GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Advanced measuring systems, PG_00064857 | | |
| Field of study | Zaawansowane systemy pomiarowe | | |
| 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<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 | 1 | Language of instruction | Polish |
| Semester of study | 2 | ECTS credits | 2.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Division of Manufacturing and Production Engineering -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology -> Wydziały Politechniki Gdańskiej | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Aleksandra Mirowska | |
| | Teachers | dr inż. Mateusz Wrzochal<br>dr inż. Michał Dobrzyński | |

**Lesson types**

| 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 | 5.0 | 15.0 | 50 |

**Subject objectives**

The aim of the course is to introduce students to modern measurement systems, including CMM, confocal and interferometric microscopy, and the use of these methods based on the geometric specifications of a product.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K7_W03] demonstrates a well-structured and theoretically grounded knowledge of the key issues in Mechanical Engineering to enable the design and diagnosis of mechanical systems, processes and devices | The student is able to design a quality control process for complex mechanical components and interpret measurement results in terms of the manufacturing technology used for machine parts. | [SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym |
| [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 | The student is able to evaluate existing technical solutions in plants and understands the need to adapt technology to changing trends and needs. | [SW1] Ocena wiedzy faktograficznej<br>[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym |
| [K7_U03] plans and carries out experimental investigations to determine the parameters of devices, processes or systems in the field of Mechanical Engineering and Mechanical Engineering, appropriately selects methods, techniques and tools, interprets results and estimates measurement errors | The student has extensive knowledge of advanced measurement systems, is able to select the appropriate measurement methods related to the task problem, and correctly analyzes the results obtained. | [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu<br>[SU5] Ocena umiejętności zaprezentowania wyników realizacji zadania |

<table>
<tr><td>Subject contents</td><td>The essence of coordinate measurements, the basics of CMM machine construction and their parameters, measuring systems, measuring heads and methods of determining their accuracy, non-contact measuring heads, measurement procedures and standard computer software, Production measuring machines, accuracy of measuring machines and methods of determining it, coordinate measuring arms, industrial computed tomography, confocal microscopy, interferometric microscopy.<br>Geometric model, shape tolerances, datums, datum elements and mappings of datum elements, methods for determining measurement datums, tolerances of direction, position, shape of a specified contour or shape of a specified surface with or without a datum, spatial description of surface roughness.<br>Functional selection, designation, and interpretation of geometric tolerances. Tolerances of selected complex geometric elements.<br>Measurement of various geometric features using coordinate measuring techniques, planning measurements using various techniques, determining the geometric structure of surfaces using confocal and interferometric techniques.<br>Use of coordinate measuring machines to control dimensional and geometric deviations. Differences between EN-ISO standards and other standards.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Fundamentals of metrology, technical drawing, manufacturing techniques</td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td></td><td>60.0%</td><td>40.0%</td></tr><tr><td></td><td>60.0%</td><td>60.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>1. E. Ratajczyk: Współrzędnościowa technika pomiarowa. OWPW,Warszawa 2005<br><br>2. Piotr Kiszka, Piotr Niesłony, Wit Grzesik: Programowanie obrabiarek CNC. PWN Warszawa 2020.<br><br>3. Hybrydowe metody obróbki materiałów konstrukcyjnych. PWN Warszawa 2021.<br><br>4. Wacław Skoczyński: Sensory w obrabiarkach CNC. PWN Warszawa 2018.<br><br>5. Adamczak, S., Makieła, W. (2014). Metrologia w budowie maszyn: zadania z rozwiązaniami. Wydawnictwa NaukowoTechniczne.</td></tr><tr><td>Supplementary literature</td><td>Selected journals available online in the databases of Gdańsk University of Technology, concerning modern metrology, e.g.:<br><br>1. Measurement - https://www.sciencedirect.com/journal/ measurement<br><br>2. Metrology - https://www.mdpi.com/journal/metrology</td></tr><tr><td>eResources addresses</td><td></td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. Present the general concept of external and internal dimensions.<br>2. Specify the shape and position tolerances for the mechanical component presented.<br>3. Select the technology for manufacturing the part for the assumed dimensional and shape tolerances.<br>4. Based on the measurement data from the coordinate measuring machine, select the possible technologies used to manufacture the part.<br>5. Characterize the parameters used in the spatial description of surface roughness.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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