SYLLABUS OF THE ACADEMIC DISCIPLINE

Applied modeling

Level of Higher Education **-** "Bachelor"
Field of Knowledge: 07 "Management and Administration".
Specialty**:** 073 "Management"
Educational and professional program of Study "Management"
Year of Study**:** 2**,** Semester**:** 4
The form of study**:** Full-time study
The number of ECTS credits**: 5**
Language of instruction: English

Course Lecturer

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Virtual Office Hours (eLearn)

https://elearn.nubip.edu.ua/course/view.php?id=5115

DESCRIPTION OF THE COURSE

The Academic Discipline "Economic-Mathematical Modelling" 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 efficient management decisions.

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

<div align="center">**Acquisition of competencies:**</div>

Integrated competency (IC): The ability to solve complex specialized tasks and practical problems characterized by complexity and uncertainty in the conditions in the field of management or in the learning process, which involves the application of theories and methods of social and behavioral sciences

General Competencies (GC):
GC 4. Ability to apply knowledge in practical situations.
GC 8. Skills in using information and communication technologies.
GC 10. Ability to adapt and act in a new situation.
GC 12. The ability to generate new ideas (creativity).

Professional (special) competencies (PC):
PC 1. The ability to define and describe the characteristics of the organization.
PC 2. The ability to analyze the results of the organization's activities, to compare them with the factors of influence of the external and internal environment.
PC 10. The ability to evaluate the performed work, ensure their quality and motivate the personnel of the organization.
PC 12. Ability to analyze and structure organizational problems, form reasonable solutions.

Program Learning Outcomes (PLO):
PLO 4. Demonstrate skills in identifying problems and justifying management decisions.
PLO 6. Demonstrate the skills of searching, collecting and analyzing information, calculating indicators to substantiate management decisions.

<div align="center">**COURSE STRUCTURE**</div>

Topics	Hours (lectures / laboratory classes)	Learning outcomes	Tasks	Knowledge assessment
Semester # 4				
Module # 1 Mathematical Programming				
Topic # 1. Optimization models and methods.	2/4	To know the main concepts of Mathematical Programming: the modern theory; theorems, methods; essence and history of the academic discipline; studying the main methods for solving the problems of the course; realization of formal research received by the solver.	Performing practical tasks, self-study work using information technology tools in elearn.	10 s.s.w. 10
Topic # 2. Linear programming. Methods for solving Linear Programming Problems.	2/4			20
Topic # 3. Duality in linear programming.	2/4			10
Topic # 4. Transportation Problem.	2/4			10 s.s.w. 10
Topic # 5. Nonlinear Programming Problems.	1/2			-
Total, hours	9/18			**70**

Test and task to Module # 1				**30**
Total (on the content of module # 1)				**100**

<table>
<tr><td colspan="5" align="center">Module # 2
Mathematical Modelling</td></tr>
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Topic # 6. The theoretical basis of Economic Mathematical Modelling.	2/4	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; performance of the analysis of the solution.	Performing practical tasks, self-study work using information technology tools in elearn.	20
Topic # 7. The Models in Agriculture.	2/4			10 s.s.w. 10
Topic # 8. Some sections of modelling (Risk, Financial etc.).	2/4			10 s.s.w. 20
Total, hours	6/12			**70**
Test and task to Module # 2				**30**
Total (on the content of module # 2)				**100**

<table>
<tr><td colspan="5" align="center">Module # 3
Methods of Building a General Linear Model</td></tr>
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Theme # 9. Subject, methods and objectives of discipline	0/0	Students should know: the role of econometric studies in economics. Object, subject, goals, tasks and structure of the course. Place and course importance among basic disciplines. General view of a linear econometric model, its structure and stages of construction. The concept of the main principles of the classical correlation econometric analysis. The concept of multicollinearity, methods and characteristics of its identification. The concept of heteroscedasticity and methods of its study. The impact of heteroscedasticity on the properties of parameter estimates.	Performing practical tasks, self-study work using information technology tools in elearn.	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**.**
Theme # 10. Methods of the general linear model	2/4			
Theme # 11. Multicollinearity and its impact on the estimation of the model parameters	2/4			
Theme # 12. Generalized least squares	2/4			
Theme # 13. Econometric model of the dynamics	2/2			
Total, hours	8/14			**70**
Test and task to Module # 3				**30**
Total (on the content of module # 3)				**100**

Module # 4 Econometric Modeling				
Theme # 14. Empirical methods of quantitative analysis based on statistical equations	2/4	Students should know: concept of autocorrelation. The nature and consequences of autocorrelation in econometric models. Check for autocorrelation. Durbin-Watson criterion. Causes of correlation appearance between explanatory variables and residues. Estimation of model parameters using instrumental variables. The concept of lag and lagged variables	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.
Theme # 15. Construction an econometric model with the autocollinearity remains operations	2/4			
Theme # 16. Methods of instrumental variables	0/2			
Theme # 17. Distributed lag models	0/2			
Theme # 18. Econometric models on the basis of system structural equations	2/4			
Theme # 19. Econometric modeling based on nonlinear regression	1/2			
Total, hours	7/16			**70**
Test to Module # 4				**30**
Total (on the content of module # 4)				**100**
Total, hours	30/60			
Total for educational work	$$R_{EW} = \frac{0{,}7 \cdot (R_{MOD\,1} + R_{MOD\,2} + R_{MOD\,3} + R_{MOD\,4})}{4}$$			**70**
Certification (**Exam**)				**30**
Total	$R_{DIC} = R_{EW} + R_{CER}$			**100**

EVALUATION POLICY

Deadline and reassembly policy:	Works that are submitted in violation of deadlines without good reason are evaluated at a lower grade. Relocation of modules takes place with the permission of the teachers who provide the course, if there are serious reasons (for example, hospital).
Academic Integrity Policy:	Copying of the text during written tests and exams is prohibited. The use of mobile devices is allowed only with the permission of the teacher during online testing and preparation of practical tasks. Self-Study works in the form of abstracts, reports, presentations must have correct text links to the information sources used.

Attendance Policy:	Attendance is mandatory. For objective reasons (for example, illness, international internship) training can take place individually at a distance (online form in agreement with the dean of the faculty and the lecturer of the course).

STUDENT EVALUATION SCALE

National Grade	Rating of the Higher Education Learners, Score
"Excellent"	90 - 100
"Good"	74 - 89
"Satisfactory"	60 - 73
"Unsatisfactory"	0 - 59

REFERENCES

Main

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9. Kennedy Peter. A guide to econometrics. Massachusetts: The MIT Press, 2015. 468p.
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13. Quirk T. Excel 2019 in Applied Statistics for High School Students: A Guide to Solving Practical Problems (Excel for Statistics) 2nd ed., Springer, 2021, 264 p.
14. Ruric E. Wheeler, W.D.Peeples, Jr. Modern Mathematics. Brooks: Cole Publishing Company, 2016. 707p.
15. Simon Carl P., Blume Lawrence. Mathematics for economists. New York, London: W.W.Norton & Company, 2017. 930p.
16. Studies in mathematics education. The teaching of statistics / R.Morris. Unesco, 2015. 258p.
17. Галаєва Л.В., Коваль Т.В., Шульга Н.Г. Практикум «Теорія ймовірностей» / Навч. пос. Київ: вид центр НУБіП України, 2023. 464с.
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Recommended sources of information (Electronic Resources)

1. Кабінет Міністрів України. URL: http://www.kmu.gov.ua/control/
2. Державний Комітет статистики України. URL: http://ukrstat.gov.ua/
3. Продовольча та сільськогосподарська організація ООН (ФАО). URL: http://www.fao.org/
4. Світовий банк. URL: http://www.worldbank.org/
5. Євростат. URL: http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home
6. Положення про екзамени та заліки у Національному університеті біоресурсів і природокористування України, затверджене Вченою радою НУБіП України від 26.04.2023р. протокол № 10. URL:
https://nubip.edu.ua/sites/default/files/u284/polozh_ekzameni_zaliki_z_dopovnennyam_2023_na_sayt.pdf