International European University

European Business School

SYLLABUS

Title of the Course

	OC.7 Higher and Applied Mass

The Course Information

Title of the Educational Program:

	Educational and Professional program “Management”

Course description:

	The subject of study of the academic discipline "Higher and Applied Mathematics" is mathematical concepts, research methods and models of economic and management problems for the formation of a systematic analytical approach in future specialists to solving scientific and practical problem situations that will arise in the process of their further education and practical activities, through quantitative and qualitative analysis and modeling. The academic discipline "Higher and Applied Mathematics" is integrated with such disciplines as "Information Systems and Technologies", "Operations Research", "Economic Statistics".

Prerequisites for study (previous requirements):

	The study of the discipline "Higher and Applied Mathematics" is based on previously acquired knowledge of mathematics in accordance with the secondary school curriculum.

Number of credits/hours:

	8 ECTS credits / 240 academic hours

Discipline features

Period of Teaching	Terms	International Subject	Year of Study	Cycles: general training

			Integration		**course/vocational training/optional**	
	2 terms	1-st and 2-nd terms	available	1st year	General Training Course	

Mode of study:

	Full-time/part-time study

Classroom location:

	42V Akademika Hlushkova Ave., 4th floor, room 405 Google meet: pmgpieu

Information about the lecturer

Lecturer's full name:

	Gennadiy Taranyuk, Senior Lecturer

Department:

	Менеджменту, фінансів та бізнес-адміністрування https://business.ieu.edu.ua/pro-yemsh/struktura-kafedry-vykladachi/kafedry/kafedra-menedzhmentu

Office location:

	**42V Akademika Hlushkova Ave., 5th floor, room 501**

Work and consultation schedule:

	**LECTURES:** Offline/online every Friday from 9:00 AM to 1:20 PM **CONSULTATIONS:** Offline/online every Friday from 4:00 PM to 5:30 PM with prior appointment via corporate email, etc.

Teacher's email:

	gennadiytaranyuk@ieu.edu.ua

Course objectives / Learning outcomes

Course objectives

	The course is aimed at developing in future managers fundamental mathematical knowledge for modeling and solving applied problems that arise in the management process, and explaining the role and place of mathematical methods in solving them; developing logical and analytical thinking in students; systematic presentation of basic mathematical concepts and methods from the perspective of their practical applications; developing in students the ability to use the appropriate mathematical

	apparatus for analyzing and modeling applied management problems and conducting quantitative research on economic phenomena using computer technology. The main objectives of the course, in accordance with the requirements of the educational and professional program regarding the knowledge and skills of students, are: - mastering by students the basics of the mathematical apparatus, which are necessary for the effective study of other disciplines; - forming initial skills to independently deepen their knowledge, develop logical thinking; developing the ability to formulate and analyze the statement and solution of the problem using mathematical and statistical methods; - mastering modern methods of solving typical problems within the framework of the studied program material; mastering the skills of independent work with educational and methodological literature and using the necessary software products for analyzing and solving professionally-oriented problems.

The role of the academic discipline in achieving Program Learning Outcomes (PLO)

	PLO 6. To define skills in finding, collecting and analyzing information, calculating criteria for grounding managerial decisions. PLO 7. To determine organization design skills. PLO 20. To show skills in applying information, communication and innovative technologies.

Learning outcomes

	Integrative final program learning outcomes, the formation of which is facilitated by the discipline "Higher and Applied Mathematics" are the formation of professional competencies, the ability to solve typical and complex specialized tasks and practical problems in professional activities in the field of management by using modern software for modeling problem situations based on a systematic analysis of a complex of factors and conditions of a certain and uncertain nature, including their analytical assessment. After mastering the discipline, the student must know: - the basics of the mathematical apparatus necessary for the effective study of other disciplines provided for by the educational and professional program for training bachelors; - the principles of mathematical reasoning and mathematical proofs; development of algorithmic and logical thinking; be able to: - analyze and formulate the statement of an economic problem using mathematical and statistical methods. - solve typical problems within the framework of the studied program material; use in practical activities the acquired knowledge on the application of mathematical and statistical methods for the study of economic phenomena.

