



Subject card

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|---|---|--|--|-------------------------------------|--|---|-----|
| Subject name and code | Advanced welding processes, PG_00064855 | | | | | | |
| Field of study | Mechanical Engineering | | | | | | |
| Date of commencement of studies | February 2025 | Academic year of realisation of subject | | | | 2025/2026 | |
| Education level | second-cycle studies | Subject group | | | | Specialty 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 | |
| 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 hab. inż. Grzegorz Rogalski | | | | |
| | Teachers | | | | | | |
| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 15.0 | 0.0 | 15.0 | 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 familiarize students with advanced bonding processes. The topics covered include the physical foundations of the processes discussed, the relationships between the basic variables and their influence on the obtained properties of bonded joints, technological guidelines and areas of their implementation | | | | | | |
| Learning outcomes | Course outcome | | Subject outcome | | Method of verification | | |
| | [K7_W11] interprets social, economic, legal (including industrial and intellectual property laws), and other non-technical aspects of engineering activities, and includes them into engineering practice | | The student is aware of the impact of non-technical aspects of advanced bonding processes on the surrounding environment and knows the risks of their implementation | | [SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge | | |
| | [K7_U13] evaluates the feasibility and potential for utilizing new technical and technological achievements in accomplishing tasks characteristic for the field of study | | The student has structured technical knowledge in the field of advanced joining processes. He is able to take into account aspects related to the theoretical foundations of Mechanics and Machine Design (production, modeling of continuous and discrete technological processes) when selecting a process | | [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information | | |
| | [K7_W01] explains and describes, on the basis of general knowledge of the scientific disciplines forming the theoretical basis of Mechanics and Mechanical Engineering, the structure and principles of operation of mechanical systems and processes | | The student is able to explain and describe advanced joining technologies taking into account information that forms the theoretical foundations of Mechanics and Machine Design, e.g. issues related to the modification of technological and mechanical processes, etc. | | [SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge | | |
| Subject contents | Basic concepts and definitions. Classification of welding processes. Laser welding. Plasma welding. Electron beam welding. Hybrid welding. Solid state bonding. Vacuum brazing. Developments of standard welding processes that allow for increased efficiency and quality of the joints made, e.g. orbital welding, deep penetration welding, tandem welding and others. | | | | | | |

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| Prerequisites and co-requisites | Basic knowledge of welding processes | | |
| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
| | | 60.0% | 25.0% |
| | | 60.0% | 25.0% |
| | | 60.0% | 50.0% |
| Recommended reading | Basic literature | Pilarczyk J. (red.): Poradnik inżyniera. Spawalnictwo. tom I. Wydawnictwo Naukowe PWN, Warszawa. Pilarczyk J. (red.): Poradnik inżyniera. Spawalnictwo. tom II. Wydawnictwo Naukowe PWN, Warszawa. Chmielewski T., Zembaty Z.: Projektowanie procesów technologicznych. Spawalnictwo.. Oficyna Wydawnicza Politechniki Warszawskiej 2013 Nowacki J.: Lutowanie w budowie maszyn. wydawnictwo WNT. 2017 | |
| | Supplementary literature | Klimpel A.: Technologie laserowe. Spawanie, napawanie, stopowanie, obróbka cieplna i cięcie. Wydawnictwo Politechniki Śląskiej, Gliwice Klimpel A.: Nowoczesne lasery i technologie laserowe w inżynierii spawalnictwa. Wydawnictwo Politechniki Śląskiej, Gliwice 2023 | |
| | eResources addresses | Adresy na platformie eNauczanie: | |
| Example issues/ example questions/ tasks being completed | <ol style="list-style-type: none"> 1. Explain the differences between the joining processes, i.e. welding, brazing, soldering, gluing 2. Characterize the vacuum brazing process, provide its stages and description 3. Describe the physical phenomena characteristic of the plasma welding process 4. Explain the influence of the fundamental variables of the laser welding process on the geometry of the weld 5. Describe and explain the principle of operation of the TIG welding process with deep penetration 6. Provide the differences between the MIG/MAG and FCAW welding processes, specify the method of droplet transfer to the liquid metal pool for each method. 7. Provide the parameters of stir welding (FSW) and their influence on the construction of the joint | | |
| Work placement | Not applicable | | |

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