GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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| Subject name and code | Manufacturing techniques, PG_00055442 | | |
| Field of study | Mechatronics | | |
| Date of commencement of studies | October 2026 | Academic year of realisation of subject | 2027/2028 |
| Education level | first-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 | 2 | Language of instruction | Polish |
| Semester of study | 4 | 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 -> Faculties of Gdańsk University of Technology | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Michał Landowski | |
| | Teachers | | |

**Lesson types**

| 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 | 2.0 | 28.0 | 75 |

**Subject objectives**

The aim of the course is to provide students with basic knowledge in the field of the main manufacturing techniques of metal elements. The student learns about the issues related to foundry, forming, machining and welding.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_W08] knows and understands design and production processes of elements and simple mechatronic devices | The student is able to choose the technique of manufacturing elements of mechatronic devices. Can assess the durability of a trapezoidal thread made by machining and forming processing. | [SW3] Assessment of knowledge contained in written work and projects<br>[SW1] Assessment of factual knowledge |
| [K6_U11] is able to evaluate usefulness of methods and tools to solve simple, practical engineering task, distinctive for mechatronics and is able to choose the proper method and tools | The student learns the methods of quality assessment, the risk of material defects and on the basis of these data is able to choose the appropriate technological solution. | [SU3] Assessment of ability to use knowledge gained from the subject<br>[SU2] Assessment of ability to analyse information |
| [K6_U05] is able to use properly chosen tools to compare design solutions of elements and mechatronics systems according to given application and economic criteria (e.g. power demand, speed, costs) | The student knows the various technologies of manufacturing metal elements. The student is able to select the appropriate manufacturing technology for a specific application. | [SU5] Assessment of ability to present the results of task<br>[SU3] Assessment of ability to use knowledge gained from the subject |
| [K6_U08] is able - according to a given specification - design, calculate costs and develop a simple device, object, system or process typical for mechatronics, using appropriate methods, techniques and tools | The student knows the basic advantages and disadvantages of individual techniques for the production of metal elements. Is able to assess the appropriateness of the use of a specific technology for a given application. | [SU3] Assessment of ability to use knowledge gained from the subject<br>[SU1] Assessment of task fulfilment |

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| Subject contents | Course content – lecture<br><br>LECTURE: Geometric and kinematic parameters of cutting. Tool and workpiece movements. The geometry of the blades in the tool and working system, the geometry of the cut layer. The phenomenon of chip formation and types of chips. Heat and temperature in the cutting zone. Cooling and lubricating agents. Wear of cutting tools. Cutting force and power. Tool materials and rules for their selection. Basic machining methods: turning, milling, drilling, countersinking, reaming. Metallurgy of metals and their alloys. Pig iron metallurgy. Steel metallurgy. Steel smelting in electric furnaces. Cast iron metallurgy. Casting manufacturing methods. Manufacturing of sand castings by hand and machine. Molding sands. Automation and mechanization of forming and producing cores. Special methods of making molds and cores. Special casting methods. Basics of plastic working. Plastic deformation of metals. Influence of plastic deformation on the properties of metals. Classification of plastic working processes. Metal rolling. Rolling of sections. Rolling of pipes. Forging and ironing. Forging and pressing machines. Open-die forging. Die forging. Characteristics of drawing and extrusion processes. Technology for drawing bars, wires and pipes. Technology of extrusion processes. Pressing of non-unfolding coatings. Classification of pressing processes. Metal cutting. Metal bending. Classification of welding processes. Definition of weldability. Basic and additional materials for welding. Gas welding. MMA welding. Submerged arc welding under flux. TIG welding. Shielding gases. Gas-shielded welding with the MIG / MAG method. Laser, plasma and electron welding. Resistance welding, soldering.LABORATORY: Cutting materials and cutting machines. Machining on lathes. Machining on drills. Machining on milling machines. Machining of gears. Machining on grinders. Processing on planers and slotters. Forming machines. Influence of forming on the mechanical properties of metals. Manual welding with coated electrodes, automatic submerged arc welding. Welding in protective gas shields. Resistance welding, soldering. |
| Prerequisites and co-requisites | |
| Assessment methods and criteria | |

| Subject passing criteria | Passing threshold | Percentage of the final grade |
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| Exam | 56.0% | 60.0% |
| Laboratory | 56.0% | 40.0% |

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| Recommended reading | Basic literature | Olszak W. Obróbka skrawaniem. WNT Warszawa 2008.Podręcznik szkoleniowy. Obróbka metali skrawaniem . Sandvik Coromant 2017.Storch B.: Podstawy obróbki skrawaniem. Wyd. Politechniki Koszalińskiej, Koszalin 2001.Cichosz P.: Narzędzia skrawające. WNT, Warszawa 2006.Bartosiewicz J.: Obróbka skrawaniem i elementy obrabiarek. Wyd. Poilt. Gda. Gdańsk 1997Kosowski A.: Zarys odlewnictwa. Wyd. AGH KrakówMuszyński Z.: Zarys technologii metali PWN, WarszawaSzweycer M., Nadolska D.: Metalurgia i odlewnictwo. Poznań: Wyd. Politechniki PoznańskiejSkoblik R., Wilczewski L.: Technologia Metali. Laboratorium. Klimpel A.: Technologia spawania i cięcia metali. WNT. Warszawa 1999. Walczak W. (red.): Spawalnictwo. Ćwiczenia laboratoryjne. Wydawnictwo Politechniki Gdańskiej. Gdańsk, 2000. Butnicki S.: Spawalnośc i kruchość stali. Wydawnictwo WNT. Warszawa 1991. Pilarczyk J., Pilarczyk J.: Spawanie i napawanie elektryczne metali. Wydawnictwo Śląsk, Katowice 1996. |
| | Supplementary literature | Jemielniak K.: Obróbka skrawaniem. Ofic. Wyd. Polit. Warsz. Warszawa1998.Grzesik W.: Podstawy skrawania materiałów metalowych. WNT warszawa 1998.Materiały pomocnicze dostępne na stronach producentów narzędzi np. Seco Tools i inMurza-Mucha K.: Techniki wytwarzania. Odlewnictwo. PWN Warszawa Dobrucki W.: Zarys obróbki plastycznej metali. Śląsk |
| | eResources addresses | |

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| Example issues/ example questions/ tasks being completed | Describe the converter process.List the types of extrusion.Influence of plastic working on mechanical properties. |
| Practical activites within the subject | Not applicable |

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