



Lecturer of the course

Contact information of the lecturer (e-mail)

Course page on eLearn

COURSE SYLLABUS **«ECONOMIC AND MATHEMATICAL METHODS»**

Degree of higher education - Bachelor

Specialty: 051 “Economics”

Academic programme “International Economics”

Academic year 2, semester 4

Form of Study Full-time (full-time, extramural)

Number of ECTS credits 4

Language of instruction English (Ukrainian, English, German)

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<https://elearn.nubip.edu.ua/course/view.php?id=5109>

COURSE DESCRIPTION

The course “Economic and Mathematical Methods” belongs to series of disciplines that form the profile of the future specialist, equipping him with basic knowledge of the theory and practice in the application of economic and mathematical methods and models, because economic systems can’t be effectively studied without using the modern theoretical methods and practical experiment.

The purpose of studying this course is to form future specialists in modern thinking and give them a system of fundamental theoretical knowledge of economic-mathematical methods and models, and applied practical skills using information technology tools (including MS Excel, etc.); acquiring skills in research and analysis of economic processes and phenomena to make adequate management decisions.

The task of studying the discipline is theoretical and practical training of students on the methodology and methods of research of economic processes and phenomena using the tools of economic and mathematical modeling.

Acquisition of competencies:

Integrated competency (IC): the ability to solve complex specialized tasks and practical problems in the economic sphere, which are characterized by the complexity and uncertainty of conditions, which involves the application of theories and methods of economic science.

General competencies (GC):

GC 3. Ability to abstract thinking, analysis and synthesis.

GC 7. Information and communication skills technologies.

GC 11. Ability to make informed decisions.

Special (professional) competencies (SC):

SC 6. Ability to apply economic and mathematical methods and models to solve economic problems.

SC 7. Ability to apply computer technologies and data processing software to solve economic problems, analyze information and prepare analytical reports.

SC 8. Ability to analyze and solve problems in the field of economic, social and labour relations.

SC 9. Ability to forecast socio-economic processes based on standard theoretical and econometric models.

Program learning outcomes (PLO):

PLO 5. Apply analytical and methodological tools to substantiate proposals and make management decisions by various economic agents (individuals, households, enterprises and government bodies)

PLO 8. Apply relevant economic and mathematical methods and models for solving economic problems.

PLO 21. Be able to think abstractly, apply analysis and synthesis to identify key characteristics of economic systems at different levels, as well as the characteristics of the behavior of their subjects.

COURSE STRUCTURE

Topic	Hours (lectures/1 abs, practical classes, seminars)	Learning outcomes	Tasks	Assessment
Semester 4				
Module 1				
Topic 1. Theoretical foundations of mathematical methods and their classification	2/2	To know the main concepts of Mathematical Programming: the modern theory; theorems, methods; essence and history of the academic discipline; studying the main methods	Students will enhance their understanding and acquire practical skills by working through the exercises, which are	Execution and delivery of practical works - credited.
Topic 2. Principles and stages of construction Economic mathematical				

methods	2/2	for solving the problems of the course; realization of formal research received by the solver.	of three types. Theory exercises on derivations and model extensions. Simulation exercises illustrating statistical properties of econometric models and methods. Empirical exercises on applications with business and economic data sets to solve questions of practical interest.	Module: descriptive part 100; test part 30 * 0.1; Independent work - according to the evaluation journal in eLearn.
Topic 3. Basic methods of formalizing economic conditions	2/2			
Topic 4. The general problem of linear programming and its canonical figures	2/2			
Topic 5. Geometric interpretation of linear programming problems	2/2			
Topic 6. The solution of simplex	2/2			
Topic 7. Theory of duality and duality of linear optimization estimates tasks	4/4	4/4		
Module 2				
Topic 8. Transport problems of linear programming	2/2	To know the main concepts of Mathematical Modelling: the modern theory, studying the main types of models for solving the problems of the course; realization of formal research received by the solver	Tasks of practical work. Writing tests, essays. Doing independent work (including in elearn) Problem solving, presentations etc.	Execution and delivery of laboratory works - credited. Module: descriptive part 100; test part 30 * 0.1; Independent work - according to the evaluation journal in eLearn.
Topic 9. Analysis of optimization solutions tasks	2/2			
Topic10. Mathematical modeling of the agricultural industry	2/2			
Topic 11. Applied financial models. Production models	4/4			
Topic 12. Applied financial models	2/2			
In total for the 4th semester, $0.7 \cdot (R(1)CM + \dots + R(n)CM)$ educational work				70
Opportunity to get extra points		Additional points can be achieved for presentation and participation in a student conference, article publication, participation in the 1st round of the olympiads, etc.		up to 10
Exam				30
Total for the course $R_{course} = R_{edw} + R_{ex}$				100

ASSESSMENT POLICY

<i>Policy regarding deadlines and resits</i>	Assignments submitted after the deadline without valid reasons will be graded lower. Resitting of modules will be allowed with the permission from the lecturer and in the presence of valid reasons (e.g. medical reasons).
<i>Academic honesty policy:</i>	Cheating during tests and exams is strictly prohibited (including the use of mobile devices). Coursework and research papers must contain correct citations for all sources used.
<i>Attendance policy</i>	Class attendance is mandatory. In case of objective reasons (such as illness or international internships), individual learning may be allowed (in online format by the approval of the dean of the faculty).

