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	Electromagnetics		
Lecturer (for lectures)	Raičević B. Nebojša		
Lecturer/associate (for exercises)			
Lecturer/associate (for OFE)			
Number of ECTS	10	**Course status (obligatory/elective)**	Elective
Prerequisites	None		
Course objectives	The aim of the subject is that the student upgrades her knowledge of electrostatics and magnetism, learns to apply the most commonly used analytical and numerical methods for calculation of EM fields, as well as to get familiar with existing software packages for solving practical problems in the field of her PhD studies and become capable of doing the PhD thesis.		
Course outcomes	The student is trained to calculate the electromagnetic field of the designed device, and predict or measure the field in its surroundings. He is capable of improving the performance of a devise, increasing its compatibility with other devices, as well as ensuring its safe usage.		
Course outline			
Theoretical teaching	Electrostatics. Stationary and time-varying electromagnetic field. Integral and differential form of Maxwell's equations. Maxwell's equations in the complex domain. Electromagnetic properties of the medium. Boundary conditions. Electromagnetic field potentials in the homogenous media. Painting's theorem. Analytical methods for calculation of the electromagnetic fields - method of separation of variables, application of the complex variable functions (conformal mapping). Numerical methods for calculation of electromagnetic fields - finite different method, finite element method (FEM), finite difference time domain method (FDTD), equivalent electrodes method (EEM), hybrid boundary element method (HBEM). Plane-wave propagation (in vacuum, dielectrics, imperfect conductors, ferrites and layered media). Wave polarization. Propagation of electromagnetic waves. Fresnel's coefficients. TEM, TE and TM guided waves. Electromagnetic radiation and antennas.		
Practical teaching (exercises, OFE, study and research work)	Electrostatics. Stationary and time-varying electromagnetic field. Integral and differential form of Maxwell's equations. Maxwell's equations in the complex domain. Electromagnetic properties of the medium. Boundary conditions. Electromagnetic field potentials in the homogenous media. Painting's theorem. Analytical methods for calculation of the electromagnetic fields - method of separation of variables, application of the complex variable functions (conformal mapping). Numerical methods for calculation of electromagnetic fields - finite different method, finite element method (FEM), finite difference time domain method (FDTD), equivalent electrode method (EEM), hybrid boundary element method (HBEM). Plane-wave propagation (in vacuum, dielectrics, imperfect conductors, ferrites and layered media). Wave polarization. Propagation of electromagnetic waves. Fresnel's coefficients. TEM, TE and TM guided waves. Electromagnetic radiation and antennas.		
Textbooks/references			
1	D. M. Veličković: Electromagnetics (in Serbian) - the first book, Faculty of Electronic Engineering, Niš, 2004.		
2	D. M. Veličković et al., Collection of solved examples from Electromagnetics - I part (in Serbian), Faculty of Electronic Engineering of Niš, Niš, 2000.		
3	D. M. Veličković, F. H. Uhlmann, K. Brandisky, R. D. Stancheva, H. Brauer: Fundamentals of Modern Electromagnetics for Engineering, TU Ilmenau, Germany, 2005.		
4	J. V. Surutka: Electromagnetics (in Serbian), Građevinska knjiga, Beograd, 1966.		
5	Fawwaz T. Ulaby: Fundamentals Applied Electromagnetics, Pearson, Prentice Hall, New York, ISBN-13: 978-0132139311, 2010.		

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 and auditive practice classes. Besides board work, multimedial presentations, photographs and video clips are presented. Obligatory consultations with lecturers help successful course material adoption.

Grade (maximum number of points 100)

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