

## 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>		Solar Systems, Technologies and Devices		
<b>Lecturer (for lectures)</b>		Pantić S. 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>	The acquisition of new knowledge in the field of design and practical implementation of solar components, technologies and systems.			
<b>Course outcomes</b>	Students are able to effectively and efficiently apply accepted knowledge in the field of solar energy technologies.			
<b>Course outline</b>				
<b>Theoretical teaching</b>	Solar energy. The photovoltaic effect. Generation of charge carriers by the absorption of light. Absorption in direct and indirect semiconductors. Solar cells. The basic mechanisms of energy conversion. Current-voltage characteristics. Photocurrent, saturation currents and ohmic resistance of solar cells. High efficiency solar cells. Structures and processes for high efficiency solar cells. Materials and technologies for the production of Si solar cells. New materials, new concepts and future developments. Types of solar cells. Analysis and characterization of solar cells. Current-voltage characteristics, spectral response. Modeling of solar cells TCAD software tools. Generalized PSpice solar cells. PV systems. Components of PV systems. Types of PV systems. Applications of PV systems and their installation. Small PV systems to power mobile devices. Impact of PV systems. Recycling of PV systems. Price and PV markets. The future of PV systems.			
<b>Practical teaching (exercises, OFE, study and research)</b>	The practical classes are organized by exercises and design of solar systems using different software packages. The practical exercises involving the characterization of the different types of solar modules in existing PV systems, as well as the measurement of basic electrical parameters of solar cells. Visits to the solar power plant, where the students to the practical problems in their constructions.			
<b>Textbooks/references</b>				
1	Course website			
2	Photovoltaic Devices, Systems and Applications CD-ROM, C. Honsberg and S. Bowden, (free online resource)			
3	Planning and Instalng Photovoltaic Systems, Eartscan UK&USA, 2008.			
4	Photovoltaic Science and Engineering Handbook, Second Edition, Antonio Luque and Steven Hegedus, John Wiley and Sons, 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>	Lectures, active involvement in the implementation of research projects, participate in the educational process at the undergraduate and graduate studies, seminars and 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			