COURSE SYLLABUS
"APPLIED MODELLING"

Degree of higher education - Bachelor
Specialty 073 Management
Academic program "Management"
Academic year 2, semester 4
Form of Study Full-time (full-time, part-time**)**
Number of ECTS credits 5
Language of training English

Lecturer of the course 	**Liudmyla V. Galaieva,** PhD (Associate Professor of Economy Cybernetics Department)
	**Lesia R. Voliak,** PhD (Associate Professor of Statistics and Economic Analysis Department)
Contact information of the lecturer (e-mail)	lgalaeva@nubip.edu.ua voliaklr@ nubip.edu.ua
Course page on eLearn	https://elearn.nubip.edu.ua/course/view.php?id=5115

COURSE DESCRIPTION

The Academic Discipline **"Applied 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.

Competencies

Integrated competency (IC): the ability to solve complex specialized problems and practical problems that are characterized by complexity and uncertainty of conditions, in the field of management or in the process training involving the application of theories and methods social and behavioral sciences.

General competencies (GC):

- GC 3. Ability to abstract thinking, analysis, synthesis.
- GC 4. Ability to apply knowledge in practical situations.
- GC 8 Information and communication skills technologies.
- GC 10. Ability to conduct research at an appropriate level.
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Special (professional) competencies (SC):

- SC 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.
- SC 3 The ability to determine the prospects for the development of the organization.
- SC 12 Ability to analyze and structure problems organizations, form informed decisions.
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***Program learning outcomes (PLO)*:**

PLO 4 Demonstrate skills in identifying problems and substantiating managerial solutions.

PLO 6 Demonstrate the skills of searching, collecting and analyzing information, calculating indicators to justify management decisions.

PLO 7 Demonstrate organizational projecting skills.

PLO 17 Conduct research individually and/or in a group under the guidance of a leader.

COURSE STRUCTURE

Topics	Hours (lectures/ practical classes)	Learning outcomes	Tasks	Assessment
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			-
Module test				30
Total for module 1				100

Module 2. Mathematical Modelling				
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
Module test				30
Total for module 2				100
Module 3. Methods of Building a General Linear Model				
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			
Module test				30
Total for 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	Tasks of practical work.	Execution and delivery of laboratory

Theme 15. Construction an econometric model with the autocollinearity remains operations	2/4	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	Writing tests, essays. Doing independent work (including in elearn) Problem solving, presentations etc.	works - credited. Module: descriptive part 100; test part 30 * 0.1; Independent work - according to the evaluation journal in eLearn**.**
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			
Module test				30
Total for module 4				100
Total for the semester	30/60			
In total for the 4th semester, 0.7· (R(1)CM + ... + 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 $\mathbf{R}_{course} = \mathbf{R}_{ed\ w} + \mathbf{R}_{ex}$				100

ASSESSMENT POLICY

Policy regarding deadlines and resits	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).
Academic honesty policy:	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.
Attendance policy	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 KNOWLEDGE 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. Anderson D.R., Sweeney D.J., Williams T.A. Statistics for Business & Economics, 14th Edition, Cengage Learning, 2019, 1120 p.
2. Basic Statics. Electronic source: https://www.adb.org/publications/basic-statistics-2017
3. Carl P. Simon, Lawrence Blume. Mathematics for economists. New York, London: W.W.Norton & Company, 1994. 930p.
4. Cox Dennis, Cox Michael. The Mathematics of Banking and Finance. The Atrium, Southern Gate, Chichester , John Wiley & Sons Ltd, 2016. 332 p.
5. Devore Jay L., Berk Kenneth N. Modern mathematical statistics with applications. Belmont, Calif.: Thomson Brooks/Cole, 2007. 810p.
6. Drury C. Management and cost accounting. C&C Offset, China, 2016. 775p.
7. Illukkumbura A. Introduction to Regression Analysis (Easy Statistics), 2020, 121 p.
8. John E. Freund's. Mathematical Statistic, USA, 2014
9. Keller, Gerald. Essentials of business statistics / Gerald Keller, Brian Warrack. Wadsworth, Inc., 2014. 593p.
10. Kennedy Peter. A guide to econometrics. Massachusetts: The MIT Press, 2015. 468p.
11. Kravchenko V.M., Galaieva L.V., Shulga N.G. Applied modeling: Economic and mathematical modeling. Kyiv: NULESU, 2023. 363 p.
12. Morris R. Studies in mathematics education: The teaching of statistics. Unesko, 2016. 258p.
13. Peter Kennedy. A guide to econometrics. Massachusetts: The MIT Press, 1998. 468.
14. Quirk T. Excel 2010 for Business Statistics. A Guide to Solving Practical. Business Problems, School of Business and Technology Webster University, 2018, 264 p.
15. 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.
16. Ruric E. Wheeler, W.D.Peeples, Jr. Modern Mathematics. Brooks: Cole Publishing Company, 2016. 707p.
17. Simon Carl P., Blume Lawrence. Mathematics for economists. New York, London: W.W.Norton & Company, 2017. 930p.
18. Studies in mathematics education. The teaching of statistics / R.Morris. Unesco, 2015. 258p.
19. Taha Hamdy A. Operations Research. Ninth Edition. Prentice Hall; 2010. 832 p.
20. Барковський В.В., Барковська Н.В., Лопатін О.К. Теорія ймовірностей та математична статистика. Київ: ЦУЛ, 2012. 448 с.
21. Боднар Р.Д., Єлейко В.І., Демчишин М.Я. Економетричний аналіз діяльності підприємств. Навчальний посібник. Київ: Навчальна книга Богдан, 2019. 368 с.
22. Галаєва Л.В., Коваль Т.В., Шульга Н.Г. Практикум «Теорія ймовірностей» / Навч. пос. Київ: ВЦ "Компринт", 2023. 464с.
23. Горкавий В.К. Статистика: Навч. посібник.К.: Алерта, 2020. 644 с.
24. Горошанська О.О. Статистика: Практикум. Харк. держ. університет харчування та торгівлі. Харків, 2017. 133 с.
25. Григорків В.С. Моделювання економіки: підручник. В.С. Григорків. Чернівці: Чернівецький нац. ун-т ім. Ю. Федьковича, 2019. 360 с.

