GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Biosignal measurements and processing, PG_00053359 | | |
| Field of study | Biomedical Engineering | | |
| Date of commencement of studies | February 2026 | Academic year of realisation of subject | 2025/2026 |
| Education level | second-cycle studies | Subject group | Optional subject group<br>Specialty subject group<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 | 1 | ECTS credits | 3.0 |
| Learning profile | general academic profile | Assessment form | exam |
| Conducting unit | Department Of Biomedical Engineering -> Faculty Of Electronics Telecommunications And Informatics -> Wydziały Politechniki Gdańskiej | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | prof. dr hab. inż. Jerzy Wtorek | |
| | Teachers | prof. dr hab. inż. Jerzy Wtorek<br>dr Tomasz Neumann<br>dr inż. Adam Bujnowski<br>mgr inż. Ignacy Rogoń | |

| 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 | 4.0 | 26.0 | 75 |

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| Subject objectives | To familiarize students with the methods of measurement and processing on selected examples of biosignals. |

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K7_W02] knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study | The student knows and understands the basics of physiology and pathology enabling the assignment and use of selected laws and physical phenomena to describe selected biosignals and to understand the relationships between them. | [SW1] Assessment of factual knowledge |
| [K7_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study by: - appropriate selection of source information and its critical analysis, synthesis, creative interpretation and presentation, - application of appropriate methods and tools | The student will design and implement a procedure to support advanced methods of biosignal analysis. | [SU3] Assessment of ability to use knowledge gained from the subject |
| [K7_U02] can perform tasks related to the field of study as well as formulate and solve problems applying recent knowledge of physics and other areas of science | The student will design and implement a solution that uses processing methods to automate the analysis of biosignals to achieve a specific goal. | [SU1] Assessment of task fulfilment |
| [K7_W01] knows and understands, to an increased extent, mathematics to the extent necessary to formulate and solve complex issues related to the field of study | The student is able to describe, using a mathematical language, a selected problem in the field of biosignals in terms of both measurement and processing, including extraction of features and classification. | [SW1] Assessment of factual knowledge |

**Subject contents**

Basic concepts, Classification of signals, definition of biosignals. Metrological problems. Electrocardiography - signal modeling. Custom electrocardiography. Derivative electrocardiographic signals. Electrocardiography - methods of processing, extraction and classification. Electrocardiography - new applications. Electromyography - signal source, mathematical model. Electromyography - methods of processing, analysis and classification. Electromyography - applications (prosthetics, control, assessment of fatigue, gait ...)

**Prerequisites and co-requisites**

Knowledge of Anatomy, Physics, Mathematics at the 1st degree of engineering studies

**Assessment methods and criteria**

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Lecture | 60.0% | 40.0% |
| Laboratory | 60.0% | 60.0% |

**Recommended reading**

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|---|---|
| Basic literature | Gari D. Clifford, Francisco Azuaje, Patrick E. McSharry, Advanced Methods and Tools for ECG Data Analysis, artechhouse.com |
| Supplementary literature | Leif Sornmo, Pablo Laguna, BIOELECTRICAL SIGNAL PROCESSING IN CARDIAC AND NEUROLOGICAL APPLICATIONS, Elsevier ACADEMIC PRESS |
| eResources addresses | Adresy na platformie eNauczanie: |

**Example issues/ example questions/ tasks being completed**

Design a filter to remove mains interference from the EKG/EMG signal

**Work placement**

Not applicable

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