COURSE DESCRIPTION CARD - SYLLABUS

Course name

Design of converters and electric drives

Course

Field of study

Electrical Engineering

Year/Semester

1/2

Area of study (specialization)

Drive Systems in Industry and Electromobility

Profile of study

practical

Level of study

Second-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

15

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

15

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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Prerequisites

Knowledge - The student has basic knowledge of electrical engineering, electromagnetic field theory, electrodynamics, machines and electric drive as well as numerical methods used in electrical engineering.

Skills - The student has the ability to effectively self-educate in the field related to the chosen field of study; the ability to make the right decisions when solving tasks and problems in the field of designing electromagnetic converters, machines and electric drives.

Competences - The student is aware of expanding his competences, demonstrates readiness to work in a team, the ability to comply with the rules applicable during lectures and laboratories.

Course objective

The aim of this course is to provide the student with basic knowledge in the field of methods and techniques of designing electromagnetic converters, machines and electric drives, as well as acquiring the ability to use selected computing packages

Course-related learning outcomes

Knowledge

1. The student has theoretically ordered knowledge of the methods and techniques of designing converters, machines and electric drives,
2. The student has knowledge of the theory of magnetic circuits, the theory of the electromagnetic field and electrodynamics necessary to understand the phenomena occurring in converters, machines and electric drives.
3. The student has knowledge of numerical methods of designing systems with an electromagnetic field.

Skills

1. The student is able to design and develop documentation of an engineering task, in accordance with the given specification and with the use of appropriate methods and tools,
2. The student is able to design and develop simple systems, electromagnetic converters, electric machines and drives.

Social competences

1. The student understands the importance of improving professional, personal and social competences,
2. The student is aware that knowledge and skills very quickly become obsolete in technology.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:

- assessment of knowledge and skills by the completion of a written test (solving problem),
- continuous evaluation for each lecture (rewarding activity and quality of the expression).

Project:

- assessment of knowledge and skills related to the implementation of project tasks,
- continuous evaluation of the student's activity and level of his knowledge and skills.

Extra points for the activity in the classroom, and in particular for:

- discussion and proposition of additional aspects of the subjects,
- effectiveness of the application of the knowledge gained during solving the given problem.

Programme content

Lecture:

Methods and techniques of designing converters, machines and electric drives. Models used in the analysis of systems with an electromagnetic field. Methods for analyzing magnetic circuits, including those with magnets. The method of equivalent networks (Roters solids). Numerical methods used in design: Finite Element Method. Designing low power transformers, including pulse transformers. Calculation of circuits of induction motors and magnetoelectric motors. Factors influencing the selection of the parameters of the magnetic circuit. The use of professional software in the design of circuits with an electromagnetic field.

Design classes:

Implementation of at least 2 engineering projects in the field of:
- design of the magnetic circuit of a single-phase low-power network transformer,
- design of the magnetic circuit of a pulse transformer,
- design of the magnetic circuit of a three-phase induction motor,
- magnetic circuit design of a permanent magnet synchronous motor (BLDC).

Teaching methods

Lectures - presentation of issues using multimedia, illustrated with examples given on a board,discussion of problem issues.

Project - implementation of projects.

Bibliography

Basic

1. Glinka T. Eksploatacja i diagnostyka maszyn elektrycznch i transformatorów, Wyd. Nau. PWN, 2022.
2. Przyborowski W., Suproniuk M., Wybrane zagadnienia eksploatacyjne oraz elementy obliczeń parametrów i charakterystyk maszyn elektrycznych, Wojskowa Akademia Techniczna, 2020.
3. Glinka T., Maszyny elektryczne wzbudzane magnesami trwałymi, Wydawnictwo Politechniki Śląskiej, Gliwice 2018.
4. Mazur D., Gołębiowski M., Rudy M., Modelowanie i analiza układów elektromechanicznych metodą elementów skończonych, Oficyna Wydawnicza Politechniki Rzeszowskiej, 2016.
5. Balderes T. Finite element method, AccessScience, 2014.
6. Michalski W., Podstawy teorii pola elektromagnetycznego. Statyczne pola elektryczne i magnetyczne, Oficyna Wydawnicza Politechniki Wrocławskiej, 2013.
7. Demenko A., Obwodowe modele układów z polem elektromagnetycznym, WPP, Poznań, 2004.
8. Nowak L., Modele polowe przetworników elektromechanicznych w stanach nieustalonych, WPP, Poznań, 1999.
9. Turowski J., Elektrodynamika techniczna, Wyd.II, WNT, Warszawa, 1993,
10. Dabrowski M. Projektowanie maszyn elektrycznych pradu przemiennego, WNT, Warszawa, 1988.

Additional

Scientific articles and publications in the area of designing converters, electrical machines

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	30	1,0

[1] delete or add other activities as appropriate