

Course Syllabus

Title of the course	Instrumental Methods of Economic Analysis		
Title of the Academic Programme	Masters in Economics (1 st year), Masters in Finance (1 st year)		
Type of the course	Adapting; available to foreign students		
Prerequisites	Calculus, Linear algebra		
ECTS workload	6		
Total indicative study hours	Directed Study	Self-directed study	Total
	24	52	76
Course Overview	The purposes of the discipline "Instrumental Methods of Economic Analysis" are: understanding the basic concepts of mathematical analysis and linear algebra; and acquiring skills in solving optimization problems of various types.		
Intended Learning Outcomes (ILO)	Understand the theory of elementary functions, methods of calculus related to the differentiation of single and multiple variable functions. Know the necessary and sufficient conditions for concavity/convexity of the function and maximum/minimum. Be able to solve unconstrained and constrained optimization problems. Have an understanding of the envelope theorem and be able to use it in the optimization problems.		
Teaching and Learning Methods	The course consists of lectures (8 hours) and tutorials (16 hours). The tutorials involve studying calculus and linear algebra methods and their application to solving constrained and unconstrained optimization problems using terms and concepts studied in class.		

Content and Structure of the Course

№	Topic / Course Chapter	Total	Directed Study		Self-directed Study
			Lectures	Tutorials	
1	Linear algebra: operation with matrices, square matrices, determinant, eigenvalues and eigenvectors	11	1	2	8
2	Functions of one variable: derivative of the function, necessary and sufficient conditions for increasing/decreasing, concavity/convexity, extremum and inflection points.	11	1	2	8
3	Functions of multiple variables: first and second order partial derivatives, Schwarz theorem, necessary and sufficient conditions for concavity/convexity and extremum points	16	2	4	10

4	Unconstrained optimization of multiple variables functions: necessary and sufficient conditions for local/global maximum/minimum, envelope theorem	18	2	4	12
5	Constrained optimization of multiple variable functions. Equality constrains: necessary and sufficient conditions for maximum/minimum, relationship between concavity/convexity of the function with the type of extremum. Inequality constrains: Kuhn-Tucker theorem, relationship between concavity/convexity of the function with the type of extremum	20	2	4	14
Total study hours		76	8	16	52
Indicative Assessment Methods and Strategy	Students' progress will be measured by in-class quizzes (40% of the final grade), class participation (10%), and an 80-minute written final exam (50%).				
Readings / Indicative Learning Resources	<u>Mandatory</u> Hugh Gravelle , and Ray Rees. Microeconomics. Harlow: Prentice Hall (2004). <u>Optional:</u> 1. Jehle, Geoffrey A., and Philip J. Reny. Advanced Microeconomic Theory. Harlow, England, New York: Financial Times, 2011 2. Sundaram, Rangarajan K. A first course in optimization theory. Cambridge University Press, 1996 3. Vinogradov, Viatcheslav. Mathematics for economists. Karolinum Press, 2010				
Indicative Self- Study Strategies	Type	+/-	Hours		
	Reading for seminars / tutorials (lecture materials, mandatory and optional resources)	+	14		
	Assignments for seminars / tutorials / labs	+	20		
	E-learning / distance learning (MOOC / LMS)	-	0		
	Fieldwork	-	0		
	Project work	-	0		
	Other (please specify)	-	0		
	Preparation for the exam	+	18		
Academic Support for the Course	Academic support for the course is provided via LMS, where students can find: guidelines and recommendations for doing the course; guidelines and recommendations for self-study; samples of assessment materials				
Facilities, Equipment and Software	Projector, white board.				

Course Instructor	Sergey Kichko
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Intended Learning Outcomes (ILO) Delivering

Programme ILO(s)	Course ILO(s)	Teaching and Learning Methods for delivering ILO(s)	Indicative Assessment Methods of Delivered ILO(s)

Course Content

1. Linear algebra: operation with matrices, square matrices, determinant, eigenvalues and eigenvectors.
2. Functions of one variable: derivative of the function, necessary and sufficient conditions for increasing/decreasing, concavity/convexity, extremum and inflection points.
3. Functions of multiple variables: first and second order partial derivatives, Schwarz theorem, necessary and sufficient conditions for concavity/convexity and extremum points.
4. Unconstrained optimization of multiple variables functions: necessary and sufficient conditions for local/global maximum/minimum, envelope theorem.
5. Constrained optimization of multiple variable functions:
 - a. Equality constrains: necessary and sufficient conditions for maximum/minimum, relationship between concavity/convexity of the function with the type of extremum.
 - b. Inequality constrains: Kuhn-Tucker theorem, relationship between concavity/convexity of the function with the type of extremum.

Assessment Methods and Criteria

Assessment Methods

Types of Assessment	Forms of Assessment	Modules			
		1	2	3	4
Formative Assessment	Test	*			
	Essay				
	Report/Presentation				
	Project				
	In-class Participation	*			
	In-class quizzes	*			
Interim Assessment (if required)	Assignment (e.g. written assignment)				
Summative Assessment	Exam	*			

Assessment Criteria

In-class Participation

Grades	Assessment Criteria
«Excellent» (8-10)	A critical analysis which demonstrates original thinking and shows strong evidence of preparatory research and broad background knowledge.
«Good» (6-7)	Shows strong evidence of preparatory research and broad background knowledge. Excellent oral expression.
«Satisfactory» (4-5)	Satisfactory overall, showing a fair knowledge of the topic, a reasonable standard of expression. Some hesitation in answering follow-up questions and/or gives incomplete or partly irrelevant answers.
«Fail» (0-2)	Limited evidence of relevant knowledge and an attempt to address the topic. Unable to offer relevant information or opinion in answer to follow-up questions.

Project Work

Grades	Assessment Criteria
«Excellent» (8-10)	A well-structured, analytical presentation of project work. Shows strong evidence and broad background knowledge. In a group presentation all members contribute equally and each contribution builds on the previous one clearly; Answers to follow-up questions reveal a good range and depth of knowledge beyond that covered in the presentation and show confidence in discussion.
«Good» (6-7)	Clearly organized analysis, showing evidence of a good overall knowledge of the topic. The presenter of the project work highlights key points and responds to follow up questions appropriately. In group presentations there is evidence that the group has met to discuss the topic and is presenting the results of that discussion, in an order previously agreed.
«Satisfactory» (4-5)	Takes a very basic approach to the topic, using broadly appropriate material but lacking focus. The presentation of project work is largely unstructured, and some points are irrelevant to the topic. Knowledge of the topic is limited and there may be evidence of basic misunderstanding. In a group presentation, most of the work is done by one or two students and the individual contributions do not add up.
«Fail» (0-2)	Fails to demonstrate any appropriate knowledge.

Written Assignments (Essay, Test/Quiz, Written Exam, etc.)

Grades	Assessment Criteria
«Excellent» (8-10)	Has a clear argument, which addresses the topic and responds effectively to all aspects of the task. Fully satisfies all the requirements of the task; rare minor errors occur;
«Good» (6-7)	Responds to most aspects of the topic with a clear, explicit argument. Covers the requirements of the task; may produce occasional errors.
«Satisfactory» (4-5)	Generally addresses the task; the format may be inappropriate in places; display little evidence of (depending on the assignment): independent thought and critical judgement include a partial superficial coverage of the key issues, lack critical analysis, may make frequent errors.
«Fail» (0-2)	Fails to demonstrate any appropriate knowledge.