



Subject card

| | | | | | | | |
|---|--|--|-------------------------------------|------------|--|---------|-----|
| Subject name and code | Advanced engineering materials, PG_00059499 | | | | | | |
| Field of study | Management and Production Engineering | | | | | | |
| Date of commencement of studies | February 2023 | Academic year of realisation of subject | | | 2023/2024 | | |
| Education level | second-cycle studies | Subject group | | | Optional subject group 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 Polish | | |
| Semester of study | 2 | ECTS credits | | | 3.0 | | |
| Learning profile | general academic profile | Assessment form | | | assessment | | |
| Conducting unit | Zakład Technologii Materiałów Konstrukcyjnych i Spajania -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Krzysztof Krzysztofowicz | | | | | |
| | Teachers | dr inż. Michał Landowski dr inż. Krzysztof Krzysztofowicz | | | | | |
| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 15.0 | 0.0 | 15.0 | 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 | 10.0 | | 35.0 | | 75 |
| Subject objectives | Obtaining basic knowledge of modern construction materials and their behavior in working environment in industry. | | | | | | |

| Learning outcomes | Course outcome | Subject outcome | Method of verification |
|---------------------------------|---|--|--|
| | [K7_W01] knows and understands to a greater extent selected issues in the field of management and quality sciences and mechanical engineering, their location in the field of social sciences and engineering and technical sciences, as well as relationships with related disciplines, and sees the possibility of applying the knowledge in practice | The student understands issues in the field of mechanical engineering in the field of modern materials and sees the possibilities of their application | [SW1] Assessment of factual knowledge |
| | [K7_U07] is able to communicate fluently using various techniques in professional environment and in other environments, also in English or another foreign language recognized as the language of international communication in a given engineering discipline | The student has communication skills using various techniques | [SU3] Assessment of ability to use knowledge gained from the subject |
| | [K7_U01] can obtain information from literature, databases and others sources, also in English or another foreign language recognized as the language of international communication in a given engineering discipline; is able to integrate the obtained information, interpret it, as well as draw conclusions and formulate and justify opinions. | The student is able to obtain and use engineering information and formulate appropriate conclusions based on it | [SU2] Assessment of ability to analyse information |
| | [K7_U04] is able to plan and carry out experiments, including measurements and computer simulations, interpret the obtained results and extract conclusions; can use analytical, simulation and experimental methods to formulate and solve engineering tasks | The student is able to plan an experiment, analyze the obtained results and draw conclusions | [SU4] Assessment of ability to use methods and tools |
| | [K7_K04] is aware of the social role of the university graduate, and especially understands the need to formulate and communicate to society - incl. through the mass media - information and opinions on technological achievements and other aspects of an engineer's activity; makes efforts to provide such information and opinions in a generally comprehensible manner, justifying different points of view | The student is aware of the need to disseminate knowledge | [SK4] Assessment of communication skills, including language correctness |
| Subject contents | LECTURE:Weldable structural steels with increased and high strength.Steel for industry automotive.Stainless steels: ferritic, austenitic, duplex ferritic-austenitic and hardened secretory.Passivation treatment of stainless steel to protect against corrosion.Reasons corrosion damage to austenitic steels in industrial installations.Low-alloy steels for operation at elevated temperatures.Creep; influence of temperature, time and stresses on the mechanical properties of alloys.Heat-resistant steels and superalloys based on iron, nickel and cobalt, used in the energy industry and in petrochemical and chemical industry equipment.Heat-resistant alloys; chemical composition, operating temperatures.High-melting metals; molybdenum, niobium, tungsten, zirconium, hafnium and their alloys.Materials with an intermetallic phase structure. Heat-resistant light metal alloys. Materials resistant to abrasive wear. LAB:1. Weldable structural steels with increased and high strength. Vickers hardness distribution in welded joints.2. Austenitic and duplex stainless steels. Analysis of operational damage cases.3. Low-alloy Cr-Mo steels for operation at elevated temperatures; assessment of the degree of degradation after long-term operation in creep conditions.4. Heat-resistant alloys (ferritic and austenitic) and heat-resistant alloys (austenitic and martensitic), assessment of the degree of degradation after long-term use.5. Materials resistant to abrasive wear. | | |
| Prerequisites and co-requisites | | | |

| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
|--|--|--|-------------------------------|
| | Lecture | 60.0% | 70.0% |
| | Laboratory | 100.0% | 30.0% |
| Recommended reading | Basic literature | 1. Adamczyk J.: Inżynieria materiałów metalowych. Monografia. Cz. 1 i Cz. 2. Wyd. Politechniki Śląskiej. Gliwice 2004. 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. 3. Blicharski M.: Inżynieria materiałowa. Stal. WNT W-wa 2004. 4. Bala H.: Korozja materiałów Teoria i praktyka. Wyd. WIPMiFS. Częstochowa 2002. 5. Baszkiewicz J., Kamiński M.: Korozja materiałów. Wyd. Polit. Warsz. Warszawa 2006. 6. Boczkowska A., Krzesiński G.: Kompozyty i techniki ich wytwarzania, Oficyna Wyd. PW, Warszawa 2016 7. Dobrzański J.: Materiałoznawcza interpretacja trwałości stali dla energetyki. Open Access Library vol. 3, 2011. 8. Dobrzański L.A.: Podstawy nauki o materiałach i metaloznawstwo. PWN 2004. 9. Hernas A.: Żarowytrzymałość stali i stopów. Wyd. Polit. Śląskiej. Gliwice 2000. 10. Łabanowski J.: Stale odporne na korozję i ich spawalność. Wyd. Politechniki Gdańskiej. Gdańsk 2018. 11. Oczó K.E., Kawalec A.: Kształtowanie metali lekkich. PWN. Warszawa 2012. 12. Tasak E., Ziewiec A.: Spawalność materiałów konstrukcyjnych. T1. Spawalność stali. Wyd. Fotobit. Kraków 2008 13. Skrzypek S., Przybyłowicz K. (red): Inżynieria metali i ich stopów. Wyd. AGH Kraków 2012. 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 2. Głowacka M., Łabanowski J.: Inżynieria powierzchni. Wybrane zagadnienia. PWSZ w Elblągu. Elbląg 2015. | |
| | eResources addresses | Adresy na platformie eNauczanie: Zaawansowane materiały inżynierskie, W, ZiP, sem.2, zimowy, 2023/24 - Moodle ID: 34942 https://enauzanie.pg.edu.pl/moodle/course/view.php?id=34942 Zaawansowane materiały inżynierskie, W, ZiP, sem.2, zimowy, 2023/24 - Moodle ID: 34942 https://enauzanie.pg.edu.pl/moodle/course/view.php?id=34942 | |
| Example issues/ example questions/ tasks being completed | Metallurgical weldability of steel, carbon equivalent. The use of weldable non-alloy steels. Steel strengthening mechanisms. Bainitic steels, alloy additions, CTP chart, applications. Austenitic stainless steels, the role of chromium and nickel, basic heat treatment. Examples of modern steel grades for the automotive industry. | | |
| Work placement | Not applicable | | |