

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
SUMY NATIONAL AGRARIAN UNIVERSITY**

Cybernetics and Computer Science Chair

«CONFIRMED»

**Chief of Cybernetics and
Computer science Chair**

«19» 06 2019y.
S. Agadzhanova (S. Agadzhanova)

CURRICULUM

Modern information technologies in scientific activity

Specialty: 072 Finance, Banking and Insurance, 073 Management, 075 Marketing, 081 Law, 091 Biology, 101 Ecology, 133 Industrial Engineering, 181 Food Technology, 201 Agronomy, 202 Plant Protection and Quarantine, 204 Technology of Production and Processing of Livestock Products, 211 Veterinary medicine, 212 Veterinary hygiene, sanitation, examination

Faculty: *Economics and Management, Law, Agrotechnology and Nature Management, Engineering and Technology, Food Technology, Biological and Technological, Veterinary Medicine*

Level of higher education - the third (educational and scientific) level

2019 - 2020 academic year

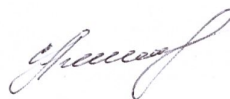
Working program on Modern Information Technologies in Scientific Activity for English-speaking Students of *Economics and Management, Law, Agrotechnology and Nature Management, Engineering and Technology, Food Technology, Biological and Technological, Veterinary Medicine Faculties, 1-st year graduate students.*

Author: Associate Professor, PhD S. Agadzhanova

Curriculum has been approved on the Cybernetics and Computer Science Chair Meeting.

Protocol # 12 from 28.05.2019 year

Head of Cybernetics and Computer Science Chair



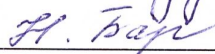
S. Agadzhanova

Agreed:

Head of the graduate students' department



Engineer of Educational Department



Registered in electronic database: date: 21.07 2019 p.

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Curriculum description

| | | |
|--|--------------------------------------|---------------------------------------|
| Branch of knowledge, direction of training, educational and qualification level | Characteristics of the discipline | |
| | full-time education | external form of education |
| Educational degree: third (educational and scientific) level doctor of philosophy | Year of training: | |
| | 1-st | - |
| | Semester | |
| | 1-st | - |
| | Lectures | |
| | 22 h. | - |
| | Practical, seminars | |
| | 22 h. | - |
| | Independent work | |
| | 46 h.. | |
| | Type of control | |
| | credit | |

1. Aim and Tasks

Aim: is the formation of postgraduate students' knowledge and skills related to the use of information technology in research; the development of skills in computer programs of text editors and electronic sheets; the disclosure of the essential aspects of the application of computer networks for the tasks of searching for scientific information; familiarization with the functional capabilities of software tools, intended for scientific analysis of information.

Task:

- reveal the role of information technology in research;
- expand the knowledge and skills of graduate students in the field of computer networks use;

- deepen postgraduate skills associated with the search for information on the Internet;
- Disclose the meanings and methods of applying statistical methods in scientific research;
- Develop skills to build scientific accountability using modern information technology.

As a **result of studying** the discipline the student must:

Know:

the basic principles of the search, systematization and processing of scientific information with the help of information technology; technological bases of functioning of computer networks; the essential aspects of statistical analysis; possibility of registration of scientific reporting with the help of modern software tools.

Be able to:

determine the effectiveness of a scientific and design organization; to develop and use bibliographic data bases; to search information on the Internet using search engines; to perform a statistical analysis of scientific data and to be able to graphically present them; to carry out the preparation of scientific reporting with the help of information technologies.

2. Program of Discipline

(approved by academic Council of SNAU Protocol #7 from 9.06.17y.)

Content module 1. New information technologies. Use of applied software for registration of scientific information

Topic 1. The concept and development of information technology.

The concept of information technology and information. Semantic filling of information in various fields of human activity. Difference between data and information. Approaches to determining the amount of information. Information quality and measurement. Types of new information technologies.

Concepts and types of software: system programs (operating systems, maintenance systems, antivirus software, archivers, tests, drivers); software tools or programming

systems (text editors, assemblers, compilers, interpreters, bootloaders or communication editors, control and debugging tools); applications (word processors, table processors, DBMS, graphic editors) and their use in scientific activities. Market classification of software: commercial software, free software, shareware, trial versions, demo version.

Definition of information systems. Classification of information systems. The general structure of information systems, functional and security parts. System's components.

Unified system of primary documentation, concept, composition and requirements. Unique forms of input and output documentation.

Ways of organization and advantages of the concept of databases (DB). The concept, classification and composition of the automated data bank. Characteristics of the logical and physical models of the database. Methods of creating an optimal database model. The theory of normalized relations.

Requirements for using data warehouse in database technology.

