GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Basics of Digital Techniques, PG_00038091 | | |
| Field of study | Automation, Robotics and Control Systems | | |
| Date of commencement of studies | October 2023 | Academic year of realisation of subject | 2024/2025 |
| Education level | first-cycle studies | Subject group | |
| Mode of study | Full-time studies | Mode of delivery | at the university |
| Year of study | 2 | Language of instruction | Polish |
| Semester of study | 3 | ECTS credits | 5.0 |
| Learning profile | general academic profile | Assessment form | exam |
| Conducting unit | Department of Control Engineering -> Faculty of Electrical and Control Engineering | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Andrzej Kopczyński | |
| | 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 | 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 | 7.0 | 73.0 | 125 |

**Subject objectives**

Knowledge of number systems, binary cods, logic functions and elements. Acquire skills of synthesis of combination and simple sequential synchronous circuits.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_K02] can work in a group taking on different roles in it | A team of students assembles the system and connects power supply and measuring devices. Measurements are carried out as a team - setting parameters, operating the meter and recording the results. | [SK5] Assessment of ability to solve problems that arise in practice<br>[SK1] Assessment of group work skills |
| [K6_W01] has basic knowledge in the field of mathematics including algebra, geometry, mathematical analysis, probabilistics, numerical methods - necessary to describe and analyze automation and robotics systems | Based on a schematic diagram, the student is able to describe the operation and design simple digital automation systems. | [SW3] Assessment of knowledge contained in written work and projects |
| [K6_U01] can obtain information from literature, databases and other sources; integrate the information obtained, interpret it and draw conclusions, formulate and justify opinions | The student is able to use the literature on the topic. | [SU2] Assessment of ability to analyse information |

**Subject contents**

**Lecture:** Number systems and cods. Arytmethics of binary numbers. Boolean algebra. Boolean functions and their representation. Minimisation of Boolean functions. Classification of digital circuits and their mathematical description. Elements of switching circuits: contact, liquid, semiconductors, logical gates. Classical combination circuits synthesis. Multiplexers, demultiplexers summing circuits and memories, their application at combination circuits synthesis. Encoders, decoders and transcoders - transformation of digital information representation. Flip-flops, registers and counters. Generators and time dependent circuits. Synchronous and asynchronous sequential circuits synthesis bases. Description of Mealy and Moore digital automata - tables of state transitions and outputs, graphs. Synchronous sequential circuits synthesis using D Flip flops. Design of switching circuits using blocks and functional units. Simple micro-programmable circuits.

**Laboratory:** Investigation of gates and Flip flop parameters. Counters, decoders and multiplexers. Combination circuits design using logical gates. Combination circuits design using multiplexers. Design and realisation of synchronous sequential circuits. Design of simple micro-programmable circuits.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="2">Knowledge of an electronic and measure bases.</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Written exam</td><td>60.0%</td><td>60.0%</td></tr>
<tr><td>Practical exercise</td><td>60.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. Skorupski A.: Podstawy techniki cyfrowej, WKŁ, Warszawa, 2001.<br>2. Pieńkoś J., Turczyński J: Układy scalone TTL w systemach cyfrowych, WKŁ, Warszawa, 1986.<br>3. Kalisz J.: Cyfrowe układy scalone w technice systemowej, WMON, Warszawa, 1977.<br>4. Tyszner J., Mrugalski G., Pogiel A., Czysz D.: Technika cyfrowa - Zbiór zadań z rozwiązaniami, WBTC, Legionowo, 2016.</td></tr>
<tr><td>Supplementary literature</td><td>1. Saal W.: Układy scalone serii UCA64/UCY74, parametry i zastosowania, WKŁ, Warszawa 1990.</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Methods of kombinational circuits description.<br><br>What kind of methods of Boolean function minimalization do you know?<br><br>Desctibe Mealy automata.</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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