GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Fundamentals of electronic, PG_00058341 | | |
| Field of study | Hydrogen Technologies and Electromobility | | |
| Date of commencement of studies | October 2025 | Academic year of realisation of subject | 2025/2026 |
| 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 | 1 | Language of instruction | Polish |
| Semester of study | 2 | ECTS credits | 3.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Department of Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering -> Wydziały Politechniki Gdańskiej | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. inż. Marek Turzyński | |
| | Teachers | dr hab. inż. Arkadiusz Lewicki<br>prof. dr hab. inż. Jarosław Guziński<br>prof. dr hab. inż. Piotr Chrzan<br>dr hab. inż. Jarosław Łuszcz<br>dr hab. inż. Marek Turzyński | |

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 | 5.0 | 25.0 | 75 |

Subject objectives

The aim of the course is to provide the student with knowledge of basic electronic components and systems used for hydrogen technology and electromobility. The student will learn the principles of operation of elementary semiconductor devices and the operational properties of basic electronic systems. In addition, the student will acquire the skills of independent analysis of simple electronic systems.

Learning outcomes

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_K04] can react in abnormal and emergency situations, threats to health and life when using automation and robotics components and systems in hydrogen devices and installations | Performs measurements of electronic systems while maintaining the required safety principles. | [SK1] Assessment of group work skills<br>[SK3] Assessment of ability to organize work<br>[SK5] Assessment of ability to solve problems that arise in practice |

Subject contents

Lectures: Laboratory equipment: multimeters, oscilloscopes, measuring probes. Passive electronic components: resistors, capacitors,inductors. Semiconductors: conduction processes, doped semiconductors, pn junction, ms junction. Diodes: switching, rectifier, Schottky, Zener, photodiodes, light emitting diodes, solar panels. Transistors bipolar and unipolar: structure, operation principles, electrical data and characteristics. Optoelectronic components. Amplifiers: technical data, characteristics, influence of negative feedback. Differential and operational amplifiers. Filters. Power amplifiers. Generators. Power supply units. Phase lock loop. Digital circuit technologies.

Laboratory: 1) Semiconductor diodes. 2) Unipolar transistor. 3) Photovoltaic cells. 4) Negative feedback amplifier and comparator, univibrator. 5) Voltage-tuned generator and pase-locked loop. 6) Active filters.

Prerequisites and co-requisites

Fundamentals of physics. Basic circuit theory.

<table>
<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>Practical exercises</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Written test</td><td>50.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>Opolski A.: Elektronika dla elektryków. Wydawnictwo PG, Pomorska Biblioteka Cyfrowa, 2008.<br>Opolski A. (red.): Elektronika dla elektryków - Laboratorium. Wydawnictwo PG. Gdańsk 2000.<br>Schubert T.F, Kim E.:Fundamentals of Electronics: Book 1 Electronic Devices and Circuit Applications, Springer 2015.<br>Bartlett J.:Electronics for Beginners: A Practical Introduction to Schematics, Circuits, and Microcontrollers, Apress 2020.</td></tr>
<tr><td>Supplementary literature</td><td>Hennel J.: Podstawy elektroniki półprzewodnikowej. WNT Warszawa 2003.<br>Boksa J.: Analogowe układy elektroniczne. Wydawnictwo BTC Warszawa 2007.<br>Filipkowski A.: Układy elektroniczne analogowe i cyfrowe. WNT Warszawa 2006.<br>Horowitz P, Hill W.: Sztuka elektroniki, Wydawnictwa Komunikacji i Łączności WKŁ, 2018.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Field-effect transistors: structure, classification, graphic symbols and current-voltage output characteristics<br>Inverting amplifier: circuit, transfer characteristic, amplification factor.</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
</table>

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