GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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| Subject name and code | Physical basis of conversion and accumulation of energy, PG_00037297 | | |
| Field of study | Technical Physics | | |
| Date of commencement of studies | October 2021 | Academic year of realisation of subject | 2022/2023 |
| Education level | first-cycle studies | Subject group | Optional subject group<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 | 1.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Department of Physics of Electronic Phenomena -> Faculty of Applied Physics and Mathematics | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Piotr Grygiel | |
| | Teachers | dr inż. Piotr Grygiel | |

**Lesson types and methods of instruction**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 15.0 | 0.0 | 0.0 | 0.0 | 0.0 | 15 |

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 | 15 | 2.0 | 8.0 | 25 |

**Subject objectives**

The knowledge of phisical processes involved in conversion and accumulation of energy in the environment and technology.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| K6_W02 | Is able to formulate a a qualitative and quantitative description of different processes of energy accumulation and conversion in the environment and technology. | [SW1] Assessment of factual knowledge<br>[SW2] Assessment of knowledge contained in presentation |
| K6_U02 | Is able to analyse a given problem and to obtain information from proper literature in order to prepare a written elaboration. | [SU1] Assessment of task fulfilment<br>[SU4] Assessment of ability to use methods and tools<br>[SU5] Assessment of ability to present the results of task |
| K6_U08 | Is able to prepare and perform a written elaboration concerning different processes of energy accumulation and conversion in the environment and technology. | [SU2] Assessment of ability to analyse information<br>[SU3] Assessment of ability to use knowledge gained from the subject<br>[SU4] Assessment of ability to use methods and tools<br>[SU5] Assessment of ability to present the results of task |

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| Subject contents | The Lecture:<br><br>1. Energy and the principle of energy conservation (1h). 2. The phenomena of energy conversion in nature: solar energy and solar energy conversion on Earth, the energy balance on Earth, the formation of stars, stars energy sources, the structure of Sun and energetic processes on the Sun (3 h). 3. The phenomena of energy conversion in classical physics: conversion of mechanical and gravitational energy, conversion of chemical energy, conversion of electric energy (3 h). 4. Quantum and nuclear phenomena of energy conversion: the Seebeck, Peltier and Thomson effects, the electroluminescence, the thermoluminescence, nuclear explosions and controlled nuclear reactions (3h). 5. The physical mechanisms of energy transport: transport of heat, transport of electric energy, energy propagation through mechanical waves (3 h). 6. The energy storage: the storage of heat and sun energy, the accumulation of electric, mechanical, chemical and nuclear energy (2h).<br><br>Problems to be written:<br><br>1. Characters of the principle of energy conservation. The principle of conservation of mass - energy. 2. Energy sources and energy quality. 3. Energy sources of stars. 4. Sources of solar energy. 5. Forms of solar energy and their impact on processes taking place on Earth. 6. Devices converting mechanical energy into electricity. 7. Generation of X-rays. 8. Devices converting solar energy into thermal energy. 9. Devices converting solar energy into electricity. 10. Devices converting electricity into heat. 11. Seebeck effect and its use. 12. Peltier effect and its use. 13. Examples of combustion processes and their use in technology and energy. 14. Contemporary electrochemical cells. 15. Modern electric energy batteries. 16. Mechanical energy storage devices. 17. Factors causing storage and transport of energy. 18. Methods of energy transfer. 19. Modern electric light sources. 20. Chemical light sources. 21. Technical use of luminescence phenomena. 22. Inorganic light emitting diodes. 23. Organic light emitting diodes. 24. Nuclear reactions of synthesis and cleavage. 25. Energy aspects of a nuclear explosion. 26. Conversion of energy in hydroelectric and pumped storage power plants. 27. Conversion of energy in a wind power plant. 28. Conversion of energy in a thermal power plant. 29. Energy conversion at a nuclear power plant. 30. Energy conversion in a tidal power plant. |
| Prerequisites and co-requisites | 1. Basic knowledge of mechanics and electricity. 2. Basic knowledge of nuclear and atomic physics (incl. quantum physics). 3. Basic knowledge of chemistry and thermodynamics. 4. Integral and differential calculus skills. |
| Assessment methods and criteria | |

| Subject passing criteria | Passing threshold | Percentage of the final grade |
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| Credit for the course (written form) | 50.0% | 50.0% |
| Written elaboration of the selected problem | 50.0% | 50.0% |

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| Recommended reading | Basic literature | 1. J. Mikielewicz, J.T. Cieśliński ,,Niekonwencjonalne urządzenia i systemy konwersji energii", Maszyny Przepływowe pod red. E.S. Burki. Tom 24. IMP PAN, Ossolineum, Wrocław 1999. |
| | Supplementary literature | 1. F.J.Keller, W.E. Gettys, M.J. Skove ,,Physics"", McGraw-Hill Inc.,US; 2nd Revised edition, 1993. |
| | eResources addresses | Adresy na platformie eNauczanie: |
| Example issues/ example questions/ tasks being completed | Describe the processes of energy conversion in a wind generator.<br><br>Describe the process of energy accumulation in an acid battery. | |
| Work placement | Not applicable | |