



Subject card

Subject name and code	Electric Machines, PG_00042043						
Field of study	Power Engineering, Power Engineering, Power Engineering, Power Engineering, Power Engineering						
Date of commencement of studies	October 2020		Academic year of realisation of subject		2021/2022		
Education level	first-cycle studies		Subject group		Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		4.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Grzegorz Kostro				
	Teachers		dr inż. Grzegorz Kostro				
			dr inż. Ireneusz Mosoń				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	30.0	0.0	0.0	75
	E-learning hours included: 0.0						
	Adresy na platformie eNauczanie:						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	75		10.0		15.0	100
Subject objectives	To provide students with:						
	general principles of construction and physical performance of electrical machines;						
	principles of construction, modeling and performance characteristics of power transformers;						
	principles of construction, modeling and performance characteristics of dc machines;						
principles of construction, modeling and performance characteristics of synchronous machines;							
principles of construction, modeling and performance characteristics of induction machines;							
general principles of electrical machines design.							

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K6_K03	Knows and applies the rules working with electrical equipment	[SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice
	K6_W05	Student explains the general principles of construction and physical performance of electrical machines, Student explains the construction, performance and modelling of transformers, Student draws and explains the performance characteristics of transformers, Student explains the construction, performance and modelling of dc machines, Student draws and explains the performance characteristics of dc machines, Student explains the construction, performance and modelling of synchronous machines, Student draws and explains the performance characteristics of dc synchronous, Student explains the construction, performance and modelling of induction machines, Student draws and explains the performance characteristics of dc induction.	[SW1] Assessment of factual knowledge
	K6_U03	Student selects measuring devices to perform basic measurements in electrical systems. Makes measurements. Assesses the condition of the device based on measurements results	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
Subject contents	General buildings rules and performance physical fundamentals of electrical machines (EM). Transformers. Buildings, performance and cooling methods. Circuit model. Performance states. Voltage changing, power losses and efficiency. Connections systems. Parallel operating. Special transformers. DC machines. Buildings and performance. Generation of electromagnetic torque. Pattern electromechanical coupling. Armature reaction. Circuit model. Performance states. Power losses and efficiency. Performance characteristics. Speed control. Brushless dc motors with permanent magnets - application of electronic commutator. Synchronous machines. Buildings, performance and cooling methods. Rotating magnetic field excited by mechanical and electrical methods. Generation of electromagnetic torque. Armature reaction. Performance states. Turbogenerator and hydrogenerator. Circuit model. Performance characteristics. Single operating and operating in power system - synchronizing. Universal diagram. Synchronous motor. Reluctance motor. Speed control. Induction machines. Buildings and performance. Generation of electromagnetic torque. Circuit model. Performance states. Power losses and efficiency. Performance characteristics. Single phase motors. Piezoelectric machines. Constructions and performance. Performance characteristics. Speed control.		
Prerequisites and co-requisites	General knowledge of the subject of Electrical fundamentals, ability to analyse electrical and magnetic circuits.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Practical exercise	60.0%	50.0%
	Oral exam	60.0%	10.0%
	Midterm colloquium	60.0%	40.0%
Recommended reading	Basic literature	1. Latek W.: Zarys maszyn elektrycznych. WNT, W-wa 1974. 2. Manitus Z.: Transformers. DC machines. Synchronous machines. Asynchronous machines (series of textbooks in Polish). Wyd. Pol. Gd., Gdańsk 1973 - 1978. 3. Matulewicz W.: Eletrial machines. Fundamentals (textbook in Polish). Wyd. PG, Gdansk 2005. 4. Plamitzer A.: Maszyny elektryczne. WNT, W-wa 1976. 5. Roszczyk S.: Teoria maszyn elektrycznych. WNT, W-wa 1979. 6. Ronkowski M., Michna M., Kostro G., Kutt F.: Electrical machines around us (E-textbook in Polish). Wyd. EiA PG, Gdańsk 2009-2010 (access at internet). 7. Ronkowski M., Michna M., Kostro G.: Laboratory of electrical machines (in Polish). Wyd. EiA PG, Gdańsk 2009-2010. (set of instructions, access at internet).	

	Supplementary literature	1. Fitzgerald A.E.: Electric Machinery. 6th edition. McGraw-Hill Book Comp., New York 2003. 2. Rafalski W., Ronkowski M.: Solving problems of electrical machines. Part. I i II (textbooks in Polish). Wyd. PG, Gdańsk 1994. 3. Staszewski P., Urbański W.: Solving problems of electrical machines in exploitations (textbook in Polish), Oficyna Wyd. PW, W-wa 2009.
	eResources addresses	
Example issues/ example questions/ tasks being completed	<p>Explain the purpose of the no-load and short-circuit tests of transformer.</p> <p>For a given data of no-load test measurements of a transformer calculate: no-load current (in A and %), core losses and equivalent circuit parameters (in ohms and %).</p> <p>For a given data of short-circuit test measurements of a transformer calculate: short-circuit (in V and %), winding losses (in W and %); equivalent circuit parameters (in ohms and %); steady-state short-circuit (in A and %) at rated supply voltage.</p>	
Work placement	Not applicable	