



## Subject card

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                     |                                                      |            |     |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------|------------|-----|
| Subject name and code                       | Mathematics 2, PG_00068448                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                     |                                                      |            |     |
| Field of study                              | Engineering Management                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                     |                                                      |            |     |
| Date of commencement of studies             | October 2025                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                          | Academic year of realisation of subject                                                                                                                                                                                                                                                                                                                                                                          |                                     | 2025/2026                                            |            |     |
| Education level                             | first-cycle studies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                          | Subject group                                                                                                                                                                                                                                                                                                                                                                                                    |                                     | Obligatory subject group in the field of study       |            |     |
| Mode of study                               | Part-time studies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                          | Mode of delivery                                                                                                                                                                                                                                                                                                                                                                                                 |                                     | at the university                                    |            |     |
| Year of study                               | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                          | Language of instruction                                                                                                                                                                                                                                                                                                                                                                                          |                                     | Polish                                               |            |     |
| Semester of study                           | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                          | ECTS credits                                                                                                                                                                                                                                                                                                                                                                                                     |                                     | 6.0                                                  |            |     |
| Learning profile                            | general academic profile                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                          | Assessment form                                                                                                                                                                                                                                                                                                                                                                                                  |                                     | exam                                                 |            |     |
| Conducting unit                             | Mathematics Center -> Vice-Rector For Education                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                     |                                                      |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                     |                                                      |            |     |
|                                             | Teachers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                     |                                                      |            |     |
| Lesson types and methods of instruction     | Lesson type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Lecture                                                  | Tutorial                                                                                                                                                                                                                                                                                                                                                                                                         | Laboratory                          | Project                                              | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 16.0                                                     | 24.0                                                                                                                                                                                                                                                                                                                                                                                                             | 0.0                                 | 0.0                                                  | 0.0        | 40  |
|                                             | 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 40                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                  | 6.0                                 |                                                      | 104.0      | 150 |
| Subject objectives                          | Uses the apparatus of linear algebra and mathematical analysis to solve theoretical and practical problems occurring in social sciences                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                     |                                                      |            |     |
| Learning outcomes                           | Course outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                          | Subject outcome                                                                                                                                                                                                                                                                                                                                                                                                  |                                     | Method of verification                               |            |     |
|                                             | [K6_U04] develops logical solutions to complex or unstructured problems, even under conditions of uncertainty.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                          | integrates the information obtained from solving complex problems, interpreting them, drawing conclusions and formulating and justifying opinions                                                                                                                                                                                                                                                                |                                     | [SU4] Assessment of ability to use methods and tools |            |     |
|                                             | [K6_W02] possesses advanced knowledge of methods and techniques that enable precise formulation and effective problem solving.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                          | uses a mathematical apparatus to solve management problems, combining knowledge of mathematics with knowledge of social sciences                                                                                                                                                                                                                                                                                 |                                     | [SW1] Assessment of factual knowledge                |            |     |
| Subject contents                            | Integral calculus of one variable functions antiderivatives, Definite integrals. Complex numbers - basic informations. Elements of linear algebra: Matrices, their properties and operations on matrices. Determinants. Inverse of a square non-singular matrix. Systems of linear equations and inequalities. Eigenvectors and eigenvalues. Functions of two variables: Partial derivatives. Total differential. Maxima and minima of a function of several variables. Ordinary differential equations: First order differential equations. General and particular solution. Second order linear differential equations with constant coefficients. Fundamental set of solution of the homogeneous linear differential equation. |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                     |                                                      |            |     |
| Prerequisites and co-requisites             | Knowledge of the subject: Mathematics 1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                     |                                                      |            |     |
| Assessment methods and criteria             | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                          | Passing threshold                                                                                                                                                                                                                                                                                                                                                                                                |                                     | Percentage of the final grade                        |            |     |
|                                             | Tests                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                          | 50.0%                                                                                                                                                                                                                                                                                                                                                                                                            |                                     | 20.0%                                                |            |     |
|                                             | Activity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                          | 50.0%                                                                                                                                                                                                                                                                                                                                                                                                            |                                     | 20.0%                                                |            |     |
|                                             | Exam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                          | 50.0%                                                                                                                                                                                                                                                                                                                                                                                                            |                                     | 60.0%                                                |            |     |
| Recommended reading                         | Basic literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                          | Jankowska, K., Jankowski, T. Zbiór zadań z matematyki. Gdańsk: Wydawnictwo PG<br>Jankowska, K., Jankowski, T., Funkcje wielu zmiennych - Całki wielokrotne - Geometria analityczna. Gdańsk: Wydawnictwo PG<br>Dymkowska, J., Beger, D. (2015). Rachunek całkowy w zadaniach, Gdańsk: Wydawnictwo PG<br>Gurgul, H., Suder, M. Matematyka dla kierunków ekonomicznych, Warszawa: Oficyna a Wolters Kluwer business |                                     |                                                      |            |     |

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|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                | Supplementary literature                                                                                                                                                                                                                                                                                                                                       | Banaś, J., Podstawy matematyki dla ekonomistów. Warszawa: Wydawnictwa Naukowo-Techniczne<br>Gewert, M., Skoczylas, Z. Analiza matematyczna 1, Przykłady i zadania. Wrocław: Wydawnictwo GiS<br>Gewert, M., Skoczylas, Z. Analiza matematyczna 2, Definicje, twierdzenia wzory. Wrocław: Wydawnictwo GiS<br>Gewert, M., Skoczylas, Z. Analiza matematyczna 2, Przykłady i zadania. Wrocław: Wydawnictwo GiS<br>Sozański, B., Dziedzic, I. Algebra i analiza w zagadnieniach ekonomicznych. Rzeszów: Wydawnictwo Bila |
|                                                                | eResources addresses                                                                                                                                                                                                                                                                                                                                           | Adresy na platformie eNauczanie:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Example issues/<br>example questions/<br>tasks being completed | 1. Find extreme values of the function $f(x,y)$ .<br><br>2. Discuss the existence of the solution for the given system of linear equations.<br><br>3. Find the rank of the matrix.<br><br>4. Find the total differential of the function $f$ .<br><br>5. Find a particular solution of the differential equation ... satisfying the given initial conditions . |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Work placement                                                 | Not applicable                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

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