FACULTY: ***Economic and Social Sciences***
COURSE: ***Economics***
LEVEL OF EDUCATION: ***first-level studies (bachelor)***
FORM OF EDUCATION: full-time
PROFILE: ***practical***

SUBJECT CARD
(Syllabus)

Subject Name**: Mathematics**						**ECTS credits: 6**
Lecturer: **according to the list of lecturers and the schedule of classes**						
Year: **1**	Lectures	Seminars	Laboratory exercises	Exercise	BUNA*	Form of credit*
Semester: **1**	**24**	**0**	**0**	**24**	**12**	**E/ZO**
* E – exam; Z – credit; ZO – passing with a grade, BUNA – without the participation of an academic teacher						
The aim of the course: *to gain knowledge of the application of selected aspects of mathematics in economic issues.*						
Didactic methods: *lecture using audiovisual means, seminars, semester work – self-made project*						
Prerequisites: *Actively participate in conversations, perform recommended tasks to solve on your own.*						

Yes	**Subject matter of the classes**
I	**LECTURE:** 1. Calculus of a function of one variable. 2. Functions of many variables: partial derivatives, extremes of functions - economic applications. 3. Integral calculus of a function of one variable - an unmarked, denoted and improper integral. 4. Matrices, systems of linear equations, determinants – applications: Input-Output models, tasks in the field of operational research.
II	**SEMINARS: not applicable**
III	**LABORATORY EXERCISES - not applicable**
IV	**EXERCISE:** 1.Matrix classification. Matrix calculus. Determinant and its properties. Matrix government. Matrix indispensability. The inverse matrix and its determination by the method of algebraic complements. A system of linear equations, the use of the Cramer method and/or the inverse matrix. Elementary operations and their application to determine the order and indispersibility of the matrix. General and base solution. The system of m linear equations with n unknowns, problem problems. Economic examples: Input – Output prayers, operational research tasks. 2.Function, definition, domain, counterfield, function graph, complex and inverse function, monotonicity, differentiability, parity, function boundaries, improper boundaries, continuity of function, definition, continuity study, tasks. 3.Strings, the concept of string, arithmetic and geometric sequence, string boundary, tasks. 4.Calculus, derivative of functions, extremes and inflection points, smallest and largest value on the interval, monotonicity, use of derivatives for the study of monotonicity, extremes, convexity (concavity), inflection points. Study of the course of variability of functions, Partial derivatives of the first and second order. Theorem about mixed derivatives. Partial elasticity. Tasks. Integral calculus (bases), Primitive function, unmarked integral, methods of integration by substitution, by parts and elementary cases of integration of rational functions. The denoted integral, its geometric and economic interpretation. The basic theorem of integral calculus. Use the denoted integral to calculate a) the values of the mean functions, b) the area of the flat area. The improper integral of type a) the first, b) the second, its coincidence or divergence, definition and applications, tasks.
V	**BUNA:** 1. Examples of systems of linear equations, tasks. 2. Functions – charts, tasks. 3. Marked integral, its geometric and economic interpretation

Learning outcomes			
Directional effects – symbol and specification			**Objective effects – specification**
in the field of <u>KNOWLEDGE</u>:			
P6U_W	P6S_WG	**E1_W01** Has a comprehensive knowledge of the place of economics in the system of sciences, its nature, methodology and related to other scientific disciplines, knows and understands the basic terminology of economic sciences along with the application of this practical knowledge in business activities.	Has theoretical and practical knowledge of mathematical methods used in economic analysis. Presents the connections between mathematics and economics.
P6U_W	P6S_WG P6S_WK	**E1_W02** Knows and understands economic conditions, forms and standards, as well as phenomena and processes related to the market. Has knowledge of economic structures and institutions, as well as their elements, characteristics and development.	Analyzes and interprets phenomena, processes, entities, structures and activities of organizations operating on the market. Knows the conditions and principles of making optimal decisions by market entities on a micro and macro scale, also in practice.
P6U_W	P6S_WGP6S_WK	**E1_W03** Identifies mutual relations between economic phenomena, entities, structures and institutions on a microeconomic and sectoral scale, both in real and monetary terms, including in the field of selected specialization in the field of economics. Knows how to put this knowledge into practice.	Is able to use the acquired mathematical knowledge for quantitative analysis of economic processes. Understands the abstract aspect of mathematical analysis (e.g. transitioning limit of a function, infinite calculus).
in terms of <u>SKILLS</u>:			
P6U_U	P6S_UW	**E1_U01** Is able to correctly observe and interpret economic phenomena and economic processes in the context of legal, technological, political and cultural changes.	Uses theoretical knowledge in the field of mathematics. Knows the concepts of calculus and integral calculus (a function of one variable) and the mathematical symbolism inherent in it

