GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

| | | | |
|---|---|---|---|
| Subject name and code | Automatic and control engineering, PG_00044602 | | |
| Field of study | Transport | | |
| Date of commencement of studies | October 2022 | Academic year of realisation of subject | 2023/2024 |
| 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 | assessment |
| Conducting unit | Department of Electrical Engineering of Transport -> Faculty of Electrical and Control Engineering | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Sławomir Judek | |
| | Teachers | dr inż. Sławomir Judek | |

**Lesson types and methods of instruction**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 30.0 | 15.0 | 0.0 | 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 | 5.0 | 25.0 | 75 |

**Subject objectives**

Understanding of automatic control systems and control devices. The acquisition of the ability to solve simple problems of automation and control.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_U01] able to use technical documentation and literature, databases and other sources of transport related information; able to interpret information, make logical links and formulate opinions and conclusions based on the above | Able to use the technical literature on automation in the transport applications. | [SU3] Assessment of ability to use knowledge gained from the subject |
| [K6_W06] has basic knowledge of economic processes, transport economics and transport management | Student describes dynamical systems, electrical, mechanical, electromechanical and liquid-level. Formulate mathematical models of linear dynamical systems in terms of continuous time and frequency domain. Determines the stability of linear dynamical systems. Chooses the control equipment to the set of application.-, including transport. | [SW1] Assessment of factual knowledge |

**Subject contents**

LECTURE Basic concepts of automation. Mathematical modeling of linear one-dimensional description of dynamic systems. Examples of control systems. The Laplace transform. Models of dynamic systems: electrical, mechanical, electromechanical and liquid-level. Continuous and discrete of control systems. Block diagrams. Linear feedback control systems functions, elements and structure, mathematical description, transfer functions, frequency domain characteristics, stability. Mathematical conditions of stability control system - stability criterion. PID controllers, tuning rules. Steady-state errors, dynamic errors, feedback control systems synthesis. Analysis and design of control systems with Matlab. Example problems and solutions. Controllability and observability. Introduction to nonlinear feedback control systems. Digital control algorithms. Equipments and components automation systems. Programmable control systems, computer aided control. upervisory Control And Data Acquisition SCADA. Intelligent Transport Systems. TUTORIALS Models of dynamic systems: electrical, mechanical, electromechanical, liquid-level systems. Mathematical models of continuous linear dynamic systems: time models (differential equations, state variables), models of frequency (transfer function, spectral transmittance), the basic dynamic units (inertialess, integrating, differential, inertial first and second row). The stability of dynamical systems: basic concepts, the study of stability, stability criteria. Programmable logic controllers PLC.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Basic knowledge of higher mathematics and physics.</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Practical exercise</td><td>60.0%</td><td>30.0%</td></tr>
<tr><td>Midterm colloquium</td><td>60.0%</td><td>70.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">Kowal J.: Podstawy automatyki -tom 1. Kraków: AGH, Uczelniane Wydawnictwa Naukowo-dydaktyczne, 2006. Kowal J.: Podstawy automatyki - tom 2. Kraków: AGH, Uczelniane Wydawnictwa Naukowo-dydaktyczne, 2007. Kaczorek T., Dzieliński A., Dąbrowski W., Łopatka R.: Podstawy teorii sterowania. Warszawa: WNT, 2005.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">Domachowski Z.: Automatyka i Robotyka. Podstawy. Gdańsk: Wydawnictwo PG, 2003.</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:<br>Automatyka i sterowanie [2023/2024], stud. I stopnia, Transport, sem. 4 - Moodle ID: 36214<br>https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36214</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">1. What is transmittance? List its most important properties.<br>2. Specify the principle of selection of the PID controller. Draw a block diagram of the control system.<br>3. Draw and describe of the block diagram of programmable controller PLC.</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
</table>