University of Gdańsk

Subject card

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| Subject name and code | Mathematical Applications in Economics and Management, PG_00135876 | | |
| Field of study | International Economic Relations | | |
| Date of commencement of studies | October 2024 | Academic year of realisation of subject | 2024/2025 |
| Education level | undergraduate 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 | 1 | ECTS credits | 5.0 |
| Learning profile | academic | Assessment form | |
| Conducting unit | Katedra Mikroekonomii -> Faculty of Economics | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. Leszek Czerwonka | |
| | Teachers | dr hab. Leszek Czerwonka | |

| Lesson types | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|---|
| | Number of study hours | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 20 |
| | 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 | 20 | 0.0 | 0.0 | 20 |

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| Subject objectives | Introducing students to the fundamentals of higher mathematics and its applications in economics and management. |

| Learning outcomes | Course outcome | Subject outcome | Method of verification |
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| | [MSGL3_K05] correctly identifies, diagnoses and solves dilemmas and various options of solutions related to the profession | The student correctly identifies, diagnoses and resolves dilemmas and different solution options, based on knowledge of mathematical methods, related to the profession. | [SK4] test/exam - oral or written |
| | [MSGL3_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 is acquainted with selected methods and tools, including IT tools and data acquisition techniques, as well as mathematical methods that make it possible to describe and analyse economic entities operating on the international market, and is acquainted with processes and phenomena in and between them, as well as processes supporting decision-making. | [SW4] test/exam - oral or written |
| | [MSGL3_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 an advanced knowledge of economic sciences, in particular economics and its place in the system of sciences, including within related scientific disciplines and its relationship to mathematics. | [SW4] test/exam - oral or written |
| | [MSGL3_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 | The student is able to evaluate economic and social phenomena taking place in an open economy, interpret statistical data and economic indicators necessary in this respect, as well as forecast economic phenomena and processes using standard methods and tools applied in economic sciences, in conjunction with knowledge of mathematical methods. | [SU4] test/exam - oral or written |
| | [MSGL3_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 applies his/her theoretical knowledge of economics in connection with the knowledge of mathematical methods to analyse and evaluate the operation of economic entities on the international market, with particular emphasis on the European Union market. | [SU4] test/exam - oral or written |

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| Subject contents | 1. Matrix algebra<br><br>Matrix operations, basic properties of determinants, finding the inverse matrix, Cramer's formula, application to market and national income models (matrix notation and model solution)<br><br>2. Sequences and series<br><br>Concept of a numerical sequence, arithmetic and geometric sequences, convergence of a sequence, operations on the limits of sequences, concept of a numerical series, sum of a series, application to the calculation of the present value of cash flows (elements of financial mathematics)<br><br>3. Functions of one and many variables<br><br>Basic elementary functions, graph of a function, inverse representation, monotonicity, limit of a function, continuity of a function, convexity and concavity of a function<br><br>4. Elements of differential calculus<br><br>Rules of differentiation for functions of one variable, local extrema of functions of one variable, elasticity of functions, marginal calculus, maximisation of economic result, rules of differentiation for functions of many variables, optimisation of functions of many variables, conditional extremum, minimisation of costs by Lagrange multipliers method<br><br>5. Integral calculus<br><br>Concept of primary function, definite and indefinite integral, method of integration by parts, method of integration by substitution, applications in marginal calculus and financial mathematics<br><br>6. Difference and differential equations<br><br>First order difference equations, cobweb model, differential equations, application of differential equations in economic growth models. |
| Prerequisites and co-requisites | Knowledge and skills in secondary school mathematics. |
| Assessment methods and criteria | |

| Subject passing criteria | Passing threshold | Percentage of the final grade |
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| | 51.0% | 100.0% |

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| Recommended reading | Basic literature | 1. Babula E., Czerwonka L. (red.), Zastosowanie matematyki w ekonomii i zarządzaniu, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2015.<br>2. Blajer-Gołębiewska A., Czerwonka L., Pankau E., Zielenkiewicz M., Ekonomia matematyczna w zadaniach, red. T. Kamińska, Wyd. UG, Gdańsk 2010. |
| | Supplementary literature | 1. Czerwonka L., Matematyczne modele połączeń przedsiębiorstw uwzględniające czynniki menedżerskie, "Pieniądze i Więź. Kwartalnik Naukowy", 2009, nr 3, s. 81-88.<br>2. Czerwonka L., Zastosowanie matematycznych modeli fuzji egzogenicznych, "Pieniądze i Więź. Kwartalnik Naukowy", 2008, nr 1, s. 133-140.<br>3. Chiang A.C., Podstawy ekonomii matematycznej, PWE, Warszawa 1994.<br>4. Matłoka M., Matematyka dla ekonomistów, Wyd. AE w Poznaniu, Poznań 2008.<br>5. Ostoja-Ostaszewski A., Matematyka w ekonomii. Modele i metody t. 1 i 2, Wydawnictwo Naukowe PWN, Warszawa 2006.<br>6. Piszczała J., Matematyka i jej zastosowanie w naukach ekonomicznych, Wydawnictwo AE w Poznaniu, Poznań 2008. |
| | eResources addresses | Adresy na platformie eNauczanie: |
| Example issues/ example questions/ tasks being completed | The determinant of matrix of order (*n* 1) obtained by deleting row *i* and column *j* of matrix A of order *n* is called ... | |
| Work placement | Not applicable | |

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