P6U_U	P6S_UW	**E1_U02** Is able to use his theoretical knowledge and effectively and effectively obtain reliable data from primary and secondary sources to analyze specific economic processes and phenomena in the field of economic disciplines.	Efficiently and effectively obtains data enabling appropriate calculations to be carried out. Forecasts economic processes and phenomena using standard methods used in mathematics
P6U_U	P6S_UW	**E1_U09** Is ready to perform tasks innovatively and solve complex and unusual problems in conditions burdened with risk and uncertainty, using normative systems, using specialized terminology	Analyzes specific economic processes and phenomena using mathematical tools. Performs innovative tasks and solves unusual mathematical problems.
P6U_U	P6S_UW P6S_UO	**E1_U10** Independently identifies, diagnoses and resolves problems and applies various variants of solutions in business practice, in connection with the studied specialty.	Has the ability to rationally think and infer and analyze micro- and macroeconomic phenomena. Influences the behavior of members of the organization using rational mathematical arguments.
in the field of <u>SOCIAL COMPETENCES:</u>			
P6U_K	P6S_KK P6S_KR	**E1_K01** Is ready to critically assess the level of their knowledge; recognizes the importance of knowledge in solving cognitive and practical problems and seeks the opinion of experts in case of difficulty in solving the problem on their own.	Understands the need to improve his knowledge and skills by solving subsequent tasks. Sees the need to deepen and supplement his knowledge of the methods of applied mathematics depending on the needs of his professional work.
P6U_K	P6S_KO P6S_KR	**E1_K02** Is able to actively cooperate in teams, including international ones, and take on various roles with respect for social, cultural and legal norms, and perform responsible roles in the team, being aware of the decisions he makes, and also takes responsibility for the results of his work and the whole team.	Performs tasks individually and as a team. is characterized by openness to new ideas leading to results. Promotes the development of his own and the team's work. Assumes responsibility for the results of the work of both its own and the task force.
P6U_K	P6S_KO P6S_KR	**E1_K06** Is able to think in an entrepreneurial way and skillfully communicate with the environment; adapts to new situations and conditions, acquires resistance to failure and stress.	Is able to present his position (his way of thinking) and defend it using factual arguments in the discussion. Is able to adapt mathematical language to the surrounding environment of people.

Ways to verify the outcome of this learning (*KNOWLEDGE, SKILLS, SOCIAL COMPETENCES*)

Effects(symbol)	Written exam	Oral exam	Colloquium	Essay/Paper	Homework	Individual presentation	Group presentation	Activity in class	Participation in the discussion	Individual project	Group project
E1_W01, E1_W02, E1_W03	**X**		**X**		**X**			**X**			**X**
E1_U01, E1_U02, E1_U09, E1_U110	**X**		**X**					**X**			
E1_K01, E1_K02, E1_K06,			**X**		**X**			**X**			**X**

Form and conditions of passing the subject: passing the exercises in the form of a test, open/closed/mixed questions, additionally an entrance colloquia of 5-7 minutes, an exam in written form – issues of a closed and open interpretative nature.

Nstudent work required to achieve learning outcomes in hours and ECTS credits

Contact hours with an academic teacher	
Types of classes	**Number of hours**
Participation in lectures	24
Participation in seminars	
Participation in exercises	24
Participation in laboratory classes	
Consultations (2 hours for the lecture, 1 hour for one training group, conv., sem.)	
Sum of	**48**
Student's own work divided into time (*examples of student work forms)*	
Form of student work	**Number of hours**
Preparing for classes	20
Writing a paper/project/essay	10
Gathering materials and preparing presentations	8
Self-reading	27
Preparing for colloquia/tests	15
Preparing for the written/oral exam in a subject	15
Preparation for written/oral credit in a subject	7
Sum of	**102**
Total (contact hours + student's own work)	**150**
	5 ECTS
1.including the number of ECTS credits for contact hours with the direct participation of an academic teacher	**1 ECTS**
2.including the number of ECTS credits for hours carried out in the form of independent work	**4 ECTS**

Classes with a practical profile	
Types of classes	**Number of hours**
Participation in laboratory exercises	
Preparing for practical credit	30
Sum of	**30**
Number of ECTS credits for practical classes	**1 ECTS**

Basic literature:

1. B. Wong, L. Bukalov, S. Slavin, Practical Algebra: a Self-Teaching Guide, John Wiley & Sons Inc, New York 2022.
2. M. Hoy, J. Livernois, Ch. McKenna, R. Rees, T. Stengos, Mathematics for Economics, MIT Press, [Cambridge] 2022.

Supplementary literature**:** *(up to 5 items)*

1. I. Jacques, Mathematics for Economics and Business, Pearson Education Ltd, London 2023.M. Matłoka, *Matematyka dla ekonomistów*, Wyd. Akademii Ekonomicznej w Poznaniu, Poznań 2001.
2. B. Batóg, B. Bieszk-Stolorz, I. Foryś, M. Guzowska, K. Heberlein, Mathematics for students of economics, finance and management, Difin, Warsaw, Difin 2021.

Acceptance of the Vice-Rector: