Specification for the book of courses

Study program	Electrical Engineering and Computer Science		
Module	Electrical Power Engineering		
Type and level of studies	Undergraduate Academic Studies		
The name of the course	Special Electrical Machines		
Lecturer (for lectures)	Petronijević P. Milutin, Mitrović N. Nebojša		
Lecturer/associate (for exercises)	Filipović R. Filip		
Lecturer/associate (for OFE)	Filipović R. Filip		
Number of ECTS	5	**Course status (obligatory/elective)**	Elective
Prerequisites	None		
Course objectives	This course introduces students to the fundamentals of special electrical machines (SEM). Students are introduced to their principle of operations, constructions, analysis on characteristics in steady and transient state performances and application in electric drives.		
Course outcomes	Understanding the basic principles of the permanent magnet electric motors and other types of special electrical machines (SEMs). Ability to application and design of control SEM in automotive industry, servo drives and other modern, high efficiency drives.		
Course outline			
Theoretical teaching	Stepper motors. Construction and basic types. Basic equations. Transients characteristics. Stability. Control of stepper motors. Permanent magnet synchronous motor. Construction and types. Fundamental equations and equivalent circuit. Transients processes. PMSM application and control. Brushless DC motors: Power supply and construction. Operation principles. Basic formulas and equivalent circuit. Characteristics. Control. DC servo-motors. Block diagrams and transfer functions. Switching reluctant motors, construction, work principles, characteristics. Control.		
Practical teaching (exercises, OFE, study and research	Numerical exercises: stepper motors, basic calculations in permanent magnet synchronous motors and brushless DC motors. Laboratory excercises: SEM simulations with Matlab. Experiments with stepper motors and PM motors. DSP application in SEM control. Student project: a written report and presentation.		
Textbooks/references			
1	Jacek F. Gieras, Permanent Magnet Motor Technology: Design and Applications, Third Edition, CRC Press, 2009		
2	Miller, T.J.E. “Brushless permanent magnet and reluctance motor drives”,Clarendon Press, Oxford,1989		
3	P. P. Acarnley, Stepping Motors: A Guide to Theory and Practice, 4th edition, IET, 2007		
4	R.Krishnan, “Switched Reluctance Motors Drives: Modelling, Simulation, Analysis Design and Applications”, CRC Press, New York, 2001.		
5	S. N. Vukosavic, "Electrical machines", Springer, 2013.		

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

Lectures	**Exercises**	**OFE**	**Study and research work**	**Other classes**
2	1	1	0	0

Teaching methods	Lectures with application of demonstrative aids – slides and specialized softwares presentations. Numerical examples as illustration of theory. Student seminar work. Laboratory exercises with Matlab software, didactic tools and industry grade devices.

Grade (maximum number of points 100)

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