Course content

MODULE 1. Fundamentals of linear algebra and analytic geometry.
1. Matrices. Operations on matrices.
2. Determinant of a matrix. Inverse matrix.
3. Systems of linear equations. Matrix method.
4. Cramer's rule.
5. Gauss's method.
6. Varieties of solutions of systems of linear equations.
7. Vectors. Vector coordinates.
8. Operations on vectors.
9. Decomposition of a vector by a basis.
10. Coordinate method.
11. Equations of a line and a plane.
12. Second-order lines and surfaces.
13. Intermediate knowledge control.
MODULE 2. Fundamentals of mathematical analysis.
14. Derivative of a function. Finding derivatives.
15. Differential of a function of one and several variables. Application of the differential.
16. Study of functions of two and several variables. Optimization.
17. Indefinite integral. Integration rules and methods.
18. Definite integral. Application of definite integral.
19. Numerical series. Application of convergence signs.
20. Functional series. Taylor series. Approximate calculations.
MODULE 3. Ordinary differential equations.
21. Differential equations. Differential equations with separable variables.
22. First-order differential equations.
23. Second-order differential equations.
24. Linear homogeneous differential equations with constant coefficients.
25. Modeling based on differential equations.

Course materials and requirements

Tutorials

1. І.П. Васильченко. Вища математика для економістів / Підручник.
2. В.В. Барковський, Н.В. Барковська. Вища математика для економістів. / Навчальний посібник.
3. В.В. Барковський, Н.В. Барковська. О.К. Лопатін. Теорія ймовірностей та математична статистика. / Навчальний посібник.

4. E. K. Ummer. Basic Mathematics for Economics, Business, and Finance.
5. Applied Mathematics for Business and Economics / Norton University, 2010
6. Bernard Friedman. Principles and techniques of Applied Mathematics.
7. James A. Robinson. Project Math: Tools and Techniques for Project Managers.
8. Боровик О.В., Боровик Л.В. Дослідження операцій в економіці. - К.: Центр навч. л-ри, 2007 р.
9. Дубовик В.П., Юрик І.І. Вища математика. Навч. посібник.- Київ, А.С.К., 2004.

Course technical requirements

To work on the course of the discipline "Higher and Applied Mathematics", you need regular access to a computer (or phone) and the Internet.
To successfully study and pass the exam in the discipline, you need to familiarize yourself with the remote platform (Moodle or Classroom) and study all the folders on which there is already or gradually placed information or materials for studying the course. You will also need to download and create documents, watch a video, or create it.
The ability to use remote platforms is possible only if you have corporate mail.
If you are unable to enter the course, you need to notify the dean's office, or the headmaster, or directly the course instructor.

Learning Process

The process of studying the discipline "Higher and Applied Mathematics" consists of lectures, practical classes and independent work of higher education students.
1. Lecture classes are conducted using such forms and methods of teaching as lecture, lecture-conversation, discussion, discussion of problem issues, demonstration, analysis of problem situations in accordance with the topic of the lesson.
2. Practical classes include conducting practice-oriented educational and educational-scientific work using technical equipment, solving analytical-computational and qualitative tasks, performing individual and group (team) tasks, listening to and discussing reports, surveys, testing.
Lecture and practical classes are conducted using explanatory-illustrative, reproductive, problem-based, heuristic, research, interactive, dual and transdisciplinary teaching methods.
3. Independent work is an individual and group educational activity of higher education students outside of lectures and practical classes and includes:
- processing of educational material;
- performing individual tasks in the form of a problem question, test, qualitative or computational task;
- preparing reports, writing abstracts (essays);
- performing project educational and scientific research works;
- consulting with a teacher;
- preparing for the final knowledge control.
Independent work is carried out using problem-based, heuristic and research methods of learning.

