COURSE DESCRIPTION CARD - SYLLABUS

Course name
Control of electrical drives [S1AiR1E>ANE2]

Course

Field of study
Automatic Control and Robotics

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
english

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
0

Laboratory classes
15

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

The student has a basic knowledge of physics, including electricity, magnetism, including the knowledge necessary to understand the physical phenomena occurring in electrical and electronic systems, has knowledge of electrical circuit theory and DC and AC electrical engineering (including three-phase). He is able to obtain information from literature, databases and other sources; he has self-education skills to improve and update his professional competence.

Course objective

To become familiar with the construction, principle of operation and characteristics of selected converter drives in open-loop control systems used in machinery, equipment, robots, land and water vehicles, aircraft. To acquire the skills of their analysis of electric drive systems.

Course-related learning outcomes

Knowledge:
Has advanced structured knowledge in the construction, application and control of automation and robotics executive systems [K1_W18 (P6S_WG)].
Knows and understands typical engineering technologies, principles and techniques of construction of

simple automation and robotics systems; knows and understands the principles of selection of executive systems, computational units and measurement and control elements and devices [K1_W20 (P6S_WG)].
Skills:
Can determine and use models of simple electromechanical systems and selected industrial processes, and use them for analysis and design of automation and robotics systems [K1_U11 (P6S_UW)].
Is able to build, commission and test a simple electronic and electromechanical system [K1_U15 (P6S_UW)].
Is able to design simple control systems for industrial processes; is able to consciously use standard functional blocks of automation systems and form dynamic properties of measuring circuits [K1_U29 (P6S_UW)].
Social competences:
Is ready to critically assess his/her knowledge; understands the need for and knows the possibilities of continuous training - improving professional, personal and social competence, is able to inspire and organize the learning process of others [K1_K1 (P6S_KK)].
Is aware of the need to approach technical issues in a professional manner, to be meticulously familiar with the documentation and the environmental conditions in which the equipment and its components may function; is ready to adhere to the principles of professional ethics and to demand this from others, to respect the diversity of views and cultures [K1_K5 (P6S_KR)].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: the exam consists of a test in the form of a written answer to a given question and an interview (optional) on selected issue(s) with an explanation of written answers from the scope of the program content.
Laboratory exercises: attendance in class and performance of laboratory exercises in groups and submission of written reports.

Programme content

General structure of converter drive in open and closed system, mechanics of the drive, mechanical characteristics. Principles of motor selection, types of rated operation, protection. Control principles and characteristics of DC drives, thyristor and transistor reversing structures. AC drives with induction and permanent magnet synchronous motors, control characteristics, space vectors and mathematical models, closed loop DC motor control, frequency control of induction motor.

Teaching methods

Lecture
Lecture with multimedia presentation (including: drawings, photos, animations, sound, videos) supplemented by examples given on the blackboard. Initiating discussions during the lecture.
Laboratory.
Working in teams and team programming, performing tasks given by the instructor - practical exercises.

Bibliography

Basic
1. Zawirski K., Deskur J., Kaczmarek T., Automatyka napędu elektrycznego, Wydawnictwo Politechniki Poznańskiej, Poznań, 2012.
2. Kaźmierkowski M.P, Tunia H., Automatic Control of Converter-Fed Drives, ELSEVIER, Amstertdam, London, New York, Tokyo, Warszawa , 1994
3. Zawirski K., Deskur J., Kaczmarek T., Automatyka napędu elektrycznego, Wydawnictwo Politechniki Poznańskiej, Poznań, 2012.
4. Lech Grzesiak L., Kaszewski A., Ufnalski B.: Sterowanie napędów elektrycznych. Analiza, modelowanie, projektowanie. Wydawnictwo Naukowe PWN, Warszawa 2016.
5. Sieklucki G., Bisztyga B., Zdrojewski A., Orzechowski T., Sykulski R.: Modele i zasady sterowania napedami elektrycznymi, Wydawnictwo AGH, Kraków 2014.
6. A. M. Plamitzer, Maszyny Elektryczne, wyd. VII, WNT Warszawa, 1982.
7. Stein Z. :Maszyny i nap□d elektryczny Wyd. 5. WsiP, Warszawa 1989

Additional

1. Leonhard W., Control of Electrical Drives, Springer, Berlin, New York, 2001
2. Leonhard W., Control of Electrical Drives, Springer, Berlin, New York, 2001
3. Kaczmarek T. , Napęd elektryczny robotów, Wydawnictwo Politechniki Poznańskiej, Poznań, 1998
4. Kaźmierkowski M.P, Tunia H., Automatic Control of Converter-Fed Drives, ELSEVIER, Amstertdam, London, New York, Tokyo, Warszawa , 1994

Breakdown of average student's workload

	Hours	ECTS
Total workload	30	2,00
Classes requiring direct contact with the teacher	15	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	15	1,00