Topic 2. Working with structured documents

Possibilities for processing scientific texts in MS Word: formatting the font and paragraph, setting borders and pouring, applying styles, creating footnotes, footers, hyphenation, pointers, automatic content. Creating tables and diagrams, adding pictures. Microsoft Word Publishing Features. Application of OLE technology. Creating Web pages.

Presentation of scientific information in the form of a presentation using the MS Power Point program. Structure and dialog elements. Main menu, standard and custom drawing toolbars. Components of the Power Point presentation. The concept of masters and templates. Objects and markup. Create a new presentation and save it. Typing Editing and formatting text. Using Structures. Add slides to the presentation. Editing slides. The concept of masters and templates. Objects and markup. Presentation view modes. Insert drawings, tables, charts. Create special effects. Formatting text. Demonstration of presentations.

Content module 2. Local and global networks

Topic 3. Computer networks. Global Internet Network

Computer networks. Protocols as sets of rules for exchanging information between computers. Global Internet Network. Use of client / server technology to solve the main task of the Internet - providing the user with the necessary information and services.

Internet addressing system: IP addresses and domains, network identifiers, computer identifiers.

Web Browser: Configuring the user interface, using the horizontal menus and toolbars, replacing the encoding, searching for information using search engines and search directories. Working with electronic libraries.

Rules for working with e-mail and etiquette.

Topic 4. Organization of computer security and information security

An overview of the main methods and scenarios of attacks on a computer user who works on the Internet. Major types of network security violations: the threat of remote administration, the threat of active content, the threat of interception or substitution of data on transportation routes, the threat of interference with privacy, the threat of supply of inappropriate content and the ability to protect against these threats. Viruses and antivirus programs (notion, classification, types). The main ways of infection and methods of protection and treatment.

Methods for protecting local networks from unauthorized access through proxy servers and firewall systems. Data encryption systems and security levels.

Basic concepts and concepts of cryptography. Use of cryptographic systems to protect information on the Internet. Symmetric and asymmetric cryptographic systems. The concept of encrypting data with a dual key. The technology of encryption and digital signature of electronic documents using the PGP package. Certification of public keys, certification centers, selection rules. Blockchain technology.

Content module 3. Fundamentals of statistical processing

Topic 5. Processing of scientific data using Microsoft Excel

The program interface, the use of formulas and rules for working with them. Wizard functions. Application of diagrams for data analysis; types of diagrams, parts editing. Presentation of scientific data in the form of function graphs; the basis of correlation and regression analysis. Using lists, card forms, sorting and filtering data.

4. Structure of the discipline

| Name of content modules and topics | Number of hours | | | | | |
|---|-----------------|-----------|-----------|------|-----------|--|
| | total | also | | | | |
| | | Lectures | PC | Labs | IW | |
| <i>Module 1. Basic concepts of modern information technologies.</i> | | | | | | |
| <i>Content module 1. New information technologies. Use of applied software for registration of scientific information</i> | | | | | | |
| Topic 1. The concept and development of information technology | 14 | 4 | 4 | | 6 | |
| Topic 2. Work with structured documents | 14 | 4 | 4 | | 6 | |
| Total content module 1 | 28 | 8 | 8 | | 12 | |
| <i>Content module 2. Local and global networks</i> | | | | | | |
| Topic 4. Organization of computer security and information security | 16 | 4 | 4 | | 8 | |
| Total content module 2 | 16 | 4 | 4 | | 8 | |
| Total module 1 | 44 | 12 | 12 | | 20 | |
| <i>Module 2. Organization of calculations in scientific research using a table processor. Data analysis and visualization of results.</i> | | | | | | |
| <i>Content module 3. Fundamentals of statistical processing</i> | | | | | | |
| Topic 5. Processing of scientific data using Microsoft Excel | 46 | 10 | 10 | | 26 | |
| Total module 2 | 46 | 10 | 10 | | 26 | |
| TOTAL | 90 | 22 | 22 | | 46 | |

5. Topics of lectures

| № | Name of topic | Quantity of hours |
|----------|--|--------------------------|
| 1 | Topic 1. Information technologies and their role in scientific researches 1. The concept of information technology and information. 2. Classification of software. 3. Use of software in scientific research. | 4 |
| 2 | Topic 2. Work with structured documents 1. Page options. Preview 2. Font design and paragraph formatting 3. Create header footers, footnote 4. Creating an automatic content | 4 |
| 3 | Topic 3. Topic 3. Computer networks. Global Internet Network 1. 1. A comparative overview of modern Internet browsers. 2. Find information in the WWW. 3. Email Etiquette. | 4 |
| 4 | Topic 4. Organization of computer security and information security 1. The concept of computer security. 2. Classification of hardware and software. 3. Technology blockade. | 4 |
| 5 | Topic 5. Processing of scientific data using Microsoft Excel 1. The concept of a database (list) in the MS Excel environment, constraints and features of creation and use. Typical operation of MS Excel databases. 2. Predict values using the "what-if" analysis package. 3. Debug and use the analysis package. Functional overview and examples of use. 4. Analysis of data using the add-in Select Options and Find a solution. | 6 |
| | Total | 22 |

