COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electrical machines in electromobility [S1Elmob1>MEwE1]

Course

Field of study
Electromobility

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr hab. inż. Cezary Jędryczka prof. PP
cezary.jedryczka@put.poznan.pl

prof. dr hab. inż. Andrzej Demenko
andrzej.demenko@put.poznan.pl

Lecturers

Prerequisites

Basic knowledge of electromagnetism and electrical engineering. 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 basic methods of calculation of magnetic circuits in electromagnetic converters that are used in the motor drives of electric vehicles. Learning of construction, principles of operation, characteristics, exploitation properties and basic methods of analysis of transformers and induction machines.

Course-related learning outcomes

Knowledge:
1. have well-ordered knowledge related to magnetic circuits and essentials of the method of magnetic

field and electromotive force excitation as well as knowledge of the principles of electromagnetic energy conversion.
2. have well-ordered and completed by theory knowledge of construction and principles of operation as well as fundamental analysis of transformers and induction machines.

Skills:
1. calculation a simple magnetic systems, e.g. inductors within various applications using proper methods and techniques, i.e. proper methods of power loss calculation
2. can identify parameters and determine characteristics of transformers and induction machines, moreover use the known methods, mathematical models and computer simulations for analysis and estimation of these system operation.

Social competences:
1. have awareness of importance and understanding of different aspects and results of technical activities, taking into consideration influence on environment; awareness of responsibility for decisions think and work by creative way within the new method of energy storage and conversion
2. think and work by creative way within the electromobility.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Lecture accepted on the ground of written tests checking knowledge and student classroom 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. Basics of electromagnetic energy conversion. Electrical machines fundamental definitions: distributed windings, rotating magnetic fields, electromotive force induced by rotating magnetic fields. 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. Braking operation of induction machine. Induction generator. Single-phase induction motors. Linear motors

Course topics

Magnetic circuits. Transformers. Basics of electromagnetic energy conversion. Induction machines.

Teaching methods

Lectures with multimedia presentations supported by blackboard exercises.
Tutorial with preliminary calculations of magnetic circuits and identification of equivalent circuits and characteristics for transformer and induction machines.

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. J. Gieras, Electrical Machines, Fundamentals of Electromechanical Energy Conversion, Taylor&Francis Inc, 2016.
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	85	3,00
Classes requiring direct contact with the teacher	47	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	38	1,50