

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
SIMON KUZNETS KHARKIV NATIONAL UNIVERSITY OF ECONOMICS



Educational and methodological work vice-rector

Karina NEMASHKALO

TABLE DATA PROCESSING AND ANALYSIS

Syllabus of the educational discipline

Level of education *all*  
Specialty *all*  
Educational level *first (bachelor)*  
Educational program *all*

Type of discipline *elective*  
Language of teaching, studying and assessment *English*

Head of the Department of  
Informatics and Computer Engineering

Sergei UDOVENKO

Kharkiv  
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APPROVED

By the Department of Informatics and Computer Engineering meeting  
Protocol № 7 dated on January 10, 2022p.

The developers are:

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**Renewal and reapproval list of the academic subject curriculum**

Academic year	Date of the Department meeting – the developer of ASWP	Protocol №	Signature of the Department Head

## Annotation

At the present stage of information environment development it can be assumed that a person is no longer able to process information effectively manually. Significant amounts of data that exist in information systems and are used in software products to solve current problems of professional activity require the use of technical tools for data processing and analysis. The tabular form of data storage and collection, for the processing of which table processors are used, is quite common. Accordingly, the presence of competencies for the processing and analysis of tabular data and knowledge of relevant tools is a professional necessity for modern specialists.

The program of the discipline provides learning in the form of lectures, laboratory classes and independent work of students. For the practical mastering of the main topics of the discipline, laboratory classes, individual work and consultations are performed with the use of personal computers, local networks and the Internet in the computer classes of S. Kuznets KhNUE. All types of classes are provided with the necessary electronic teaching materials.

In order to increase the effectiveness of the learning of the discipline, students have the opportunity to use the system of distance learning of S. Kuznets KhNUE.

The goal of teaching the course is to form in future professionals a system of competencies to solve such tasks of professional activity that require automatic and semi-automatic data processing, structuring, monitoring and analysis.

The course introduces the basic principles of using a spreadsheet software for data processing and analysis to students. Attention is paid to the use of the most popular functions and tools of the spreadsheet. Examples of solving practical problems of data processing and analysis are considered.

### Characteristic of an academic subject

Year of study	2
Semester	4
ECTS credits	5
Final control	Pass

### Structural and logical scheme of an academic subject

<b>Previous disciplines</b>	<b>Following disciplines</b>
Informatics	All courses

## Competencies and course learning results

Competencies	Learning results
Create tabular data by automatic calculation	Using basic spreadsheet software tools for data processing
Visualize anomalous values in data tables	
Create tabular data with efficiently collecting relevant data from other sources (tables)	
Apply remote data processing by means of "cloud" technologies	
Perform single-level and multi-level data sorting	Effective automatic processing and analysis of the data
Perform data filtering by one or more criteria of different types	
Perform grouping of similar data from different sources, summarize data groups	
Use the pivot table tool for processing, grouping, data analysis and data mining	
Perform correlation data analysis	
Apply elements of regression data analysis for forecasting	

## Course program

### **Content module 1. Using MS Excel functions in calculations**

#### **Topic 1.** Basic concepts of data processing in a spreadsheet.

##### 1.1 Principles of using MS Excel.

Areas of application of spreadsheets. The most popular spreadsheet software. MS Excel versions and main differences. MS Excel interface. Basic rules of work. CSV data storage format.

1.2 Addressing and formatting of data. Data types. Formatting data in cells. Automatic filling of cells with data. Cell address. Absolute, relative and mixed addresses. Features and areas of application of addresses of different types.

1.3 Conditional formatting. Conditional data formatting. Bar graphs, color scales and icon sets. Conditional formatting by formulas. Creating rules.

#### **Topic 2.** Multi-table data processing.

##### 2.1. Creating of tables using data from other tables.

Data search functions: VLOOKUP, HLOOKUP, OFFSET, INDEX, MATCH. Areas of application of search functions. Interval search. Creating dynamic formulas. Array functions. SUMPRODUCT function.

#### **Topic 3.** Processing of tabular data in the "cloud".

##### 3.1. Definition of "cloud" technologies.

"Cloud" technologies. Principles of work in "clouds". Existing "cloud" services. Disadvantages and advantages of "cloud" computing. Different types of "cloud" technologies. Organization of joint work online.

##### 3.2. Google's "cloud" spreadsheet service/

### **Content module 2. Analysis and filtering of tabular data using MS Excel**

#### **Topic 4.** Sorting and filtering of data.

##### 4.1. Sorting.

Data sorting. Sort data in one column and in several. Multilevel sorting. Sorting text and numeric data. Smart tables and SUBTOTAL function.

