

## Опис блоку/предмета

Title of Discipline / <b>Economic and Mathematical Methods and Models</b>				
Semester	Duration	Type of Discipline	ECTS Credits	Student Workload
5	180 hrs.	mandatory	6	аудиторні заняття 50 год, самостійне навчання 130 год.

Requirements for Participation	Type of examination (oral, written, term paper, etc.)	Methods of teaching and learning (lectures, seminars, etc.)	Discipline Coordinator
Completed discipline 'Mathematical Modeling of Business Activity'	Written exam	Lectures, practical classes, laboratory work	M. Synenko

Learning Outcomes
<p>GC3. Ability to abstract thinking, analysis and synthesis.</p> <p>GC4. Ability to apply knowledge in practical situations.</p> <p>GC5. Ability to communicate in the state language both orally and in writing.</p> <p>GC7. Skills in the use of information and communication technologies.</p> <p>GC8. Ability to search, process and analyze information from various sources.</p> <p>GC9. Ability to adapt and act in a new situation.</p> <p>GC11. Ability to make informed decisions.</p> <p>SC1. Ability to show knowledge and understanding of the problems of the subject area, the basics of the modern economy at the micro, meso, macro and international levels.</p> <p>SC4. Ability to explain economic and social processes and phenomena on the basis of theoretical models, analyze and interpret the results.</p> <p>SC6. Ability to apply economic and mathematical methods and models to solve economic problems.</p> <p>SC7. Ability to use computer technology and data processing software to solve economic problems, analyze information and prepare analytical reports.</p> <p>SC9. Ability to predict socio-economic processes on the basis of standard theoretical and econometric models.</p> <p>SC10. Ability to use modern sources of economic, social, managerial, accounting information for the preparation of official documents and analytical reports.</p> <p>SC11. Ability to substantiate economic decisions on the basis of understanding the laws of economic systems and processes and using modern methodological tools.</p> <p>SC12. The ability to independently identify problems of an economic nature in the analysis of specific situations, to suggest ways to solve them.</p> <p>SC14. Ability to analyze in depth problems and phenomena in one or more professional areas, taking into account economic risks and possible socio-economic consequences.</p> <p>SC17. Have methods, techniques and tools for assessing the results of the functioning and development of economic systems at the micro, meso, macro levels.</p> <p>SC27. Ability to prepare information, choose the type of model, calculate its parameters and assess adequacy.</p> <p>PLO5. Apply analytical and methodological tools to substantiate proposals and make management decisions by various economic agents (individuals, households, enterprises and public authorities).</p> <p>PLO6. Use professional reasoning to convey information, ideas, problems and ways to solve them to professionals and non-specialists in the field of economic activity.</p> <p>PLO7. Apply appropriate economic and mathematical methods and models to solve economic problems.</p>

- PLO9. To analyze the functioning and development of economic entities, to determine the functional areas, to calculate the relevant indicators that characterize the effectiveness of their activities.
- PLO11. Identify sources and understand the methodology for determining and methods of obtaining socio-economic data, collect and analyze the necessary information, calculate economic and social indicators.
- PLO15. Use information and communication technologies to solve socio-economic problems, prepare and present analytical reports.
- PLO31. Master the skills of oral and written professional communication in state and foreign languages.
- PLO36. Ability to present and discuss the results obtained and transfer the acquired knowledge.

## Contents

### THEORETICAL BASES OF ECONOMIC AND MATHEMATICAL MODELING

**Topic 1. Conceptual aspects of mathematical modeling of economic processes (2 hrs.)**

The concept of an economic and mathematical model. Typical problems that are solved by modeling. The scope, advantages and disadvantages of the modeling method. Stages of economic and mathematical modeling. Classification of economic and mathematical methods and models.

**Topic 2. Models of intersectoral balance (2 hrs.)**

The balance method. Economic model of inter-sectoral balance Analysis of economic indicators using models of intersectoral balance.

### OPTIMIZATION MODELS AND METHODS

**Topic 3. Linear optimization economic-mathematical models and methods. Linear programming (6 hrs.)**

General linear optimization mathematical model. Geometric interpretation of linear optimization models. Linear programming software.

**Topic 4. Duality theory and dual estimation of linear optimization problems (2 hrs.)**

Rules for constructing dual models of optimization problems. Basic duality theorems and their economic content. Analysis of linear optimization problems. Evaluation of the profitability of the products being produced and of new products. Analysis of limitations of scarce and non-scarce resources.

**Topic 5. Non-linear optimization models and methods (2 hrs.)**

Economic formulation of problems leading to non-linear optimization models. Geometric interpretation of the problem of nonlinear programming. The method of Lagrange multipliers. Economic interpretation of Lagrange multipliers.

### ELEMENTS OF THE QUEUING THEORY

**Topic 6. Queuing systems as random processes (4 hrs.)**

Classification of queuing systems. Random processes. The Chapman–Kolmogorov equation. Performance indicators of queuing systems.

## Exemplary Literature

### Primary

- 1 Vitlinsky V.V. Modeling of the economy: Textbook. - K.: KNEU, 2002.
2. Nakonechny S.I., Savina S.S. Mathematical programming: Textbook. - K.: KNEU, 2003. - 452 p.
3. Abchuk V.A. Economic and mathematical methods, SP, "Union", 1999.
4. Akulich I.L. Mathematical programming in examples and problems. - M.: Higher school, 1986. - 317 p.
5. Vitlinsky V.V., Nakonechny S.I., Tereshchenko T.O. Mathematical programming: Textbook for self-study. - K.: KNEU, 2001. - 248 p.
6. Gorchakov A.A., Orlova I.V. Computer economic and mathematical models, M.: "UNITI", 1995.

7. Zamkov O.O., Tolstopyatenko A.V., Cheremnykh Yu.N. Mathematical methods in economics. - M.: DIS, 1997. - 365 p.

**Web resources**

1. [http://www.unn.ru/books/met\\_files/EconMatMetMod.pdf](http://www.unn.ru/books/met_files/EconMatMetMod.pdf)

2. <http://old.bfigu.ru/books>

Academic staff

<b>Name</b>	<b>Academic degree</b>	<b>Position</b>	<b>Qualification / Academic Discipline</b>	<b>Full-time / Part-time</b>	<b>Area of Teaching</b>
Syenko Maryna Anatoliivna	PhD in Physics and Mathematics	Associate Professor at the Department of Cybersecurity and Mathematical Modeling	Vinnitsia Ostrovskiy State Pedagogical Institute (1986), qualification – Teacher of Physics and Mathematics; PhD in Physics and Mathematics, 01.01.01 Mathematical Analysis	Full-time	Economic and Mathematical Methods and Models