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**INTERNATIONAL EUROPEAN
UNIVERSITY**



**EUROPEAN SCHOOL
OF BUSINESS**

**Probability theory and mathematical statistics
Educational program «Software engineering»**

2024



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| | |
|---|--|
| 1 | Name of the course and educational program |
| | Probability theory and mathematical statistics Educational program "Software engineering" |
| 2 | Course description |
| | Probability theory and mathematical statistics are an important discipline that forms basic knowledge in the field of application of probabilistic and statistical apparatus, the study of patterns in mass random phenomena, the determination of their probabilistic characteristics for the purpose of application to the analysis of economic phenomena and forecasting . The purpose of teaching this discipline is to form a system of theoretical knowledge, practical skills and competencies in the basics of probabilistic and statistical apparatus, basic methods of quantitative measurement of the randomness of the action of factors affecting any processes, the basics of mathematical statistics used in planning, organizing and managing production, assessing product quality, and systemic analysis of economic structures and technological processes. The course of lectures is intended to study patterns in mass random phenomena, the determination of their probabilistic characteristics for the purpose of application to the analysis of economic phenomena and forecasting. |
| 3 | Study prerequisites |
| | The academic discipline is related to the disciplines "Computer Discrete Mathematics", "Algorithms and Data Structures". |
| 4 | Amount of credits/hours |
| | 4 ECTS credits/ 120 hours |
| 5 | Training format |
| | Blended learning |
| 6 | Classroom location |
| | Audience 405. https://dist.ieu.edu.ua/enrol/index.php?id=598 |
| 7 | Information about the teacher |
| | Ivan Kazachkov , Dr. technical Sciences, professor |
| 8 | Department |
| | Department of Information Technologies |
| |  |
| 9 | Office location |
| | Kyiv, Akademika Glushkova Ave., 42 B, room 505 |



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10 Schedule of counseling

Every Monday from 12:00 to 16:00 with prior appointment via corporate mail

11 E-mail of the teacher

ivankazachkov@ieu.edu.ua

12 Course objectives

Students acquire knowledge about the basic principles and algorithms underlying patterns in mass random phenomena, determining their probabilistic characteristics for the purpose of applying them to the analysis of economic phenomena and forecasting.

13 The role of academic discipline in achieving program results

PR05. Know and apply relevant mathematical concepts, methods of domain, system and object-oriented analysis and mathematical modeling for software development.

PR11. Select input data for design, guided by formal methods of requirements description and modeling.

14 Learning outcomes

Know:

- basic concepts of combinatorics, foundations of probability theory,
- theories of estimation of unknown parameters,
- statistical hypothesis testing,
- elements of correlation-regression analysis,
- methods, theorems and formulas of probability theory and mathematical statistics.

Be able:

- perform qualitative and quantitative mathematical analysis random events , random variables and systems of such variables;
- use elements dispersion analysis and theory correlations in study of random variable systems ;
- comprise results research in mathematics models of economic problems and management;

15 Course content

Topic 1. Random Events . Event frequency and probability.

Topic 2. Elements combinatorics and Event Algebra .

Topic 3. Basics theorems theories probabilities .

Topic 4. Models reliability technical systems .

Topic 5. Bayes formula .

Topic 6. Law and distribution random variables .

Topic 7. Numerical characteristics of random variables .

Topic 8. Laws distribution random variables



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Course materials and requirements

1. Hykhman I. I., Skorokhod A. V., Yadrenko M. I. Probability theory and mathematical statistics. Kyiv: Higher School, 1988. 438 p.
2. Gmurman V. THERE ARE. Guide to solving problems in probability theory and mathematical statistics. Moscow: Higher School, 1977. 479 p.
3. Hnedenko B. IN. Probability theory course. Moscow: Nauka, 1987. 400 p.
4. Zhaldak M. I., Kuzmina N. M., Mykhalin G. O. Theory Probability and mathematical statistics: a textbook [for students physical and mathematical specialties pedagogical universities]. Ed. 2, revised and supplemented. Poltava: " Dovkilya -K", 2009. 500 p.
5. Zhluktenko Yu. O. Theory Probability and mathematical statistics: teaching-methodical manual in 2 parts. Kyiv : KNEU, 2000. 734p.
6. Ivanyuta I. D., Rybalka V. I., Rudomino-Dusyatska I. A. Elements theories Probability and Mathematical Statistics. Kyiv : Slovo, 2006. 272 p.
7. Barkovsky V. V., Barkovskaya N. V., Lopatin O. K. Theory Probability and mathematical statistics. Mathematics for economists . Kyiv : NAU, 1997. 424p.
8. Bulyga K. B., Baranovskaya L. V. Workshop on theory Probability and Mathematical Statistics : Textbook . Kyiv : European University (Finance , Information Systems , Management and Business), 2003. 173 p.
9. Medvedev M. G., Pashchenko I. O. Theory Probability and Mathematical Statistics. Kyiv : Lira. K, 2008. 536 p.
10. Theory workshop Probability and mathematical statistics / R. K. Chorney et al . Kyiv : MAUP, 2003. 228p.
11. Sheftel Z. G. Theory Probability – 2nd ed., revised and supplemented . Kyiv : Higher School, 1994. 192 p.
12. Samoilenko M. I. , Kuznetsov A. I. , Kostenko O. B. Theory Probability : Textbook .Kharkiv : KhNAMG, 2008. 194 p

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Technical requirements for working on the course

In order to access the course materials, you will need regular access to a computer and the Internet. In order to successfully study and pass the exam from the training course, it is necessary to constantly familiarize yourself with the materials posted on the university's remote platform (Moodle) in the course " Probability theory and mathematical statistics ". You also need to create reporting documents for the performance of practical work and upload them to the platform (the platform can only be used from a corporate email account).

In the case of problems with access to the distance learning platform, it is necessary to notify the dean's office or the headmaster, or the course teacher directly.

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Learning process

The process of studying the course " Probability theory and mathematical statistics " includes lectures and laboratory sessions.

During the lectures, such teaching methods as lecture, lecture-conversation, discussion, discussion of problematic issues, demonstration, and analysis of various situations will be used according to the topic of the lectures.

During laboratory classes, such teaching methods as surveys, testing, performance of individual tasks, performance of analytical and calculation works, solved specific problems and situations will be used).





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Signs of discipline

| Term of teaching | Semester | International Disciplinary integration | Course study | Cycles: general training/ professional training/ free choice |
|------------------|--------------|--|--------------|--|
| 1 semester | 3rd semester | No | 2ty course | Cycle of professional training |

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Evaluation policies

You will have different ways to demonstrate your knowledge and skills throughout the semester. This includes how you attend class, how and what you contribute to topic discussions, how you complete and complete lab assignments and tests on time, how you complete independent work assignments, and the ability to present your work. In addition, it is possible to perform tasks that are performed individually or in a small group in the form of a student scientific work.

| Activities during the semester | Maximum number of points during the semester |
|---|--|
| Current work (visits, oral interviews, solving calculation problems and tasks, situational exercises) | 16 |
| Tests (8) | 16 |
| Laboratory work (8 pieces) | 24 |
| Performing independent work | 4 |
| Together | 60 |
| Exam | 40 |
| TOTAL | 100 |

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Rating scale

The grade for the discipline is defined as the sum of the points scored for the current activity in the semester. Each module includes an assessment score for the student's current work. Module control activities are carried out upon completion of the study of the taught material of this module. The minimum number of points for the current educational activity, which allows the discipline to be counted as completed, must be at least 60. The maximum point for the discipline is 100.

The total grade for studying the discipline is set according to the national and European scale (ECTS).

The overall final grade in points, according to the national scale and according to the ECTS scale, is entered in the student's assessment and examination information, study card and student's assessment book.





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Rating scale: national and ECTS

| The sum of points for all types of educational activities | Evaluation ECTS | Evaluation on a national scale | |
|---|-----------------|--|--|
| | | for an exam, course project (work), practice | for credit |
| 90-100 | A | perfectly | Enrolled |
| 82-89 | B | good | |
| 74-81 | C | | |
| 66-73 | D | | |
| 60-65 | E | satisfactorily | not counted with the possibility of retaking |
| 30-59 | FX | unsatisfactory with possibility reassembly | |
| 1-29 | F | unsatisfactory with mandatory repeated study of the discipline | not enrolled with mandatory repeated study of the discipline |

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How to find out your score

To check your assignment grades and read the teacher's comments, you need to check the relevant tabs on the distance learning platform (Moodle) in this course.

You can also get information about the received grades in the joint chat of the subject group (Viber or Telegram) or directly from the course instructor via corporate mail, messengers or by appointment on the days of consultations.

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Course policies

For the productive educational and cognitive activity of the applicants when studying the discipline, thematic lectures are held and practical classes are conducted in the form of laboratory works.

In classes and during his stay at the university, the student must treat teachers, staff and other students with respect, attend classes according to the schedule, come on time and not leave the classroom without the teacher's permission. It is necessary to complete all academic tasks and their work within the specified time.

The teacher, in turn, must constantly raise his professional level, pedagogical skill, and general culture, provide conditions for students to master educational programs at the level of mandatory requirements for the content, level and scope of education, and promote comprehensive professional development of students. It is mandatory to follow the educational and thematic plan, not to be late for classes, not to allow any manifestations of corruption, discrimination, bullying, harassment and oppression of the rights of those seeking education.

Education is based on the application of active learning methods. Active participation is expected and the norm. Attendance and active participation make up 80% of the grade. A student who, for good reasons, documented, was not subject to current control has the right to undergo current control within a two-week period after returning to studies.

A student who was absent from classes without valid reasons, did not participate in current control activities, did not liquidate academic debt, is not allowed to take the final semester control of knowledge in this discipline, and on the day of the exam in the examination information by a scientific and pedagogical employee the grade "not admitted" is issued. Retaking the exam in the discipline is prescribed on the condition that all types of educational, independent (individual) work provided for in the work curriculum of the discipline are performed, and is carried out in accordance with the liquidation schedule approved by the directorate.



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The academic integrity of any institution of higher education requires integrity in teaching and research, so academic integrity is required of all MEU students. Academic dishonesty is prohibited in all programs at our university. All participants in the educational process are guided by the principles of academic integrity.



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Completing the task late, correcting grades, working out

Assignment reports must be uploaded to Moodle by the due dates specified in the course schedule. Best practice would be to complete assignments as soon as possible after receipt to allow enough time to actively participate in class. If more time is needed to complete the task, flexible deadlines are available. Completed assignments are accepted for full credit until the last class in the discipline on the schedule, after which 40% partial credit based on the grade received will be awarded within a week of the last day of class. Assignments that were not submitted at all will receive 0.

If classes are missed for more than one week due to illness or other reasons, it is necessary to contact the teacher to agree on alternative options for completing tasks. Deadlines work both ways, and meeting them ensures that your instructor provides timely feedback on your assignments to ensure you stay on course.



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Teacher's response time (about checking assignments)

Via corporate mail (within 24 hours), via messengers (within 1-2 hours).

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Effective communication

Effective communication is essential to success in this course, we recommend using the following channels:

Forum of questions and answers: for general course questions, you need to check the FAQ section in Moodle and then post your question in the Q&A forum to ask your colleagues or the instructor (guaranteed to receive a notification by e-mail every time a new publication or an answer to a question appears);

E-mail: have a personal question related to studying the course, write to the teacher directly;

Social networks, messengers: personal communication with classmates, teacher;

Face-to-face meeting: communication with classmates during classes and with the teacher on consultation days.

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Policy of publication and distribution of course materials

Students may not post, publish, sell, or otherwise publicly distribute course materials without written Permission the teacher. Such materials include: lecture notes, slides (presentations) of lectures, video or audio recordings, tasks, problem sets, tests, other students' works and answers, etc. Students who sell, post, publish, or distribute course materials without written permission or otherwise may be subject to disciplinary action, up to and including withdrawal.

The use of generative AI is permitted subject to adherence to the principles of academic integrity.



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Expected workload and involvement of students

Approximately 2-3 hours per week should be allocated to work in this course. If circumstances arise that force you to spend more time on one of the tasks, you must inform the teacher by e-mail (messenger).

An extension of the submission deadline is possible only under the condition that the teacher is informed in advance that it is impossible to submit the assignment by the specified time. Students are expected to have a backup plan in case of computer malfunctions or Internet outages.

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Support services

Electronic schedule: <https://rozklad.ieu.edu.ua>

Online library: <https://onlinelibrary.ieu.edu.ua>

Repository: <https://sed.ieu.edu.ua/index.php/sed/index>

Educational Ombudsman: <https://ieu.edu.ua/pro-mieu/ombudsmen>

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Course schedule

| Topic name | Content of practical class |
|---|--|
| Topic 1. Random Events. Event frequency and probability. | <ol style="list-style-type: none">1. Oral survey2. Consideration of problems of determining the frequency of events and probabilities of events in various situations.3. Questions for self-control and tasks for independent solution.4. Tests |
| Topic 2. Elements combinatorics and Event Algebra. | <ol style="list-style-type: none">1. Oral survey – elements of combinatorics.2. Practical exercise – Consideration of problems of determining probabilities in various situations.3. Questions for self-control and tasks for independent solution.4. Tests |
| Topic 3. Basics theorems theories probabilities roles. Criteria for choosing a company (group). | <ol style="list-style-type: none">1. Oral survey2. Practical lesson – Consideration of problems of determining probabilities.3. Basic theorems – Questions for self-control and tasks for independent solution.4. Tests |
| Topic 4. Reliability models of technical systems | <ol style="list-style-type: none">1. Oral survey2. Practical exercise – Determining reliability series-connected and parallel-connected systems .3. Questions for self-control and tasks for independent solution.4. Tests |
| Topic 5. Bayes formula | <ol style="list-style-type: none">1. Oral survey2. Practical lesson – problems on applying Bayes' formula.3. Questions that are proposed for independent study.4. Tests |
| Topic 6. Law and distribution random variables | <ol style="list-style-type: none">1. Oral survey2. Practical Lesson – Distribution of discrete and continuous values .3. Questions for self-control and tasks for independent solution4. Test |
| Topic 7. Numerical characteristics of random variables. | <ol style="list-style-type: none">1. Oral survey2. Definition mean, variance, correlation and other characteristics.3. Questions for self-control and tasks for independent work solution.4. Tests |



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Topic 8. Laws distribution random variables.

1. Oral survey
2. Practical lesson – Normal law, Poisson's law and others .
3. Questions for self-control and tasks for independent solution.
4. Tests

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Tips for successful study

The goal is unique to everyone, but its correct setting greatly affects the result, as well as the learning process. For example,

- processing the materials of the theoretical component (lectures) of the discipline will provide insight and knowledge about the
- development process and the architecture of the OS itself, and the implementation of the practical component - the acquisition
- of practical skills in the use of methods and tools for creating system software. After all, any training that follows a clear plan and
- with a serious attitude to the material will always be successful.

So, if you want to successfully master this subject, you must be:

- persistent, attentive and inquisitive;
- creative and cheerful, open to communication and discussions
- ready to receive information and knowledge on the subject not only during lectures, but also during extracurricular hours

See you soon!