COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electrical machines

Course

Field of study
Electrical Engineering

Year/Semester
2/4

Area of study (specialization)

Profile of study
practical

Level of study
First-cycle studies

Course offered in
Polisch

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
45

Other (e.g. online)

Tutorials
15

Projects/seminars

Number of credit points

6

Lecturers

Responsible for the course/lecturer:
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Wydział Elektryczny

ul. Piotrowo 3A, 60-965 Poznań

Responsible for the course/lecturer:
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Wydział Elektryczny

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Prerequisites

Knowledge of methods of electric and magnetic circuits analysis. Knowledge of methods of magnetic field and electromotive force generation. Acquirements of the construction and operation of transformers and induction machines. Cognizance within the framework of methodology. Ability to analysis of simple electric and magnetic circuits and determination of equivalent ciruit parameters of the transformer and the induction motor. Ability to circuits connection and realization of measurements of electric and mechanical quantities. Awareness of necessity of knowledge and acquirements extension. Ability to submission to rules standing during lectures and laboratory class. Ability to communicate with the teamwork during lectures and exercises.

Course objective

Getting to know construction, principles of operation, characteristics, exploitation properties and basic methods of analysis of typical operation states of synchronous, commutator and special machines. Learning the fundamental methods of investigation and measurements of electrical machines.

Course-related learning outcomes

Knowledge

1. The student has knowledge of design, construction and principle of operation of electrical power engineering devices
2. The student has both well-ordered and theory aided knowledge of construction and principle of operation of transformers electrical machines and knowledge of technical systems exploatation

Skills

1. prepare and make short presentation on a subject of the problem connected with electrical engineering
2. use known methods and mathematical models and computer simulations for analysis and evaluation of elements operation and electric systems
3. plan and realize the simulation and measurements of basic characteristic quantities for electric systems; present the obtained results both in the numerical and graphical form; make interpretation and draw proper conclusions

Social competences

1. have awareness of importance and understand different aspects and results of electrical engineer activities - also influence on environment - and to be responsible for taking decisions
2. think and to be active by constructive way within electrical engineering

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures and exercise classes:
- evaluation of knowledge and skills presented in the written exam,
- frequent appraisal during exercise classes (the awarding student activity),

Laboratory classes:
- test and awarding knowledge during realization of laboratory classes on electrical machines,
- evaluation of student activity and appraisal both of increase of his knowledge, skills and social competences connected withactivities in teamwork,
- evaluation of knowledge and skills related to the individual laboratory class, appraisal of the report.

Obtainment of the additional points in connection with activity, in particular:
- preparation of answers on questions and problems given by the lecturer,
- effectiveness and brilliance during exercise classes at problems solving,
- skill of co-operation in the teamwork in laboratory,

- annotations connected with improvement of didactic materials,
- care and aesthetics of reports and problems elaborations within own learning.

Programme content

Lecture

Induction generator. Synchronous machines: construction and principle of operation, vector diagram, equivalent circuit, noload and short-circuit of synchronous generator, steady-state characteristics, salient-pole machines, synchronous machine operation in power network, machines with permanent magnets, starting of synchronous motors, damping windings, selected transient states. Stepper motors. Direct-current commutator machines: construction and principle of operation, connection systems of windings, magnetic field in air-gap, armature reaction, commutation, compensating winding, generator characteristics, motor characteristics, control of motor speed, selected transient states. Alternating-current commutator motors. Brushless direct-current machines. Servo-motors.

Laboratory

Systems and laboratory stands for tests and measurements of electrical machines and transformers. Fundamental tests of electrical machines and transformers. Determination of parameters and characteristics of transformers and electrical machines (1 phase and 2 phase trannsformer, induction and DC motor, synchronous machine) on the ground of measurements. Analizys of measurement results.

Tutorials

Preleminary design calculations of selected electromagnetic transducters. Deterination, using rated data, elements of equvalent circuits for transformer and electrical machines. Calculations of selected steady -state characteristics of electrical machines.

Teaching methods

Teaching methods - lectures with multimedia presentations that are supported by blackboard exercises and laboratory 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 Pollitechniki Warszawskiej, Warszawa 2009.
5. W. Przyborowski, G. Kamiński, Maszyny Elektryczne, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2014

6. G. Kamiński, W. Przyborowski, A. Biernat, J. Szczypior, Badania laboratoryjne maszyn elektrycznych, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2018.

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	160	6,0
Classes requiring direct contact with the teacher	105	4,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	55	2,0

[1] delete or add other activities as appropriate