STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Modern storage and energy conversion systems		**1010312431010328893**
Field of study: **Power Engineering**	Profile of study (general academic, practical): **(brak)**	Year /Semester: **2 / 3**
Elective path/specialty: **-**	Subject offered in: **Polish**	Course (compulsory, elective): **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time): **full-time**	
No. of hours: Lecture: **30** Classes: **-** Laboratory: **-** Project/seminars: **-**		No. of credits: **2**
Status of the course in the study program (Basic, major, other): **(brak)**	(university-wide, from another field): **(brak)**	
Education areas and fields of science and art: **technical sciences** **Technical sciences**		ECTS distribution (number and %): **2 100%** **2 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of electrical engineering, electronics, energy, microprocessor technology and electrical machines.
2	**Skills**	Knowledge of the laws and phenomena of the physical and electrical. Linking physics with the principles of operation of technical equipment.
3	**Social competencies**	Awareness of the importance and need for the use of electrical and electronic engineering work. The ability to expand its powers.

Assumptions and objectives of the course:

Knowing the theoretical and practical problems of electrical engineering and energy.

To acquaint students with activities related to the proper management of sources, storage and receivers of electric energy in order to achieve the best possible management of resources and energy.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. He has a detailed knowledge of the principles of the construction, operation and exploitation of power system components related to the quality and reliability of power supply. - [K_W04 ++]

2. He has practical knowledge in the field of power electronics systems used to improve the quality and flexibility of electricity supply. - [K_W08 ++]

3. He has knowledge of development trends in the area of reliability of power supply and energy storage in the power supply system. - [K_W18 +]

Skills:

1. He can suggest improvements of existing technical solutions in the field of systems related to the provision, processing and accumulation of energy. - [K_U14 ++]

2. Able to analyze and diagnose operation of equipment related to the provision, processing and accumulation of energy. - [K_U07 +]

Social competencies:

1. Able to think and act in a creative and entrepreneurial, understands the need to formulate and providing the public with information and opinions on the achievements of energy and electrical engineering. - [K_K01 ++]

Assessment methods of study outcomes

Assess the knowledge and skills demonstrated during the examination of a problematic, realized in the form of written or oral.

Course description

The effect of disturbances in supply networks, elimination of these negative impacts; improve the quality and reliability of power receivers priority, guaranteed power supply systems, scalable power and runtime emergency power rating of practical performance and functionality of power systems; redundant structure; energy storages (batteries, supercapacitors, kinetic energy storage, fuel cells, compressed air systems, superconducting energy storage) and alternative power supply systems (power generators and their cooperation with the UPS and mains); nature of the various energy receivers, reactive power compensation.

Basic bibliography:

1. Clayton R. P., Introduction to electromagnetic compatibility, Wiley - Interscience, John Wiley & Sons Inc., New Jersey, 2006
2. Charoy A., Zakłócenia w urządzeniach elektronicznych. Zasady i porady instalacyjne, cz. 1-4, z serii: Kompatybilność elektromagnetyczna, WNT, Warszawa 1999-2000
3. Griffiths D. J., Introduction to electrodynamics, New Jersey: Prentice-Hall Inc., 1999
4. Kurdziel R., Podstawy elektrotechniki, WNT, Warszawa 1973
5. Markiewicz H., Bezpieczeństwo w elektroenergetyce, WNT, Warszawa 1999
6. Piątek Z., Jabłoński P., Podstawy teorii pola elektromagnetycznego, WNT, W-wa
7. Bolkowski S., Teoria obwodów elektrycznych, WNT, W-wa 2015

Additional bibliography:

1. Krakowski M., Elektrotechnika teoretyczna, tom 1, Teoria obwodów, tom 2, Pole elektromagnetyczne, PWN, Warszawa 1999
2. Wiatr J., Miegoń M., Zasilacze UPS oraz baterie akumulatorów w układach zasilania gwarantowanego, seria Zeszyty dla elektryków - nr 4, DW MEDIUM, W-wa, 2008

Result of average student's workload

Activity	Time (working hours)
1. participation in class lectures	30
2. participate in the consultations on the lecture	6
3. exam preparation	20
4. participation in the exam	2

Student's workload

Source of workload	hours	ECTS
Total workload	58	2
Contact hours	38	1
Practical activities	0	0