

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Electrical machines		Code 1010324341010320050
Field of study Electrical Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 2 / 4
Elective path/specialty -	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) part-time	
No. of hours Lecture: 20 Classes: - Laboratory: - Project/seminars: -		No. of credits 3
Status of the course in the study program (Basic, major, other) (brak)		(university-wide, from another field) (brak)
Education areas and fields of science and art technical sciences Technical sciences		ECTS distribution (number and %) 3 100% 3 100%
Responsible for subject / lecturer: dr hab. inż. Wiesław Łyskawiński email: Wieslaw.Lyskawinski@put.poznan.pl tel. 61 665 2781 Elektryczny ul. Piotrowo 3A, 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge of electromagnetism and electrical circuits analysis.
2	Skills	Skill of analysis of simple electrical circuits of two degrees of freedom and solving systems of differential linear equations.
3	Social competencies	Awareness of necessity of knowledge and skills extension. Ability to submission to rules standing during lectures in big group. Skill of communication with the cooperating students and lecturers.
Assumptions and objectives of the course: Learning of construction, principles of operation, characteristics, exploitation properties and basic methods of analysis of typical operation states of transformers and induction machines. Learning of basic methods of calculation of magnetic circuits in electromagnetic converters.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. have well-ordered knowledge related to electromagnetism and essentials of the theory of the electromagnetic field - [K_W06++]		
2. have well-ordered and completed by theory knowledge of construction and principles of operation of transformers and electrical machines; have knowledge of exploitation of technical systems - [K_W13+++]		
Skills:		
1. design a simple electric system within various applications using proper methods, techniques and - [K_U03+]		
2. use the known methods, mathematical models and computer simulations for analysis and estimation of elements and electric systems operation - [K_U10++]		
Social competencies:		
1. . have awareness of importance and understanding of different aspects and results of electrical engineer activities, taking into consideration influence on environment; awareness of responsibility for decisions - [K_K02+++]		
2. think and work by creative way within the electrical engineering - [K_K04+++]		
Assessment methods of study outcomes		
Lecture accepted on the ground of written tests checking knowledge and studentclassroom activity (test is scored)		

Course description		
<p>Magnetic circuits. Transformers ? no-load state, equivalent circuit, transformer operation at load, three-phase transformers, parallel operation, selected transient states. The elements of electromagnetic energy conversion. Electrical machines ? fundamental definitions: distributed windings, rotating magnetic fields, electromotive force induced by rotating magnetic fields, winding factors. Induction machines: construction and principle of operation, equivalent circuit, dependence of torque on rotational speed, machines with cage rotor, skin effect in bars, speed control. Starting and braking operation of induction machine. Single-phase induction motors.</p> <p>Teaching methods - lectures with multimedia presentations that are supported by blackboard exercises.</p>		
<p>Basic bibliography:</p> <ol style="list-style-type: none"> 1. A. M. Plamitzer, <i>Maszyny Elektryczne</i>, wyd. VII, WNT Warszawa, 1982. 2. W. Karwacki, <i>Maszyny Elektryczne</i>, Wyd. Pol. Wrocławskiej, Wrocław, 1993. 3. M. S. Sarma, <i>Electric Machines, Steady-State Theory and Dynamic Performance</i>, West Publishing Company, wyd. 2, 1994 i wyd. następne 4. P. Staszewski, W. Urbański, <i>Zagadnienia obliczeniowe w eksploatacji maszyn elektrycznych</i>. Oficyna Wyd. Pol. Warszawskiej, Warszawa. 2011 5. W. Przyborowski, G. Kamiński, <i>Maszyny Elektryczne</i>, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2014. 		
<p>Additional bibliography:</p> <ol style="list-style-type: none"> 1. W. Latek, <i>Teoria Maszyn Elektrycznych</i>, wyd. II, WNT Warszawa, 1987. 2. Praca zbiorowa, <i>Poradnik Inżyniera Elektryka</i>, Tom 2, wyd 3, WNT Warszawa 2009. 		
Result of average student's workload		
Activity	Time (working hours)	
1. participation in lectures	20	
2. consultations related to lectures	5	
3. consultations related to project	6	
4. realization of project problems	28	
5. preparation to subject tests	36	
Student's workload		
Source of workload	hours	ECTS
Total workload	94	3
Contact hours	31	1
Practical activities	0	0