GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | The impact of energy sector on the climate, PG_00064772 | | |
| Field of study | Power Engineering | | |
| Date of commencement of studies | February 2026 | Academic year of realisation of subject | 2026/2027 |
| Education level | second-cycle studies | Subject group | Specialty 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 | 1 | Language of instruction | Polish |
| Semester of study | 2 | ECTS credits | 3.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Division of Thermal Power Systems -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology -> Wydziały Politechniki Gdańskiej | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | prof. dr hab. inż. Dariusz Mikielewicz | |
| | Teachers | | |

**Lesson types and methods of instruction**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 15.0 | 15.0 | 0.0 | 15.0 | 0.0 | 45 |

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 | 45 | 5.0 | 25.0 | 75 |

**Subject objectives**

The aim of the course is to familiarise students with the impact of energy systems on the climate and its anthropogenic changes.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K7_U02] formulates and tests hypotheses concerning problems related to energy conversion processes, their efficiency, control, safety and impact on the environment, as well as simple research problems | Is familiar with the energy strategies of Poland, the European Union and global agreements in the area of anticipated energy mixes and the prevention of climate change | [SU2] Assessment of ability to analyse information |
| [K7_W01] explains and describes, based on general knowledge in the field of scientific disciplines forming the theoretical foundations of Power Engineering, the structure, principles of operation and evironmental impact of energy systems, machines and devices, transmission grids and internal installations | Has knowledge of exergetic analysis with environmental cost analysis. Knows the effects of fossil fuel combustion on environmental contaminants | [SW1] Assessment of factual knowledge |

**Subject contents**

1. Basic statistics on energy consumption in Poland, the EU and worldwide. Basic treaties introducing emission limitations. Energy policy of Poland, the EU and the world.

2. Characteristics of the formation of the atmosphere and its changes over time. Models for determining the equilibrium temperature.

3. Causes and mechanisms of climate change.

4. Exergy and the determination of the environmental cost.

5 Determination of the carbon footprint of different energy technologies

6. Prospective low carbon technologies and opportunities for decarbonisation of the Polish economy.

**Prerequisites and co-requisites**

Knowledge of thermodynamics I and II especially in the area of therodynamic cycles.

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|---|---|---|---|
| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
| | project presentation | 60.0% | 40.0% |
| | lecture credit colloquium | 60.0% | 30.0% |
| | tutorials credit colloquium | 60.0% | 30.0% |
| Recommended reading | Basic literature | Lecture notes | |
| | Supplementary literature | Any literature on the influence of energy on climate change | |
| | eResources addresses | | |
| Example issues/ example questions/ tasks being completed | 1. Composition of the atmosphere at the beginning of the world's formation and at present<br>2. Causes of climatic forcing<br>3. Main greenhouse gases, their lifetime in the atmosphere, reasons for their presence in the atmosphere<br>4 Definition of the equilibrium temperature of the earth's surface<br>5. Energy balance model of the earth without and with the atmosphere<br>6 Definition of albedo<br>7. Basic combustion reactions of primary fuels<br>8 Definition of exergy and unit costs of energy technologies<br>9. Causes of acid rain<br>10. Causes of smog.<br>11. Examples of low carbon technologies | | |
| Work placement | Not applicable | | |

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