MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
SUMY NATIONAL AGRARIAN UNIVERSITY

Cybernetics and Informatics Department

«CONFIRMED»

Head of Cybernetics and Informatics Department

«___»_____2020y.
_____(S. Ahadzhanova)

CURRICULUM

ECONOMETRICS

Specialty: 073“Management”

Educational program Management of Organizations and Administration

Faculty: Economics and Management

2020 – 2021 academic year

Curriculum of ***Econometrics*** was worked out for the third-year students of specialty 073“Management”.

Author: **Associate Professor, PhD S. Agadzhanova**

Curriculum has been approved on the Cybernetics and Informatics Department Meeting.

Protocol # 10 from 17.06.2020 year

Cybernetics and Informatics Department **S. Ahadzhanova**

Coordinated by:

Guarantor of educational and professional program

(project team leader) _____

Dean of the Faculty _____

Methodist of the Department

of Education Quality,

licensing and accreditation _____

Registered in electronic data base _____

Description of educational discipline

<table>
<tr><th>Indicators</th><th>Branch of knowledge, training direction, qualification level</th><th>Characteristics of course</th></tr>
<tr><td>Number of credits-3</td><td>Branch of knowledge 0306 “Management and Administrating”</td><td>Normative</td></tr>
<tr><td>Modules -2</td><td rowspan="8">Specialty: 073”Management”</td><td>Years</td></tr>
<tr><td>Content modules -2</td><td>2020 – 2021</td></tr>
<tr><td rowspan="3">Individual scientific research task</td><td>Course</td></tr>
<tr><td>2</td></tr>
<tr><td>Semester</td></tr>
<tr><td>Total quantity, hours-90</td><td>3</td></tr>
<tr><td>Lectures</td></tr>
<tr><td rowspan="11">Week classes for full day studing:
classes – 2,6
individual - 2,4</td><td rowspan="11">Educational level:
bachelor</td><td>30</td></tr>
<tr><td>Practical classes</td></tr>
<tr><td>14</td></tr>
<tr><td>Labs</td></tr>
<tr><td></td></tr>
<tr><td>Individual work</td></tr>
<tr><td>46</td></tr>
<tr><td>Individual tasks</td></tr>
<tr><td>Forms of Control</td></tr>
<tr><td>Credit</td></tr>
</table>

Note. Correlation of numbers of classes to individual work is 49/51 (44/46)

1. Aim and task of educational discipline

Aim: there is a study of methods constructions of econometric models, which in number describe intercommunications between economic indicators.

Task:

1) to teach to build econometric models and analyze their quality;
2) to teach to apply programmatic facilities for a regressive analysis;
3) to give skills of the use of econometric models in economic researches.

The study of the discipline "***Econometrics***" involves the formation of students' competencies (derived from the educational and professional program):

№	Type of program competencies	Program competence	Code
	General		
1		Ability to abstract thinking, analysis and synthesis and establishing relationships between socio-economic phenomena and processes.	ЗК 1
2		Ability to learn and master modern knowledge	ЗК 6
3		Ability to adapt, be creative, generate ideas and actions in a new situation	ЗК 7
	Special (professional, subject) competencies		
4		Ability to analyze the results of the organization' activity, compare them with the factors of external and internal environment, to determine the prospects for the organization.	ФК2
5		Ability to manage the organization and its divisions through the implementation of management functions	ФК4
6		Ability to choose and use modern management tools.	ФК5
7		Ability to plan and manage time.	ФК6
8		Ability to analyze and structure the problems of the organization, to form to form reasonable decisions.	ФК9

2.3 Program learning outcomes

As a result of studying the discipline "Econometrics" the student must be able to demonstrate the following learning outcomes (derived from the educational-professional program):

№	Program learning outcomes	Code
1	Demonstrate skills of search, collection and analysis of information, calculation of indicators to substantiate management decisions.	ПРН 6
2	Be able to use modern information technologies, blockchain technologies in the management of resources and databases to justify management decisions on the choice of innovative technologies in agricultural enterprises.	ПРН 19

2.Program of Discipline

(*approved by academic Council of SNAU Protocol #67 from 24.05.17y*)

Semantic module 1. Bases of econometric design

Theme 1. Mathematical design as method of scientific cognition of the economic phenomena and processes. Mathematical model of process. Design of socio-economic processes. Features of econometric design.

