Silabus Selective Component SC

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Mathematical statistics			
Name of the discipline:	Mathematical statistics		
Higher education level:	first (Bachelor's degree)		
Moodle course page:	https://dl2022.khadi.kharkov.ua/course/view.php?id=3260		
Scope of the sample component	4 credits (120 hours)		
Final control form	Credit		
Consultations:	on schedule		
Department name:	Department of higher mathematics		
Language of instruction:	English		
Course manager:	Yarkho Tetiana Oleksandrivna, Doctor of Pedagogical		
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Summary of the educational component: the purpose of studying the discipline is: general mathematical training of applicants, necessary for mastering the theoretical and practical foundations of applying methods and models for analyzing statistical patterns based on observations in economic processes and making statistical decisions.

Subject of the discipline: development of methods for recording, describing and analyzing statistical experimental data of modern economic processes for further obtaining scientifically based conclusions.

The main objectives of the discipline are:

- study of general information about the selective method, methods of point and interval estimation of unknown parameters of the general population under study;

- formation of practical application of point and interval assessment in economic tasks;
- formation of the concept of statistical verification of parametric and nonparametric hypotheses;

- application of the general scheme for testing parametric hypotheses to solving practical problems;

- application of the method of testing zero nonparametric hypotheses according to the criterion of consistency of K. Pearson to solving practical economic problems;

- study of the concept of applying correlation and regression analysis methods in economic research;

- formation of abilities to solve practical economic problems in the statistical study of relationships between phenomena.

Prerequisites for studying the educational component: elementary mathematics course of Secondary School; mandatory mathematical discipline of The Bachelor's degree "higher mathematics".

Competencies that the applicant acquires:

General competencies:

ability to think abstractly, analyze and synthesize, ability to apply the acquired knowledge in practical situations.

Special (professional) competencies:

critical understanding of the theoretical foundations of entrepreneurial, trading and exchange activities,

ability to apply economic and mathematical methods and models to solve economic problems

Learning outcomes according to the educational program:

use basic knowledge and skills of critical thinking, analysis and synthesis for professional purposes,

apply the acquired theoretical knowledge to solve practical problems and interpret the results in a meaningful way

Thematic plan

№	Topic name (I C DD SD)	Number of hours	
	Topic name (LC, PR, SR)		
	LC Review of the main aspects of probability theory.	2	2
1	PR Solving practical economic problems for constructing distribution laws for discrete and continuous random variables and determining their numerical characteristics.	2	2
	SR Repetition of sections of the probability theory course: "random events", "random variables", "limit theorems of probability theory"	24	24
2	LC Updated problems of Mathematical Statistics. Statistical distributions of the sample, their graphical representation and numerical characteristics. Empirical distribution function.	2	2
	PR Is a graphical representation of statistical series. Solving practical economic problems on numerical characteristics of a statistical distribution.	2	2
	SR Gamma function and its properties.	4	4
3	LC Point estimates of distribution parameters. The concept of Point Estimation, properties of point estimates. Point estimates of mathematical expectation and variance. Methods for finding estimates: the method of moments, the method of maximum likelihood.	2	2
	PR Solving practical economic problems for finding point estimates of the parameters of the general population.	2	2
	SR Substantiation of the study of plausibility by methods of differential calculus of functions of one and many variables.	6	6
4	LC Basic Laws of distribution of random variables used in Mathematical Statistics: χ^2 – distribution; t – Distribution; F – distribution.	2	2
	PR Solving practical problems for composing expressions for $F(x),F(x),M(X),D(X),\sigma(X) \chi^2$,t, and F-distributions.	2	2
	SR Gamma distribution. Beta distribution	8	8
5	LC Interval estimates of parameters of an unknown distribution. The concept of interval estimation of parameters. Confidence intervals for M (X) normal RV X for known and unknown σ.	2	2
	PR Solving practical economic problems for finding interval estimates of the parameters of a normally distributed RV X based on experimental research data.	2	2
	SR Is the confidence interval for the root-mean-square deviation σ of a normally distributed random variable X.	6	6
6	LC statistical verification of parametric hypotheses. Basic concepts. Statistical criterion for testing the null hypothesis.	2	2
	PR Solving practical problems to test statistical hypotheses about the mathematical expectation and variance of a normally distributed random variable.	2	2
	SR The principle of practical confidence in the impossibility of unlikely events. Errors made when testing statistical hypotheses. The level of significance of statistical criteria.	10	10
7	LC Statistical testing of nonparametric hypotheses. The χ^2 - Pearson consistency criterion.	2	2
	PR Solving practical economic problems on testing the null hypothesis of the normal distribution law of the general population (discrete statistical distribution).	2	2
	SR Solving practical economic problems on testing the null hypothesis of	10	10

	the normal distribution law of the general population (interval statistical				
	distribution).				
8	LC Elements of regression and correlation analysis. Functional, statistical, and regression dependencies. Modal and empirical regression functions. Basic tasks of regression analysis. Correlation coefficient. The main task of	2	2		
	correlation analysis.				
	PR Finding empirical regression functions.	2	2		
	SR Testing the hypothesis about the significance of the sample correlation coefficient. Solving practical economic problems.	20	20		
Together	LC	16	16		
	PR	16	16		
	SR	88	88		

Training methods:

* lectures, practical exercises, explanations, etc.;

- * standard calculation works;
- * standardized tests;
- * tasks for in-depth creative training;
- * test papers;
- * presentations of completed tasks and research;
- * student presentations and presentations at scientific events;
- * final comprehensive tests.

Evaluation system and requirements

1 Current academic performance:

1.1 the current success of applicants for performing educational types of work in training sessions and for performing tasks of independent work is evaluated using a four-point Assessment Scale, followed by recalculation to a 100-point scale. When evaluating current academic performance, all types of work provided for in the curriculum are taken into account.

1.2 lectures are evaluated by determining the quality of performance of specified tasks.

1.3 practical exercises are evaluated by the quality of performing a control or individual task, performing and completing practical work.

1.4 assessment of the current academic performance of higher education applicants is carried out at each practical lesson (laboratory or seminar) on a four-point scale ("5", "4", "C", "2") and are entered in the academic performance log.

- "excellent": the applicant has perfectly mastered the theoretical material, demonstrates deep knowledge of the relevant topic or academic discipline, the main provisions;

- "good": the applicant has mastered the theoretical material well, has the main aspects from the original sources and the recommended literature of the RI, presents it in an argumentative manner; has practical skills, expresses his thoughts on certain problems, but admits certain inaccuracies and errors in the logic of presenting the theoretical content or when analyzing the practical one;

- "satisfactory": the applicant has mainly mastered the theoretical knowledge of the educational topic or discipline, is guided in the primary sources and recommended literature of the RI, but does not answer convincingly, confuses concepts, does not answer additional questions uncertainly, does not have stable knowledge; answering questions of a practical nature, shows inaccuracy in knowledge, does not know how to evaluate facts and phenomena, connect them with the future profession;

- "unsatisfactory": the applicant has not mastered the educational material of the topic (discipline), does not know scientific facts, definitions, almost does not navigate in primary sources and recommended literature, there is no scientific thinking, practical skills are not formed.

2 Final assessment:

An applicant for Higher Education receives a credit in the last lesson in the discipline based on the results of the current assessment. The average score for current activities is converted to points on a 100-point scale.

Higher education applicants who have an average current grade in the discipline below "3" (60 points) can improve their current score in the last lesson by passing tests in the discipline.

Assessment of applicants ' Knowledge by testing is carried out on a scale of:

- "Excellent": the theoretical content of the course is fully mastered, without gaps, the necessary practical skills of working with the mastered material are formed, all the training tasks provided for in the training

program are completed, the quality of their implementation is estimated by the number of points close to the maximum. (at least 90% of correct answers);

- "Very good": the theoretical content of the course is fully mastered, without gaps, the necessary practical skills of working with the mastered material are mostly formed, all the training tasks provided for in the training program are completed, the quality of most of them is estimated by the number of points close to the maximum. (82% to 89% of correct answers);

- "Good": the theoretical content of the course is fully mastered, without gaps, some practical skills of working with the mastered material are not sufficiently formed, all the training tasks provided for in the training program are completed, the quality of None of them is evaluated with a minimum number of points, some types of tasks are completed with errors (from 74% to 81% of correct answers);

- "Satisfactory": the theoretical content of the course is partially mastered, but the gaps are not significant, the necessary practical skills of working with the mastered material are mostly formed, most of the training tasks provided for in the training program are completed, some of the completed tasks may contain errors (from 67% to 73% of correct answers);

- "Satisfactory enough": the theoretical content of the course is partially mastered, but the gaps are not significant, the necessary practical skills of working with the mastered material are mostly formed, most of the training tasks provided for in the training program are completed, some of the completed tasks may contain errors (from 60% to 66% of correct answers);

- "Unsatisfactory": the theoretical content of the course is partially mastered, the necessary practical skills of work are not formed, most of the provided training programs for training tasks are not completed, or the quality of their performance is estimated by a number of points close to the minimum; with additional independent work on the course material, it is possible to improve the quality of performing educational tasks(with the possibility of re-passing)(less than 60% of correct answers);

- "Unacceptable" - the theoretical content of the course is not mastered, necessary

practical work skills are not formed, all completed training tasks contain gross errors, and additional independent work on the course material will not lead to any significant improvement in the quality of training tasks.(with a mandatory repeat course).

	Rating on the	Rating on the ECTS scale	
Rating national scale (exam, credit)	Grade	Criteria	
90-100	Excellent	Α	"Excellent" - the theoretical content of the course is fully mastered, without gaps, the necessary practical skills of working with the mastered material are formed, all the training tasks provided for in the training program are completed, the quality of their implementation is estimated by the number of points close to the maximum.
82 – 89	Good	В	"Good" - the theoretical content of the course is fully mastered, without gaps, the necessary practical skills of working with the mastered material are mostly formed, all the training tasks provided for in the training program are completed, the quality of most of them is estimated by the number of points close to the maximum.
75 – 81		С	"Good" - the theoretical content of the course is fully mastered, without gaps, some practical skills of working with the mastered material are not sufficiently formed, all the training tasks provided for in the training program are completed, the quality of performance of any of them is not evaluated with a minimum number of points, some types of tasks are performed with errors
67 – 74	Satisfactory	D	"Satisfactory" - the theoretical content of the course is partially mastered, but the gaps are not significant, the necessary practical skills of working with the mastered material are mostly formed, most of the training tasks provided for in the training program are completed, some of the completed tasks may contain errors.
60 - 66		Ε	"Enough" - the theoretical content of the course is partially mastered, some practical work skills are not formed, many of the training tasks provided for in the training program are not completed, or the quality of performance of some of them is estimated by a number of points close to the minimum.

Table-correspondence of final rating ratings in points to national scale and ECTS scale ratings

35 – 59	Unsatisfactory	FX	"Unsatisfactory" - the theoretical content of the course is partially mastered, the necessary practical skills of work are not formed, most of the provided training programs for educational tasks are not completed, or the quality of their performance is estimated by a number of points close to the minimum; with additional independent work on the course material, it is possible to improve the quality of performing educational tasks(with the possibility of re-passing)
1 – 34		F	"Unacceptable" -the theoretical content of the course is not mastered, the necessary practical skills are not formed, all completed training tasks contain gross errors, additional independent work on the course material will not lead to any significant improvement in the quality of training tasks.(with a mandatory repeat course)

Course policy:

- the course involves working in a team, the environment in the classroom is friendly, creative, open to constructive criticism;

- mastering the discipline involves mandatory attendance at lectures and practical classes, as well as independent work;

- independent work involves the study of individual topics of the academic discipline, which are submitted in accordance with the program for independent study, or were considered briefly;

- all tasks provided for in the program must be completed on time;

- when studying the course, applicants for higher education must adhere to the rules of academic integrity set out in the following documents: "Rules of academic integrity of participants in the educational process of (https://www.khadi.kharkov.ua/fileadmin/P Standart/pologeniya/stvnz 67 01 dobroch 1.pdf), KHNADU "Moral ethical code of participants in the educational process of KHNADU and (https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_67_01_MEK_1.pdf).

- cheating during test papers and tests is prohibited (including using mobile devices). Mobile devices can only be used during online testing.

Recommended literature:

1. Жильцов О.Б. Теорія ймовірностей та математична статистика у прикладах і задачах : навчальний посібник для студентів вищих навчальних закладів / О.Б. Жильцов, за ред. Г.О. Михаліна. — К. : Київ. ун-т ім. Б. Грінченка, 2015. — 336 с.

2. Савченко О.Г., Валько Н.В., Кавун Г.М., Кузьмич Л.В. Теорія ймовірностей та математична статистика: [базовий курс з прикладами і задачами] – Херсон: РВЦ «Колос», ХДАУ, 2017. – 406 с.

3. Огірко О. І., Галайко Н. В. Теорія ймовірностей та математична статистика: навчальний посібник / О. І. Огірко, Н. В. Галайко. – Львів: ЛьвДУВС, 2017. – 292 с.

4.Василенко О. А. Математично-статистичні методи аналізу у прикладних дослідженнях : навч. посібник / О. А. Василенко, І. А. Сенга. – Одеса : ОНАЗ ім. О. С. Попова, 2011. – 160 с.

5. Ярхо Т. О. Теорія ймовірностей для професійно-математичної підготовки бакалаврів технічного профілю: навчально-методичний посібник. Ч. 1: Випадкові події / Т. О. Ярхо. – Х. : ХНАДУ, 2017. – 84 с.

Additional sources:

1. distance learning course https://dl2022.khadi.kharkov.ua/course/view.php?id=3260

Developer (s)

syllabus of the academic discipline

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