

Specification for the book of courses

Study program		Electrical Engineering and Computer Science		
Module		Computing and Informatics		
Type and level of studies		Undergraduate Academic Studies		
The name of the course		Fundamentals of Control Systems		
Lecturer (for lectures)		Perić Lj. Staniša, Nikolić S. Saša		
Lecturer/associate (for exercises)		Todorović Z. Darko		
Lecturer/associate (for OFE)		Todorović Z. Darko		
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites				
Introduction to the basic ideas and principles of control systems, as well as modelling and simulation of automatic control systems. Acquiring basic knowledge of the structure, mode, programming and practical application of the PLC systems in the industry. Introducing the SCADA systems and acquiring knowledge about implementation of these systems in supervision and control of industrial processes.				
Course objectives				
System approach to modelling of automatic control systems (ACS) components. Operations with structural block diagrams. Practical implementation of ACS in industry. Familiarising with MATLAB software tools. Theoretical and practical knowledge of PLC systems. Design of control systems based on PLC. Knowledge of the implementation of SCADA systems and solving practical problems in industry and distributed systems.				
Course outcomes				
System approach to modelling of automatic control systems (ACS) components. Operations with structural block diagrams. Practical implementation of ACS in industry. Familiarising with MATLAB software tools. Theoretical and practical knowledge of PLC systems. Design of control systems based on PLC. Knowledge of the implementation of SCADA systems and solving practical problems in industry and distributed systems.				
Course outline				
Overview of the development of ACS. Division of ACS. Modelling of components of linear and digital ACSs. Structure of ACS. Feedback concept. Structural block diagrams of control systems. Introduction to Programmable Logic Controllers (PLC). Processing of input-output signals. Programming of PLC. Ladder diagrams. Examples. Components of PLC. The application of up-to-date PLC systems from different manufacturers (Siemens, Omron, Mitsubishi, Allen Bradley, Schneider Electric). Introduction to SCADA systems. Definition and elements of SCADA systems. Historical development of SCADA systems. Real-time operating systems. Remote control systems. Communication within SCADA systems.				
Theoretical teaching				
Application of MATLAB Control and System Identification Toolbox in modelling and simulation of ACS. Familiarising with the operating mode and application of PLC-Siemens and development software Step7. Working with PLC-Omron and development software CX One Programmer. Programming of PLC using Ladder diagram. Installation and activation of the software - Citect SCADA. Concept of the project- Citect SCADA (user levels, project compiling and running, project information). Concept of the Page - CitectSCADA. Concept of the tag. Objects. Types of alarm. Alarm subtypes. Alarm tag definition. Animation of project elements. Cluster data definition. Server data definition. User data definition. Cicode editor. Cicode functions. Cicode scripts. Patterns. Pattern customisation. Examples. Project.				
Practical teaching (exercises, OFE, study and research work)				
Application of MATLAB Control and System Identification Toolbox in modelling and simulation of ACS. Familiarising with the operating mode and application of PLC-Siemens and development software Step7. Working with PLC-Omron and development software CX One Programmer. Programming of PLC using Ladder diagram. Installation and activation of the software - Citect SCADA. Concept of the project- Citect SCADA (user levels, project compiling and running, project information). Concept of the Page - CitectSCADA. Concept of the tag. Objects. Types of alarm. Alarm subtypes. Alarm tag definition. Animation of project elements. Cluster data definition. Server data definition. User data definition. Cicode editor. Cicode functions. Cicode scripts. Patterns. Pattern customisation. Examples. Project.				
Textbooks/references				
1	Čedomir Milosavljević, "Fundamentals of automation: 1st part - Linear continuous time ACS" (in Serbian), Faculty of Electronic Engineering in Nis, 2002.			
2	Dragan Antić, Bratislav Danković, "Modelling and simulation of dynamical systems" (in Serbian), Faculty of Electronic Engineering in Nis, 2001.			
3	Denis Collins, Eamonn Lane, "Programmable Controllers: A Practical Guide", McGraw-Hill, 1995.			
4	William Bolton, "Programmable Logic Controllers", Newnes, 2003.			
5	Stuart Boyer, "SCADA: Supervisory Control and Data Acquisition", Instrument Society of America, 2016.			
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	2	1	0	0
Teaching methods				
Мултимедијална предавања; Аудитивне вежбе; Лабораторијске вежбе				
Grade (maximum number of points 100)				
Pre-exam duties		Points	Final exam	
Activity during lectures		10	Written exam	
Exercises		20	Oral exam	
Colloquia		40		
Projects				