# GDAŃSK UNIVERSITY OF TECHNOLOGY

## Subject card

| Subject name and code | Digital Signal Processing, PG_00038187 | | |
|---|---|---|---|
| Field of study | Automation, Robotics and Control Systems | | |
| Date of commencement of studies | February 2024 | Academic year of realisation of subject | 2023/2024 |
| Education level | second-cycle studies | Subject group | |
| Mode of study | Full-time studies | Mode of delivery | at the university |
| Year of study | 1 | Language of instruction | Polish |
| Semester of study | 1 | ECTS credits | 3.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Department of Metrology and Information Systems -> Faculty of Electrical and Control Engineering | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Ariel Dzwonkowski | |
| | Teachers | dr inż. Ariel Dzwonkowski  dr hab. inż. Dariusz Świsulski | |

| 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 introduce students to the subject of digital signal processing. |
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| Learning outcomes | Course outcome | Subject outcome | Method of verification |
|---|---|---|---|
| | K7_W03 | The student knows the types of signals and their characteristics. The student knows the methods of frequency analysis of signals. The student knows the types of filters and the methods of their design. The student knows the algorithms for processing multidimensional signals. | [SW1] Assessment of factual knowledge |
| | K7_U07 | The student is able to evaluate the parameters of the signals. The student knows how to apply algorithms of frequency analysis. The student is able to design filters and verify their correct operation. The student is able to analyze multivariate signals. | [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools |

| Subject contents | **LECTURE** The types of signals. Processing A / D and D / A circuits sample & hold S & H. Aliasing. Continuous and Discrete Fourier Transform. Correlation and autocorrelation signals. Filtration signals. Filters of finite and infinite impulse response - how it works, musical, design. Hilbert transform. STFT and wavelet analysis, the basis and application. Two-dimensional signal processing. Examples of applications of digital signal processing. **LABORATORY** Introduction to Digital Signal Processing in LabVIEW. Sampling, quantization, signal reconstruction, aliasing, spectral analysis. Filters of finite and infinite impulse response. Adaptive filtering. Time-frequency analysis (STFT, wavelet analysis). |
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| Prerequisites and co-requisites | Basic knowledge of mathematical analysis. |
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| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|---|
| | Laboratory - Practical exercise | 60.0% | 40.0% |
| | Lecture - midterm colloquium | 60.0% | 60.0% |

| Recommended reading | Basic literature | 1. Zieliński T. P.: Cyfrowe przetwarzanie sygnałów. Od teorii do zastosowań. Wydawnictwa Komunikacji i Łączności. Warszawa 2005.<br>2. Marven C., Ewers G.: Zarys cyfrowego przetwarzania sygnałów. Wydawnictwa Komunikacji i Łączności. Warszawa 1999.<br>3. Lyons R. G.: Wprowadzenie do cyfrowego przetwarzania sygnałów. Wydawnictwa Komunikacji i Łączności. Warszawa 2006. |
| | Supplementary literature | 1. Kehtarnavaz N., Kim N.: Digital Signal Processing. System-Level Design Using LabVIEW. Elsevier 2005.<br>2. Clark C. L.: Digital Signal Processing and Digital Communications. McGraw-Hill 2005.<br>3. Haykin S.: Communication Systems. John Wiley & Sons 2000.<br>4. Świsulski D.: Komputerowa technika pomiarowa. Oprogramowanie wirtualnych przyrządów pomiarowych w LabVIEW. Agenda Wydawnicza PAK, Warszawa 2005. |
| | eResources addresses | Adresy na platformie eNauczanie:<br><br>CYFROWE PRZETWARZANIE SYGNAŁÓW [2023/24] - Moodle ID: 36491<br>https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36491 |
| Example issues/ example questions/ tasks being completed | 1. How are they made    and what they are sample & hold circuits?<br><br>2. What is aliasing?<br><br>3. Types of digital filters.<br><br>4 What is the Fourier transform for discrete signals?<br><br>5. What is the STFT analysis?<br><br>6. Describe the properties of parametric Kaiser window.<br><br>7. Introduce an example of practical use of digital signal processing. | |
| Work placement | Not applicable | |