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| Course title | | Mathematical Applications in Economics and Management | | | | | | ECTS code | | 14.3.EM.PZ.2 | | |
| | | | | | | | | ECTS credits | | 8 | | |
| Name of unit administrating study | | KMikr | | Field of study | | MSG** | | Field of specialisation | | IB; | | |
| Teaching staff | | Leszek Czerwonka, Associate Professor ; Elżbieta Babula, Ph.D. | | | | | | | | | | |
| Number of hours | | | | | | | | | | | | |
| Lectures | 15 | Classes | 30 | Tutorials | 0 | Laboratory | 0 | Seminars | 0 | Language classes | 0 | |
| Forma aktywności | | | | | | | Year&Type of studies* | | 1 SS1, | | | |
| Hours with the participation of the academic teacher (including office hours, exams, others): | | | | | | 54 | Semester: | | 1, | | | |
| Hours without the participation of the academic teacher (student's self-study, homeworks): | | | | | | 146 | Type of course: | | obligatory | | | |
| Total number of hours: | | | | | | 200 | Language of instruction: | | English | | | |
| Teaching form | | in-class learning | | | | | | | | | | |
| Teaching methods | | Lectures including multimodal presentations, Activating methods in training classes, Collaborating, group activities, Use of academic English terminology and set books, academic English speaking. | | | | | | | | | | |
| Prerequisites (required courses and introductory requirements) | | | | | | | | | | | | |
| Required courses | | None. | | | | | | | | | | |
| Introductory requirements | | Recommended knowledge in mathematics: Functions of One Variable, Functions of Many Variables, Foundations of Differential Calculus, Solving Systems of Linear Equations | | | | | | | | | | |
| Assessment method, forms and criteria | | | | | | | | | | | | |
| Assessment method | | Exam | | | | | | | | | | |
| Assessment criteria | | The percentage of points to obtain grades: below 50% - 2.0 51% - 3.0 61% - 3.5 71% - 4.0 81% - 4.5 91% - 5.0. | | | | | | | | | | |
| Course objectives | | | | | | | | | | | | |
| Acquainting students with the introduction to higher mathematics and its applications in economics and management. Use of academic English language, references and vocabulary. | | | | | | | | | | | | |
| Learning outcomes | | | | | | | | | | | | |
| Knowledge | | MSG1_W01 | Student has an advanced knowledge of economic sciences, in particular of economics and its place in the system of sciences, including within related disciplines and linking it to mathematics. | | | | | | | | | |
| | | MSG1_W10 | Student knows selected methods and tools, including IT tools and data acquisition techniques and mathematical methods, 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. | | | | | | | | | |
| Verification of learning outcomes - Knowledge | | | | | | | | | | | | |
| Outcomes | | written exam | oral exam | test | essay/paper /portfolio | tasks/ homeworks | individual presentation | group presentation | classroom activities | classroom discussion | individual project | group project |
| | | MSG1_W01 | X | | X | | | | | | | |
| | | MSG1_W10 | X | | X | | | | | | | |
| Skills | | MSG1_U02 | Student 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 | | | | | | | | | |

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| | | sciences and relating to the application of mathematical methods. |
| | MSG1_U04 | Student uses the acquired theoretical knowledge in economics and relating to the application of mathematical methods to analyse and evaluate the operation of economic entities on the international market, with particular emphasis on the European Union market. |

Verification of learning outcomes - Skills

| Outcomes | written exam | oral exam | test | essay/paper /portfolio | tasks/ homeworks | individual presentation | group presentation | classroom activities | classroom discussion | individual project | group project |
|----------|--------------|-----------|------|------------------------|------------------|-------------------------|--------------------|----------------------|----------------------|--------------------|---------------|
| MSG1_U02 | X | | X | | | | | | | | X |
| MSG1_U04 | X | | X | | | | | | | | |

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| Attitudes | MSG1_K05 | Student correctly identifies, diagnoses and solves dilemmas and various options of solutions related to the profession, relating to the application of mathematical methods. |
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Verification of learning outcomes - Attitudes

| Outcomes | written exam | oral exam | test | essay/paper /portfolio | tasks/ homeworks | individual presentation | group presentation | classroom activities | classroom discussion | individual project | group project |
|----------|--------------|-----------|------|------------------------|------------------|-------------------------|--------------------|----------------------|----------------------|--------------------|---------------|
| MSG1_K05 | X | | X | | | | | | | | X |

Course contents
1. Subject: Matrices.

Contents: matrix operations, inverse of a matrix, determinant of a matrix, properties of determinants of matrices, application to models of a market and national income

2. Subject: Sequences and series.

Contents: notion of sequence, arithmetic and geometric sequence, convergence of the sequence, convergence criteria, notion of series, general properties of series, application to financial mathematics

3. Subject: Functions.

Contents: elementary functions, inverse functions, monotonicity, composition of functions, functions of many variables, notion of limit, continuity of elementary functions, concavity and convexity

4. Subject: The differential calculus.

Contents: tangent to a curve, arithmetic of derivatives, second derivatives, partial derivatives, optimization, profit maximization, cost minimization with Lagrange multipliers

5. Subject: Integration.

Contents: notion of primitive function, definite and indefinite integrals, formula for the integration by parts, formula for the integration by substitution, applications of integration to financial mathematics

6. Subject: Differential equations.

Contents: first order differential equations, application to growth models

Recommended reading lists
Basic references:

1. Babula E., Czerwonka L. (ed.), *Zastosowanie matematyki w ekonomii i zarządzaniu-Mathematical Applications in Economics and Management*, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2015.
2. Bradley T., *Essential mathematics for economics and business*, Wiley, 2013.
3. Wisniewski M., *Mathematics for economics*, Palgrave Macmillan, 2013.
4. Barnett R.A., Ziegler M.R., Byleen K.E., *College Mathematics for Business, Economics, Life Sciences, and Social Sciences*, Pearson Prentice Hall, Upper Saddle River, New Jersey 2008.
5. Werner F., Sotskov Y., *Mathematics of Economics and Business*, Routledge, Abingdon 2006.

Facultative references:

1. Czerwonka L., *Mathematical Models of Mergers: Conditions of Application and Conclusions* [in:] *Market Concentration and Economy, Series of Monographs, Vol. 7, Macro & Microeconomics Case Studies*, T. Bernat (ed.), Publishing House Volumina.pl Daniel Krzanowski, Szczecin 2010, pp. 206-219.

Contact

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* SS1 - undergraduate studies * SS2 - graduate studies * SDang - doctoral studies

** MSG - International Economic Relations