COURSE DESCRIPTION CARD - SYLLABUS

Course name
Design of electrical machines for electromobility [S2Elmob1-SPE>PMEdE2]

Course

Field of study
Electromobility

Year/Semester
2/3

Area of study (specialization)
Energy Processing Systems

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
0

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Possession of basic knowledge of electrical engineering and electromagnetism. Ability to analyze simple magnetic circuits. Knowledge of the basic parameters and properties of magnetic and electroinsulating materials and the effect of temperature on their change. Knowledge of basic methods of describing electromagnetic, mechanical and thermal phenomena, in particular, knowledge of basic analytical and numerical methods of solving differential equations describing phenomena in electromagnetic transducers.

Course objective

Acquisition of knowledge and skills of methods of synthesis of magnetic circuits of electromechanical converters taking into account the requirements for electric vehicle traction drives.

Course-related learning outcomes

Knowledge:
Has expanded and deepened knowledge of selected branches of mathematics necessary to describe components, systems and systems used in electromobility
Has an in-depth knowledge of magnetic and electro-insulating materials, as well as of coupled phenomena in systems with electric, magnetic, thermal and mechanical fields

Has advanced and in-depth knowledge of the design, diagnosis and operation of propulsion systems of hybrid and electric vehicles including traction vehicles; knows the basic processes occurring in the life cycle of technical systems of hybrid and electric vehicles including traction vehicles

Skills:
Able to apply knowledge of the latest technical and technological developments in the design of non-standard devices and systems in the field of electromobility
Is able, when determining the functionality and design of electric vehicle systems and systems, to apply adequate analytical, simulation and experimental methods, assessing in advance their suitability and limitations, as well as adapting them to the specifics of the problem or the need to take into account unpredictable operating conditions
Is able, in the formulation and implementation of engineering projects, to integrate knowledge from various sources and related disciplines

Social competences:
Understands that in the field of technology, knowledge and skills are rapidly devaluing which requires their constant replenishment

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Laboratory/Project:
- a reward for practical knowledge gained from previous laboratory exercises,
- practical testing of the ability to develop simple simulation models using commercial software,
- evaluation of knowledge and skills related to the implementation of individual and group projects
Earning extra points for activity during classes, especially for:
- ability to work together as part of a team practically implementing a detailed task in the laboratory,
- use of elements and techniques beyond the material of the lecture and laboratory exercises,
- aesthetic diligence of completed projects.

Programme content

Development of numerical models of selected electromechanical transducers using dedicated specialized programs.

Course topics

Laboratory/Project:
- Develop numerical models of a permanent magnet synchronous machine to determine integral parameters,
- carrying out verification calculations,
- design of a permanent magnet synchronous machine adapted to drive a traction electric vehicle with given meeting the specified operating parameters.

Teaching methods

Group work with the use of proffesional commercial software in the computer laboratory in the form of seminar work on the basis of instructions provided by the instructor.
Evaluation and discussion of the obtained results and the adopted design assumptions, in particular, evaluation of the realizability of the project with consideration of the knowledge of the technological aspects of the manufacture of electromechanical transducers.

Bibliography

Basic:
1. T. Glinka, "Maszyny elektryczne wzbudzane magnesami trwałymi", Wydawnictwo Naukowe PWM, 2018
2. M. Dąbrowski, "Projektowanie maszyn elektrycznych prądu przemiennego', Wydawnictwa Naukowo-Techniczne, Warszawa, 1994
3. Design of Rotating Electrical Machines, 2nd Edition, Juha Pyrhonen, Tapani Jokinen, Valeria Hrabovcova, ISBN: 978-1-118-58157-5, December 2013, 616 Pages.

Additional:
1. T Glinka, "Ćwiczenia tablicowe z maszyn elektrycznych i transformatorów", Wydawnictwa Naukowe PWN SA, Warszawa, 2022
2. J. Gieras, M. Win, Permanent Magnet Motor Technology. Design and Applications. M. Dekker, Inc., New York, 2002
3. Electric Vehicle Machines and Drives: Design, Analysis and Application, K. T. Chau, ISBN: 978-1-118-75252-4, August 2015, Wiley-IEEE Press, 375 Pages.

Breakdown of average student's workload

	Hours	ECTS
Total workload	85	3,00
Classes requiring direct contact with the teacher	45	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50