GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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| Subject name and code | Electronic Coupling Systems in Automatic Control, PG_00047942 | | |
| Field of study | Automatic Control, Cybernetics and Robotics | | |
| Date of commencement of studies | October 2021 | Academic year of realisation of subject | 2022/2023 |
| Education level | first-cycle studies | Subject group | Obligatory subject group 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 | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. inż. Tomasz Stefański | |
| | Teachers | dr hab. inż. Tomasz Stefański | |

Lesson types and methods of instruction

| 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 | 2.0 | 18.0 | 50 |

Subject objectives

The aim of the course is to familiarize students with the physics of electronic coupling systems in automation.

Learning outcomes

| Course outcome | Subject outcome | Method of verification |
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| [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 understood the basic issues of Maxwell's equations and their physical interpretation as well as the principles of energy conservation for electromagnetic fields. Thanks to this, he can design sensors and actuators operating based on these principles. | [SU1] Assessment of task fulfilment<br>[SU4] Assessment of ability to use methods and tools |
| [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 electromagnetic wave properties, phenomena and mechanisms of their propagation, and understands the principles of operation of AiR electronic coupling systems based on these phenomena. | [SW1] Assessment of factual knowledge |

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| Subject contents | 1. Introduction to the subject; discussion of applications and techniques for implementing executive, sensory and communication elements in automation systems.<br><br>2. Fundamentals and principles of physics of electronic and electro-mechanical actuators, sensory and communication elements:<br><br>- Gauss's law {electricity and magnetism},<br><br>- Amper's law {charge and inductance},<br><br>- Faraday's law {electromagnetic induction},<br><br>- Propagation and guidance of electromagnetic waves,<br><br>- Electromagnetic wave energy and Poynting's theorem,<br><br>- geometrical optics,<br><br>- Photoelectric effect,<br><br>- Forced emission and lasers.<br><br>3. Sensory elements based on electromagnetic phenomena (proximity sensors, laser rangefinders, electromagnetic radiation detectors, cameras).<br><br>4. Actuators based on electromechanical phenomena (engines, MEMSs).<br><br>5. Piezoelectric coupling elements.<br><br>6. Radio communication.<br><br>7. Fiber optic communication. |
| Prerequisites and co-requisites | |
| Assessment methods and criteria | |

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| 5x quiz | 50.0% | 100.0% |

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| Recommended reading | Basic literature | 1. K. Suchocki, "Sensors and Transducers," vol. 1-2, Gdańsk University of Technology Publishing House 2016<br>2. J. Orear, "Physics," vol. 1-2, Scientific and Technical Publishing House 1993<br>3. P. Kowalczyk, R. Lech, W. Zieniutycz, "Basics of Electromagnetism in Tasks," Gdańsk University of Technology Publishing House 2015<br>4. T. Stefański, Presentations for the lecture |
| | Supplementary literature | 1. T. Morawski, W. Gwarek, "Electromagnetic Fields and Waves," Scientific and Technical Publishing House 2014 |
| | eResources addresses | Adresy na platformie eNauczanie: |
| Example issues/ example questions/ tasks being completed | - Discuss the propagation and guiding of electromagnetic waves,<br><br>- Discuss the photoelectric phenomenon,<br><br>- Discuss the phenomenon of stimulated emission and lasers. | |
| Work placement | Not applicable | |