SCALE OF ASSESSMENT OF STUDENT KNOWLEDGE

Student rating, points	National grade based on exam results	
	exams	credits
90-100	excellent	credited
74-89	good	
60-73	satisfactory	
0-59	unsatisfactory	not credited

RECOMMENDED SOURCES OF INFORMATION

1. Bruce E. Hansen. Econometrics. University of Wisconsin. Princeton University Press, 2022, 700 p.
2. Business Problems, School of Business and Technology Webster University, 2018, 264 p.
3. Hamulczuk M., Makarchuk O., Kuts T. Time-Varying Integration of Ukrainian Sunflower Oil Market with the EU Market. *Agris on-line (Papers in Economics and Informatics)*. 2021. Vol. XIII, №3. P. 35-49.
URL: <https://doi.org/10.7160/aol.2021.130304>
4. Hamulczuk M., Cherevyk D., Makarchuk O., Kuts T., Voliak L. Integration of Ukrainian grain markets with foreign markets during russia's invasion of Ukraine. *Zagadnienia Ekonomiki Rolnej Problems of Agricultural Economics*. 2023. Vol. 377(4). P. 1-25. URL: <https://doi.org/10.30858/zer/177396>
5. Illukkumbura A. *Introduction to Regression Analysis (Easy Statistics)*, 2020, 121 p.
6. Kuts T., Makarchuk O. Environmental Awareness of students of National University of Life And Environmental Sciences (Nules) of Ukraine in the context of modern challenges, *Papers: Management, Economic Engineering in Agriculture & Rural Development*. 2023. Vol. 23 Issue 16, P. 363-370.
URL: https://managementjournal.usamv.ro/pdf/vol.23_2/Art42.pdf
7. Makarchuk O., Kuts T., Voliak L. Green economy in Ukraine: analysis and modelling of development in agriculture. *Grail of Science*, 2024. №46, pp. 264-270.
URL: <https://archive.journal-grail.science/index.php/2710-3056/issue/view/29.11.2024/34>

8. Makarchuk O., Kuts T., Labenko O., Kuts O. Market evaluation of rapessed in Ukraine: perspectives and challenges. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural development. 2024. Vol. 24 (4), pp. 505-513. URL: https://managementjournal.usamv.ro/pdf/vol.24_4/volume_24_4_2024.pdf
9. Makarchuk O. Sunflower oil market in Ukraine: state and challenges. Біоекономіка і аграрний бізнес. 2022 р., НУБіП України. 2022. №2. С. 100-110. URL: <https://economicscience.com.ua/uk/journals/t-13-2-2022/rinok-sonyashnikovoyi-oliyi-v-ukrayini-stan-ta-vikliki>
10. Sean Beckett. Introduction to Time Series Using Stata. Stata Press, 2020, 670 p.
11. Економіко-математичні методи і моделі в галузі управління персоналом: навч. посіб. За заг. редакцією Л.В. Мазник. К. : Кафедра, 2019. 290 с.
12. Економіко-математичні методи та моделі у науково-дослідних роботах: навч. посіб. / за заг. ред. д-ра екон. наук, проф. О. Є. Кузьміна. Львів : Видавництво Львівської політехніки, 2021. 284 с.
13. Козьменко О.В. Економіко-математичні методи та моделі (економетрика): навчальний посібник. Суми: Університетська книга, 2023. 406 с.
14. Кузьмичов А. І. Економетрія. Моделювання засобами MS Excel: навчальний посібник. К. : ЦУЛ, 2019. 214 с.
15. Оптимізаційні методи та моделі в підприємницькій діяльності : Навч. посіб. / Л.О. Волонтир, Н.А. Потапова, І.М. Ушкаленко, І.А. Чіков, Вінницький національний аграрний університет. Вінниця : ВНАУ, 2020. 404 с.
16. Офіційний сайт Державної служби статистики України. URL: <http://ukrstat.gov.ua/>
17. Офіційний сайт Державної служби України з питань праці. URL: <https://dsp.gov.ua/>
18. Офіційний сайт Євростату. URL: <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home>
19. Офіційний сайт Кабінету Міністрів України. URL: <http://www.kmu.gov.ua/control/>
20. Офіційний сайт Міністерства економічного розвитку і торгівлі України. URL: <http://www.kmu.gov.ua>
21. Офіційний сайт Продовольчої та сільськогосподарської організації ООН (ФАО). URL: <http://www.fao.org/>
22. Офіційний сайт Світового банку. URL: <http://www.worldbank.org/>
23. Присенко Г. В., Равікович Є.І. Прогнозування соціально-економічних процесів: навч. посібник. К.: КНЕУ, 2020. 378 с.
24. Продовольча та сільськогосподарська організація ООН (ФАО). URL: <http://www.fao.org/>
25. Руська Р. В. Економетрика: навч. посібник. Тернопіль: Тайп, 2021. 248 с.
26. Теоретичні основи кількісних методів моделювання та прогнозування економічних процесів. URL: http://bookss.co.ua/book_medoti-ekonomyko-statestichnih-doslidzhen_806/3_1.-teoretichn-osnovi-klksnih-metodv-modelyuvannya-taprognozuvannya-ekonomchnih-procesv.
27. Флегантов Л.О. Математичне програмування: лекції. Полтава: ПДАУ, 2022. 96 с.

28. Якимова Л. П. Оптимізаційні методи та моделі : практикум в MS Excel : навч.- метод. посіб. Чернівці : Чернівець. нац. ун-т ім. Ю. Федьковича, 2022. 272 с.

29. Яровий А. А, Ваховська Л. М., Крилик Л. В. Математичні методи дослідження операцій. Лінійне програмування. Частина 1 : навчальний посібник Вінниця : ВНТУ, 2020. 86 с.

30. Яцько О. М., Томка Ю.Я. Дослідження операцій та теорія ігор. Навчально-методичний посібник.. Чернівці: Технодрук, 2023. 392 с.