COURSE DESCRIPTION CARD - SYLLABUS

Course name
Power Electronics [S1AiR2P>PO7-Enel]

Course

Field of study
Automatic Control and Robotics

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
practical

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Knowledge: Basic knowledge of mathematics, physics, circuit theory, electronics. [K1_W01 (P6S_WG), K1_W02 (P6S_WG), K1_W03 (P6S_WG), K1_W05 (P6S_WG)]. Skills: Ability to use literature, ability to solve linear equations, operations on complex numbers, ability to critically observe and draw conclusions. [K1_U01 (P6S_UW), K1_U02 (P6S_UU)]. Social competence: Ability to work in a team, taking care to improve own competences. [K1_K01 (P6S_KK), K1_K02 (P6S_KR)].

Course objective

Understanding the basics of electronic components and systems with power electronics. Acquiring the ability to analyze complex and design simple electronic circuits.

Course-related learning outcomes

Knowledge:
Knows and understands to an advanced degree the theory and methods in the principles of basic electronic components operation: analogue and digital and selected electronic circuits and systems [K1_W12 (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)].
Is familiar with the current status and latest development trends of the field of automation and robotics [K1_W21 (P6S_WG)].

Skills:
Is able to build, commission and test a simple electronic and electromechanical system [K1_U15 (P6S_UW)].
Is able to select the type and parameters of the measurement system, control unit and peripheral and communication modules for the selected application and integrate them in the form of the resulting measurement and control system [K1_U22 (P6S_UW)].
Be able to design simple mechanical components, electrical and electronic systems for various applications (taking into account material properties) [K1_U25 (P6S_UW)].

Social competences:
Is aware of the importance and understands the non-technical aspects and consequences of engineering activities, including their impact on the environment and the related responsibility for decisions; is ready to care for the achievements and traditions of the profession [K1_K2 (P6S_KR)].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Final test, ongoing control of reports and activities during laboratory sessions.

Programme content

Introduction to transforming power using electronic circuits.
Power electronic elements, power electronics key theory.
Network chargers.
A simple controlled rectifier.
DC / DC voltage conversion:
- voltage converters,
- voltage boosters,
- reduction / boosting converters,
- complex multi-stage DC converters.

The idea of converting DC voltage into alternating voltage wave theory.
Single and multi-phase AC voltage converters.
Theory of modulation.
Applications of power electronics
- DC power supplies, including energy ones,
- industrial inverters.

Course topics

none

Teaching methods

Lectures: multimedia presentations, blackboard examples
Laboratory: investigation on real and simulated setups

Bibliography

Basic:
1. Ned Mohan, Tore M. Undeland, William P. Robins, POWER ELECTRONICS, Converters, Applications and Design, 3-rd edition, Wiley, 2003, 802 pp.
2. Adrian Ioinovici, Power Electronics and Energy Conversion Systems, Volume 1 Fundamentals and Hard-switching Converters, Wiley, 2013
3. M. P. Kazmierkowski, R. Krishnan and F. Blaabjerg (Eds), Control in Power Electronics , Academic Press
- USA, 2002, (in English), Author of 4 Chapters 250 pages.

Additional:
1. Leszek Frąckowiak, Energoelektronika, cz.2, wyd.5, WPP, Poznań 2003, 354s.
2. S. Januszewski, A. Pytlak, M. Rosnowska-Nowaczyk, H. Świątek, Energoelektronika, WSiP, Warszawa 2004, 296s.
3. Leszek Frąckowiak, Stefan Januszewski, Energoelektronika, cz. 1 ? Półprzewodnikowe przyrządy i moduły energoelektroniczne, WPP, Poznań2001, 166s.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00