

## Specification for the book of courses

<b>Study program</b>		Electrical Engineering and Computer Science		
<b>Module</b>		Common		
<b>Type and level of studies</b>		Doctoral studies		
<b>The name of the course</b>		Ultrasonic Technique		
<b>Lecturer (for lectures)</b>		Mančić D. Dragan		
<b>Lecturer/associate (for exercises)</b>				
<b>Lecturer/associate (for OFE)</b>				
<b>Number of ECTS</b>	10	<b>Course status (obligatory/elective)</b>	Elective	
<b>Prerequisites</b>				
<b>Course objectives</b>	Expanding and upgrading the fundamental knowledge acquired in the field of ultrasonic technique and guidance towards the adoption of new techniques required by concrete and specific applications which are subject of interest to students.			
<b>Course outcomes</b>	Students gain the necessary theoretical and practical knowledge to meet any specific request in development, modeling, performance assessment, optimization, realisation, control, practical application and verification of the various devices of ultrasonic technique mainly of the various sandwich transducers and electronic generators.			
<b>Course outline</b>				
<b>Theoretical teaching</b>	Piezoelectric ceramics. Modelling of piezoelectric ceramics. Development of ultrasonic waveguide concentrators and sonotrodes. Modeling of metal resonators. Development, modeling and optimization of the power ultrasonic transducers. Development, modeling and optimization of the power electronic ultrasonic generators. Basic applications of power ultrasound. Ultrasonic systems for cleaning and welding.			
<b>Practical teaching (exercises, OFE, study and research)</b>				
<b>Textbooks/references</b>				
1	M.Radmanovic, D.Mancic, "Design and modelling of power ultrasonics transducers", MP Interconsulting, Le Lockle, Switzerland, 2004.			
2	D.Ensminger, L.J.Bond, "Ultrasonics: Fundamentals, Technologies, and Applications", CRC Press, 2011.			
3	J.David, N.Cheeke, "Fundamentals and Applications of Ultrasonic Waves", CRC Press, 2012.			
4	D.Mancic, V.Paunovic, "Application of impedance spectroscopy for electrical characterization of La doped BaTiO <sub>3</sub> -ceramics" (in Serbian), Faculty of Electronic Engineering Nis, Edition: Monographies, Nis, 2012.			
5				
<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>
3	0	0	0	0
<b>Teaching methods</b>	Teaching is held in lectures while simultaneously mentoring students. Individual and team work of students takes place during their practical and scientific and research work on the defined projects.			
<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>		<b>Written exam</b>		
<b>Exercises</b>		<b>Oral exam</b>	50	
<b>Colloquia</b>				
<b>Projects</b>	50			