

## Subject card

|                                             |                                                                                                                              |                                                          |                                         |                                     |                                                                          |            |     |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|--------------------------------------------------------------------------|------------|-----|
| Subject name and code                       | Data Analysis Tools, PG_00208667                                                                                             |                                                          |                                         |                                     |                                                                          |            |     |
| Field of study                              | Mathematics                                                                                                                  |                                                          |                                         |                                     |                                                                          |            |     |
| Date of commencement of studies             | October 2024                                                                                                                 |                                                          | Academic year of realisation of subject |                                     | 2026/2027                                                                |            |     |
| Education level                             | Bachelor's studies                                                                                                           |                                                          | Subject group                           |                                     | Obligatory subject group in the field of study<br>Optional subject group |            |     |
| 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                            |                                     | 6.0                                                                      |            |     |
| Learning profile                            | academic                                                                                                                     |                                                          | Assessment form                         |                                     | exam                                                                     |            |     |
| Conducting unit                             | Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector                                        |                                                          |                                         |                                     |                                                                          |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                           |                                                          | dr Adrian Karpowicz                     |                                     |                                                                          |            |     |
|                                             | Teachers                                                                                                                     |                                                          |                                         |                                     |                                                                          |            |     |
| Lesson types                                | Lesson type                                                                                                                  | Lecture                                                  | Tutorial                                | Laboratory                          | Project                                                                  | Seminar    | SUM |
|                                             | Number of study hours                                                                                                        | 30.0                                                     | 30.0                                    | 0.0                                 | 0.0                                                                      | 0.0        | 60  |
|                                             | 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                                                                                                        | 60                                                       |                                         | 0.0                                 |                                                                          | 0.0        | 60  |
| Subject objectives                          | The main objective of the course is to equip students with skills in modern data processing, modeling, and data exploration. |                                                          |                                         |                                     |                                                                          |            |     |

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| Learning outcomes                                              | Course outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Subject outcome                                                                                                                | Method of verification                                                                                  |
|                                                                | [MATL3_U09] is able to plan how to solve a specific problem and prepare a correct record of this solution, providing strict and precise justification for the correctness of his reasoning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | The student analyzes numerical data rigorously, selects appropriate algorithms, and critically evaluates the results obtained. | [SU4] test/exam - oral or written                                                                       |
|                                                                | [MATL3_K02] is ready to precisely formulate questions to deepen his/her own understanding of a given topic or to find missing elements of reasoning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | The student formulates precise questions concerning the analyzed data and critically evaluates the obtained results.           | [SK1] oral statement/conversation/discussion<br>[SK4] test/exam - oral or written                       |
|                                                                | [MATL3_W09] knows and understands the role and importance of proof in mathematics, as well as the concept of the importance of assumptions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | The student rigorously justifies the conclusions drawn from the analyzed data.                                                 | [SW4] test/exam - oral or written                                                                       |
|                                                                | [MATL3_U08] is able to formulate definitions and theorems in an understandable way, both orally and in writing, and present correct mathematical reasoning regarding the acquired issues                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | The student formulates data analysis algorithms in a clear and understandable manner and justifies their correctness.          | [SU4] test/exam - oral or written                                                                       |
|                                                                | [MATL3_K01] is ready to accept the limitations of his/her own knowledge and understands the need for further education                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | The student is able to recognize the limits of their own knowledge and is willing to continue learning.                        | [SK1] oral statement/conversation/discussion                                                            |
|                                                                | [MATL3_K06] is ready to formulate opinions on basic mathematical issues                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | The student is able to formulate and express opinions on data analysis.                                                        | [SK1] oral statement/conversation/discussion                                                            |
|                                                                | [MATL3_K04] is ready to understand and appreciate the importance of intellectual honesty in one's own and other people's actions; is willing to act ethically                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | The student appreciates the importance of intellectual integrity in their own work and in the work of others.                  | [SK1] oral statement/conversation/discussion<br>[SK8] observation of student's independent or team work |
| Subject contents                                               | <ul style="list-style-type: none"><li>• Methods of data cleaning and transformation using Power Query creating and formatting tables, defining headers, data profiling, and operations on rows and columns.</li><li>• Data modeling and analysis using Power Pivot building relational data models, defining relationships between tables, creating measures and KPI indicators using DAX, and time-based analysis.</li><li>• Modern analytical tools in Excel: array formulas, advanced search, sorting and filtering techniques, as well as integration with Python and the use of artificial intelligence tools.</li><li>• Introduction to Power BI a set of tools for combining, transforming, and visualizing data from various sources (e.g., Excel, SQL, the cloud) in interactive reports and dashboards.</li><li>• Introduction to automating work in Excel by writing macros in VBA.</li></ul> |                                                                                                                                |                                                                                                         |
| Prerequisites and co-requisites                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                |                                                                                                         |
| Assessment methods and criteria                                | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Passing threshold                                                                                                              | Percentage of the final grade                                                                           |
|                                                                | Colloquium                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 51.0%                                                                                                                          | 45.0%                                                                                                   |
|                                                                | Class participation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 51.0%                                                                                                                          | 10.0%                                                                                                   |
|                                                                | Exam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 51.0%                                                                                                                          | 45.0%                                                                                                   |
| Recommended reading                                            | Basic literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | George Mount, Nowoczesna analiza danych w Excelu. Power Query, Power Pivot i inne narzędzia, Helion, Gliwice, 2025.            |                                                                                                         |
|                                                                | Supplementary literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Felix Zumstein, Python i Excel. Nowoczesne środowisko do automatyzacji i analizy danych, Helion, Gliwice, 2022.                |                                                                                                         |
|                                                                | eResources addresses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                |                                                                                                         |
| Example issues/<br>example questions/<br>tasks being completed | not included                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                |                                                                                                         |
| Work placement                                                 | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                |                                                                                                         |

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