#### 4.2. Automatic filter.

Principles of using an automatic filter. Areas of application of the filter. Disadvantages and advantages of automatic filter. Data filtering of different types. Restrictions on automatic filtering. Application of conditions I and OR.

#### 4.3 Advanced filter.

Advanced filter. Features of advanced filtering. Areas of use. Application of conditions I and OR. Advanced filter restrictions. Apply a filter to different types of data. DMIN, DMAX functions.

### **Topic 5. Data grouping.**

#### 5.1. Subtotals.

Subtotals and areas of use. Subtotals within subtotals. Deleting of subtotals.

#### 5.2. Data consolidation.

Data grouping. Data consolidation. Calculation of aggregate values in data from different tables.

#### 5.3. Pivot tables.

Definition of pivot tables. Construction of pivot tables. Calculating values inside pivot tables. Data filtering in tables. Data slices. Pivot charts.

### **Topic 6. Elements of data analysis.**

#### 6.1. Correlation coefficient.

Correlation and covariance. Correlation coefficient. Random correlation. COVARIANCE and CORREL functions.

#### 6.2. Regression.

Regression analysis. Prediction. Trend lines. Functions FORECAST, TREND, LINEST.

#### 6.3 Data Analysis Tools.

Histograms of data. Generation of random numbers. Rank and percentile.

The list of laboratory classes, as well as questions for tasks for independent work is given in the table "Rating-plan of the discipline".

## **Learning and teaching methods**

The following methods are used during classes types classes defined by the plan:

- presentation of educational lecture material on topics 1-7: verbal (conversation, explanation, story, instruction) with the use of visual material (presentations);
- completing of laboratory works on topics 2-8: explanations, instruction, work in small groups, discussions, debates; also the preparation for presentations by students on individual tasks in topic 8 is planned.

## **Learning results evaluation**

The system of evaluation of formed competencies for students takes into account the types of classes, which according to the curriculum of the discipline include lectures and laboratory classes, as well as independent work. Assessment of the formed competencies of students is performed according to the accumulative 100-point system. Control tools in S. Kuznets KNUE include current, modular and final types of control.

Current control is performed during the semester in lectures and laboratory classes and is estimated by the sum of points scored.

The control of students mastering of the educational material at the lecture is performed out by concentrating the students' attention by asking questions on the previously studied material related to the subject of the lecture.

Independent (home) work of students includes analysis of literature on the subject, homework, preparation for testing, tests, presentations and defense of laboratory work. The independent work of

students based on the results of thematic individual homework and preparation and presentation is presented by the total number of points for these types of work and is 60 (10 points per each of 6 laboratory tasks) points.

Test control is performed using a computer in the distance learning system in automatic mode. The tests consist of 15 - 20 questions and are limited in time. The student has only one attempt to complete the test tasks. The maximum score for the test tasks by modules is 20 points.

Modular control is evaluated with taking into account the current control for the relevant content module and aims at an integrated assessment of student learning achievements after studying the material from the logically complete part of the discipline - the content module.

The grade for intermediate control works is set after the end of the calendar period allotted for the task in accordance with the current content module. Assessment and conduct of control works is performed using a distance learning system, tasks for each thematic module includes theoretical and practical problems and the total number of points for control work is 20 points.

The **final control** is performed in the form of a semester credit. The credit is set as the total quantity of points scored on the results of current and modular control. The maximum is 100 points; the minimum quantity that allows student to get credit is 60 points. The total result in points for the semester is evaluated in the ECTS scale. In case the student receives less than 60 points, the dean of the faculty appoints a commission consisting of three teachers headed by the head of the department and determines the term of re-examination. In case of failure to pass the course, the dean of the faculty offers the student to re-study the discipline during the next academic period independently.

Forms of assessment and distribution of points are given in the table "Rating plan of the discipline".

#### Learning scale: national and ECTS

Total points	ECTS mark	National mark	
		For the exam, coursework, practics	For the credit
90 – 100	A	excellent	passed
82 – 89	B	good	
74 – 81	C		
64 – 73	D		
60 – 63	E	satisfactory	failed
35 – 59	FX	failed	

#### Rating plan of the discipline

Top	Learning form and type		Assessment form	Max points
Topic 1-4	<i>Work in classes</i>			
	Lecture	Lecture 1. Basic concepts of data processing in a spreadsheet. Multi-table data processing	-	-
	Lecture	Lecture 2. Processing of tabular data in the "cloud". Sorting and filtering of data	-	-
	Laboratory classes	Laboratory work 1. Addressing and data formatting in MS Excel	-	-
	<i>Independent work</i>			
	Questions to process	Retrieving practical experience with	-	-

