

## Subject card

|                                             |                                                                                                                    |                                                          |                                         |                                     |                                                |            |     |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|------------------------------------------------|------------|-----|
| Subject name and code                       | Mathematical Applications in Economics and Management, PG_00172281                                                 |                                                          |                                         |                                     |                                                |            |     |
| Field of study                              | International Economic Relations                                                                                   |                                                          |                                         |                                     |                                                |            |     |
| Date of commencement of studies             | October 2025                                                                                                       |                                                          | Academic year of realisation of subject |                                     | 2025/2026                                      |            |     |
| Education level                             | Bachelor's studies                                                                                                 |                                                          | Subject group                           |                                     | Obligatory subject group in the field of study |            |     |
| Mode of study                               | full-time studies                                                                                                  |                                                          | Mode of delivery                        |                                     | at the university                              |            |     |
| Year of study                               | 1                                                                                                                  |                                                          | Language of instruction                 |                                     | Polish                                         |            |     |
| Semester of study                           | 1                                                                                                                  |                                                          | ECTS credits                            |                                     | 4.0                                            |            |     |
| Learning profile                            | academic                                                                                                           |                                                          | Assessment form                         |                                     | credit                                         |            |     |
| Conducting unit                             | Department of Microeconomics -> Faculty of Economics -> Rector                                                     |                                                          |                                         |                                     |                                                |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                 |                                                          | dr Marcin Brycz                         |                                     |                                                |            |     |
|                                             | Teachers                                                                                                           |                                                          | dr Marcin Brycz                         |                                     |                                                |            |     |
| Lesson types                                | Lesson type                                                                                                        | Lecture                                                  | Tutorial                                | Laboratory                          | Project                                        | Seminar    | SUM |
|                                             | Number of study hours                                                                                              | 0.0                                                      | 30.0                                    | 0.0                                 | 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                                                       |                                         | 10.0                                |                                                | 60.0       | 100 |
| Subject objectives                          | Acquainting students with the introduction to higher mathematics and its applications in economics and management. |                                                          |                                         |                                     |                                                |            |     |

| Learning outcomes               | Course outcome                                                                                                                                                                                                                                                                                                          | Subject outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Method of verification                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | [MSG3_U04] uses the acquired theoretical knowledge in economics to analyse and evaluate the operation of economic entities on the international market, with particular emphasis on the European Union market                                                                                                           | The student has the ability to apply mathematics in economics and management and to use mathematical methods in modeling and interpreting economic phenomena. He can analyze the causes and course of economic processes based on basic economic models. The student independently uses the learned matrix methods to solve market models. With the help of simple mathematical methods and based on the necessary economic indicators, he knows how to assess the degree of convergence of the economies of different countries. | [SU1] oral statement/conversation/discussion<br>[SU4] test/exam - oral or written<br>[SU8] observation of student's independent or team work |
|                                 | [MSG3_W10] knows selected methods and tools, including IT tools and data acquisition techniques, which make it possible to describe and analyse economic entities operating on the international market; knows the processes and phenomena occurring in them and between them, and processes supporting decision-making | The student has knowledge of functions of one and many variables and knows the elements of differential and integral calculus. He knows the methods of unconditional and conditional optimization and their applications in modeling enterprise decisions. Has basic knowledge of modeling the dynamics of economic processes.                                                                                                                                                                                                    | [SW4] test/exam - oral or written<br>[SW1] oral statement/conversation/discussion<br>[SW5] implementation of a problem task                  |
|                                 | [MSG3_W01] has an advanced knowledge of economic sciences, in particular of economics and its place in the system of sciences, including within related disciplines                                                                                                                                                     | The student has knowledge of basic economic models such as market equilibrium models, the firm, the consumer, and the national income model. The student also knows the applications of differential equations in economic growth models.                                                                                                                                                                                                                                                                                         | [SW4] test/exam - oral or written<br>[SW1] oral statement/conversation/discussion<br>[SW5] implementation of a problem task                  |
|                                 | [MSG3_K05] correctly identifies, diagnoses and solves dilemmas and various options of solutions related to the profession                                                                                                                                                                                               | The student correctly identifies, diagnoses and solves dilemmas and possibilities regarding economic problems related to the use of mathematical methods.                                                                                                                                                                                                                                                                                                                                                                         | [SK1] oral statement/conversation/discussion<br>[SK4] test/exam - oral or written<br>[SK5] implementation of a problem task                  |
|                                 | [MSG3_U02] can assess economic and social phenomena occurring in an open economy, interpret necessary statistical data and economic indicators, as well as forecast economic phenomena and processes, using standard methods and tools applied in economic sciences                                                     | Using the elements of differential calculus, he is able to carry out optimization of functions of one and many variables in the problems of the theory of the firm and market organization. He can use basic methods and tools to diagnose economic processes and on this basis make appropriate economic decisions. Can determine integrals of elementary functions and apply them to solve tasks based on marginal values.                                                                                                      | [SU1] oral statement/conversation/discussion<br>[SU4] test/exam - oral or written<br>[SU8] observation of student's independent or team work |
| Subject contents                | 1. Matrix algebra<br><br>2. Differential calculus<br><br>3. Integral calculus<br><br>Any doubts arising during the task solving stage can also be discussed during consultations.                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                              |
| Prerequisites and co-requisites | Knowledge and skills in mathematics from high school.                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                              |
| Assessment methods and criteria | Subject passing criteria                                                                                                                                                                                                                                                                                                | Passing threshold                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Percentage of the final grade                                                                                                                |
|                                 | To receive a positive grade for the exercises, the student must obtain at least 51% of the total points for the activity, group work performed on computers, individual work tasks and final tests.                                                                                                                     | 51.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 100.0%                                                                                                                                       |

