COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
HIGHER MATHEMATICS	

Academic staff	Core academic unit(s)
Coordinating: Assoc. prof. dr. Liepa Bikulčienė	Kaunas Faculty Institute of Language, Literature and Translation Studies ☐ Institute of Social Sciences and Applied Informatics ☒

Study cycle	Type of the course unit
First ☒ Second ☐	Compulsory Course ☒ Optional Couse ☐ Course Unit (Module) of the General University Studies ☐ Course Unit (Module) of Individual Studies ☒ Interdisciplinary Studies Course Unit (Module) ☐

Mode of delivery	Semester or period when it is delivered	Language of instruction
Auditorium, individual work	Autumn semester	Lithinaina/English

Requisites	
Prerequisites: None	**Co-requisites (if relevant):** Information Technology Basics

Number of ECTS credits allocated	Student's workload (total)	Contact hours	Individual work
5	130	48	82

Purpose of the course unit		
The aim of the course is to provide the theoretical knowledge andpractical skills which are necessary for the application of mathematical methods in various business situations and economic calculations.		
Learning outcomes of the course unit	**Teaching and learning methods**	**Assessment methods**
Knows how to apply linear algebra and linear programming methods, knows their interpretation, distinguishes types	Lectures, exercises, individual work	Exam, tests, individual work
Understands the concepts of functions, their limits, derivatives and integrals, basic formulas and calculation methods, knows how to apply them in real business calculations.	Lectures, exercises, individual work	Exam, tests, individual work
Knows the basic concepts and theorems of probability theory and understands combinatorial calculus.	Lectures, exercises, individual work	Exam, tests, individual work
Able to select and apply mathematical methods, mathematical software to solve various problems, use modern information technologies	Exercises, individual work	Individual work

Able to apply mathematical foundations to business and economic studies, understands in which situations mathematical analysis or forecasting methods are applicable.	Lectures, exercises, individual work	Exam, tests, individual work

Content	**Contact hours**							**Individual work: time and assignments**	
	Lectures	Tutorials	Seminars	Workshops	Laboratory work	Internship	**Contact hours, total**	**Individual work**	**Tasks for individual work**
1. Introductory lesson to the course. Linear control models. Overview of linear control models. Linear systems.	1						1	2	Individual work (solving tasks)
2. Linear matrix operations: sum, difference, product by a constant. Matrix multiplication, inverse matrix. The concept of determinant. Cramer's formulas.rules.	2			4			6	8	Individual work (solving tasks)
3. Definition and geometric interpretation of systems of linear equations. Solving systems by Gauss and Gauss-Jordan methods. Undefined and inconsistent systems of equations.	1			2			3	2	Individual work (solving tasks)
4. Economic interpretation of linear equations, inequalities and their systems. Linear optimization problem, its graphical solution. Production planning, diet, transport problems.	2			4			6	6	Individual work (solving tasks), Preparation for control work
5. Sequences and series of numbers. Rational functions and their graphs. General definition of a function. Limit of a function and the concept of continuity. Properties of continuous functions.	2			4			6	6	Individual work (solving tasks)
6. Limits of functions. Continuous and discontinuous functions. Types of breakpoints. Uncertainties. Methods of calculating limits. Application of limits.	2			4			6	8	Individual work (solving tasks)
7. Derivative of a function. Differentiation rules, table of derivatives. Differentiation of complex, inverse functions. Derivatives of higher orders. Differential. L'Hopital's rule. Asymptotes. Applications of derivatives.	2			4			6	6	Individual work (solving tasks) Preparation for control work
8. Indefinite and definite integral. Direct integration. Integration by change of variable. Integration by parts. Integration of rational, irrational and trigonometric functions. Area of a curved trapezoid and the concept of a definite integral. Newton-Leibniz formula. Calculation of area and volume. Applications.	2			4			6	10	Individual work (solving tasks)
9. Probability theory. Concepts and theorems. Definitions of probability. Space of elementary events. Random events and actions with them. Basic probability theorems.	2			4			6	6	Individual work (solving tasks)

10. Mathematical software. Mathcad program. Its capabilities and user environment. Writing and solving problems. Working with Mathcad. Using Wolfram Mathematica.				2			2	4	Individual work (solving tasks)
11. Exam consultation and examExam preparation (consultation) and exam		4					4	10	Preparation for exam
Total	**16**			**32**			**48**	**82**	
Note: No more than 4 contact hours may be replaced by guest lectures from social partners or educational visits to social partner organizations									

