GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Advanced engineering materials, PG_00057255 | | |
| Field of study | Power Engineering | | |
| Date of commencement of studies | February 2024 | Academic year of realisation of subject | 2023/2024 |
| Education level | second-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 | 1 | Language of instruction | Polish |
| Semester of study | 1 | ECTS credits | 2.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Department of Materials Engineering and Bonding -> Faculty of Mechanical Engineering and Ship Technology | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Michał Landowski | |
| | Teachers | dr inż. Michał Landowski<br>prof. dr hab. inż. Jerzy Łabanowski | |

**Lesson types and methods of instruction**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 30.0 | 0.0 | 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 | 5.0 | 15.0 | 50 |

**Subject objectives**

Acquirement of the essential knowledge in modern structural materials and maintain their at industrial work environment.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K7_W08] as knowledge about development trends in the field of known technologies and non-technical aspects to solve simple engineering tasks in the field of power systems and equipment or transmission networks and internal installations | Student has knowledge of modern engineering materials used in the energy industry. | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects |
| [K7_K05] is aware of the impact of engineering activities on the environment | Student has knowledge of the impact of techniques for the production of elements from modern materials on the environment. | [SK5] Assessment of ability to solve problems that arise in practice |
| [K7_W06] knows the extended issues of reliability of power equipment and diagnostics of defects in this equipment | Student has knowledge of the degradation processes of materials used in the energy industry. | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects |
| [K7_W02] has extended and deepened knowledge of physics, chemistry, thermodynamics, fluid mechanics, material science, necessary to understand and describe basic thermal and flow phenomena occurring in and around power equipment and systems, transmission networks and internal installations | Student has an extensive knowledge of materials science and techniques of shaping the properties of modern engineering materials, including composite materials. | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects |

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| Subject contents | Weldable structural steels AHSS (Advanced High Strength Steels). Modern steel grades for automotive industry. Corrosion-resistant steels: ferritic, austenitic, duplex, and precipitation hardening steels. Surface treatments of the stainless steels needed to prevent corrosion. The causes of corrosion damages of austenitic stainless steel in industrial systems. Low alloy steels operating at elevated temperature. Creep; influence of temperature, time and stresses to mechanical properties of metals. Creep-resisting steels and super alloys on the base of iron, nickel, and cobalt used in power industry, petrochemical or chemical systems. Heat-resisting steels; chemical composition, operating temperature. Refractory metals; Mo, Nb, W, Zr, Hf and their alloys. Materials on the intermetallic phase matrix. Creep-resisting light metal alloys. Wear resistant materials. Composite materials. | |
| Prerequisites and co-requisites | Completed courses: Material Science I and Material Science II | |
| Assessment methods and criteria | Subject passing criteria: | Passing threshold: 60.0% / Percentage of the final grade: 100.0% |
| Recommended reading | Basic literature | 1. Adamczyk J.: Inżynieria materiałów metalowych. Monografia. Cz. 1 i Cz. 2. Wyd. Politechniki Śląskiej. Gliwice 2004.<br>2. Ashby M.F., Jones D.R.H.: Materiały inżynierskie. Tom 1. Właściwości i zastosowanie. WNT, W-wa 1995. Tom 2. Kształtowanie struktury i właściwości, dobór materiałów. WNT. Warszawa 1996.<br>3.Blicharski M.: Inżynieria materiałowa. Stal. WNT W-wa 2004.<br>4. Bala H.: Korozja materiałów Teoria i praktyka. Wyd. WIPMiFS. Częstochowa 2002.<br>5. Baszkiewicz J., Kamiński M.: Korozja materiałów. Wyd. Polit. Warsz. Warszawa 2006.<br>6. Boczkowska A., Krzesiński G.: Kompozyty i techniki ich wytwarzania, Oficyna Wyd. PW, Warszawa 2016<br>7. Dobrzański J.: Materiałoznawcza interpretacja trwałości stali dla energetyki. Open Access Library vol. 3, 2011.<br>8. Dobrzański L.A.: Podstawy nauki o materiałach i metaloznawstwo. PWN 2004.<br>9. Hernas A.: Żarowytrzymałość stali i stopów. Wyd. Polit. Śląskiej. Gliwice 2000.<br>10. Łabanowski J.: Stale odporne na korozję i ich spawalność. Wyd. Politechniki Gdańskiej. Gdańsk 2018.<br>11. Oczoś K.E., Kawalec A.: Kształtowanie metali lekkich. PWN. Warszawa 2012.<br>12. Tasak E., Ziewiec A.: Spawalność materiałów konstrukcyjnych. T1. Spawalność stali. Wyd. Fotobit. Kraków 2008<br>13. Skrzypek S., Przybyłowicz K. (red): Inżynieria metali i ich stopów. Wyd. AGH Kraków 2012.<br>14. Głowacka M., Zieliński A. (red.): Podstawy materiałoznawstwa Wyd. Polit. Gdańskiej. Gdańsk 2014. |
| | Supplementary literature | 1. Chodorowski J., Ciszewski A., Radomski T.: Materiałoznawstwo lotnicze. Oficyna Wyd. Politechniki Warszawskiej. Warszawa 1996<br>2. Głowacka M., Łabanowski J.: Inżynieria powierzchni. Wybrane zagadnienia. PWSZ w Elblągu. Elbląg 2015. |
| | eResources addresses | Adresy na platformie eNauczanie: |
| Example issues/ example questions/ tasks being completed | Weldability of steel, equivalent CEV.<br>Application of the welded carbon steels<br>Strengthening mechanisms of steel.<br>Bainitic steels, alloying elements, TTT diagram, application.<br>Corrosion-resistant austenitic steel, the role of chromium and nickel, essential heat treatment.<br>Examples of modern steel grades for automotive industry.<br><br>Composite materials manufacturing techniques. | |
| Work placement | Not applicable | |