Theme 2. Auxiliary mathematical material. Matrices and operations are above them: elements of theory of matrices, special types of matrices, actions of algebra above matrices, matrices and determinants. Systems of linear equalizations. Differentials. Optimization

Semantic module 2. Estimation of parameters of pair linear regression and analysis of its quality

Theme 3. General linear econometric model. Concept of regression. A general concept is about pair linear regression. An estimation of parameters of pair linear regression is by a least-squares method (MNK). Coefficients of correlation and determination. Verification of statistical meaningfulness of coefficients of linear equalization of regression. Verification of statistical meaningfulness of coefficient of correlation. Checking of regressive model is for adequacy after the F-criteria of Fisher. Prognostication after the model of linear regression. A concept is about the crooked growths. A report of exponent function is to the simple linear function. A report of function of degree is to linear regression. Examples of application of functions of degree are in business and finances. Reverse transformations.

Semantic module 3. Estimation of parameters of multivariable linear regression and analysis of its quality

Theme 3. General linear econometric model. Unfolded and vectorial-matrix form of record of theoretical model of multivariable linear regression. Empiric form of record of model of multivariable linear regression. Pre-conditions of least-squares method. Theorem of Gauss. Criterion of MNK. Estimation of parameters of linear equalization of multivariable regression. Verification of model correctness: estimation of meaningfulness of parameters and model on the whole. Confidence intervals of regression and prognosis: a t-test of Student is for verification of meaningfulness of parameters of linear equalization of multivariable regression. General quality of equalization of regression control: coefficient of determination, analysis of statistical meaningfulness of coefficient of determination. Point prognosis. Dispersion of point prognosis. Intervals of trust.

Semantic module 4. A construction of econometric models is on the basis of the system of simultaneous equalizations

Theme 4. Systems of simultaneous equalizations. Systems of simultaneous equalizations, their intercommunication, erected form of the system. Concept of authentication of the system. General description of methods of estimation of parameters. Indirect least-squares method. Three-foot-pace least-squares method**.**

Semantic module 5. Mathematical methods of research of high-quality economic indicators

Theme 5. Research of high-quality economic indicators. Criteria of estimation of independence of indexes: method of Pirson, criterion of consent of Kolmogorov.

Semantic module 6. The special cases are in a regressive analysis

Theme 6. Multicollenearity. A concept is about multicollenearity. Basic consequences of multicollenearity. Signs of multicollenearity. Algorithm of Farrar-Glober. Methods of removal of multicollenearity

Theme 7. Heteroskedastic. A concept is about homo- and heteroskedastic. Consequences of heteroskedastic. Exposure of heteroskedastic. Graphic analysis of tailings. Method of the self-weighted least squares, feature of his application.

3.Structure of training discipline

Names of the semantic modules and themes	**Amount of hours**											
	daily form						**Extra-mural form**					
	total	**including**										
		lecture	**pc**	**labs**	**iw**							
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Module 1. Linear regression												
Semantic module 1. Bases of econometric design												
Theme1. Main terms. Introduction.	**4**	4			**-**							
Theme 2. Integer Programming	**6**	4	2		**-**							
Together after the semantic module 1	**10**	8	2									
Semantic module 2. ***Estimation of parameters of linear regression but analysis of its quality***												
Theme 3. Logical and Statistical functions.	**8**	**4**	**4**	**-**								
Together after the semantic module 2	**8**	**4**	**4**	**-**								
All the hours after the module 1	**18**	**12**	**6**									
Module 2. Multivariable linear regression												
Semantic module 3. ***Estimation of parameters of multivariable linear regression but analysis of its quality***												

Theme 4. General linear econometric model	**4**	**2**	**2**										
Together after the semantic module 3	**4**	**2**	**2**										
Semantic module 4. ***A construction of econometric models is on the basis of the system of simultaneous equalizations***													
Theme 5. Systems of simultaneous equalizations	**18**	4	4	**10**									
Together after the semantic module 4	**18**	4	4	10									
Semantic module 5. ***Mathematical methods of research of high-quality economic indicators***													
Theme 6. Research of high-quality economic indicators	**6**	4	2										
Together after the semantic module 5	**6**	4	2										
All the hours after the module 2	**28**	**10**	**6**	**10**									
Module 3. The special cases are in a regressive analysis. Models lag variables													
Semantic module 6. The special cases are in a regressive analysis													
Theme 7. Multicollenearity	**16**	**4**	2	**10**									
Theme 8. Heteroskedastic **Theme 9.** Autocorrelation	**30**	**4**		**26**									
Together after the semantic module 6	**44**	**8**		**36**									
All the hours after the module 3	**56**	**8**	**2**	**46**									
All the hours	**90**	**30**	**14**	**46**									

4. Topics of lecture

N	Name of theme	Amount hours
1	**Theme 3. General linear econometric model**	
	Lecture 1. Linear model with two by variables, its structure, estimation of parameters. Plan 1. Concept of regression. A general concept is about linear regression. 2. An estimation of parameters of linear regression is by a least-	4

	squares method.	
	Lecture 2. Analysis of variance of regression, prognosis. Plan 1. Coefficients of correlation and determination. 2. Verification of statistical meaningfulness of coefficients of linear equalization of regression. 3. Verification of statistical meaningfulness of coefficient of correlation. 4. Checking of regressive model is for adequacy after the F-criteria of Fisher. 5. Prognostication after the model of linear regression.	4
	Lecture 3. Nonlinear models and their linearizing. Plan 1 The concept of growth curves. 2. Summary exponential function to a simple linear function. 3. The power function. The report to the linear regression. Examples of power-law functions of finance. 4. Inverse transformation.	4
	Lecture 4. General view of multivariable linear regression Plan 1. Unfolded and vectorial-matrix form of record of theoretical model of multivariable linear regression. 2. Empiric form of record of model of multivariable linear regression. 3. Pre-conditions of MNK. Theorem of Gauss.	2
	Lecture 5. Estimation of parameters of linear equalization of multivariable regression. Plan 1. Criterion of MNK 2. Estimation of parameters of linear equalization of multivariable regression.	4
	Lecture 6. Verification of model correctness: estimation of meaningfulness of parameters and model on the whole. Confidence intervals of regression and prognosis. Plan 1. a t-test of Student is for verification of meaningfulness of parameters of linear equalization of multivariable regression 2. General quality of equalization of regression control 2.1. Coefficient of determination 2.2. Analysis of statistical meaningfulness of coefficient 3. Point prognosis. Dispersion of point prognosis. Intervals of trust.	4
2	**Theme 6. Multicollenearity**	
	Lecture 7. Concept about multicollenearity and its influence on the	4

	estimation of parameters. Methods of determination of presence of multicollenearity and methods of its removal. Plan 1. A concept about 2. Basic consequences of multicollenearity 3. Signs of multicollenearity 4. Algorithm of Farrar-Glober 5. Methods of removal	
3	**Theme 7. Heteroskedastic** **Theme 8. Autocorrelation**	
	Lecture 8. A concept about homo- and heteroskedastic. An estimation of model parameters is with heteroskedastic tailings. Nature and consequences of autocorrelation, methods of its determination. Plan 1. Heteroskedastic 1.1. A concept is about homo- and heteroskedastic. 1.2. Consequences of heteroskedastic 1.3. Exposure of heteroskedastic. Graphic analysis of tailings. 1.4. Method of the self-weighted least squares. Features of application of method are at the unknown values of dispersions of casual rejections. 2. Autocorrelation 1. Nature of autocorrelation. 2. Consequences of autocorrelation. 3. Exposure of autocorrelation. Graphic method. Method of rows. Criterion of Darbin-Watson. 4. Methods of removal of autocorrelation. Methods of estimation of coefficient	4
	Total:	**30**

5. Topics of practical classes

№	*Name of topics*	*Quantity of hours*
1.	***Practical work 1.*** Integer Programming.	**2**
2.	***Practical work 2.*** Logical functions.	**2**
3.	***Practical work 3.*** Statistical calculations.	**2**
4.	***Practical work 4.*** Inventory management.	**2**
5.	***Practical work 5.*** Regression.	**2**
6.	***Practical work 6.*** Correlations.	**2**
7.	***Practical work 7.*** Prediction.	**1**
8.	***Practical work 8.*** Consolidation.	**1**
	Total:	**14**

