Syllabus
«Modeling of Economic, Ecological and Social Processes»

Lecturer: *Eduard Lysenkov*
DrSc, Professor, Professor of the Intelligent Information Systems Department

Expected learning outcomes

As a result of studying the discipline, the student

must know:

- conceptual principles of mathematical modeling of economic, ecological and social phenomena and processes;
- aspects of using theoretical provisions of economic-mathematical modeling to solve specific practical problems;
- aspects of using application program packages to solve specific practical problems;

must be able to:

- apply economic-mathematical models of economic, ecological and social phenomena and processes in theoretical studies and when solving practical problems;
- apply in practice packages of applied programs for economic-mathematical modeling of economic, ecological and social phenomena and processes and use them to solve applied problems.

The scope of the discipline: 5 ECTS credits (16 hours of lectures, 48 hours of practice).

Purpose: formation of a system of knowledge on methodology, methods and tools for building economic-mathematical models of economic, ecological and social phenomena and processes, their analysis and use. The practical part of the course is directed to consideration of topical issues of using modern information technologies to solve intellectual problems with the use of mathematical models to solve various problems, in particular to study and forecast the growth of markets, population, gross domestic product, in linguistics, business and financial data, etc.

The content of the discipline

Topic 1. Introduction to the course. Fundamentals of mathematical modeling.
Topic 2. Conceptual principles of modeling economic, ecological and social processes.
Topic 3. Market models and the theory of general equilibrium.
Topic 4. Modeling the processes of economic growth and distribution of capital investments.
Topic 5. Macroeconomic instability. Cycle of business activity, unemployment, inflation.
Topic 6. The "predator-prey" model.
Topic 7. Lake ecosystem model.
Topic 8. Leontiev-Ford intersectoral model.
Topic 9. Kinetic model of Mono-Yerusalimskyi.
Topic 10. Simulation models.

Prerequisites
"Higher mathematics", "Theory of algorithms", "Probability theory, probabilistic processes and mathematical statistics", "Mathematical methods of intelligent calculations".

Consequences
The knowledge gained during the discipline can be used in the disciplines or areas "Intelligent decision support systems", "Software intelligent control systems", "Methods of computational intelligence".

Technical support
Practices on the discipline are carried out in computer classes using Microsoft Visual Studio, Java SE, Python, C#.

Deadline policy
Works that are submitted in violation of deadlines without good reason are evaluated at a lower grade.

Academic Integrity Policy
Provides independent performance of practices. Write-off (including using mobile devices) is prohibited. The work is not credited in case of detection of plagiarism or write-off.

Evaluation criteria of laboratory works / practices / individual works / reports / projects

Maximum number of points – a student with high quality independently performed the entire scope of work, answers all questions related to the work performed, and does additional tasks, for example, correctly applied a certain economic, ecological or social modell offered to him by the teacher. The teacher has no complaints about the software implementation and performance requirements.
Approximately 70%-99% of the maximum number of points – a student with sufficient quality independently completed all tasks, but in the process he made some mistakes, which, after pointing to them by the teacher, corrected themselves. He answers some questions with a slight error. The additional calculations offered by the teacher make with some complexity. Not all work requirements are met.
Approximately 40%-69% of the maximum number of points – a student of average quality independently completed all tasks, but did not meet all the requirements for implementation. He answers the question with a slight error. The additional calculations offered by the teacher, for example, the application of a certain economic, ecological or social model makes with insignificant errors. Not all requirements for the design of the work are met.
Approximately 1%-39% of the maximum number of points – a student performed all the work independently, but the quality of implementation is insufficient (errors in calculations, not all work requirements are met). The answers to the questions about the work are not entirely clear. There are errors in the answers.
0 points – a student did not perform the entire amount of work, or performed with gross errors. He has problems with calculations by certain models, does not know the theoretical material, the software implementation does not meet the requirements.