

## 。 GDAŃSK UNIVERSITY OF TECHNOLOGY

## Subject card

| Subject name and code                       | STATISTICS, PG_00059998  |   |  |  |  |  |         |     |
|---|--|---|--|--|--|--|---------|-----|
| Field of study                              | Environmental Engineering  |   |  |  |  |  |         |     |
| Date of commencement of studies             | February 2025  |   | Academic year of realisation of subject  |  |  | 2024/2025  |         |     |
| Education level second-cycle st             |  |   | Subject group  |  | Obligatory subject group in the field of study   |  |         |     |
|   |  |   |  |  |  | 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  |  |  | English  |         |     |
| Semester of study                           | 1  |   | ECTS credits   |  |  | 3.0  |         |     |
| Learning profile                            | general academic profile   |   | Assessment form  |  |  | assessment   |         |     |
| Conducting unit                             | Faculty of Civil and E   | nvironmental E  | ingineering  |  |  |  |         |     |
| Name and surname                            | Subject supervisor   |   | dr inż. Wojcie   | ch Artichowicz                         |  |  |         |     |
| of lecturer (lecturers)                     | Teachers   |   |  |  |  |  |         |     |
| Lesson types and methods                    | Lesson type  | Lecture   | Tutorial   | Laboratory                             | Projec   | t  | Seminar | SUM |
| of instruction                              | Number of study<br>hours   | 15.0  | 30.0   | 0.0                                    | 0.0  | 0.0  |         | 45  |
|   | E-learning hours inclu   | ided: 0.0   |  |  |  | i  |         |     |
| Learning activity and number of study hours | Learning activity  | Participation in<br>classes includ<br>plan  | n didactic<br>led in study   | Participation in<br>consultation hours |  | Self-study SUM   |         | SUM |
|   | Number of study hours  | 45  |  | 5.0                                    |  | 30.0 80  |         | 80  |
| Subject objectives                          | <ul> <li>The aim of the subject is to teach students the basics of statistics, and its practical utilization. During lectures the teorethical background of statistical methods is presented, whereas dirong tutorials practical exercises are performed. The focus of the practice is engineering, business and scientific activity. At the course attendees gain:</li> <li>Basics of statistics and probability theory</li> <li>Basic skills of working with data</li> <li>Basic skills of data science tools: Tableau®, Python, Jupyter Notebook</li> <li>Awareness of existence of data science community. f.e.: Analytics Vidbya or Kangle</li> </ul> |   |  |  |  |  |         |     |
| Learning outcomes                           | Course outcome   |   | Subject outcome  |  |  | Method of verification   |         |     |
| Ğ   | K7_U09   |   | An attendee is acknowledged with<br>sources of tools and knowledge<br>bases allowing for further<br>development in the field of data<br>science and statistics.  |  | [SU2] Assessment of ability to<br>analyse information<br>[SU4] Assessment of ability to<br>use methods and tools                         |  |         |     |
|   | K7_W01   |   | The student knows the basic<br>concepts and methods of<br>mathematical and descriptive<br>statistics.  |  | [SW1] Assessment of factual<br>knowledge   |  |         |     |
|   | [K7_U05] can rely on scientific<br>sources for modern methods and<br>technologies, and propose trends<br>in the development of methods<br>and rules for acquiring, filtering,<br>processing and analyzing data   |   | An attendee is acknowledged with<br>sources of tools and knowledge<br>bases allowing for further<br>development in the field of datta<br>science and statistics. |  | [SU5] Assessment of ability to<br>present the results of task<br>[SU1] Assessment of task<br>fulfilment                                  |  |         |     |
|   | [K7_W12] has knowl<br>contemporary and us<br>principles on data ac<br>filtration, processing   | Student is acknowledged with<br>rules and processes of data<br>handling pipelines in data science.<br>Also learns to use tools<br>appropriate for advanced data<br>analyses (Tableau®, Python,<br>Jupyter Notebook) |  |  | [SW3] Assessment of knowledge<br>contained in written work and<br>projects<br>[SW2] Assessment of knowledge<br>contained in presentation |  |         |     |

| Subject contents                   | Lectures and tutorials  |  |                               |  |  |  |  |
|------------------------------------|---|--|-------------------------------|--|--|--|--|
|                                    | 1.Introduction (what is statistics, how do engineers, medicians, biologists use it, tools used for statistical computing) |  |                               |  |  |  |  |
|                                    | 2. Probability (definitions, interpretations and approaches of computing), combinatorical computation of probability      |  |                               |  |  |  |  |
|                                    | 3. Conditional probability, totla probability, Bayes theorem  |  |                               |  |  |  |  |
|                                    | 4. Random variable (discrete and continuous), examples of random variables (f.e. normal distribution)                     |  |                               |  |  |  |  |
|                                    | 5. Sample collection methods and design of experiments  |  |                               |  |  |  |  |
|                                    | 6. Descriptive statistics and graphical data exploration  |  |                               |  |  |  |  |
|                                    | 7. Estimation theory (maximum likelihood method, least squares method, etc.), point and interval estimation               |  |                               |  |  |  |  |
|                                    | 8. Statistical inference, confidence intervals  |  |                               |  |  |  |  |
|                                    | 9. Statistical hypotheses testing, parametric hypostheses, nonparametric hypotheses                                       |  |                               |  |  |  |  |
|                                    | 10. Pseudo random number generators, permutation tests, bootstrap estimation  |  |                               |  |  |  |  |
|                                    | 11 Regression and correlation   |  |                               |  |  |  |  |
|                                    |   |  |                               |  |  |  |  |
|                                    | 13 Regression and correlation - advanced approach   |  |                               |  |  |  |  |
|                                    | 14. Data analysis   |  |                               |  |  |  |  |
|                                    | 15. End test  |  |                               |  |  |  |  |
|                                    | Workshops:<br>1. Data anlysis with Tableau<br>2. Introduction to Jupyter Notebook for statistical computing               |  |                               |  |  |  |  |
| Prerequisites<br>and co-requisites | Basics of advanced mathematics: algebra and calculus  |  |                               |  |  |  |  |
|                                    | Basic computer skills.  |  |                               |  |  |  |  |
| Assessment methods                 | Subject passing criteria  | Passing threshold  | Percentage of the final grade |  |  |  |  |
| and criteria                       | End test  | 60.0%  | 70.0%                         |  |  |  |  |
|                                    | Project (datase analysis)   | 80.0%  | 30.0%                         |  |  |  |  |
| Recommended reading                | Basic literature  | Jay L. Devore, Probability and Statistics for Engineering and the Sciences. 8th edition.<br>Norman Lloyd Johnson, Statistics and experimental design in engineering and the physical sciences. |                               |  |  |  |  |
|                                    |   |  |                               |  |  |  |  |

|  | Supplementary literature | Ven Te Chow, David R. Maidment, Larry W. Mays, Applied hydrology      |
|--|--------------------------|---|
|  |                          | John C. Davis Statistics and Data Analysis in Geology. Third Edition. |
|  | eResources addresses     | Adresy na platformie eNauczanie:                                      |
| Example issues/<br>example questions/<br>tasks being completed |                          |   |
| Work placement   | Not applicable           |   |

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