Assessment strategy	Weight %	Deadline	Assessment criteria
Control work (CW)	33%	During the semester(I (6 week) II (12 week)	The control work/exam consists of open and closed questions and/or tasks (of varying difficulty, from understanding to evaluation). Graded on a 1-10 scale: 10-9: Excellent knowledge and skills. Evaluation level. 90-100% correct answers. 8-7: Good knowledge and skills, may contain minor errors. Synthesis level. 70-89% correct answers. 6-5: Average knowledge and skills, there are errors. Analysis level. 50-69% correct answers. 4-3: Knowledge and skills are below average, there are (major) errors. Knowledge application level. 20-49% correct answers. 2-1: Minimum requirements not met. 0-19% correct answers The use of AI tools during settlements is prohibited.
Exam (E)	34%	Durring the sesion	
Final Grade = CW1*0,33+CW2*0,33+E*0,34			

REGARDING THE EXTERNAL EXAMINATION OF THE COURSE UNIT

Mark ☒					**If permitted, please provide the conditions**
Not permitted	☐	**Permitted**	☒		**Final Grade = CW1*0,33+CW2*0,33+E*0,34**

REGARDING THE USE OF GENERATIVE ARTIFICIAL INTELLIGENCE (GenAI) TOOLS (SUCH AS "CHATGPT", ETC.) WHEN STUDYING THE COURSE UNIT

Mark ☒				**If permitted, please provide the conditions**
Not permitted	☐	**Permitted**	☒	*The use of an Artificial Intelligence (AI) generative model must be disclosed, so if an AI generative model has been used in a text, paper, report or other work, this must be clearly stated (with appropriate citations and/or a declaration of the use of an AI generative model). Failure to disclose the use of an AI generative model in an academic work is considered academic dishonesty. In order to ensure that generative AI tools (ChatGPT, etc.) have not been used in the preparation of the essay (i.e. the content of the essay has not been generated by the AI tools), if not disclosed, the lecturer has the right to ask follow-up questions, to use the AI detection tools and, if necessary, to modify or cancel the grade of the assignment.*

REGARDING ACADEMIC PROGRESS

A student who (1) **throughout the semester consistently** fails to demonstrate **progress in achieving the expected learning outcomes of a subject (module)** during the practical classes (seminars, exercises, laboratory work, etc.) and (2) fails to complete all interim assessment requirements and tasks within the time specified in the course description, is not allowed to participate in the examination session.

Author (-s)	Publishing year	Title	Issue of a periodical or volume of a publication	Publishing house or web link
Required reading				

Dabrišienė V., Kravčenkienė V, et al.	2018	Matematikos savamokslis studentams. Serija „žaliems“. Pirmasisžingsnis	ISBN: 9786090215197	https://www.ebooks.ktu.lt/eb/1452/matematikos-savamokslis-studentams-serija-zaliems-pirmasis-zingsnis/
Kabašinskas A., Šutienė K., Kravčenkienė V.	2017	Matematika 1. Tiesinė algebra ir matematinė analizė	ISBN: 9786090213384	https://www.ebooks.ktu.lt/eb/1387/matematika- 1-tiesine-algebra-ir-matematine-analize/
Kabašinskas A., Šutienė K., Ragulskienė J	2015	Matematika 2. Diferencialinės lygtys, tikimybių teorija ir matematinėstatistika	ISBN 9786090211601	https://www.ebooks.ktu.lt/eb/1345/matematika- 2-diferencialines-lygtys-tikimybiu-teorija-ir-matematine-statistika/ /
R.A.Barnett, CH.J.Burke, M.R.Ziegler.	2010	Applied mathematics for Business and Economics, Life Sciences and Social Sciences.	ISBN 9780321694331	Collier MacMillan Publichers, London. P.1093
Recommended reading				
V. Pekarskas	1996	Diferencialinis r integralinis skačiiavimas, 1d.	ISBN 9789986091189	Kaunas: Technologija
V. Pekarskas	2000	Diferencialinis ir integralinis skaičiavimas, 2d.	ISBN 9789986092063	Kaunas: Technologija
E.Boman, R.Rogers	2023	Differential Calculus: From Practice to Theory		https://milneopentextbooks.org/differential-calculus-from-practice-to-theory/
S.Tan	2000	Calculus for the managerial, life and social sciences.	ISBN 9780534379226	6 ed. Brooks/Cole, Thomson Learning
G.Strang	2016	Introduction to Linear Algebra, Fifth Edition		https://math.mit.edu/~gs/linearalgebra/ila5/indexila5.html

NOTE: *Including Open Educational Resources in the reading list is recommended*