



Subject card

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| Subject name and code | Modelling of heat and plastic treatment processes of materials, PG_00064853 | | | | | | |
| Field of study | Mechanical 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 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 | | 4.0 | | |
| Learning profile | general academic profile | | Assessment form | | exam | | |
| Conducting unit | Division of Materials Science and Technology -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology -> Wydział Politechniki Gdańskiej | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | | dr inż. Michał Landowski | | | | |
| | 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 | 15.0 | 0.0 | 60 |
| | 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 | 60 | | 4.0 | | 36.0 | 100 |
| Subject objectives | The aim of the course is to familiarize students with the basic issues related to heat treatment and plastic working of construction materials. | | | | | | |
| Learning outcomes | Course outcome | | Subject outcome | | Method of verification | | |
| | [K7_W13] explains the main principles of individual and teamwork organization, including various forms of entrepreneurship utilizing knowledge from the field of engineering and technical sciences and disciplines relevant to the course of study | | As part of the project, the student works in a team to solve a technical problem. | | [SW3] Assessment of knowledge contained in written work and projects | | |
| | [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 describe the operation of processing equipment. | | [SW3] Assessment of knowledge contained in written work and projects | | |
| | [K7_W04] demonstrates knowledge covering selected topics of advanced specific knowledge, in particular methods, techniques, tools specific to Mechanics and Mechanical Engineering processes, systems and equipment | | The student demonstrates knowledge about issues of heat treatment and forming. | | [SW1] Assessment of factual knowledge | | |
| | [K7_U04] creatively designs or modifies devices, processes or systems specific to Mechanics and Mechanical Engineering, using computer-aided design systems in the form of technical documentation, taking into account aspects of economic analysis, using appropriate tools and techniques | | The student designs tool elements for forming processes. | | [SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject | | |

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| Subject contents | Lecture: Design and modeling of thermo-chemical treatment processes in relation to plastics iron-based metal. Diffusion saturation with non-metallic elements. Nitriding conventional and ionic, selective nitriding. Conventional carburizing, high temperature and ionic. Diffusion saturation with metallic elements. Machining defects thermochemical. Basics of plastic working. Plastic deformation of metals. The influence of plastic deformation on the properties of metals. Classification of plastic working processes. Rolling of metals. Rolling of sections. Rolling of pipes. Forging and ironing. Forging and pressing machines. Open-die forging. Die forging. Classification of forgings. Drawing and extrusion. Characteristics of drawing and extrusion processes. Drawing machines. Extrusion presses. Technology for drawing bars, wires and pipes. Technology of extrusion processes. Classification of pressing processes. Metal cutting. Metal bending. Multiple and simultaneous pressing Project: Design of the OC process, Design of the plastic forming process Laboratory: Hardening, tempering, thermo-chemical treatment, plastic forming processes | | |
| Prerequisites and co-requisites | | | |
| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
| | Exam | 50.0% | 30.0% |
| | Project | 50.0% | 40.0% |
| | Laboratory | 50.0% | 30.0% |
| Recommended reading | Basic literature | 1. Burakowski T., Roliński E., Wierzchoń T.: Inżynieria powierzchni metali. WPW, Warszawa 1992. 2. Jarzębski M.Z.: Dyfuzja w metalach. Śląsk. Katowice 1976. 3. Praca zbiorowa.: Metaloznawstwo. Skrypt Politechniki Gdańskiej, Gdańsk 1991. 4. Poradnik inżyniera. Obróbka cieplna stopów żelaza. WNT, Warszawa 1977. | |
| | Supplementary literature | 1. Askeland, D, Phules P.: The science and engineering of materials. Thomson 2008 | |
| | eResources addresses | | |
| Example issues/ example questions/ tasks being completed | 1. Quenching and tempering process 2. Annealing 3. Design of the heat treatment process 4. Design of the plastic forming process | | |
| Work placement | Not applicable | | |

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