# GDAŃSK UNIVERSITY OF TECHNOLOGY

## Subject card

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| Subject name and code | Basics of Biometrics, PG_00049298 |
| Field of study | Biomedical Engineering |

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| Date of commencement of studies | October 2025 | Academic year of realisation of subject | 2028/2029 |
| Education level | first-cycle studies | Subject group | Optional 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 | 4 | Language of instruction | Polish |
| Semester of study | 7 | ECTS credits | 2.0 |
| Learning profile | general academic profile | Assessment form | assessment |

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| Conducting unit | Department Of Biomedical Engineering -> Faculty Of Electronics Telecommunications And Informatics -> Wydziały Politechniki Gdańskiej |

| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. inż. Mariusz Kaczmarek |
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| | Teachers | dr hab. inż. Mariusz Kaczmarek |

| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|---|
| | Number of study hours | 15.0 | 0.0 | 0.0 | 15.0 | 0.0 | 30 |
| | 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 |
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| | Number of study hours | 30 | 2.0 | 18.0 | 50 |

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| Subject objectives | The aim of the course is to acquaint students with the basics of biometrics and methods for its use. An important objective is to present detailed practical use biopomiarów and analysis to apply for identification of persons or verify his identity. It is assumed that the reported content of education in this subject should encourage self-awareness utilizing available within the subject elements of distance education and other electronic resources. |

| Learning outcomes | Course outcome | Subject outcome | Method of verification |
|---|---|---|---|
| | [K6_W51] Knows and understands, to an advanced extent, selected aspects of biomedical diagnostics and human anatomy and physiology, constituting general knowledge related to the field of study | He is able to choose the measurement method for the recorded life signal.<br>Is able to assess the usefulness of the measurement method for the needs of biometrics. | [SW1] Assessment of factual knowledge |
| | [K6_U08] while identifying and formulating specifications of engineering tasks related to the field of study and solving these tasks, can:n- apply analytical, simulation and experimental methods,n- notice their systemic and non-technical aspects,n- make a preliminary economic assessment of suggested solutions and engineering work n | It can optimize resources and measurement methods for a specific solution. | [SU2] Assessment of ability to analyse information<br>[SW1] Assessment of factual knowledge |
| | [K6_W02] knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study | He can assess the suitability of measurement method for biometrics. | [SU2] Assessment of ability to analyse information |

| Subject contents | 1. Introduction. Basic concepts. Identification and verification of identity,<br>2. Biometric systems.<br>3. Concurrency in distributed processing.<br>4. Physical descriptors - the collection and analysis of fingerprint<br>5. Physical descriptors - the collection and analysis of facial features<br>6. Physical descriptors - the collection and analysis of facial features - features topology<br>7. Physical descriptors - collection and analysis of facial features using thermography<br>8. Physical descriptors - collection and analysis of the characteristics of the hand (geometry, thermography)<br>9. Physical descriptors - the collection and analysis of DNA<br>10. Descriptors behavioral traits - the collection and analysis of posture and movement (walking, running)<br>11. Descriptors behavioral traits - the collection and analysis of voice features<br>12. Classification of data in biometrics<br>13. Measures of the quality of the identification / verification. Evaluation of usability methods.<br>14. Multimodal biometrics.<br>15. Typical applications of biometrics (healthcare, military, border guards, and others). |
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| Prerequisites<br>and co-requisites | **Information Technology:**<br><br>1. Launch an application<br><br>1.1. Running applications from the command line (terminal)<br><br>1.2. Launching the application from the operating system GUI<br><br>2. Computer Configuration<br><br>2.1. Installing the software<br><br>2.2. Setting the environment variables<br><br>**Methods and techniques of programming:**<br><br>1. The construction program in structured programming<br><br>1.1. Variables, data types, functions<br><br>1.2. control Statements<br><br>1.3. Compilation and execution of programs<br><br>1.4. Basic data structures<br><br>1.5. The ability to move from ideas to the program by the algorithm<br><br>2. Construction of the program in object-oriented programming<br><br>2.1. Designing and writing classes<br><br>2.2. Creating and using objects<br><br>2.3. Elements of object-oriented paradigm (abstraction, encapsulation, inheritance, polymorphism)<br><br>2.4. Using class libraries<br><br>**Fundamentals of image processing:**<br><br>Acquisition and representation of the model<br>Operations pixels<br>Techniques for improving the quality of<br>geometry processing<br><br>**Biomeasurements:**<br><br>Measurement and representation of the data in the study of thermal infrared<br>ECG Basics |

| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
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| | Test 1 | 0.0% | 20.0% |
| | Test 2 | 0.0% | 20.0% |
| | Project | 51.0% | 60.0% |

| Recommended reading | Basic literature | 1. Script of material to the subject "Fundamentals of biometrics"<br>2. Course materials developed in the form of distance education, access: http://uno.biomed.gda.pl<br>3. RM Bolle, JH Connell, S. Pankanti, NK Ratha, Senior, Biometria, WNT, 2008 |
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| | Supplementary literature | 1. Slot K. Wybrane zagadnienia biometrii (Selected topics of biometrics), WKŁ, 2008<br>2. Literature available in the library, in particular a series of IEEE Transactions on ... |
| | eResources addresses | Adresy na platformie eNauczanie: |

| Example issues/ example questions/ tasks being completed | |
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| Work placement | Not applicable |

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| Work placement | Not applicable |