|                                                                |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Recommended reading                                            | Basic literature         | <p>1. E. Babuła, L. Czerwonka (red.), Zastosowanie matematyki w ekonomii i zarządzaniu, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2015</p> <p>2. A. Blajer-Gołębiewska, L. Czerwonka, E. Pankau, M. Zielenkiewicz, Ekonomia matematyczna w zadaniach, red. T. Kamińska, Wyd. UG, Gdańsk 2010</p> <p>3. M. Wisniewski, Mathematics for economics, Palgrave Macmillan, 2013</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                | Supplementary literature | <p>1. K. Sydsaeter, P. Hammond, A. Seierstad, A. Strom, Further mathematics for economic analysis, FT Prentice Hall, Harlow 2005</p> <p>2. B. Batóg, B. Bieszk-Stolorz, I. Foryś, M. Guzowska, K. Heberlein, Mathematics for students of economics, finance and management, Difin, Warszawa 2021</p> <p>3. T. Bradley, Essential mathematics for economics and business, Wiley, 2013</p> <p>4. A.C. Chiang, Podstawy ekonomii matematycznej, PWE, Warszawa 1994</p> <p>5. L. Czerwonka, Matematyczne modele połączeń przedsiębiorstw uwzględniające czynniki menedżerskie, Pieniądze i Więź. Kwartalnik Naukowy, Nr 3/2009, s. 81-88</p> <p>6. L. Czerwonka, Zastosowanie matematycznych modeli fuzji egzogenicznych, Pieniądze i Więź. Kwartalnik Naukowy, Nr 1/2008, s. 133-140</p> <p>7. M. Matłoka, Matematyka dla ekonomistów, Wyd. AE w Poznaniu, Poznań 2008</p> <p>8. A. Ostoja-Ostaszewski, Matematyka w ekonomii. Modele i metody t. 1 i 2, Wydawnictwo Naukowe PWN, Warszawa 2006</p> |
|                                                                | eResources addresses     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Example issues/<br>example questions/<br>tasks being completed |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Work placement                                                 | Not applicable           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

Document generated electronically. Does not require a seal or signature.