GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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| Subject name and code | , PG_00056112 | | |
| Field of study | Mechatronics | | |
| Date of commencement of studies | October 2021 | Academic year of realisation of subject | 2023/2024 |
| Education level | first-cycle studies | Subject group | |
| Mode of study | Full-time studies | Mode of delivery | at the university |
| Year of study | 3 | Language of instruction | Polish<br>Not applicable |
| Semester of study | 5 | ECTS credits | 2.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| 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. Daniel Chuchała | |
| | Teachers | dr hab. inż. Daniel Chuchała | |

**Lesson types and methods of instruction**

| 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 | 0.0 | 0.0 | 30 |

**Subject objectives**

Acquainting with the most commonly used varieties of control systems of modern numerically controlled machines and their programming languages. Understanding the impact of the basics of CNC programming of commercial control systems.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_W10] has a basic knowledge about development trends in terms of engineering and technical sciences and scientific disciplines: Mechanical Engineering, Automation, Electronics and Electrical Engineering, adequate for Mechatronics curse | Student knows the basic control systems of CNC machine tools, their possibilities and limitations | [SW1] Assessment of factual knowledge |
| [K6_U05] is able to use properly choosen tools to compare design solutions of elements and mechatronics systems according to given application and economic crtierions (e.g. power demand, speed, costs) | Be able to verify that the machine tool has the correct power of main and feed drives to carry out the machining process | [SU2] Assessment of ability to analyse information<br>[SU3] Assessment of ability to use knowledge gained from the subject |
| [K6_U02] is able to elaborate on specific mechatronic topics as well as topics from engineering and technical sciences and disciplines such as Mechanical Engineering, Automation, Electronics and Electrical Engineering | Can assign CNC programming commands to control individual drive components of machine tools | [SU2] Assessment of ability to analyse information<br>[SU3] Assessment of ability to use knowledge gained from the subject |

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| Subject contents | LECTURE: Structure and fundamentals of operation of selected CNC machine tools. Basic control systems of commercial CNC machine tools and their programming languages. Design of CNC machining programmes. Basic programming in ISO code (G code). Fundamentals of programming in Heidenhain. Use of special cycles. Contour programming.<br><br>PRACTICAL EXERCISES:<br><br>Programming of CNC machine tools in Heidenhain code for milling processes of a flat workpiece with holes. Programming of CNC machine tools in Heidenhain code for milling processes of circular pockets and fine holes. Programming of CNC machine tools in Heidenhain code for milling of square pockets. Programming of CNC machine tools in Heidenhain code for complex internal and external contours. CNC programming of machine tools in ISO-G code for shaft type parts. CNC programming of machine tools in ISO-G code for body-type parts. Special cycles in controllers based on ISO-G and Heidenhain code. |
| Prerequisites and co-requisites | |

Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Laboratory | 100.0% | 30.0% |
| Lecture | 56.0% | 70.0% |

Recommended reading

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| Basic literature | 1. Grzesik W., NIesłony P., Kiszka P.: Programowanie obrabiarek CNC. PWN Warszawa, 2020.2. Honczarenko J.: Obrabiarki sterowane numerycznie. WNT Warszawa 20083. Users Manual HEIDENHAIN Conversational TNC 640, 4, 20124. Lathe Operators Manual. December 2018, English, Original Instructions, Haas Automation Inc., U.S.A. HaasCNC.com |
| Supplementary literature | 1. Kaushik Kumar, Chikesh Ranjan, J. Paulo Davim. CNC Programming for Machining. Springer International Publishing, 1st Edition, 2020, p.136. DOI: 10.1007/978-3-030-41279-1<br><br>2. Fundamentals of CNC Machining. A Practical Guide for Beginners. Compliments of Autodesk, Inc. USA, 2014<br><br>3. Graham T. Smith. CNC Machining Technology. Volume 3: Part Programming Techniques. Springer-Verlag London, 1993, p. 137. DOI: 10.1007/978-1-4471-1748-3 |
| eResources addresses | Adresy na platformie eNauczanie:<br>Systemy obrabiarek sterowalnych numerycznie, W/L , Mechatronika, I stop., sem. 05, Zima 23/24 (PG_00056112) - Moodle ID: 31306<br>https://enauczanie.pg.edu.pl/moodle/course/view.php?id=31306 |

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| Example issues/ example questions/ tasks being completed | 1. Linear interpolation in G-Code.2. Circular interpolation in Heidenhain. |
| Work placement | Not applicable |