Assessment policy

Summative assessment

	The assessment of the initial performance in the discipline "Higher and Applied Mathematics" consists of two components: assessment of current performance and assessment based on the results of the final knowledge control, which is carried out in the form of an exam. The assessment of current performance is carried out by calculating the arithmetic average of the grades for all subjects of the discipline provided for by the program on a 4-point scale ("2", "3", "4", "5") with subsequent conversion on a 60-point scale into a rating score of current performance (final score of current performance). 60 points corresponds to the average thematic grade of "5". So, according to this scale, the conversion factor is: 60/5 = 12. Accordingly, the rating score is calculated as the product of the arithmetic average thematic score by the conversion factor "12" and rounded to an integer number of rating scores: Rating score = arithmetic average thematic x 12. For example, if the arithmetic average thematic score is 3.00 points, then the rating score is 3.00 x 12 = 36, if the average score is 3.62, then 3.62 x 12 = 43.44 ≈ 43 according to the rules of approximate calculations. In turn, the score for each topic is a generalized average of scores for individual types of educational activities within a given topic, namely: - activity during a practical lesson; - completion of an individual/group task in a practical lesson and/or extracurricular independent work (homework); - survey/testing; - writing an essay; - oral report (presentation). The minimum rating level of current success required for admission to the final knowledge control is 36 points. The assessment based on the results of the final knowledge control (exam) is carried out on a 4-point scale ("2", "3", "4", "5") and is converted into a 40-point scale with a conversion factor of "8": "5" - 40 points (40 = 5x8), "4" - 32 points, "3" - 24 points. The score "2" is counted as 0 points. The score for the final knowledge control on a 4-point scale is calculated as the arithmetic average of the scores for each task. The maximum number of points that a student can score during the final test is 40. The final test is considered passed if the student scores at least 60% of the maximum number of points for the final test, i.e. 24 points.

Grading scale

	The grade for the discipline is determined as the sum of the final score for current performance and the score for the final control in the form of an exam, and is expressed on a 100-point scale. The total maximum final score for the discipline is 100. For example, if the rating score for current performance is 50, and the final control of knowledge is 34, then the initial rating score is: 50 + 34 = 84 points. The final score for the discipline is given according to the national and European assessment scales.

Grading scale: national and ECTS

Sum of points for all types of learning activities	ECTS grade	According to the national scale	
		Exam, course project (work), practice	Test (credit)
90-100	A	5 (excellent)	pass
82-89	B	4 (good)	
74-81	C		
66-73	D	3 (satisfactory)	
60-65	E		
30-59	FX	unsatisfactory with the possibility of reassembly	Fail with the possibility of retaking
1-29	F	Unsatisfactory with mandatory re-study of the discipline	Fail with mandatory re-study of the discipline

How to find out your score:

To check your assignment grades and read your instructor's comments, you should check the appropriate tabs of the Moodle or Classroom distance learning platforms. You can also obtain information about your grades directly from the course instructor via corporate email or by appointment during consultation days (room 405).

Course policy

General guidelines

The study of the discipline is based on collegiality, cooperation, and solidarity between the lecturer and students. Scientific inquiry and research work by students is encouraged. Topics of the academic discipline are considered in terms of their practical application and bioethical feasibility. Regular attendance of classes without absences, presence of both the lecturer and students during the class according to the schedule and the stipulated class schedule. The lecturer and students should be neatly dressed in a white lab coat during classes. The lecturer is required to fully deliver the course material in accordance with the program of the discipline. Students should take lecture and practical class notes

	The mutual behavior of the lecturer and students, as well as students among themselves, both during class and outside of it, adheres to generally accepted norms and role models of conduct, which involve mutual respect and a collegial nature of relationships, excluding religious, racial, ethnic, cultural, age, gender, social, political, or any other biases and prejudices, as well as bullying, sexual harassment, and other forms of intolerance or human dignity violations. Any manifestations of corruption in the educational process, whether by the lecturer or students, are strictly unacceptable.

Class attendance and participation

	The University's current policies require mandatory attendance at all classes. However, if you are unable to attend one or more classes for a valid reason, please contact your lecturer promptly to arrange a make-up format. Assessment of learning outcomes can be conducted either through an oral response or a test control format, or through the preparation of an essay or presentation that demonstrates mastery of the necessary methodologies or software.

