

## Specification for the book of courses

<b>Study program</b>		Electronics and Microsystems		
<b>Module</b>		Electronics and Microsystems		
<b>Type and level of studies</b>		Master studies		
<b>The name of the course</b>		Microelectromechanical Systems (MEMS)		
<b>Lecturer (for lectures)</b>		Paunović V. Vesna, Pešić M. Biljana		
<b>Lecturer/associate (for exercises)</b>		Đorđević D. Miloš		
<b>Lecturer/associate (for OFE)</b>		Đorđević D. Miloš		
<b>Number of ECTS</b>	5	<b>Course status (obligatory/elective)</b>	Elective	
<b>Prerequisites</b>				
<b>Course objectives</b>	Introducing the students in the structure, operating principle and application of various microelectromechanical systems (MEMS).			
<b>Course outcomes</b>	Necessary knowledge on the operating principles, realization and application of MEM devices. Working with certain types of pressure, acceleration and temperature sensors. Calculation and construction of simple electronic systems. Realization of wireless communication systems for information transmission			
<b>Course outline</b>				
<b>Theoretical teaching</b>	Basic elements of MEM systems: sensors, actuators, passive structures and electronic circuits. Techniques for sensing and actuation. Operation and application of following MEM devices: acceleration sensors and gyroscopes, pressure sensors and fluid flow sensors, gas sensors and biochemical sensors, microelectrodes, microphones, micromotors, microelectromechanical valves and micropumps, microelectromechanical resonators, optical and RF switches, digital micromirrors and optical displays, thermomechanical memories, integrated MEM devices.			
<b>Practical teaching (exercises, OFE, study and research)</b>	Practical work with specific types of pressure sensors, acceleration sensors and temperature sensors. Computer simulations and corresponding lab measurements. Design and realization of simple electronic systems. Realization of wireless communication systems for information transmission, acquaintance and work with accelerometers made in MEMS technology, realization of Data Logger microsystems based on various sensing techniques and storage of data on various media.			
<b>Textbooks/references</b>				
1	V. Lindroos, M. Tilli, A. Lehto and T. i Motooka, Handbook of Silicon Based MEMS Materials and Technologies, 2010, Elsevier			
2	J. Gardner, V. Vardan and O. Awadelkarim, Smart Material Systems and MEMS: Design and Development Methodologies, John Wiley, 2006.			
3	V. Vardan, K. Vinoy and S. Gopalakrishnan, RF MEMS and Their Applications, John Wiley, 2003			
4	N, Maluf, K. Williams, An Introduction to Microelektromechanical Systems Engineering, Artech House, Inc. 2004			
5	S. E. Lyshevski, MEMS and NEMS: Systems, Devices, and Structures, CRC Press, 2002			
<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	2	1		
<b>Teaching methods</b>	Power Point presentation for theoretical teaching. Computer simulations and lab measurements for practice teaching. Students within the seminar work individually or teamally solve the practical problem of applying one of the available MEM systems.			
<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>	25	
<b>Exercises</b>	20	<b>Oral exam</b>	25	
<b>Colloquia</b>	15			
<b>Projects</b>	10			