

## 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>		Power Quality in Distribution Networks		
<b>Lecturer (for lectures)</b>		Korunović M. Lidija		
<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>	The objective of the course is to introduce up to date problems of power quality in distribution networks to the students, and to habilitate them to apply contemporary scientific literature, valid standards, recommendations and other technical literature. Students should be habilitated to perform complex measurements of power quality indices in the laboratory and in the field.			
<b>Course outcomes</b>	Students will be habilitated to analyse and research wide range of power quality issues in up to date distribution networks, to apply and create standards, recommendations and other technical instructions, as well as to plan and to perform measurements of power quality indices in laboratory and in high voltage substations.			
<b>Course outline</b>				
<b>Theoretical teaching</b>	Importance of power quality for operation of distribution networks. Basic terms and definitions, importance and relevancy, tolerance limits. Methods of measurement and monitoring of power quality indices - advanced measuring systems. Voltage variations in steady state operating conditions and flicker - definitions, sources and effects. Voltage dips - definitions, characteristics, causes, propagation and effects. Sensitivity of the equipment on voltage dips and estimation of financial losses. Harmonics - definitions, sources and effects. Methods of the analysis of higher harmonics. Propagation of harmonics - calculation of the flows of higher harmonic currents. Methods of the elimination of higher harmonics. Design and calculation of filters. Overview of the international regulation and standards.			
<b>Practical teaching (exercises, OFE, study and research)</b>				
<b>Textbooks/references</b>				
1	R. Dugan, M. McGranaghan, S. Santoso, H. W. Beaty, Electrical Power System Quality, Second Edition, McGraw-Hill Companies, 2002.			
2	V. Katić, Power Quality - Higher Harmonics (in Serbian), memoir, Faculty of Technical Sciences, Novi Sad, 2002.			
3	M. H. J. Bollen, Understanding Power Quality Problems, IEEE, Wiley, 2000.			
4	596 CIGRE/CIREC JWG C4.112, Guidelines for Power Quality Monitoring - Measurement Locations, Processing and Presentation of Data, Final Report, CIGRE, 2014.			
5	M. M. Kostić, Reactive Energy Compensation and Higher Harmonics in Electric Networks (in Serbian), memoir, Electrical Engineering Institute Nikola Tesla, Belgrade, 2014.			
<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 includes the classic lectures and consultations regarding different issues of power quality in distribution networks. The individual work with students includes the study of different scientific sources, laboratory and field measurements, and the work on seminar paper.			
<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		