Specification for the book of courses

Study program	Electrical Engineering and Computer Science		
Module	Common		
Type and level of studies	Doctoral studies		
The name of the course	Power Devices and Circuits		
Lecturer (for lectures)	Manić Đ. Ivica		
Lecturer/associate (for exercises)			
Lecturer/associate (for OFE)			
Number of ECTS	10	**Course status (obligatory/elective)**	Elective

Prerequisites	
Course objectives	To acquire detailed knowledge on the structure, technology, principles of operation, characteristics and applications of specific power semiconductor devices and integrated circuits
Course outcomes	Theoretical and practical knowledge for understanding of power device functions in the circuit and proper choice of power devices for given applications and reliable operation of electronic circuits
Course outline	
Theoretical teaching	Introduction. Types and applications of power devices. Structures and technologies: bipolar, CMOS, BiCMOS, SOI. Discrete power devices. PN, PiN and Schottky diodes. Thyristors: SCR, GTO, triac, optically triggered thyristor. Bipolar Transistors. Darlington couple. Static induction power devices: SIT and SITh. MOS power devices: LDMOS and VDMOS transistors, MOS controlled thyristor. IGBT. Electrical characteristics and special effects. High current density effects, quasi-saturation, on-resistance, thermal effects, secondary breakdown, the effects of parasitic elements. Safe operating area (SOA). Electrical SPICE models. Power integrated circuits. Principles of integration of power devices, power modules and hybrid ICs. Monolithic power ICs: high-voltage ICs, smart power ICs and system-on-chip (SoC), isolation of devices on a chip. Functional blocks of smart power ICs. Driving circuits. Voltage references. Circuit for external communication. Protection blocks: over-voltage, over-current and temperature protection. Smart power application examples: smart power in automotive electronics, lighting control, electric motor operation control.
Practical teaching (exercises, OFE, study and research	Study-research work includes individual theoretical and practical investigations of particular issues related to the design, technology, application and reliability of specific power devices
Textbooks/references	
1	V. Benda, J. Gowar, D.A. Grant, Power Semiconductor Devices – Theory and Applications, John Wiley & Sons, Chichester (UK), 1999, ISBN 0-471-97644-X
2	B. Jayant Baliga, Modern Power Devices, John Wiley & Sons, New York, 1987 ISBN 0-471-81986-7
3	B. Murari, F. Bertotti, G.A. Vignola, Smart Power ICs (2nd ed.), Springer, Berlin, 2002, ISBN 3-540-43238-8
4	M. H. Rashid (Editor), Power Electronics Handbook, Academic Press, San Diego, 2001, ISBN 0-12-581650-2
5	J. Lutz, H. Schlangenotto, U. Scheuermann, R. De Doncker, Semiconductor Power Devices: Physics, Characteristics, Reliability (2nd ed.), Springer, 2018, ISBN 978-3-319-70916-1

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
3	0	0	0	0

Teaching methods	Lectures, study-research work, consultations

Grade (maximum number of points 100)

Pre-exam duties	Points	Final exam	Points
Activity during lectures	10	**Written exam**	
Exercises	30	**Oral exam**	40
Colloquia			
Projects	20		