Top	Learning form and type		Assessment form	Max points	
	as independent work	usage of different types of addressing			
Topic 1	<i>Work in classes</i>				
	Laboratory classes	Laboratory work 1. Addressing and data formatting in MS Excel	Passing lab 1	10	
			Testing	5	
	<i>Independent work</i>				
	Questions to process as independent work	Preparation for the testing and passing laboratory work	-	-	
Topic 2	<i>Work in classes</i>				
	Laboratory classes	Laboratory work 2. Multi-table data processing in MS Excel	-	-	
	<i>Independent work</i>				
		Questions to process as independent work	Learning of the basic functions for multitable data processing	-	-
	<i>Work in classes</i>				
	Lecture	Lecture 3. Data grouping	-	-	
	Laboratory classes	Laboratory work 2. Multi-table data processing in MS Excel	-	-	
	<i>Independent work</i>				
		Questions to process as independent work	The application of functions for multitable data processing	-	-
	<i>Work in classes</i>				
	Laboratory classes	Laboratory work 2. Multi-table data processing in MS Excel	Passing lab 2	10	
			Testing	5	
<i>Independent work</i>					
	Questions to process as independent work	The application of functions for multitable data processing	-	-	
Topic 3	<i>Work in classes</i>				
	Laboratory classes	Laboratory work 3. Table data processing in "cloud"	Control work 1	10	
	<i>Independent work</i>				
		Questions to process as independent work	Usage of "cloud" services for data processing	-	-
	<i>Work in classes</i>				
	Laboratory classes	Laboratory work 3. Table data processing in "cloud"	-	-	
<i>Independent work</i>					
	Questions to process as independent work	Usage of "cloud" services for data processing	-	-	
Topic 4	<i>Work in classes</i>				
	Lecture	Lecture 4. Elements of data analysis	-	-	
	Laboratory classes	Laboratory work 4. Data filtration	Passing lab 3	10	
	<i>Independent work</i>				
		Questions to process as independent work	Research of the functions for data analysis	-	-
	<i>Work in classes</i>				
	Laboratory classes	Laboratory work 4. Data filtration	-	-	
<i>Independent work</i>					

<b>Top</b>	<b>Learning form and type</b>		<b>Assessment form</b>	<b>Max points</b>
	Questions to process as independent work	Research of the filtrations of different types	-	-
	<b>Work in classes</b>			
	Laboratory classes	Laboratory work 4. Data filtration	Passing lab 4	10
			Testing	5
	<b>Independent work</b>			
Questions to process as independent work	Preparation for the testing and passing the laboratory work	-	-	
<b>Topic 5</b>	<b>Work in classes</b>			
	Laboratory classes	Laboratory work 5. Data grouping	-	-
	<b>Independent work</b>			
Questions to process as independent work	Research of the features of data grouping	-	-	
<b>Topic 6</b>	<b>Work in classes</b>			
	Laboratory classes	Laboratory work 5. Data grouping	-	-
	<b>Independent work</b>			
Questions to process as independent work	Research of the features of data grouping	-	-	
<b>Topic 6</b>	<b>Work in classes</b>			
	Laboratory classes	Laboratory work 6. Data analysis	Passing lab 5	10
			Control work 2	10
	<b>Independent work</b>			
	Questions to process as independent work	Research of the mathematical methods of data analysis	Testing	5
	<b>Work in classes</b>			
	Laboratory classes	Laboratory work 6. Data analysis	Passing lab 6	10
<b>Independent work</b>				
Questions to process as independent work	The application of data analysis tools	-	-	

### **Recommended literature**

#### **Main**

1. Alexander, M. Excel 2019 Bible, First edition / M. Alexander, D. Kusleika, J. Walkenbach. – Wiley, 2018. – 1074 p.

#### **Additional**

2. Frye, C. MS Excel 2010 step by step / C. Frye. – Microsoft Press, 2010. – 438 p.

#### **Internet sources**

3. Table data processing and analysis (O. Gorokhovatskyi). – Access mode: <https://pns.hneu.edu.ua/course/view.php?id=8479>.

4. Excel help and learning – Access mode: <https://support.microsoft.com/en-GB/excel> (access date 31.10.2021). – Title from screen.

5. Corporate finance institute. Excel. Access mode: <https://corporatefinanceinstitute.com/assets/CFI-Excel-eBook.pdf> (access date 31.10.2021). – Title from screen.