Academic integrity

	The academic integrity of any institution of higher education requires honesty in teaching and research, and therefore academic integrity is required of all students at MEU. Academic dishonesty is prohibited in all programs at our university. This means that we expect all submitted work to be the result of your own intellectual and creative work. If you submit someone else's work, in whole or in part, without proper citation, the assignment will not be accepted and will be graded 0 (no rewriting allowed). Academic dishonesty includes, but is not limited to: plagiarism, fabrication, plagiarism, and abetment of dishonesty. In academic communities, plagiarism represents a serious breach of trust and can result in severe consequences, including disciplinary action. Appropriate sanctions may be applied to any student who commits an act of academic dishonesty. Faculty members must take reasonable steps to remedy academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should promptly bring such information to the attention of the appropriate course instructor. Incidents of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department head. Since students are expected to be familiar with this policy and generally accepted standards of academic integrity, ignorance of such standards is generally not sufficient evidence of lack of intent (https://ieu.edu.ua/images/AndreyContent/docs/16.pdf).

Late task performance, correction of grades, making up missed classes

	Typically (unless a longer period is specified), tasks should be completed by the next class but no later than the Pass/Fail test. If you are unable to complete the task on time, please contact your lecture and inquire about the possibility of extending the deadline.

	If you receive an unsatisfactory grade for a specific topic, it can be corrected: usually by completing a practical task or passing a test. Making up missed classes is conducted in the form an oral response, computer testing, or the preparation of a practical assignment. Students who miss the current control for valid reasons confirmed by documents have the right to take current control within two weeks after returning to studying. Repeated taking of the graded test in the discipline is appointed in case of accomplishing all types of educational, independent (individual) work stipulated by the working program of the academic discipline and is carried out according to the approved schedule of academic failure liquidation. https://ieu.edu.ua/docs/050.pdf

Lecturer's response time (regarding checking tasks)

	Within 48 hours after the deadline for submission, and no later than the midterm and final exam.

Efficient communication

	Effective communication is essential to your success in this course, and we recommend that you use the following channels: ▪ Q&A Forum. ▪ Email: If you are unable to get an answer in the Q&A forum or have a personal question related to your course, please email the instructor directly. We aim to respond to emails within 24-48 hours. ▪ Course Announcements: We will regularly communicate important information and course updates through course announcements in Google Classroom / Moodle. At the beginning of each week, we will send an announcement with an overview of that week's content, upcoming assignments, and expectations. Additional announcements will be sent with reminders or other important information as needed. Remember, effective communication is a two-way street, and we encourage you to interact with each other in the course forum, answer your fellow students' questions in the Q&A forum, and participate in discussions throughout the course. By working together, we can create a positive learning environment and achieve success in this course.

ChatGPT and other generative AI policy

	The use of AI is welcome in the preparation of project tasks, abstracts, and additional information materials. The use of artificial intelligence is encouraged to the extent that it complements but does not replace the student's intelligence.

The use of electronic devices during classes

	Please, use your electronic devices only for class-related purposes and as needed to make course content accessible. Please put your phone on silent mode (not vibrate) during class. If there are serious circumstances, such as a family emergency, that require you to answer a phone call, please notify the instructor prior to class and turn on vibrate so that you can quietly exit the classroom and answer the call. Additionally, no part of the class may be audio or video recorded without my consent and the consent of your classmates. This violates the privacy of other students and may hinder the participation and learning of other students. These expectations will help you stay focused on class and will allow you to set up your personal space for active learning and open dialogue.

Policy of publication and distribution of course materials

	Students may not post, publish, sell, or otherwise publicly distribute course materials without written permission from the instructor. Such materials include, but are not limited to: lecture notes, lecture slides, video or audio recordings, assignments, problem sets, exams, other students' work, and answer keys. Students who sell, post, publish, or distribute course materials without written permission for the purpose of obtaining answers or otherwise may be subject to disciplinary action, up to and including dismissal from the course. In addition, students may not make video or audio recordings of classes for their own personal use without written permission from the instructor.

Expected student workload and engagement

	You should dedicate at least 6 hours per week to this course. If circumstances arise that require you to spend more time on any assignment, please inform your instructor by email. Extensions to due dates are only possible if the instructor is informed in advance that you will not be able to submit the assignment on time. Students are expected to have a backup plan in case of computer failure or internet outages.