26. Економетрика з R : навчальний посібник . А.В. Скрипник, Д.М. Жерліцин, Ю.О. Нам'ясенко. Київ: ФОП Ямчинський О.В., 2020. 248 с

27. Економетрика: підруч. для студ. вищ. навч. закл. О. І. Черняк та ін.; /за ред. О. І. Черняка; Київ. нац. ун-т ім. Т. Шевченка. ВПЦ "Київський університет", 2020. 359 с.

28. Економетрія: навч. посіб. І. Л. Ковальова та ін. Одеса: ОДАБА, 2019. 423 с.

29. Жерліцин Д.М., Галаєва Л.В., Наконечна К.В. Статистичний аналіз та візуалізація даних. Навчальний посібник. Київ: Видавничий центр НУБіП України. 2022. 344с.

30. Козирєва О.В., Федорова В.О. Статистика: навчальний посібник. Харків: Видавництво Іванченка І.С., 2021. 187 с.

31. Козьменко О.В. Економіко-математичні методи та моделі (економетрика) : навчальний посібник. О.В. Козьменко. Суми: Університетська книга, 2019. 406 с.

32. Кремень В.М., Кремень О.І. Фінансова статистика: Навч. посібник. Київ: Центр навчальної літератури, 2017. 368 с.

33. Лоднар С. І. Економетрія засобами MS Excel. навчальний посібник / С. І. Лоднар, Р. В. Юринець Київ: Вид-во Європ. Ун-ту, 2018. 242 с.

34. Мармоза А.Т. Економічна статистика: Навч. посібник. Київ: ЦУЛ, 2019. 600 с.

35. Мармоза А.Т. Практикум з теорії статистики і сільськогосподарської статистики: Навч.посіб. Центр навчальної літератури, 2019. 664 с.

36. Мармоза А.Т. Теорія статистики: Навч. посібник. К.: ЦУЛ, 2019.592 с.

37. Опря А.Т., Дорогань-Писаренко Л.О., Єгорова О.В., Кононенко Ж.А. Статистика (модульний варіант з програмованою формою контролю знань). Навчальний посібник. Підручник. Київ: Центр навчальної літератури, 2019. 536 с

38. Педченко Г. П. Статистика: Навчальний посібник Мелітополь: Колор Принт, 2018. 266 с.

39. Підгорний А. З., Погорєлова Т. В. Фінансова статистика : навчальний посібник. Київ: ФОП Гуляєва В.М., 2020. 204 с.

40. Провост Ф., Фоусет Т. Data Science для бізнесу. Як збирати, аналізувати і використовувати дані. Київ: Видавництво: Наш формат, 2019 . 400 с.

41. Рязанцева В.В. Економетрія. Моделювання макроекономічних процесів: навч.посіб. Київ : Київ. нац. торг.-екон. ун-т, 2018. 388 с.

42. Скрипник А.В., Галаєва Л.В., Коваль Т.В., Шульга Н.Г. «Теорія ймовірностей ймовірнісні процеси та математична статистика». Київ: ТОВ» Аграр Медіа Груп», 2017. 265с. – Режим доступу: http://elibrary.nubip.edu.ua/16947/

43. Статистика : підручник. Колектив авторів: С. І. Пирожков, В. В. Рязанцева, Р. М. Моторин та ін. Київ : Київ. нац. торг.-екон. ун-т, 2020. 328 с.

44. Ткач Є.І., Сторожук В.П. Загальна теорія статистики: Навч.посібник. К.: Центр навчальної літератури, 2017. 442 с.

45. Толбатов Ю.А. Статистика засобами Excel: Навч. посібник. Київ: Університет «Україна», 2019. 326 с.

46. Чекотовський Е. Статистичні методи: Навч.посібник. Київ: Знання, 2018. 408 с.

Internet 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