

Study program / course: Mechanical Engineering				
Type and level of study: Bachelor academic studies				
Course: Computer Supported Measurement and Control				
Lecturers: Milan S. Matijevic				
Status of course: Elective for module M ₇ , VI semester				
Number of ECTS: 6				
Prerequisite: none				
The course objective: The goal of this course is aspect of practical implementation of modern computer technology in measurement and control systems. Theoretical concepts will be discusses in amount necessary for understanding and connecting issues form basic process dynamics, theory of measurement, hardware components (sensors, actuators, controllers and computers...) signals processing and software implementation (PLC programming, LabView, C/C++, ect), SCADA and DCS systems.				
The course outcome: Fundamental knowledge about principles of system engineering, continual and digital signals and systems, structural, functional and other technical characteristics of measurement and control systems, principles of measurement of pressures, temperature, level, flow, velocity, acceleration, methods of modeling and identification of objects and processes, selection of sensors, actuators, regulators and adjustment of industrial PID regulators, communication in measurement and control systems, principles of real time programming, implementation of computer techniques in measurement and control systems, architecture and characteristics of SCADA and DCS systems, principles of formal design and techno economical aspects of designed system.				
Syllabus: <i>Theory</i> 1. Introduction. General concepts and principles of system engineering. Historical perspectives. Industrial system and control theory. 2. Theoretical ground for digital signals and systems. Digital signals and systems. Analysis of signals in dynamic systems. Theory of sampling and reconstruction of analog signal. Structure of digital system. Discrete function of transmission. Frequent characteristics of digital systems. 3. Stability. Measurement and control systems with feed-back. 4. Basic of functional and technical characteristics of measurement and control systems. Static and dynamic characteristics of dynamic systems. Technical characteristics of equipment and systems. Communication in systems for measurement and control. 5. Modeling and identification. 6. Sensors. Basic principles of measurement. 7. Sensors. Industrial applications. Acquisition and processing of measured data. Tools for visualization – LabView. 8. Actuators. 9. Control algorithms. General principles of synthesis. PID control. 10. PID controllers – design and adjustment. Typical industrial control algorithms. Implementation and operational aspect. Control algorithms based on fuzzy logic. 11. Introduction to real time systems. Hardware and software demands for operation in real time. Measurement and control systems in real time. 12. Industrial controllers and automatization. Sequential control. PLC programming, - Ladder diagrams. 12. SCADA and DCS systems. 14. Integration and implementation of control systems. Computer network. Communication protocols in control systems. Integration with other information systems. Safety issues and reliability. 15. Principles of formal design. Technical and economic analysis. <i>Practice:</i> Practical classes, other classes Listed issues will be presented during laboratory exercises working in class with laboratory models				
Recommended reading: 1. Matijevic M., Jakupovic G. Car J. “Computer supported measurement and control” Faculty of Mechanical Engineering, Kragujevac, 2005.				
The number of hours of active teaching:				Other classes: 1
Theory: 3	Practical classes: 1,6	Other forms of teaching: 0,4	Research study: 0	
Methods of teaching The goals is learning in the context - less as reproduction of information mode as ability to gather and creatively use information. Teaching is based on lecturing using multimedia devices and laboratory exercise. Each lesson has accompanied presentation set on web portal.				
Evaluation of knowledge (maximal 100 points)				
Pre-final exam obligations		Points	Final exam	Points
Activities during the classes		10	Written	
Activities during the exercises			Oral presentation	30
Tests:		30		
Homeworks:		30		

