



Subject card

|   |  |  |  |                                     |   |            |     |
|---|--|--|--|-------------------------------------|---|------------|-----|
| Subject name and code                       | Materials science in welding, PG_00055248  |  |  |                                     |   |            |     |
| Field of study                              | Management and Production Engineering  |  |  |                                     |   |            |     |
| Date of commencement of studies             | October 2023   | Academic year of realisation of subject                  |  |                                     | 2025/2026   |            |     |
| 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                               | 3  | Language of instruction                                  |  |                                     | Polish  |            |     |
| Semester of study                           | 6  | ECTS credits   |  |                                     | 3.0   |            |     |
| Learning profile                            | general academic profile   | Assessment form  |  |                                     | exam  |            |     |
| Conducting unit                             | Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology   |  |  |                                     |   |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor   |  | dr hab. inż. Dariusz Fydrych   |                                     |   |            |     |
|   | Teachers   |  |  |                                     |   |            |     |
| Lesson types and methods of instruction     | Lesson type  | Lecture  | Tutorial   | Laboratory                          | Project   | Seminar    | SUM |
|   | Number of study hours  | 30.0   | 0.0  | 15.0                                | 0.0   | 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   |  | 4.0                                 |   | 26.0       | 75  |
| Subject objectives                          | The aim of the course is to provide the students with knowledge of weldability of materials  |  |  |                                     |   |            |     |
| Learning outcomes                           | Course outcome   |  | Subject outcome  |                                     | Method of verification  |            |     |
|   | [K6_U02] has the ability of self-learning and expanding knowledge in a specialized field of engineering production   |  | The student has knowledge of the directions of development of machine construction   |                                     | [SU3] Assessment of ability to use knowledge gained from the subject<br>[SU4] Assessment of ability to use methods and tools  |            |     |
|   | [K6_W02] has knowledge of materials, their properties and research methods, including construction materials used in the machinery industry, has ordered, theoretically founded knowledge of mechanics including modeling of mechanical systems in the field of statics, kinematics and dynamics, and has an ordered, theoretically founded knowledge in the field of strength analysis materials and products |  | Student recognizes structural materials and their operating properties   |                                     | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects   |            |     |
|   | [K6_K01] feels the need for self-realization by learning throughout life, is looking for modern and innovative solutions in their actions, is able to think creatively and act in an entrepreneurial way   |  | Student can choose the method of joining (welding, resistance welding, soldering, brazing) for a group of materials, properties of estimate and develop the technical specifications |                                     | [SK3] Assessment of ability to organize work<br>[SK4] Assessment of communication skills, including language correctness<br>[SK5] Assessment of ability to solve problems that arise in practice<br>[SK1] Assessment of group work skills |            |     |

| Subject contents   | <p>LECTURE</p> <p>Weldability. The phenomena of cracking during the welding process. Hot, cold, lamellar and reheat cracks. Weldability of alloy steels. Characteristics of consumables. Thermal field, thermal cycle. Crystallization of the weld metal. Metallurgical reactions and slag properties. Design of the weld metal. Heat affected zone. CTP and CTPcs charts. The concept of t8/5. Weldability of ferrous and nonferrous alloys.</p> <p>LABORATORY</p> <p>Determination of susceptibility of steel to hot and cold cracking. Evaluation of weldability of mild and high alloyed steels. Determination of diffusible hydrogen content in deposited metal.</p> |   |  |                          |                   |                               |      |       |       |                 |       |       |
|--|---|---|--|--------------------------|-------------------|-------------------------------|------|-------|-------|-----------------|-------|-------|
| Prerequisites and co-requisites                                | MetallographyMathematicsChemistryPhysicsWelding and joining processes   |   |  |                          |                   |                               |      |       |       |                 |       |       |
| Assessment methods and criteria                                | <table border="1"> <thead> <tr> <th data-bbox="451 577 794 611">Subject passing criteria</th> <th data-bbox="794 577 1137 611">Passing threshold</th> <th data-bbox="1137 577 1487 611">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="451 611 794 645">test</td> <td data-bbox="794 611 1137 645">60.0%</td> <td data-bbox="1137 611 1487 645">60.0%</td> </tr> <tr> <td data-bbox="451 645 794 683">laboratory test</td> <td data-bbox="794 645 1137 683">60.0%</td> <td data-bbox="1137 645 1487 683">40.0%</td> </tr> </tbody> </table>  |   |  | Subject passing criteria | Passing threshold | Percentage of the final grade | test | 60.0% | 60.0% | laboratory test | 60.0% | 40.0% |
| Subject passing criteria                                       | Passing threshold   | Percentage of the final grade   |  |                          |                   |                               |      |       |       |                 |       |       |
| test   | 60.0%   | 60.0%   |  |                          |                   |                               |      |       |       |                 |       |       |
| laboratory test  | 60.0%   | 40.0%   |  |                          |                   |                               |      |       |       |                 |       |       |
| Recommended reading  | Basic literature  | <p>Butnicki S.: Spawalność i kruchość stali. WNT Warszawa 1975.</p> <p>Tasak E.: Spawalność stali. Fotobit Kraków 2002.</p> <p>Węgrzyn J.: Fizyka i metalurgia Spawania. Politechnika Śląska 1990.</p>  |  |                          |                   |                               |      |       |       |                 |       |       |
|  | Supplementary literature  | <p>Praca zbiorowa. Poradnik inżyniera. Spawalnictwo. Tom 1. WNT Warszawa 2003.</p> <p>Jakubiec M., Lesiński K., Czajkowski H.: Technologia konstrukcji spawanych. WNT Warszawa 1987.</p> <p>Pilarczyk J., Pilarczyk J.: Spawanie i napawanie elektryczne metali. Wydawnictwo Śląsk Katowice 1996.</p> |  |                          |                   |                               |      |       |       |                 |       |       |
|  | eResources addresses  | Adresy na platformie eNauczenie:  |  |                          |                   |                               |      |       |       |                 |       |       |
| Example issues/<br>example questions/<br>tasks being completed | <p>Describe weldability of heat resistant steel.</p> <p>Describe weldability of stainless steel.</p> <p>Describe weldability of aluminium alloys</p>  |   |  |                          |                   |                               |      |       |       |                 |       |       |
| Work placement   | Not applicable  |   |  |                          |                   |                               |      |       |       |                 |       |       |