Support services

	**Dean's Office: ebs@ieu.edu.ua** **E-schedule: rozklad.ieu.edu.ua** **Library: library.ieu.edu.ua**

Course schedule

№	Topic	Content
1	Matrices. Operations on matrices.	Matrix. Types of matrices. Multiplying a matrix by a number. Adding matrices. Multiplying matrices.
2	Determinant of a matrix. Inverse matrix.	Rules for calculating determinants of matrices of the second, third and higher orders. Minor and algebraic complement. Rules for finding the inverse of a matrix.
3	Systems of linear equations. Matrix method.	Matrix form of a system of linear equations. Solving systems of linear equations using the inverse matrix method.
4	Kramer's rule.	Solving systems of linear equations using Cramer's rule.
5	Gauss method.	Solving systems of linear equations using the Gauss method. Matrix rank.
6	Types of solutions to systems of linear equations.	General, basic and fundamental solutions of a system of linear equations.
7	Vectors. Vector coordinates.	The concept of a vector. Linear vector space. Vector coordinates. Decomposition of a vector into components. Rectangular Cartesian coordinate system (RCCS). Components and projections of a vector on the coordinate axis.
8	Operations on vectors.	Scalar product. Vectors addition. Dot product. Cross and mixed products.
9	Decomposition of a vector by a basis.	Linearly independent and linearly dependent vector systems. Basis of n-dimensional linear space. Finding the coordinates of a vector by the basis.
10	Method of coordinates.	Coordinates of a point. Polar coordinates. Cylindrical and spherical coordinates. Distance between two points on a plane and in space. Coordinates of the midpoint of a segment. Dividing a segment in a given proportion.
11	Equations of a line and a plane.	General equation of a line. Canonical equation of a line. Equation of a line passing through two given points. Equation of a line in segments. Parametric equation of a line. Equation of a line in space. Conditions for parallelism and perpendicularity of lines. General equation of a plane. Distance from a point to a line and from a point to a plane.
12	Equations of second-order lines.	Equation of a circle. Equation of an ellipse. Equation of a hyperbola. Equation of a parabola. Sphere. Surfaces of revolution.
13	Midterm Evaluation.	Colloquium.
14	Derivative of a function. Finding derivatives.	Derivative of a function. Differentiation rules. Finding derivatives. Applying differentiation rules to functions of several variables. Partial derivative.

	15	Диференціал функції однієї та декількох змінних. Застосування диференціалу.	Differential of functions of one and several variables. Complete differential. Application of complete differential for approximate calculations and estimation of errors of indirect measurements.
	16	Research of functions of two and several variables. Optimization.	Extremum. Finding the extremum of functions of two variables. The largest and smallest value of a function in a closed domain. Conditional extremum. Least squares method.
	17	Indefinite integral.	Antiderivative of a function and indefinite integral. Integration rules. Finding indefinite integrals.
	18	Definite integral.	Calculation of definite integrals. Calculation of areas of plane figures and average values of functions on an interval.
	19	Number series.	Convergence of a numerical series. D'Alembert and Cauchy convergence signs. Cauchy integral sign. Alternating series. Leibniz sign. Absolute and conditional convergence.
	20	Functional series. Taylor series.	Power series. Taylor series. Approximate calculations by expanding functions in a Taylor series.
	21	Differential equations.	Types of differential equations. Solving differential equations with separable variables. Cauchy problem.
	22	First order differential equations.	Methods for solving first-order differential equations.
	23	Second-order differential equations.	Methods for solving second-order differential equations. Bernoulli equation. Logistic equation. Logistic curve.
	24	Linear homogeneous differential equations with constant coefficients.	Methods for solving linear homogeneous second-order differential equations with constant coefficients.
	25	Modeling based on differential equations.	Exponential growth. Equation of motion of a material point. Cooling of a body. Radioactive decay. Investment growth. Models of population dynamics. Lotka-Voltaire model.

Tips on successful study

	! Attending classes ! Cooperation with lecturer on all issues of the curriculum ! Performing tasks in accordance with the program ! Writing essays on program topics ! Discussing topics and tasks in groups outside of class time ! Using Internet resources