Educational Establishment
"Grodno State Agrarian University"

FUNDAMENTALS OF INFORMATION TECHNOLOGIES

The curriculum of higher education institutions for undergraduates

1-25 80 01 "Economics" (profiling - "Agricultural Economics")

2019 y.

EXPLANATORY NOTE

The goals and objectives of the discipline

The purpose of studying the general discipline "Fundamentals of Information Technologies" is to prepare students for the use of modern information technologies as a tool for solving high-level scientific and practical problems in their subject area.

Objectives of the discipline:

- give basic theoretical knowledge about the basic concepts of information technology;
- develop skills in creating, formatting and processing documents using information technology, designing and developing simple databases and Web applications, and analyzing experimental data.

Place of discipline in the system of training a specialist with higher education

Currently, information technology is one of the fastest growing areas. The elemental base and architecture of computers are being improved, languages and programming technologies are being developed, new application software packages are being created based on modern mathematical methods of modeling and optimization. Based on this, a necessary element of the training of specialists is both the systematization of the basic basic concepts, and familiarity with modern achievements in the field of information technology.

The program is developed on the basis of a competent approach, the requirements for the formation of competencies formulated in the minimum program of candidate classification (differentiated classification) in the discipline "Fundamentals of Information Technology".

Mastering the discipline is based on competencies acquired earlier by undergraduates, graduate students and applicants in the study of computer information technologies in higher education.

Requirements for the level of development of the content of the academic discipline

As a result of studying the discipline, undergraduates, graduate students and applicants should consolidate and develop the following academic (AC) and social-personal (SPC) competencies provided for in the minimum program of candidate classification (differentiated classification) in the general discipline "Fundamentals of Information Technologies":

AC-1. To be able to apply basic scientific and theoretical knowledge to solve theoretical and practical professional problems.

AC-2. Be able to do comparative analysis.

AC-3. Be able to work independently.

AC-4. Have an interdisciplinary approach to solving problems.

AC-5. Have skills when working with computer equipment.

SPC-1. Have the ability to interpersonal communications.

SPC-2. Be able to work in a team.

As a result of studying the discipline, undergraduates, graduate students and applicants must have the following professional competencies (PC), provided for in the minimum program of candidate classification (differentiated classification) in the general discipline "Fundamentals of Information Technologies":

PC-1. Have a clear understanding of information technology in your subject area.

PC-2. Have an idea of modern operating systems and toolkits.

PC-3. Have the skills to work with the main software products of information technology: text, graphic and tabular processors, databases, means of preparing presentations, and means of supporting mathematical calculations.

PC-4. To be able to find the necessary information on the global Internet.

PC-5. To have an idea about the problems of information security in computers and computer networks.

PC-6. To get acquainted with the basic methods of mathematical modeling and optimization in solving applied problems in various subject areas.

PC-7. Work with scientific literature.

To acquire professional competencies PC-1 - PC-9 as a result of studying the discipline, the undergraduate must know:

- basic concepts of information technology;

- principles of operation and structural organization of computers and computer networks;

- purpose and features of the functioning of the software;

- Prospects for the development of hardware and software for computer information technologies;

- principles of work in Windows;

- The main features of Microsoft Office applications;

- methods of information protection;

- principles of the organization of databases and their design;

- purpose, architecture, functionality of the DBMS and the direction of their development;

- basic concepts, definitions and classification of computer networks;

- Internet information resources;

- basic web page design features.

To be able and able to:

- create and execute documents;

- create dynamic presentations;

- use table processors for data analysis and problem solving;

- design, create and use databases;

- use the global Internet to search and post information;

- create simple web pages;

- use information technology in solving professional and research problems.

Total hours and class hours

The maximum amount of time devoted to mastering the discipline is 108 hours, including 72 hours of classroom hours.

Higher Education Form

When studying the discipline, such forms of training are provided: full-time and part-time.

Classroom time distribution by occupation, course and semester

Discipline is studied for full-time study in the 2nd semester, while the class time is divided into 40 hours of lecture and 32 hours of laboratory classes.

Forms of current certification in academic discipline

Assessment of academic achievements of undergraduates, graduate students and applicants in the differential standings is carried out on a ten-point scale. To assess the educational achievements of undergraduates, criteria are used, approved by the Ministry of Education of the Republic of Belarus.

Evaluation of intermediate academic achievements of undergraduates is carried out in accordance with the selected grade scale.

To assess the achievements of undergraduates, the following diagnostic tools are used (competencies are checked):

- presentation by a graduate student at a conference on a prepared abstract (AC-1, AC-3, AC-4, AC-5, SPC-1, SPC-2, PC-6);

- conducting ongoing quizzes on selected topics (PC-1 - PC-7);

- protection of individual tasks performed in laboratory studies (AC-3, AC-5, SPC-1, PC-1– PC-7);

- passing the differential credit in the discipline (AC-1 - AC-5, PC-1 - PC-7).

