GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

| | | | |
|---|---|---|---|
| Subject name and code | Electricity and Magnetism, PG_00067426 | | |
| Field of study | Automatic Control, Cybernetics and Robotics | | |
| Date of commencement of studies | October 2026 | Academic year of realisation of subject | 2027/2028 |
| Education level | first-cycle studies | Subject group | Obligatory subject group in the field of study<br>Subject group related to scientific research in the field of study |
| Mode of study | Full-time studies | Mode of delivery | at the university |
| Year of study | 2 | Language of instruction | Polish |
| Semester of study | 3 | ECTS credits | 2.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Department of Decision Systems and Robotics -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. inż. Tomasz Stefański | |
| | Teachers | dr hab. inż. Tomasz Stefański | |

**Lesson types**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 15.0 | 15.0 | 0.0 | 0.0 | 0.0 | 30 |

E-learning hours included: 0.0

**Learning activity and number of study hours**

| Learning activity | Participation in didactic classes included in study plan | Participation in consultation hours | Self-study | SUM |
|---|---|---|---|---|
| Number of study hours | 30 | 4.0 | 16.0 | 50 |

**Subject objectives**

The aim of the course is to familiarize students with the physics of electromagnetic phenomena in order to understand the operation of coupling and communication elements in automation systems.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_W03] knows and understands, to an advanced extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum | The student knows the laws of electrodynamics and the properties of electromagnetic waves, the phenomena and mechanisms of their propagation, and understands the principles of operation of AiR coupling systems based on these phenomena. | [SW1] Assessment of factual knowledge |
| [K6_U03] can design, according to required specifications, and make a simple device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment | The student has mastered the basic issues of Maxwell's equations and their physical interpretation, as well as the principle of energy conservation for electromagnetic fields. Thanks to this, he is able to design sensors and actuators operating on the basis of these principles. | [SU1] Assessment of task fulfilment<br>[SU4] Assessment of ability to use methods and tools |

**Subject contents**

Course content – lecture
1. Introduction to the subject; discussion of electromagnetic phenomena used to implement actuators, sensors and communication elements in automation systems.
2. Gauss's law for electricity and magnetism.
3. Ampere's law.
4. Faraday's law of electromagnetic induction.
5. Maxwell's equations for vacuum and matter.
6. Propagation and guidance of electromagnetic waves.
7. Energy of electromagnetic waves and Poynting's theorem.
8. Radio communication.
9. Geometric optics and fiber optic communication.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3"></td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>5 quizzes</td><td>50.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. K. Suchocki, "Sensors and Measurement Transducers," p. 1-2, Gdansk University of Technology Publisher 2016<br><br>2. J. Orear, "Physics," p. 1-2, Scientific and Technical Publishers 1993<br><br>3. P. Kowalczyk, R. Lech, W. Zieniutycz, "Basics of Electromagnetism in Excercises," Gdansk University of Technology Publisher 2015<br><br>4. D. Griffiths, "Introduction to Electrodynamics," PWN Scientific Publishing House 2005</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. T. Morawski, W. Gwarek, "Fields and Electromagnetic waves," Scientific and Technical Publishers 2014</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Discuss the propagation and guidance of electromagnetic waves,<br>Derive and discuss Poynting's theorem,<br>Derive the wave equation from Maxwell's equations.</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="3">Not applicable</td></tr>
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