6. Topics of practical classes

| № | Name of topic | Quantity of hours |
|---|---|-------------------|
| 1 | Practical work 1.Data visualizations in Excel | 2 |
| 2 | Practical work 2. Report information system in Excel | 2 |
| 3 | Practical work 3.Database in Excel | 2 |
| 4 | Practical work 4.Pivot table in Excel | 2 |
| 5 | Practical work 5.Multi-Pivot table in Excel | 2 |
| 6 | Practical work 6.Prediction in Excel | 2 |
| 7 | Practical work 7. Solving linear programming tasks in MS Excel. | 2 |
| 8 | Practical work 8.Simplex method for solving linear programming tasks in MS Excel. | 4 |
| 9 | Practical work 9. Transportation problem, solution in MS Excel. | 4 |
| | Total | 22 |

7. Topics and plans of individual task

| № 3/II | Name of topic | Quantity of hours |
|-----------|--|-------------------|
| 1. | <p>Topic 1. Creating presentations</p> <p>1. Presentation as a means of presenting ideas. 2. Structure of MS-PowerPoint documents. 3. MS-PowerPoint Program Interface. 4. Stages of presentation development. 5. Working with text, spreadsheets, charts, multimedia elements. 6. Presentation presentation management.</p> | 5 |
| 2. | <p>Topic 2. Basics of work in the environment of the table-top processor MS Excel.</p> <p>1. History of creating and developing table processors. 2. The main areas of IT use. 3. Tabbed Processor Interface. 4. Select the areas of the table. 5. Deleting information. 6. Copy, move. 7. Editing cell values Formatting cells. 8. Types of data in MS Excel.</p> | 5 |
| 3. | <p>Topic 4. Creating, editing and formatting spreadsheets.</p> <p>1. Typical operations for editing the spreadsheet data: changing and editing cell contents; Copy the block of cells into one or more areas of the table; moving block of cells; delete block of cells; insert cell block. 2. Typical formatting operations for spreadsheet data: debugging data formats; change the type, size, and font colors; aligning cell contents and framing; protect cells, sheets and workbooks. Set page</p> | 10 |

| | | |
|----|---|-----------|
| | options: numbering pages; header footer insertion and more. Preview and print tables. 3. Manage files (books) in the MS Excel environment. Creating a new file, loading an existing one, saving a file under a new name, opening the file, searching the file for the specified attributes. | |
| 4. | Topic 5. Creating, editing and formatting graphs and charts. 1. Purpose and basic concepts and objects Designer diagrams: the concept of a diagram, a series of data, category, legend, marker, axis of values, area of the diagram, area of diagram construction. 2. Creating and drawing diagrams. Diagonal Designer Interface Dialog Box. Diagramming modes: in the worksheet of a table, in a separate sheet of diagrams. Configure parameters and print charts. | 26 |
| | Total | 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 | | | | | | | | P W S | Total for modules and PWS | Attestation | Sum |
|--------------------------------------|-------------------|----------------------|-------------------|-------------------|-------------------|---------------------|----|-------------------|------------------------------|-------------|-----|
| Module 1 - 35 points | | Module 2 - 35 points | | | | | | | | | |
| Content module | Content module | Content module | Content module | Content module | Content module | Content module 1 | | | | | |
| T1- T3 | T4 | T5 | T6 | T7 | T8- T9 | T10 | 15 | 85 (70+ 15) | 15 | 100 | |
| 5 | 5 | 2 | 3 | 5 | 10 | 10 | | | | | |

Evaluation scale: national and ECTS

| Total points | ECTS | National rating |
|--------------|-----------|-----------------------------|
| | | Exams, term paper, practice |
| 90 – 100 | A | Excellent |
| 82-89 | B | Good |
| 75-81 | C | |
| 69-74 | D | Satisfactory |
| 60-68 | E | |
| 35-59 | FX | Unsatisfactory |
| 1-34 | F | Poor |

11. Methodical support

1. Modern information technologies in science researches *course book* for English-Speaking Students, 1-st year graduate students/ S.Agadzhanova, N.Barchenko, L.Taranjuk/ [Text] /Lecture notes for English-speaking Students, 1-st year graduate students. SNAU, Sumy - 2018. - 96 P.