



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Electrical machines

### Course

Field of study

Electrical Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

2/3

Profile of study

practical

Course offered in

Polish

Requirements

compulsory

### Number of hours

Lecture

30

Laboratory classes

Tutorials

Projects/seminars

Other (e.g. online)

### Number of credit points

2

### Lecturers

Responsible for the course/lecturer:

Prof. dr hab. inż. Andrzej Demenko

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Elektryczny

ul. Piotrowo 3A, 60-965 Poznań

Responsible for the course/lecturer:

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Elektryczny

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### Prerequisites

Basic knowledge of electromagnetism and electrical circuits analysis. Skill of analysis of simple electrical circuits of two degrees of freedom and solving systems of differential linear equations. 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.

### Course objective

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.



## Course-related learning outcomes

### Knowledge

1. have well-ordered knowledge related to electromagnetism and essentials of the theory of the electromagnetic
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

### Skills

1. design a simple electric and magnetic systems within various applications using proper methods and techniques
2. use the known methods, mathematical models and computer simulations for analysis and estimation of elements and electric systems operation

### Social competences

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 think and work by creative way within the electrical engineering
2. think and work by creative way within the electrical engineering

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture accepted on the ground of written tests checking knowledge and studentclassroom activity (test is scored)

## Programme content

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.

## Teaching methods

Teaching methods - lectures with multimedia presentations that are supported by blackboard exercises.

## Bibliography

### Basic

1. A. M. Plamitzer, Maszyny Elektryczne, wyd. VII, WNT Warszawa, 1986.
2. W. Karwacki, Maszyny Elektryczne, Wyd. Pol. Wrocławskiej, Wrocław, 1994.
3. M. S. Sarma, Electric Machines, Steady-State Theory and Dynamic Performance, West Publishing Company, wyd. 2, 1996.



4. P. Staszewski, W. Urbański, Zagadnienia obliczeniowe w eksploatacji maszyn elektrycznych. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2009.
5. W. Przyborowski, G. Kamiński, Maszyny Elektryczne, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2014

Additional

1. W. Latek, Teoria Maszyn Elektrycznych, wyd. II, WNT Warszawa, 1987.
2. Praca zbiorowa, Poradnik Inżyniera Elektryka, Tom 2, wyd 3, WNT Warszawa 2009.

**Breakdown of average student's workload**

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	35	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	15	1

<sup>1</sup> delete or add other activities as appropriate