6. Topics and plans of Individual work

N	Name of theme	Amount hours
	Topic 5. Systems of simultaneous equalizations. Plan 1. Mathematical model of process. 2. Design of socio-economic processes. 3. Features of design.	10
	Topic 6. Supporting mathematical material Plan 1. Matrices and operations are above them. 2. Systems of linear equalizations. 3. Differentials. 4. Optimization.	10
	Topic 7. Multicollenearity Plan 1. Methods of determination of presence of multicollenearity and methods of its removal	10
	Topic 8. Research of high-quality economic indicators Plan 1. Criteria of estimation of independence of indexes 1.1. Method of Pirson 1.2. Criterion of consent of Kolmogorov	16
	Together	**46**

9. Methods of Training

1. Methods of studies after the source of knowledge:

1.1. ***Verbal***: a story, explanation, lecture, instructing, work, is with a book (reading, summarizing, making of tables, graphs).

1.2. ***Evident***: demonstration, illustration.

1.3. ***Practical***: laboratory method, practical work.

2. Methods of studies after character of logic of cognition.

2.1. ***Analytical.***

2.2. ***Methods of synthesis***.

3. Methods of studies after character and level of independent intellection of students.

3.1. ***Problem*** (whether problem informative)

3.2. ***Partly searching (heuristic)***

3.3. ***Research***

4. Active methods of studies - usage of e-learning technologies, self-appraisal knowledge, educational and supervisory tests.

5. Interactive technologies of studies - usage of multimedia technologies, kahoot, mind maps.

10. Methods of Control

1. Rating control is after the 100-point scale of evaluation of ECTS.

2. Lead through of intermediate control is during a semester (intermediate attestation)

3. Polikriterial estimation of current work of students:

- level of knowledge, shown on practical and laboratory employments;
- activity is during the job processing on employment;
- results of implementation and defense of laboratory works;
- express control during audience employments;
- the independent working with theme(whole or separate questions);
- registration of abstracts, reports;
- testing results;
- written tasks during the lead through of control works.

12. Points for Credit

Current testing and independent work										**Modules + IT**	**Attestation**	**Sum**
Content module 1 - 35 points			**Content module 2 - 35 points**						**IT**			
T1	T2	T3	T4	T5	T6	T7	T8	T9	**15**	**85 (70+ 15)**	**15**	**100**
10	10	15	5	5	5	5	5	10				

Evaluation scale: national and ECTS

Total points	**ECTS**	**National raiting**	
		Exams, term paper, practice	**credit**
90 – 100	**A**	**Excellent**	**passing**
82-89	**B**	**Good**	
75-81	**C**		
69-74	**D**	**Satisfactory**	
60-68	**E**		
35-59	**FX**	**Unsatisfactory**	**Not passing, but can have second attemp**
1-34	**F**	**Poor**	**Not passind, need add training**

Methodical ware:

1. S. Agadzhanova Econometrics[e-course]: **https://cdn.snau.edu.ua/moodle/course/view.php?id=819**

11. Bibliography:

Main

1. Marno Verbeek, A Guide to Modern Econometrics, 5th Edition. ISBN: 978-1-119-47211-7 September 2017. - 520 Pages.

Additional

2. Principles of Econometrics, 5th Edition [Print Replica] Kindle Edition by R. Carter Hill (Author), William E. Griffiths (Author), Guay C. Lim (Author)

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«CONFIRMED»

Head of Cybernetics and Informatics Department

«23» 07 2020y.
(S. Ahadzhanova)

CURRICULUM

ECONOMETRICS

Specialty: **073"Management"**

Educational program **Management of Organizations and Administration**

Faculty: **Economics and Management**

2020 – 2021 academic year

Curriculum of ***Econometrics*** was worked out for the third-year students of specialty 073"Management".

Author: **Associate Professor, PhD S. Agadzhanova**

Curriculum has been approved on the Cybernetics and Informatics Department Meeting.

Protocol # 10 from 17.06.2020 year

Cybernetics and Informatics Department **S. Ahadzhanova**

Coordinated by:

Guarantor of educational and professional program

(project team leader) _____

Dean of the Faculty _____

Methodist of the Department

of Education Quality,

licensing and accreditation N. Baranik

Registered in electronic data base 09.07.2020 г.