



Subject card

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| Subject name and code | Basics of Data Analysis, PG_00047835 | | | | | | |
| Field of study | Biomedical Engineering, Biomedical Engineering, Biomedical Engineering | | | | | | |
| Date of commencement of studies | October 2022 | Academic year of realisation of subject | | | 2024/2025 | | |
| Education level | first-cycle studies | Subject group | | | Optional subject group 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 | 3 | Language of instruction | | | Polish | | |
| Semester of study | 6 | ECTS credits | | | 3.0 | | |
| Learning profile | general academic profile | Assessment form | | | assessment | | |
| Conducting unit | Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. inż. Sebastian Molin | | | | | |
| | Teachers | dr hab. inż. Sebastian Molin | | | | | |
| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 15.0 | 0.0 | 15.0 | 0.0 | 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 |
| | Number of study hours | 30 | | 3.0 | | 42.0 | 75 |
| Subject objectives | Obtaining the theoretical and practical part necessary for statistical evaluation of measurement results and the results of calculations. | | | | | | |

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| Learning outcomes | Course outcome | Subject outcome | Method of verification |
| | [K6_W01] knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study | The student knows and understands advanced mathematical concepts necessary for data analysis. They can apply statistical and probabilistic methods to formulate and solve analytical problems. They are able to interpret data analysis results, using mathematical knowledge to draw conclusions and make decisions in the context of their field of study. | [SW1] Assessment of factual knowledge |
| | [K6_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment | The student can critically analyze and evaluate existing technical solutions in data analysis. They utilize experience gained in an engineering environment to improve technical systems. They are capable of identifying and solving issues related to the maintenance and optimization of data analysis systems, adapting them to the specifics of the field of study. | [SU2] Assessment of ability to analyse information |
| | [K6_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study | The student can apply programming techniques for data analysis, selecting appropriate tools and methods. They are capable of programming computer applications and microprocessor-based devices using programming languages and analytical libraries. They solve analytical problems by implementing algorithms and interpret results in the context of the field of study. | [SU4] Assessment of ability to use methods and tools |
| Subject contents | <p>1 Introduction. Statistical and computational methods.</p> <p>2 Selected elements of probability theory. Random variables and their most important properties.</p> <p>3 Gallery distributions: normal, t, F, exponential, logarithmic, and other.</p> <p>4 Expected values, variances, covariances and correlation coefficients.</p> <p>5 Generating random numbers. Monte Carlo simulation.</p> <p>6 Properties of the normal distribution. Central limit theorem.</p> <p>7 Presentation of the test in graphical form. Histograms. Interpretation of histograms.</p> <p>8 Graphical analysis techniques. Autocorrelation plots.</p> <p>9 Quantitative assessment techniques. The confidence interval, t-test equality of means.</p> <p>10 F-test of equality of standard deviation. Levene test of equality of variances. Tests Chi-square compliance with established distribution</p> <p>11 Kolmogorov-Smirnov test compliance with the assumed distribution.</p> <p>12 The method of maximum likelihood, as the basis of modern data analysis. Examples interpretation of results.</p> <p>13 Least squares method for measuring direct and indirect.</p> <p>14 linear regression. Indicators of quality of the fit</p> <p>15 Nonlinear regression. Indicators of quality of the fit, the phenomenon of interaction parameters, the causes</p> | | |
| Prerequisites and co-requisites | | | |
| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
| | lecture | 60.0% | 60.0% |
| | laboratory | 50.0% | 40.0% |
| Recommended reading | Basic literature | 1. The script of materials "Fundamentals of data analysis" 2. Brandt S.: Analysis of the data. Statistical and computational methods. WNT, Warszawa 1999. | |
| | Supplementary literature | 1. NIST/SEMATECH e-Handbook of Statistical Methods, http://www.itl.nist.gov/div898/handbook/ | |
| | eResources addresses | Adresy na platformie eNauczanie: | |
| Example issues/ example questions/ tasks being completed | <p>1. Verification of normal distribution of the variable under consideration.</p> <p>2. Check the statistical significance of the result using the Student's t test.</p> | | |
| Work placement | Not applicable | | |

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