

Course syllabus

binding for the doctoral students of the CUT Doctoral School commencing their studies
in the academic year 2022/2023

Information on the course

Name of the course in Polish	Elektromaszynowe układy automatyki
Name of the course in English	Electromechanical systems in automation
Number of the ECTS points	1
Language of instruction	Polish
Category of the course	Elective
Field of education	Engineering and Technology
Discipline of education	Automatic Control, Electronics and Electrical Engineering
Person responsible for the course Contact	Adam Warzecha, <i>doctor habilitatus</i> in Engineering, prof. of CUT adam.warzecha@pk.edu.pl

Type of course, number of hours in the study programme curriculum

Semester	Credit type (G / NG)*	Lecture	Practical class	Laboratory	Computer laboratory	Project class	Seminar
2, 3, 4, 5	G	15					

*G – graded credit, NG – non-graded credit

Course objectives

Code	Objective description
Objective 1	Learning about the current status and development trends in electric motor design and electric motor control systems for automation systems
Objective 2	Acquiring the skills of circuit and field modelling of such systems

Learning outcomes

Code	Description of the learning outcome adjusted to the specific characteristics of the discipline	Learning outcome symbol in the CUT DS	Methods of verification
OUTCOMES RELATED TO KNOWLEDGE			
EUW1	The doctoral student knows and understands innovative motor design solutions for automation.	E_W01 E_W02	Involvement in class activities, written test
EUW2	The doctoral student knows the circuit and field modelling methods of executive engine drives focused on design and motion characteristics.	E_W01 E_W02	Involvement in class activities, written test
OUTCOMES RELATED TO SKILLS			
EUU1	The doctoral student is able to select a modelling method for a specific research task.	E_U01	Launching a test program
EUU2	The doctoral student is able to conduct model tests and perform an evaluation of their results.	E_U01	Launching a test program
OUTCOMES RELATED TO SOCIAL COMPETENCES			

EUK1	The doctoral student is prepared to critically evaluate the published new design solutions and test results for the above-mentioned motors and is aware of the importance of knowledge in the evaluation thereof.	E_K01 E_K03	Discussion
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Course outline

No.	Contents	Learning outcomes for the course	No. of hours
LECTURE			
W1	Overview of the design, power systems and characteristics of electronically controlled electric motors with rotary and linear motion.	EUW1	2
W2	Software for magnetic field modelling in motors in static states.	EUW2, EUU1	2
W3	Software for field-circuit modelling of steady-state and dynamic-state motors.	EUW2, EUU1	2
W4	Magnetic core structures of reluctance motors. The effect of magnetic nonlinearity and flux barriers on the properties of the motors. Power supply systems. A simulation model with elements of structural optimisation.	EUW1, EUW2 EUK1	3
W5	Magnetic core structures with permanent magnets. Examples of transverse field structures. Types of windings and methods of power supply.	EUW1	2
W6	Stepping motors and their control. Programmable stepping motor drive systems.	EUW1	2
W7	Systems with brushless DC motors. The influence of design and manufacturing technology on motor parameters. Measurement methods.	EUW1, EUK1	2

The ECTS points statement

WORKING HOURS SETTLEMENT	
Type of activity	Average number of hours (45 min.) dedicated to the completion of an activity type
SCHEDULED CONTACT HOURS WITH THE ACADEMIC TEACHER	
Hours allotted in the syllabus	15
Consultations	1
Examination / course credit assignment	2
HOURS WITHOUT THE PARTICIPATION OF THE ACADEMIC TEACHER	
Independent study of the course contents	8
Preparation of a paper, report, project, presentation, discussion	4
ECTS POINTS STATEMENT	
Total number of hours	30
The ECTS points number	1

Preliminary requirements

No.	Requirements
1	Knowledge of typical designs and principles of operation of electrical machines

2	Knowledge of basic power electronic systems
3	Knowledge of the basic laws of the magnetic field

Course credit assignment conditions / method of the final grade calculation

No.	Description
COURSE CREDIT ASSIGNMENT CONDITIONS	
1	Attendance in class, passing a test on knowledge covered in the lecture, successful preparation of a test program for modelling a magnetic field.
METHOD OF THE FINAL GRADE CALCULATION	
Weighted average of grades on the test of knowledge covered in the lecture and the test program.	

Additional information

None

The course reading list

1	Glinka T., Maszyny elektryczne wzbudzone magnesami trwałymi . WNT 2022
2	Boldea I, Nasar S. A., Electric Drives, CRC Press, 2016
3	Klusczyński K., Mechatronika, Analiza, projektowanie i badania wybranych elementów i systemów, Wydawnictwo: PAK , 2013
4	Wegiel T. Oddziaływania harmoniczných przestrzenných w generatorach wzbudzných magnesami trwałymi, Wydawnictwo Politechniki Krakowskiej 2013
5	Prokop J. Modelowanie matematyczne maszyn elektrycznych przełączalnych. Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów 2013
6	Warzecha A., Wielowymiarowe charakterystyki magnesowania w modelach obwodowych maszyn elektrycznych. Wydawnictwo Politechniki Krakowskiej 2010
7	Gieras J.F., Advancements in Electric Machines. Springer 2008
8	Bianchi N., Electrical machine analysis using finite elements, CRC Press 2005