COURSE DESCRIPTION CARD - SYLLABUS

Course name
Power electronics

Course

Field of study
Electromobility

Year/Semester
3/5

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
	30	
Tutorials	Projects/seminars	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Faculty of Control, Robotics and Electrical Engineering

Piotrowo 3A Street, 60965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge - Basic knowledge in the field of electrical engineering and electronics.

Skills - The ability to effectively self-educate in a field related to the chosen field of study; the ability to make the right decisions when solving simple tasks and formulating problems in the field of widely understood power electronics.

Competences - The student is aware of expanding his competences, demonstrates readiness to work in a team, the ability to comply with the rules applicable during lectures, laboratories and exercises.

Course objective

Getting to know the properties and basic characteristics of power electronic semiconductor elements. Getting acquainted with the structure, principle of operation and properties of the power electronic converters used and selected methods of their control.

Course-related learning outcomes

Knowledge

1. The student should have knowledge of the structure, principles of operation and properties of semiconductor power devices used in power electronics.

2. The student should have knowledge of the structure, operation and properties of basic power electronics systems, with particular emphasis on the applications used in the broadly understood electromobility.

3. The student is to have basic knowledge of the methods of controlling power electronic converters, with particular emphasis on closed-loop control systems.

Skills

1. The student will be able to use the knowledge of the construction and principles of operation of elements and basic power electronics systems.

2. The student will be able to propose an optimal solution for transforming electricity depending on the assumed objective function.

Social competences

1. The student understands the importance of knowledge in solving problems and improving professional, personal and social competences.

2. The student is aware that the knowledge and skills in the technique quickly become obsolete.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:

- assessment of knowledge and skills demonstrated in the solved written test of a problem nature,

- continuous assessment, rewarding activity and substantive content of statements.

Laboratory:

- verification based on the reports made,

- continuous assessment, rewarding activity and substantive content of statements.

Exercises:

- continuous assessment, rewarding activity and substantive content of statements,

- verification of knowledge based on a written test.

Programme content

Semiconductor elements used in power electronics, diode and thyristor rectifier systems, diode rectifier systems with current modulation in the output circuits, transistor rectifier systems with improved energy indicators, thyristor AC / AC voltage regulators, transistor AC / AC voltage regulators with pulse control, impulse DC / DC type (BUCK, BOOST, BUCK-BOOST), independent single and three-phase voltage inverters and methods of their control, controlled power electronic sources of current and voltage and their application, active parallel compensation systems, UPS emergency power supplies, basics of construction and principles operation of converter systems dedicated to RES, modulation algorithms in power electronic systems, issues of impact on the power grid of traditional and modern power electronic systems.

Teaching methods

Lecture: presentation of issues with the use of multimedia, illustrated with examples given on the board, discussion of the issues.

Laboratory: performing laboratory exercises in teams (preparation of the stand, building measuring systems, carrying out experiments) with the help and supervision of the teacher, testing simulation and experimental models - comparing the obtained results.

Classes: blackboard classes, use of simulation tools.

Bibliography

Basic

1. Frąckowiak L., Power electronics. Th. 2, Publishing House of the Poznań University of Technology, Poznań 2002.

2. Frąckowiak L., Januszewski S., Power electronics. Th. 1, Semiconductor devices and power electronics modules, Publishing House of the Poznań University of Technology, Poznań 2001.

3. Mikołajuk K., Fundamentals of power electronics analysis, Państwowe Wydawnictwo Naukowe, Warsaw 1998.

4. Mohan N., Undeland N., Robins W., Power Electronics, Jon Wiley; Sons Inc., New York 1999.

5. Tunia H., Smirnow A., Nowak M., Barlik R., Power electronic systems. Calculation, modeling, design, Scientific and Technical Publishing House, Warsaw 1982.

6. Strzelecki R., Supronowicz H., Power factor in AC power systems and methods of its improvement, Oficyna Wydawnicza Politechniki Warszawskiej, Warsaw 2000.

Additional

1. Kaźmierkowski M., Krishnan R., Blaabjerg H., Control in Power Electronics, Academic Press, Amsterdam 2002.

2. Technical documentation of the simulation software.

3. Technical documentation of experimental bras.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes, preparation of a report on the laboratory exercise, preparation for exam) [1]	20	1,0

[1] delete or add other activities as appropriate