Syllabus
«Probabilistic and statistical methods of modelling and forecasting»

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Expected learning outcomes
As a result of studying the discipline, the student
must know:

- Ability to search, process and analyse information from various sources.
- The ability to critically analyse and evaluate modern achievements, to formulate new approaches to solving theoretical and practical problems in scientific research.
- Readiness for independent, individual work; the ability to carry out complex research, decision-making in interdisciplinary areas.
- Ability to organize and conduct scientific research and carry out innovative developments in the field of computer science and information technology.
- Basic methods of building simulation models based on Petri nets and methods of model verification.
- Modern software tools for analysing large volumes of information.

must be able to:

- Identify, pose and solve modelling and forecasting problems based on real data sets.
- Apply modelling methods based on Petri nets for research and design of complex systems (including intelligent systems), conduct computer simulations when solving professional and socio-economic tasks,

The scope of the discipline: 4 ECTS credits (16 hours of lectures, 32 hours of practice).

Purpose: formation of future masters in the field of information systems and technologies of theoretical knowledge and practical skills for solving research and applied problems related to the application of methods of probabilistic and statistical modelling of complex information processes/systems.

The content of the discipline

Topic 1. Purpose of modelling, requirements for data and models**.**
Topic 2. Analysis of nonlinearity and no stationarity of real processes**.**
Topic 3. Methodology for building time series models**.**
Topic 4. Forecasting process dynamics using differential equations**.**
Topic 5. Introduction to probabilistic data analysis**.**
Topic 6. Getting to know the CPN Tools environment. Studying the capabilities of CPN Tools, built-in functions, arrays. Examples of building models**.**
Topic 7. Capabilities of CPN Tools when modelling processes taking into account time. Examples of building models**.**
Topic 8. Capabilities of CPN Tools when building models with nested components. Examples of building models**.**
Topic 9. Standard CPN Tools, which are designed to output information about the progress of modelling (monitors). Examples of building models.

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

Maximum number of points a student with high quality independently completed the entire amount of work, answers all questions related to the completed work, and makes additional

process and interpret research results, describe the implementation of scientific research, prepare data for the preparation of scientific reviews and publications.
- Build models based on Petri nets for the study of complex dynamic processes and objects when designing solutions to professional and socio-economic tasks in one's area.
- Analyse and choose optimal data analysis software.

Prerequisites
"Higher mathematics", "Fundamentals of programming", "Fundamentals of discrete mathematics", "System analysis", "Theory of probability and mathematical statistics", "Theory of algorithms".

Consequences
The knowledge that students will acquire while studying the course "Probabilistic-statistical methods of modelling and forecasting" will be necessary for further education, mastering professional and special disciplines, during pre-diploma practice and preparation of qualification work, as well as in production activities in a professional specialty.

Technical support
Laboratory work on the discipline is conducted in computer classes using languages and software environments: R Studio, R, Python, CPN Tools**.**

Deadline Policy
Works that are submitted late without good reason will be assigned a lower grade**.**

Academic Integrity Policy
Presupposes independent performance of laboratory work. Debiting during credit (including using mobile devices) is prohibited. If plagiarism or plagiarism is detected, the work will not be counted.

calculations offered by the teacher. The teacher has no complaints about the implementation and requirements for the performance of the work.
Approximately 70%-99% of the maximum number of points – a student completed all tasks with sufficient quality, but in the process of work he made some mistakes, which, after being pointed out by the teacher, he corrected himself. He answers some questions incorrectly. Additional calculations proposed by the teacher are done with some effort. Not all requirements for performance of work are met.
Approximately 40%-69% of the maximum number of points – a student independently completed all the work, but the quality of the implementation is insufficient (calculation errors, not all work requirements are met). The answers to questions about the performance of work are not quite clear. There are mistakes in the answers.
Approximately 1%-39% of the maximum number of points – a student did not complete all the work independently, while the quality of the implementation was insufficient (errors in calculations, does not comply with the requirements for the design of the work). He does not answer questions about the performance of work clearly. There are gross mistakes in the answers.
0 points – a student did not complete the entire amount of work, or did it with gross errors. He has problems with calculations, does not know the theoretical material, the software implementation does not meet the requirements.