CONTENT OF EDUCATIONAL MATERIAL

Theme 1. Modern information technology

History, current status and development prospects of computer technology. Element base, architecture, network layout, performance.

The concept of information. Classification and types of information technology.

OS. Purpose, classification, current status, familiarity with the possibilities and work in a modern operating system.

Programming languages and technologies. History of the development of programming languages.

Theme 2. The main software tools of information technology

2.1. Software

Text editors - Word, PageMaker, etc., their capabilities and purpose.

Graphic editor. Methods for storing and processing graphic information. Editors PhotoShop, CorelDraw and others. Their capabilities.

Excel spreadsheets. Appointment, opportunities.

Service tools: file managers, archivers, electronic dictionaries and translators, text recognition programs.

Mathematical Computing Systems MathCad, MathLab. Purpose, features, application examples.

Presentation preparation system. Appointment, opportunities. Work in MS PowerPoint.

2.2. Preparation of documents using the word processor Microsoft Word

Overview of the main features of the word processor Microsoft Word.

Customizing Microsoft Word: document viewing modes, customizing toolbars and menus, and some service features.

Work with documents. Creation, storage, search, distribution, viewing and printing of documents.

Editing a document. Copy, cut, paste, delete, search and replace text fragments. Repeat and cancel commands.

Text design. Fonts, paragraph, capital letter, case, lists.

Document processing. Style sheet. View the structure of the document, change it, create a table of contents. Footnote processing. Headers and footers layout. Pagination. Spell check text documents. Thesaurus. Word wrap in the text. Insert illustration. Formation and insertion of diagrams. Making captions to figures and tables. Create an index. Formula Editor

Tables. Creating tables. Table processing: inserting rows and columns, resizing a table, sorting data in a table, deleting rows, columns of a table. Using tables to form documents. Mathematical processing of table elements.

Using the Merge Wizard in preparing documents.

2.3. Processing information using Microsoft Excel spreadsheets

A brief overview of the features.

Organization of the system interface.

Building a table. The basic rules for constructing a table. Data input. Editing the contents of cells. Select cells and areas. Moving and copying data.

Table design. Data Formats Align the contents of cells. Font type selection. Framework. View options. Formatting columns and rows. Using automatic formatting features. Use of styles. Creating a table structure. Notes. Protection of cells and sheets. Creation of graphic objects.

The calculations. Formulas Use of names. Using features.

Work with list data. Basic work with lists. Processing lists using a data form. Processing records. Search for records. Sorting Lists. Filters

Charts. Create a chart in the Chart Types worksheet. Processing charts Formatting charts.

Data analysis. Install add-ons. Calculation of totals. Data consolidation. Parameter selection. Pivot table.

Processing of experimental data.

Connect Excel with other applications.

2.4. PowerPoint Presentations

Features of Microsoft PowerPoint.

The structure of a typical presentation: a set of slides for showing, handouts.

Create a presentation. Create slides using the Auto Content Wizard and create a self-presentation. Microsoft PowerPoint Modes: Normal, Slide Sorter, and Slide View.

Work with slides. Formatting presentation slides Linking and formatting objects. Add sound effects, music, videos, and sound. Animation of text and objects.

Create notes and handouts.

Demonstration slide show. Setting the slide show time and transitions.

Theme 3. Networking and the Internet

3.1. Computer networks

Seven-level model of the structure of communication protocols.

The organizational structure of the Internet. Internet protocols (TCP and UDP). The main Internet services (DNS, FTP, HTTP, SNMP, POP3, SNTP).

3.2. Scripting programming languages

Scripting programming languages *(Java, Perl, HTML, XML).*

Tools for creating web servers and web sites (PHP, ASP NET, Delphi). Web Design Basics

Theme 4. Database management systems

4.1. Database management systems

Data structure, data models, creating a database and tables. Access, Oracle, MySQL, Foxpro, dBase, SQL Server, and other databases. SQL language basics and building SQL queries.

4.2. Microsoft Access - Relational Database Management System

The purpose of the main components of the Access database: tables, queries, forms, reports, macros, modules.

Creating tables and data schemas. Work with data. Adding and editing data. Search for records. Quick sorting. Work with data using filters.

Using queries to work with data. Queries for data sampling. Parametric queries. Cross queries. Modifying requests.

Creation of forms and reports. Automate your Microsoft Access application using macros.

Access interaction with Microsoft Office applications.

Service features: spell checking, database analysis, database protection.

Theme 5. Information security

Methods and means of information protection. Encoding and decoding of information. Protection against unauthorized access to data. Security classes of computer systems. Electronic signature. Legal and organizational aspects of information protection and copyright

Theme 6. