МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ

ХАРКІВСЬКИЙ НАЦІОНАЛЬНИЙ ЕКОНОМІЧНИЙ УНІВЕРСИТЕТ
ІМЕНІ СЕМЕНА КУЗНЕЦЯ

"ЗАТВЕРДЖУЮ"
Заступник керівника
(проректор з науково-педагогічної роботи)

М. В. Афанасьєв

СТАТИСТИКА
робоча програма навчальної дисципліни

Галузь знань   **усі**
Спеціальність   **усі**
Освітній рівень   **перший (бакалаврський)**
Освітня програма   **усі**

Вид дисципліни   **базова**
Мова викладання, навчання та оцінювання   **англійська**

Завідувач кафедри економічної теорії,
статистика та прогнозування   О.В. Раєвнєва

Харків
ХНЕУ ім. С. Кузнеця
2018

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

SIMON KUZNETS KHARKIV NATIONAL UNIVERSITY OF ECONOMICS

<u>STATISTICS</u>
syllabus of the discipline

Area of Education	**all**
Speciality	**all specialties**
Educational level	**first (Bachelor) level**
Educational program	**all**

Type of discipline	**basic**
Language of teaching, training and evaluation	**foreign (English)**

Kharkiv
S. KUZNETS KhNUE
2018

The syllabus has been approved by the Department of Economic Theory, Statistics and Forecasting

Protocol № 2 on 01.09.2018

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**Letter of renewal and re-approval of the syllabus
of the academic discipline**

Academic year	Date of the session of the department - developer of syllabus	Protocol number	The signature of the head of the department

1. Introduction

Annotation of the discipline: In the system of economic sciences statistics is considered one of the fundamental discipline, forming the specialty of an economist. Its methods and indicators are used for making plans and forecasts, assessing the results of enterprises, analyzing the dynamical and proportional development of the country, assessing socio-economic processes.

Growing interest in statistics in modern conditions is due to the development of the economy, integration processes. The statistics themselves reflect the progress of processes occurring at macro and micro levels and serve, at the same time, as an information base for making managerial decisions.

Statistics solves important tasks to further improve the system of statistical indicators, techniques and methods of collection, processing and analysis of massive data, ensuring all levels of management of comprehensive, credible and accurate information.

Statistics is a social science. Statistics studies the quantitative aspect of mass social and economic phenomena and their qualitative characteristics. It studies their structure and distribution, location in space, direction and speed of change over time, trends and the regularities, the density of interconnections and interdependence.

The **object** of this subject is society, phenomena and processes of public life

The **subject** of statistics is quantitative and qualitative interconnections of mass phenomena at a specific place and time.

The study of the discipline "Statistics" belongs to the cycle of basic disciplines of the educational degree "Bachelor" for students of all specialties and aims at forming students with basic competencies regarding the possibility to objectively evaluate phenomena and processes, to establish the dependence of the effective indicator on a set of factors, to identify the trends of changes in the studied phenomena and predict their development.

Purpose of the discipline: is to develop students' theoretical knowledge and applied skills by means of statistical observations, statistical analysis methods and forecasting social and economic phenomena and processes.

Course	2, 3	
Semester	3, 4, 5	
Number of ECTS credits	5	
Audit lessons	lectures	32
	laboratory	32
Independent work		86
Form of final control	examination	

Structural-logical scheme of studying the discipline:

Previous disciplines	The following disciplines
Mathematics for economists	Financial management
Probability Theory and Mathematical Statistics	Business analytics
Political Economy	Economic analysis
Economic computer science	Audit
Macroeconomics	Accounting
Microeconomics	Banking business
Computer Science	And other disciplines of the first (Bachelor) level

2. Competence and outcomes of studying in a discipline:

Competence	Outcomes of studying
The ability to identify and combine methods of statistical and economic analysis to assess social and economic content of the problem.	- To use common software packages to obtain the generalized characteristics of social and economic phenomena. - To develop a statistical observation plan in accordance with a certain social and economic situation - To apply methods of data visualization based on the analytical material availability - To create a general system of statistical indicators to assess the social and economic problems at various levels. - To detect regularity and to determine the forms of its functioning in the existing statistical populations
The ability to generate analytical reviews.	- To apply scientific principles of information preprocessing according to a certain social and economic problem. - To form representative research tools - To identify cause-add-effect relations between social and economic phenomena and to form the overall scheme of their assessment.

3. Program of the academic discipline

Content module 1. Methods of descriptive statistics

Theme 1. Methodological principles of statistics

1.1. *The subject and object of statistics.* Statistics as a social science. The object and the subject of statistics. The peculiarities of the discipline. The tasks of the discipline. The theoretical basis of statistics. The law of large numbers as the ground of statistical research.

1.2. *The categories and concepts in statistics.* Qualitative variables and quantitative variables in statistics. Types of variables. Statistical classification of variables: categorical or numerical. Measurement scales: nominal, ordinal, interval and ratio scales. The concept of statistical population. The concept of statistical parameter. The concept of statistical regularity. Types of statistical regularities: the regularity of development (dynamics) of the phenomena, the regularity of structural changes, the regularity of distribution of population elements, the regularity of phenomena interdependence. The concept of homogeneity of statistical population. The concept of variation in statistics. The concept of statistical indicator. Types of statistical indicators.

Laboratory work 1 «Overview of MS Excel application»

Task 1. Defining the types of statistical regularities

Task 2. Defining the essence of statistical population homogeneity.

Theme 2. Statistical observation

2.1.The contents of statistical observation as a method of information provision. Statistical observation as the planned, scientifically organized registration of mass data concerning any social and economic phenomena and processes. The task of statistical observation. The degrees of registration for the statistical observation: primary observation and secondary observation.

The levels of generalization of statistical data. Statistical data requirements. The statistical observation plan: methodological questions, organizational questions. The concept of methodological questions for the observation plan. The purpose, object and unit of observation. The unit of population.

The concept of observation program: a set of questions which must be answered during the observation. The concept of statistical tools: the statistical blank form and manual. The concept of organizational questions for the observation plan. The observe time: subjective time and objective time.

Types of errors: the recording errors and the sampling errors.

2.2. The forms, types and methods of observation.

The forms of observation: reporting, special observation, statistical register. Types of observation and their classification according to: the coverage of population units considered; data registration time; ways of obtaining information. The classification of observation according to the coverage of population units considered: running observation, non - running observation. The types of non - running observation: sampling, monographic observation, main mass data study and monitoring. The classification according to data registration time: current observation and discontinuous observation.

The classification according to ways of obtaining information observation: direct, documented, survey.

Laboratory work 2 "Submission of statistical data: graphs"

Task 1. Defining the concept of methodological and organizational questions, to create the observation plan.

Task 2. Defining forms, types and methods of observation of different social and economic phenomena and processes/

Theme 3. Summarization and grouping of statistical data

3.1. Statistical grouping is the basis of scientific data. The concept of statistical summarization. Kinds of statistical summarization: simple summarization and complicated summarization. The concept of statistical grouping. The concept of grouping signs for statistical grouping and their choice. The concept of the statistical standard. The peculiarities of statistical classifications. Types of statistical groupings: depending on the number of grouping signs, depending on the analytical function. Types of statistical grouping according to the analytical function: typological grouping, structural grouping and analytical grouping. Analytical grouping: its interconnection with the signs. The number of groups and the period length as the basis for grouping.

Sturge's formula (rule) to determine the number of groups.

The dependence of a number of groups on the amount of units within the population. The range of the interval to determine the period length. The classification of interval types: open and closed, equal and unequal. The concept of the secondary grouping: agglomeration of intervals and share regrouping.

3.2. Methods of visualization of grouped data. Basic methods of visualization: tables, charts and distribution series. Subjects and predicates in the table. A layout of a statistical table. Types of tables: simple, group and combinational.

Laboratory work 3 "Summarization and grouping of statistical data"

Task 1 Defining the grouping signs of statistical grouping and their choice.

Task 2. Defining the statistical grouping according to the analytical function: typological grouping, structural grouping and analytical grouping.

Task 3. Defining the number of groups and the period length as the basis of grouping.

Task 4. Creating a layout of a statistical table.

Theme 4. **Generalizing statistical indicators**

4.1. The essence and types of statistical indicators. The concept of statistical indicators. The general scheme of indicator formation. The indicator model. Types of statistical indicators: according to their analytical function, time of processing information and method of calculation. The concept of absolute statistical values (indicators). The units of measurement of absolute statistical values. The concept of relative statistical values. Kinds of relative value representation: coefficient, percent, per one thousand, per ten thousand. Types of relative values: the relative value of plan fulfillment, the relative value of planned target, the relative value of dynamics. Interrelation of relative values. The relative value of comparison. The relative value of structure. The relative value of coordination. The relative value of intensity. The concept of an average value. Simple average values and weighted values. Forms of average values: arithmetic average value, harmonic average value, geometric average value, square average value, chronological average value:

Majorant properties of average values. Mathematical properties of the arithmetic average value. Kinds of arithmetic average values: simple and weighted values. Kinds of the harmonic average values: simple and weighted values.

Laboratory work 4 "Generalizing statistical indicators".

Task 1. Defining the types of statistical indicators according to their analytical function, time of information processing and method of calculation

Task 2. Calculating the types of relative values

Task 3. Calculating the kinds of arithmetic average value and the harmonic average value.

Theme 5. **Analysis of distribution series**

5.1. Characteristics of the distribution center. The concept of distribution series. Elements of distribution series: variant and frequency. Kinds of distribution series: attributive distribution series, variational distribution series, combinational distribution series. Major properties describing a set of numerical data: central tendency, variation, shape. Measures of central tendency. The concept of a mode and median in distribution series. The table form reflecting descriptive measures of the center.

The mode and median in discrete distribution series. Rules determining the mode and median in discrete distribution series. The mode and the median in interval distribution series. The theoretical rule for defining the homogeneous population.

5.2. Quantiles of distribution. The concept of distribution quantiles. Types of distribution quantiles: the median, the quartile, the decile, the percentile. The rules of quartile calculations. The simple scheme of the first quartile calculation and the third quartile of ungrouped data. The simple scheme of the first quartile and the third quartile calculation of grouped data. The content of decile and formula of the first decile and the ninth decile calculation. The content of percentile and the formula of its calculation.

5.3 Measures of the variation. Measures of variation in international statistics and national statistics: range, interquartile range, variance (or population variance, dispersion), and standard deviation. The range as the simplest measure of variation: the content, advantages and disadvantages. The content of the interquartile range. The population variance: the content, advantages and disadvantages, formula of ungrouped data and grouped data calculation. Simplified method of population variance calculation.

The kind of population variance: the total variance, the within group variance, the average of the group variance, the intergroup variance. The rule of summing population variance. The coefficient of determination: its content and calculation formula. The empirical coefficient (empirical correlation ratio): its content and calculation formula. The standard deviation of ungrouped data and grouped data. The content of variation coefficient.

5.4 Characteristics of distribution forms. The general idea of population distribution. The ratio between the mean, median and mode proposed by Karl Pearson. Symmetric distribution. Right- skewed distribution. Left - skewed distribution. Central moments of distribution: asymmetry coefficient, excesses coefficient.

Laboratory work 5 «Analysis of distribution series»
Task 1. Characteristics of the distribution center
Task 2. Quintiles of distribution
Task 3. Measurement of variation.
Task 4. Characteristics of the forms of distribution.

Content module 2. Methods of inferential statistics

Theme 6. Sampling and sampling distributions

6.1. The essence of sampling and types the sampling method. Population and sample in statistics. The law of large numbers and probability theory as the theoretical basis of sampling. The scientific principles of sampling method theory. The general scheme of sampling research. Defining the frame (or population). Simple random sample, its advantages and disadvantages.

The concept of the confidence interval for the mean. Kinds of samples: nonprobability samples and probability samples. Sampling with means replacement and sampling without the means replacement. A table of random numbers as the basis of scientific methods of selection.

6.2. Evaluating the accuracy of sampled data. The sampling statistical characteristics as estimates of the frame characteristics. The content of point and confidence interval estimates for a population mean. The content of standard error with replacement and standard error without replacement. Confidence interval general format, its advantages and disadvantages. Estimation of population proportion. Standard sampling error for a sample proportion for samples with replacement. Standard sampling error for a sample proportion for samples without replacement.

Range of values of the population for the mean and for the sample proportion.

6.3. Defining the necessary sample size. Sampling size determination for the mean with the simple random sample. Sampling size determination for the sample proportion with the simple random sample.

6.4. Simple regression. Correlation analysis: content and terms of use. The population correlation coefficient and the sample correlation coefficient: terms of use. Hypothesis test for correlation. Introduction to regression analysis. Linear regression model. Simple linear regression model.

Laboratory work 6 «Sampling and sampling distributions»
Task 1. Defining the general scheme of sampling research
Task 2. Calculating the statistical characteristics of the sampling
Task 3. Defining the necessary sample size for the mean and the sample proportion.
Task 4. The applied use of the population correlation coefficient and the sample correlation coefficient for different social and economic phenomena and processes analysis.

Theme 7. Time series analysis.

7.1. Characteristics of the dynamics intensity. Time series: the content and rules of modeling. Time - series data. A specific value of a time (dynamic) series - series level. The type of time series: moment and interval. Methodological basis of the dynamics intensity evaluation.

The generalized characteristics of time series intensity: basis and chain indicators.

Time series indicators: average series level for a moment dynamic series and the interval dynamic series; absolute increase or decrease for the chain interconnection and for the basis interconnection; growth rate (or decrease rate); increase rate; absolute value of 1% increase rate; the average absolute increase (decrease) indicator; the average annual growth rate (decrease rate). Estimation of changes within the rate dynamics: absolute acceleration (deceleration) the relative acceleration (deceleration). The empirical coefficient of elasticity as a ground of comparative dynamics analysis.

7.2. Analysis of development tendencies. Time-series components: trend component, seasonality component, cyclical component, irregular component. Time-series component analysis: additive model and multiplicative model.

Methods of time series transformation: moving average, analytical equalization, seasonality index, reduction of dynamic series to a single base, joining dynamic series, interpolation and extrapolation.

Laboratory work 7 «Analysis of data by using time series methods»

Task 1. Defining the characteristics of the dynamics intensity

Task 2. Calculating time-series components for analysis of development tendencies.

Task 3. The applied use of time series transformation methods.

Theme 8. Index method

8.1.Kinds of indices and the system of composite indices. The concept of index. Kinds of indices: according to the nature of comparison, degree of generalization of population units and methods of modeling. The function of composite indices: synthetic and analytical. The characteristic of individual indices. The characteristic of composite indices. Rules for modeling composite indices. Quantitative factors and qualitative factors in indices: the conditions of their interrelation.

Aggregative index as the main form of general indices. The total index of actual volume. The general price index. The general cost index (or turnover index). The rules for aggregative indices calculation. The interconnection of indices: multiplicative and additive.

System of indices: Paasche system, Laspeyres system and Fischer system.

8.2. Index method of analysis. Average weighted index: the concept, rules of modeling and economic interpretation. Average level dynamics index: the index of variable composition, the index of constant composition and index of shift of proportions. The system of indices interconnection: its concept and examples.

Laboratory work 8 «Analyzing data by the index method using MS Excel»

Task 1. The applied use of rules for modeling composite indices.

Task 2. The applied use of average weighted indices and average level dynamics indices.

Task 2. The interconnection of indices and their interpretation.

4. The order of assessment of the results of training

The assessment system of students' competences is based on the grades for all forms of classes conducted including lectures and laboratory works, self - preparation work and performance of individual tasks according to the program of the academic discipline

"Statistics". Evaluation of the formed competences of students is conducted on the cumulative 100-point scale. According to the Provisional Regulations "On the assessment of students' progress according to the cumulative rating system" at S. Kuznets KhNUE, the control methods include:

Current control over the semester during lectures, laboratory sessions and estimated by the sum of the points scored (the maximum amount is 60 points; the minimum amount that allows the student to take the exam - 35 points);

modular control carried out in the form of a colloquium as an intermediate mini-exam on the initiative of the teacher, taking into account the current control over the relevant content module and aims to integrate the evaluation of the student's learning outcomes after studying the material from the logically completed part of the discipline - content module;

final / semester control, conducted in the form of a semester exam, according to the schedule of the educational process.

The procedure for carrying out the current assessment of students' knowledge. Assessment of student's knowledge during seminars, practical and laboratory classes and performance of individual tasks is carried out according to the following criteria:

understanding, degree of assimilation of the theory and methodology of the problems under consideration; the degree of assimilation of the actual material of the discipline; acquaintance with the recommended literature, as well as contemporary literature on the issues under consideration; the ability to combine theory with practice when considering production situations, solving tasks, performing calculations in the process of performing individual tasks and tasks submitted for consideration in an audience; logic, structure, style of presentation of the material in written works and speeches in the audience, ability to substantiate their position, to generalize information and to draw conclusions; arithmetic correctness of the implementation of an individual and complex settlement task; the ability to conduct a critical and independent assessment of certain problem issues; the ability to explain alternative views and the presence of their own point of view, the position on a certain problematic issue; application of analytical approaches; quality and clarity of reasoning; logic, structuring and substantiation of conclusions on a specific problem; independence of work; literacy of presentation of the material; use of comparison methods, generalizations of concepts and phenomena; registration of work.

The general criteria for evaluating non-auditing independent work of students are: the depth and strength of knowledge, the level of thinking, the ability to systematize knowledge on specific topics, the ability to make sound conclusions, the possession of categorical apparatus, skills and techniques for the implementation of practical tasks, the ability to find the necessary information, carry out its systematization and processing, self-realization on practical and seminars.

The final control of the knowledge and competences of students in the discipline "Statistics" is carried out on the basis of a semester examination, the task of which is to check the student's understanding of the program material in general, the logic and interrelations between the individual sections, the ability to use the accumulated knowledge creatively, the ability to formulate their attitude to a particular educational problem discipline, etc.

The examination ticket covers the program of discipline and involves determining the level of knowledge and the degree of mastery of competencies by students.

Each examination ticket consists of 5 practical situations (two stereotyped, two diagnostic and one heuristic task), which provide for the solution of typical professional tasks of the specialist in the workplace and allow to diagnose the level of theoretical train-

ing of the student and his level of competence in the discipline.

The result of the semester exam is evaluated in points (the maximum number is 40 points, the minimum number is scored - 25 points) and entered in the "Record of success" of the academic discipline.

The student should be considered certified if the sum of the points earned on the results of the final / semester test of success is equal to or exceeds 60. The minimum number of points for the current and modular control during the semester is 35 and the minimum number of points scored on the exam is 25.

The final score in the discipline is calculated on the basis of the points obtained during the exam and the points obtained during the current control over the accumulation system. The total score in the points for the semester is: "60 and more points are counted", "59 and less points are not counted" and entered in the "Record of success" of the academic discipline.

Distribution of points for a week
(specify means of evaluation according to the technological card)

Name of content modules/themes			Lectures	Laboratory sessions	Homeworks	The written test	Modular testing	Total
Content module 1. Methods of descriptive statistics	**Theme 1**	Week 1,2	2					2
	Theme 2	Week 3	1	2				3
	Theme 3	Week 4	1					1
		Week 5	1	2		2		5
	Theme 4	Week 6	1					1
	Theme 5	Week 7	1	2	3			6
		Week 8	1			2		3
		Week 9	1	2			5,5	8,5
Module 2. Methods of inferentional statistics	**Theme 6**	Week 10	1					1
		Week 11	1	2	3			6
	Theme 7	Week 12	1			2		3
		Week 13	1	2				3
		Week 14	1					1
	Theme 8	Week 15	1	2	3			6
		Week 16	1			2		3
		Week 17		2			5,5	7,5
Examination								40
Total			**16**	**16**	**9**	**8**	**11**	**100**

Grading scale: national and ECTS

Assessment of the S. Kuznets KhNUE according to Economics scale	ECTS assessing scale		Assessment according to national scale
90-100	A	excellent performance	Excellent
82-89	B	above average	
74-81	C	work at all correct, but with a number of errors from	Good
64-73	D	not bad, but many drawbacks	Satisfactory
60-63	E	performance meets the minimum criteria	
35-59	FX	need to re-take	Unsatisfactory
1-34	F	repeat the discipline	

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