COURSE (MODUL) DESCRIPTION
DALYKO (MODULIO) APRAŠAS

Course unit title	Course unit code
ADVANCED MATHEMATICS	

Lecturer (s)	Department where course unit is delivered
Liepa Bikulčienė	KF Institute of Social Sciences and Applied Informatics

Cycle	Level of course unit	Type of the course unit
First	1/1	

Mode of delivery	Semester or period when the course unit is delivered	Language of instruction
Auditorium	1 semester	Lithuanian

Prerequisites and corequisites	
Prerequisites: High school math course	**Corequisites:** Information Technology Basics

Number of ECTS credits allocated	Student's workload	Contact work hours	Individual work hours
5	130	52	78

Purpose of the course unit: programme competences to be developed		
This is a math course for undergraduate students in informatics. His goal is to provide the theoretical knowledge and practical skills which are necessary for the application of mathematical methods in various business situations and economic calculations. During the course students are acquainted with modern mathematical terminology, basic concepts, methods and models.		
Learning outcomes of course unit	**Teaching and learning methods**	**Assessment methods**
- Students may apply linear algebra and linear programming methods, know their economic interpretation, assign types.	Lectures, exercises, independent work, individual work	Exam, colloquium (s): control works, individual work
- Understands the concepts of functions, limits, derivatives and integrals, key formulas and calculation methods, and allows them to be applied in real economic and business calculations.	Lectures, exercises, independent work, individual work	Exam, colloquium (s): control works, individual work
- Knows the basic concepts of probability theory, the main theorems and understands the combinatorial calculation.	Lectures, exercises, individual work	Exam, control works, individual work
- Are able to choose and apply mathematical methods, mathematical software for solving economic problems, use modern information technologies.	Exercises, independent work, active teaching methods (group discussion, case studies)	Individual work
- Are able to apply mathematical background for business and economics studies, understands the situations in which mathematical analysis or forecasting methods are applicable.	Lectures, exercises, independent work, active teaching methods (group discussion, case studies)	Exam, colloquium (s)

Course content: breakdown of the topics	Contact work hours							Individual work hours and tasks	
	Lectures	Consultations	Seminars	Practice classes	Laboratory	Practice	**All contact work**	**Individual work**	**Tasks**
1. Course introductory lesson. Review of linear management models. Economic system balance model. Linear systems.	1						**1**	**2**	Implementation of individual works (solving problems)
2. Linear matrix actions: sum, difference, product from the constant. Matrix multiplication, inverse matrix. The notion of determinant. Cramer's formula.	2			4			**6**	**8**	Individual works (problem solution)
3. Definition of linear equation systems and geometric interpretation. Solutions of systems by Gauss and Jordan methods. Uncertain and unmatched equation systems.	1			2			**3**	**8**	Individual works, preparation for colloquium
4. Economic interpretation of linear equations, inequalities and their systems. Balance of economic system (Leontjevo model). Linear optimization problem, its graphical solution. Production planning, Diet, Transport problems.	2			4			**6**	**6**	Individual work (problem solving), Preparation for control work.
5. Number sequences and series. Rational functions and their graphs. The general definition of the function. Limit of the function and concept of continuity. Definition of continuous functions.	2			4			**6**	**6**	Individual works (problem solution)
6. Functional boundaries. Continuous and burst functions. Types of breakage points. Uncertainties. Limit calculation methods. Limit application in the economy.	2			4			**6**	**8**	Individual works
7. Derivative of function. Differential rules, table of derivatives. Difference and continuity relationship. Compound, reverse function differentiation. Higher order derivatives. Differential Lagrange theorem, Lopital rule. Asymptotic second-order derivatives for the function. Economic applications of derivative.	2			4			**6**	**6**	Individual works (problem solving), preparation for colloquium
8. An indefinite and definite integral. Direct integration. Integration by changing the variable. Integration in parts. Integration of rational, irrational and trigonometric functions. Curved trapezium and definite integral. Newtonian-Leibnic formula. Approximate calculation of definite integral. Area and volume calculation. Application of integrals in Economics.	2			4			**6**	**10**	Individual work (problem solving), Preparation for control work.
9. Theory of probabilities. Concepts and theorems. Definition of probability. Space of elemental events. Random events and actions with them. Basic probability theorems.	2			4			**6**	**8**	Individual works (problem solution)
10. Mathematical software. Mathcad program. Its capabilities and user environment. Writing and solving tasks. Work with the Mathcad program. Using Wolfram Mathematica.				2			**2**	**8**	Individual works (problem solution)
11. Preparation for the exam (consultation) and exam		4					**10**	**10**	Preparation for the exam
Total:	**16**	**4**		**32**			**52**	**78**	

Assessment strategy	Comparative weight percentage	Date of examination	Assessment criteria
Colloquium	15%	At the set time I (6 week) II (12 week)	The control work / test / exam consists of open and closed type questions and / or problems (varying in severity, from understanding to evaluation). Assessed on a scale of 1-10 grades: 10-9: Excellent knowledge and skills. Assessment level. 90-100% correct answers. 8-7: Good knowledge and abilities, may be minor mistakes. Synthesis level. 70-89% of the correct answers. 6-5: Medium knowledge and abilities, there are errors. Analysis level. 50-69% of the correct answers. 4-3: Knowledge and skills are below average, there are major mistakes. Knowledge application level. 20-49% of the correct answers. 2-1: Minimum requirements are not met. 0-19% of the correct answers.
Control work	15%	At the set time I (6 weeks) II (12 week)	
Exam	40%	During the session	

Author s	Year	Title	Number of periodical publication or Volume	The place of publication and publisher or online link
Required reading				
Dabrišienė V., Kravčenkienė V, et al.	2018	Matematikos savamokslis studentams. Serija „žaliems“. Pirmasis žingsnis		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		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 matematinė statistika		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.		Collier MacMillan Publichers, London. P.1093
Recommended reading				
V. Pekarskas	1996	Diferencialinis ir integralinis skačiiavimas, 1d.		Kaunas: Technologija
V. Pekarskas	2000	Diferencialinis ir integralinis skaičiavimas, 2d.		Kaunas: Technologija
Puškorius S.	2001	Matematiniai metodai vadyboje.		Vilnius: TEV
S.Tan	2000	Calculus for the managerial, life and social sciences.		6 ed. Brooks/Cole, Thomson Learning, p. 700
A. Aksomaitis	2000	Tikimybių teorija ir statistika.		Kaunas: Technologija