working hours	2 hours
Type of activity	Lecture
Lecturer	Ing. Radek Štohl, Ph.D.
Short summary of content	Introduction to programming languages that are used to program the PLCs.
Bibliography	No bibliography is needed
Expected effect	Students will understand that several standardized, yet special programming languages are used to program the PLCs and they will learn fundamentals of one of the languages.

Name of activity	Programming of the PLCs
Number of working hours	3 hours
Type of activity	Tutorial
Lecturer	Ing. Radek Štohl, Ph.D.
Short summary of content	Development tools used for programming of the PLC, control of inputs and outputs, programming of simple tasks, loading and running the application.
Bibliography	No bibliography is needed
Expected effect	Students will learn how to use the development tools, they will see how a PLC is configured, how are the inputs and outputs wired, and will try to create and run their first simple control program for the PLC.

Name of activity	Trends in industrial automation
Number of working hours	2 hours
Type of activity	Lecture
Lecturer	Ing. Vaclav Kaczmarczyk, Ph.D.
Short summary of content	Recent trends in industrial automation, Industry 4.0 technologies – systems interoperability, decentralization, horizontal and vertical integration, digital factory, virtual commissioning and digital twin.
Bibliography	No bibliography is needed
Expected effect	Students will understand recent trends in control of industrial processes, they will understand challenges and benefits that are to be expected with so called Industry 4.0.

Name of activity	PLC programming labs
Number of working hours	2 hours
Type of activity	Laboratory
Lecturer	Ing. Radek Štohl, Ph.D. Ing. Miroslav Jirgl, Ph.D. Ing. Jakub Arm Ing. Ondřej Baštán Ing. Tomáš Beneš
Short summary of content	Students will learn how to use more complicated function elements that are used to program the PLCs.
Bibliography	No bibliography is needed.
Expected effect	Students will learn how to use standard function blocks that built into the PLCs (timers, counters, etc.) and they will try to control a simple real system.

Name of activity	Risk management and rational decision making
Number of working hours	2 hours
Type of activity	Group seminar
Lecturer	Assoc. prof. Petr Fiedler, Ph.D.
Short summary of content	Introduction to rational safety and security decision making based on risk management principles.
Bibliography	No bibliography is needed
Expected effect	Students will understand basic risk management principles and will be able to take more rational decisions in safety/security related tasks as well as in daily life. They will also learn about tolerable risk levels with respect to human lives, daily activities and various high/low risk sports.

Name of activity	Functional Safety and Cybersecurity
Number of working hours	2 hours
Type of activity	Lecture
Lecturer	Assoc. prof. Petr Fiedler, Ph.D.
Short summary of content	Introduction to functional safety principles, brief introduction to cybersecurity principles.
Bibliography	No bibliography is needed
Expected effect	Students will understand fundamental differences between reliability, safety and security. They will know how safety can be evaluated and achieved; they will know basic technical and non-technical elements that are used to enhance (cyber)security.

Name of activity	PLC project
Number of working hours	10 hours
Type of activity	Project Work
Lecturer	Ing. Radek Štohl, Ph.D. Ing. Miroslav Jirgl, Ph.D. Ing. Jakub Arm Ing. Ondřej Baštán Ing. Tomáš Beneš
Short summary of content	Students will work on their assigned projects. Students will analyse the given task and propose the control algorithms. Students will further develop a control application for the given task using one of the PLC programming languages. Students will be organized into two-person teams.
Bibliography	No bibliography is needed
Expected effect	Students will understand how to implement complex control algorithms for real engineering tasks using Programmable Logic Controllers.

Name of activity	Project presentation and evaluation
Number of working hours	2 hours
Type of activity	Examination
Lecturer	Ing. Vaclav Kaczmarczyk, Ph.D.
Short summary of content	Students will prepare presentation of their projects and will present the results they achieved.
Bibliography	No bibliography is needed
Expected effect	Students will experience struggles associated with team work and team presentation, they will also see various presentation styles. They will also see how other teams approached the given tasks.

Pre-materials

Name (as link)	<u>4 most popular PLC programming languages for implementation of control diagrams</u>
Topic/field	PLC programming/Industrial automation
Short description	The article will provide an initial indication of the languages in which PLCs can be programmed. With demonstration and videos.

Name (as link)	<u>Advanced PLC programming methods</u>
Topic/field	Introduction to PLC/Industrial control systems
Chapter/Section (for books)	Chapter 2 and 3
Short description	Basic information about PLC, its programming and working with it.
Professor/Author	Miroslav Hanák

Name (as link)	<u>What is a PLC?</u>
Topic/field	Introduction to PLC/Industrial control systems
Short description	The name suggests a brief description of what the PLC is, how it works and history.

Name (as link)	<u>List of STL instructions</u>
Topic/field	PLC programming/Industrial automation
Short description	A utility containing all STL programming instructions. It is not necessary to know what to do, just to know that they exist.