

COURSE DESCRIPTION

- Course name: **Programmable Logic Controllers PLC**

<i>Form of course</i>	<i>Lecture</i>	<i>Tutorial</i>	<i>Laboratory</i>	<i>Project</i>	<i>Seminar</i>
<i>Total number of hours</i>	X	X	X	46	14
<i>Form of completion</i>	X	X	X	<i>Passing with grade</i>	<i>Oral presentation</i>

- Initial requirements:
Basic knowledge of Boole's algebra;
Computer skills at basic level.
- Name, surname, title of teacher:
Kamil Klimkowski, Ph.D.
- Aims of course and educational outcomes:
Understanding the principles of operation, construction and functionality of Siemens Programmable Logic Controllers and skills in their programming with the use of specialized software and educational mockups.
- Form of teaching (traditional / e-learning):
- Short description of the course content:
- **The main aim of the course is to provide programming issues of Programmable Logic Controllers used in information systems working in the industry. The lecture will facilitate future engineer PLC configuration, design and development of computer software and design of distributed systems using programmable controllers. The course is also aimed at explanation of practical problems encountered in Programmable Logic Controllers (PLC) on the basis of the Siemens family SIMATIC S7-200 and S7-1200. The following topics are covered:**
 - basic aspects of PLC application in industry,
 - PLC operation of basic peripherals,
 - graphical languages (LADDER or FBD),
 - basic programming tools,
 - arithmetic and logic operations,
 - timers and counters,
 - latches and flip-flops.

Each detailed course topic is an introduction to intensive laboratory exercise.

- Project & Seminar - content:

Form of classes - project		Number of hours
Proj1	Opening lecture and introduction – workstations description and safety rules, types of programmable logic controllers, proper PLC selection to the control system.	4
Proj2	Basic concepts and principles of PLC programming - presentation of the basic functions of logic based on Boolean algebra and implementation of simple algorithms in the controller.	4
Sem1	<i>Presentation and discussion of the project result. Stage 1</i>	4
Proj3	Presentation of the functional blocks of programmable controllers: such as timers, counters, bistable flip-flops and programming of complex control systems.	4
Proj4	Programming of educational mockups with the use of known function blocks and SIMATIC S7-200 controller: control of the power system for induction motor, control of traffic lights, car parking service, industrial agitator using Siemens STEP 7 software.	4
Proj5	Construction and basic concepts and principles of programming of SIMATIC S7-300 controller and the new TIA PORTAL programming software. Presentation of the structures of the program blocks, functions, function blocks, memory addressing and areas.	4
Sem2	<i>Presentation and discussion of the project result. Stage 2</i>	4
Proj6	Construction and basic concepts and principles of programming of SIMATIC S7-1200 controller. Presentation of the structures of the programming tool, program blocks, functions, function blocks, memory addressing and areas.	4
Proj7	Advanced and complex educational mockups programming using the known controllers and programming tools.	4
Proj8	Presentation of the types of industrial networks including PROFIBUS DP (general characteristics, range of applications, distribution, construction, the principle of cyclic data transfer, connection topologies, sample devices, etc.). The usage of the PROFIBUS DP network for distributed control systems (structure and configuration of the ET 200S station, data exchange with the S7-200 controller using the EM277 module).	4
Sem3	<i>Presentation and discussion of the project result. Stage 2</i>	4
Proj9	Designing and development of complex technological process control program with the use of S7-200 and S7-300 controllers connected by industrial PROFIBUS DP network.	5
Proj10	Designing and development of complex technological process control program with the use of S7-200 and S7-300 controllers connected by industrial PROFIBUS DP network.	5
Proj11	Design visualization of the control process using a dedicated software and hardware.	4
Sem4	<i>Presentation of the final project.</i>	2
	Total hours	60

- Basic literature:

1. Crispin A. J., *Programmable Logic Controllers and their Engineering Applications*, McGraw-Hill Book Company UK, 1990
2. Collins D. A., Lane E. J., *Programmable controllers - A practical guide*, Collins&Lane, Cork, Ireland, 1992

- Additional literature:

3. Pawlak M., *Sterowniki Programowalne* – skrypt dla studentów współfinansowany ze środków Unii Europejskiej w ramach Europejskiego Funduszu Społecznego
4. Lagierski T., Kasprzyk J., Wyrwał J., Hajda J., *Programowanie sterowników PLC*, Wydawnictwo Pracowni Komputerowej Jacka Skalmierskiego, Gliwice 1998

- Completion rules:

1. meet the course requirements,
2. attend and take active participation in classes,
3. >80% of attendance must be filled,
4. completion of Final Project.