

<b>Annex No. 3</b>		<b>First Cycle Studies Course Programme</b>			
1.	Course Title	<b>Mathematics for Economists</b>			
2.	Code	MST 110			
3.	Study programme	E-business, Economics, Marketing, Management and Entrepreneurship, International Trade, Accounting and Auditing, Finance			
4.	Organizer of the study programme (university unit i.e. institute, chair, department)	Ss. Cyril and Methodius University in Skopje Faculty of Economics - Skopje Chair of Mathematics and Statistics			
5.	Level (first, second, third cycle)	First cycle			
6.	Academic year / semester	2022-2023 1 <sup>st</sup> (winter semester)	7.	Number of ECTS credits	7.5
8.	Professor	Prof. Igor Ivanovski, PhD Prof. Violeta Cvetkoska, PhD			
9.	Preconditions for enrolment	None			
10.	<p><b>Course Objectives (Competencies):</b> After taking this course, students should be able to:</p> <ol style="list-style-type: none"> <li>1. to understand the meaning, essence and the need for application of specific mathematical methods and models in solving numerous problems of economic theory and practice,</li> <li>2. to acquire knowledge of mathematical methods and models and be able to effectively master them and application in solving the practical elements presented in the presented matter,</li> <li>3. to develop basic quantitative analytical ability and quantitative evaluation of phenomena and processes of economic theory and practice, and</li> <li>4. to acquire a built and differentiated quantitative methodology in terms of setting and solving various problems from other economic disciplines.</li> </ol>				
11.	<p>Course content:</p> <p><b>I. Sequences and series</b></p> <ol style="list-style-type: none"> <li>1. Notion of sequences</li> <li>2. Limit of a sequence</li> <li>3. Operations with limits</li> <li>4. Series</li> <li>5. Some typical sequences and series</li> <li>6. Series convergence criteria</li> </ol> <p><b>II. Combinatorics</b></p> <ol style="list-style-type: none"> <li>1. Elements</li> <li>2. Permutations <ol style="list-style-type: none"> <li>2.1. Permutations without elements repetition</li> <li>2.2. Permutations with elements repetition</li> <li>2.3. Models for approximate determination of the number of permutations</li> </ol> </li> <li>3. Combinations <ol style="list-style-type: none"> <li>3.1. Combinations without elements repetition</li> <li>3.2. Combinations with elements repetition</li> <li>3.3. Relations between the number of combinations</li> <li>3.4. Binomial and trinomial series</li> </ol> </li> <li>4. Variations <ol style="list-style-type: none"> <li>4.1. Variations without elements repetition</li> <li>4.2. Variations with elements repetition</li> <li>4.3. Relations between the number of variations and combinations</li> </ol> </li> </ol>				

	<p><b>III. Fundamentals of probability</b></p> <ol style="list-style-type: none"> <li>1. Random events and event algebra</li> <li>2. Defining probability</li> <li>3. <i>A priori</i> probability <ol style="list-style-type: none"> <li>3.1. Aggregate probability</li> <li>3.2. Complex probability</li> <li>3.3. Conditional Probability and Bayes Theorem</li> <li>3.4. Binomial probability <ol style="list-style-type: none"> <li>3.4.1. Probable number of achievements of the expected event and maximum probability</li> <li>3.4.2. Models for approximate calculation of binomial probability</li> </ol> </li> <li>3.5. Mathematical hope (expected value)</li> </ol> </li> <li>4. <i>A posteriori</i> probability <ol style="list-style-type: none"> <li>4.1. Probability of living of a single person</li> <li>4.2. Probability of living of a more than one person</li> </ol> </li> <li>5. Random (stochastic) variables</li> </ol> <p><b>IV. Elements of linear algebra</b></p> <ol style="list-style-type: none"> <li>1. Notion and properties of matrices</li> <li>2. Matrix operations</li> <li>3. Determinants <ol style="list-style-type: none"> <li>3.1. Properties and methods for calculating determinant's value</li> <li>3.2. Solving linear homogenous equations</li> </ol> </li> <li>4. Inverse matrix and rank of a matrix</li> <li>5. Dependence and independence of vectors</li> </ol> <p><b>V. Derivatives and integrals</b></p> <ol style="list-style-type: none"> <li>1. Limit of a function</li> <li>2. Defining the limit of a function with one and two variables</li> <li>3. Function extremes with one and two variables</li> <li>4. Taylor and MacLaurin series</li> <li>5. Empirically defined functions</li> <li>6. Undefined integrals (methods of substitution and integration by parts)</li> <li>7. Defined integrals</li> </ol> <p><b>VI. Operations of economic practice</b></p> <ol style="list-style-type: none"> <li>1. Dividend, percentage, interest and term accounts</li> <li>2. Chain accounts</li> </ol> <p><b>VII. Fundamentals of financial mathematics</b></p> <ol style="list-style-type: none"> <li>1. Compound interest and interest rate</li> <li>2. Accumulated and present value</li> <li>3. Periodical investments and income</li> <li>4. Calculating loan amortization with decursive interest rate <ol style="list-style-type: none"> <li>4.1. Amortization of loans with equal and rounded annuities</li> <li>4.2. Conversion and consolidation of loans.</li> </ol> </li> <li>5. Loan amortization with anticipatory calculation of interest <ol style="list-style-type: none"> <li>5.1. Amortization of loans with equal and rounded annuities</li> <li>5.2. Conversion and consolidation of loans</li> </ol> </li> </ol>			
12.	Learning methods: Interactive lectures, video presentations, guest speakers, case studies, directed discussions, individual or group papers, seminar projects, and homework.			
13.	Total hours	7.5 ECTS x 30 classes = 225 classes		
14.	Allocation of hours per activity	60+30+30+15+90 = 225 classes		
15.	Types of teaching activates	15.1.	Lectures	60 classes
		15.2.	Exercises (Seminars)	30 classes
16.	Other types of activities	16.1.	Projects	30 classes
		16.2.	Writing Assignments	15 classes

		16.3	Homework	90 classes	
17.	Grading method: 90+10 =100 points				
	17.1.	Tests (Domain, Essay, Multiple choice exam, Case)	90 %		
	17.2.	Individual or Group Assessment / projects (Case Presentation, Case Analysis, Quizzes, Writing Assignments)	0 %		
	17.3.	Attendance and class participations	10 %		
18.	Grading scale		less than 50 points	5 (five) (F)	
			from 51 to 60 points	6 (six) (E)	
			from 61 to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
19.	Preconditions for taking the final exam		Realized activities from points 15 and 16		
20.	Language		Macedonian (or English)		
21.	Evaluation method		Internal evaluation and survey		
22.	Literature				
	22.1.	Compulsory literature			
		No.	Author	Title	Publisher
		1.	Janev, Drage	<i>Mathematics for economists</i>	Faculty of Economics - Skopje
		2.	Janev, Drage & Ivanovski, Igor	<i>Applied mathematics for economists</i>	Faculty of Economics - Skopje
	22.2.	Additional literature			
		No.	Author	Title	Publisher
		1.	Chiang, Alpha C. & Wainwright, Kevin	<i>Fundamental methods of Mathematical Economics</i>	TABERNAKUL
2.		Ivanović, Branislav	<i>Mathematics for economists</i>	Naučna knjiga, Belgrade	
				Year	
				2015	
				2016	
				2010	
				1988	