COURSE DESCRIPTION CARD - SYLLABUS

Course name
Power lines and electromagnetic compatibility [S1Energ2>LEiKE]

Course

Field of study
Power Engineering

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of electrical engineering, electronics and energy. Knowledge of laws and physical and electrotechnical phenomena. Linking physical phenomena with the principles of functioning of technical devices and their technical parameters. Ability to apply computational methods in the field of electrical engineering, electronics and electromagnetic field theory. Awareness of the importance and need to use electrical and electronic components and devices in the work of an engineer. Ability to broaden your competences.

Course objective

Understanding selected theoretical and practical problems related to electromagnetic interactions of power lines and with the electromagnetic compatibility of electrical devices and systems. Presentation in the form of a presentation of the prepared project-issue.

Course-related learning outcomes

Knowledge:
1. Has basic knowledge of the impact of electromagnetic fields on the environment and the mechanisms of penetration of electromagnetic disturbances to electrical and electronic circuits.

2. Knows and understands the fundamental dilemmas of modern civilization related to the reliability of electricity generation, supply and processing.
3. Understands the importance of energy security issues, especially the threats and ways to increase the level of energy security.
4. Knows methods of simulation of basic phenomena and quantities characteristic of electrical systems.

Skills:
1. Is able to assess the impact of electrical, electronic and energy systems on the environment.
2. Is able to use known mathematical models and computer simulations to analyze and evaluate the functioning of electrical components and systems.
3. Is able to plan and carry out simulation and measurements of basic quantities characteristic of electrical systems; can present the results obtained in numerical and graphic form, interpret them and draw the right conclusions.

Social competences:
1. Knows the aspects and effects of the power engineering engineer, including its impact on the environment and the associated responsibility for the decisions taken.
2. Understands the importance of knowledge in solving problems, has a need to improve professional, personal and social competences.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
Assessment of knowledge and skills demonstrated during the course of problematic, realized in the form of written or oral.
Projects:
- assessment of the presentation of the prepared project-issue in terms of substantive content, readability and presentation method,
- rewarding the increase in the ability to use known principles and methods,
- assessment of knowledge and skills related to the implementation of the prepared project-issue,
- rewarding activity and participation in the discussion related to the presented project-issue.
Laboratory:
- test and favoring knowledge necessary for the accomplishment of problems in the area of laboratory tasks,
- evaluation of the reports of laboratory tests.

Programme content

Basic information on electromagnetic compatibility, in particular the impact of power lines on inanimate and living matter.

Course topics

Lecture:
Basic concepts of electromagnetism and signal analysis. Impact of electromagnetic fields (in particular power lines) on the technical and biological environment. Introduction and general issues of electromagnetic compatibility (EMC), basic terms and units. Sources, classification and parameters of electromagnetic disturbances. Mechanisms of the spread of disturbances (coupling) and their impact on devices and systems. Measures and devices limiting the impact of disturbances on technical facilities.
Projects:
Understanding selected theoretical and practical problems related to the impact of electromagnetic fields on biological objects and the compatibility of devices and technical objects, as well as methods of simulation of basic phenomena and quantities characteristic of electrical systems. Technical aspects of performing compatibility tests.
Laboratory:
Research and measurements of: electric field, magnetic field, harmonic effects, analysis of electromagnetic interference in the range of radio frequency RF, selection of filters in the shaping of electrical signals.

Teaching methods

Lecture:
Lecture with multimedia presentation (including: drawings, photographs, animations, sound, films) supplemented with examples given on the board; Presenting a new topic preceded by a reminder of related content, known to students from other subjects; taking into account various aspects of the issues presented, including: economic, environmental, legal, social, etc .
Projects:
Analysis / discussion of various methods (including unconventional) to solve the problem in the area of the topic under consideration, analysis / discussion of various aspects of the problems solved, including: economic, ecological, legal, social, etc., detailed review of project documentation by the project leader and discussions on comments, multimedia show, case study, team work.
Laboratory:
Demonstrations of practical nuances specific to the issues, working in teams

Bibliography

Basic:
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9. PN-EN 61000-4-2:2011 - wersja polska - Kompatybilność elektromagnetyczna (EMC) -- Część 4-2: Metody badań i pomiarów -- Badanie odporności na wyładowania elektrostatyczne
10. PN-EN 61000-4-4:2013-05 - wersja ang. - Kompatybilność elektromagnetyczna (EMC) -- Część 4-4: Metody badań i pomiarów -- Badanie odporności na serie szybkich elektrycznych stanów przejściowych
11. PN-EN 61000-4-6:2014-04 - wersja ang. - Kompatybilność elektromagnetyczna (EMC) -- Część 4-6: Metody badań i pomiarów -- Odporność na zaburzenia przewodzone, indukowane przez pola o częstotliwości radiowej
12. PN-EN 61000-4-5:2014-10 - wersja ang. - Kompatybilność elektromagnetyczna (EMC) -- Część 4-5: Metody badań i pomiarów -- Badanie odporności na udary
13. Sroka J., Compendium on ElectroMagnetic Compatibility, Oficyna Wydawnicza Politechniki Warszawskiej, 2021, 213 s. ISBN 978-83-8156-277-5

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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