

## Specification for the book of courses

<b>Study program</b>		Control Systems		
<b>Module</b>		Computer Control Systems and Measurement Techniques		
<b>Type and level of studies</b>		Master studies		
<b>The name of the course</b>		Telemetry		
<b>Lecturer (for lectures)</b>		Denić B. Dragan, Jovanović R. Jelena		
<b>Lecturer/associate (for exercises)</b>		Miljković S. Goran, Jovanović R. Jelena		
<b>Lecturer/associate (for OFE)</b>		Miljković S. Goran, Jovanović R. Jelena		
<b>Number of ECTS</b>	5	<b>Course status (obligatory/elective)</b>	Elective	
<b>Prerequisites</b>				
<b>Course objectives</b>		The course has the goal to introduce students with basic transmission techniques of measurement signals and configuration of modern measurement systems used for remote measurement.		
<b>Course outcomes</b>		Capability to define basic problems related to transmission of measurement signals and realisation of modern measurement systems used for remote measurements. Designing of simple telemetry system examples and estimation of standards fulfillment. Capability to work with modern measurement systems used for remote measurements.		
<b>Course outline</b>				
<b>Theoretical teaching</b>		Basic terms and definitions; pneumatic telemetry systems; analog telemetry systems, frequency and pulse-width modulation; transmitters; two-wire transmitters, serial and parallel power sources; analysis of concrete two-wire transmitter examples, analogue and digital telemetry systems; delta modulation; digital telemetry systems; FSK (frequency-shift keying) modulation; pulse code modulation (PCM); digital transmitters; digital two-wire transmitters; universal asynchronous receiver-transmitter; computer based telemetry systems; standard interface systems; modems; automotive telemetry systems; fiber-optic telemetry systems; industrial telemetry systems, biotelemetry, virtual instrumentation and Internet in telemetry systems; connection of distant measurement systems, distributed virtual laboratories; telemetry system testing; telemetry standards; the basic principles of Internet of Things technology and its applications in telemetry systems.		
<b>Practical teaching (exercises, OFE, study and research)</b>		Demonstration of operational principles of measurement systems that are based on the Arduino platform, through various measurement examples of environmental parameters.		
<b>Textbooks/references</b>				
1	D. Denić, G. Miljković, Telemetry - script (in Serbian), on the website of the Faculty of Electronic Engineering, 2007.			
2	D. Denić, I. Ranđelović, D. Živanović, Computer Measurement and Information Systems in Industry - script (in Serbian), Faculty of Electronic Engineering in Niš, and WUS Austria, script, 2005.			
3	J. Webster, "The measurement, instrumentation, and sensors handbook", CRC Press, 1999.			
4	S. Horan, "Introduction to PCM telemetering systems", CRC Press, 2002.			
5	W. Nawrocki, „Measurement systems and sensors“, Artech House, 2005.			
<b>Number of classes of active education per week during semester/trimester/year</b>				
<b>Lectures</b>	<b>Exercises</b>	<b>OFE</b>	<b>Study and research work</b>	<b>Other classes</b>
2	1	1		
<b>Teaching methods</b>		Theoretical and practical teaching, seminar papers. Practical teaching is of demonstrational type.		
<b>Grade (maximum number of points 100)</b>				
<b>Pre-exam duties</b>		<b>Points</b>	<b>Final exam</b>	<b>Points</b>
<b>Activity during lectures</b>		5	<b>Written exam</b>	20
<b>Exercises</b>		10	<b>Oral exam</b>	10
<b>Colloquia</b>		40		
<b>Projects</b>		15		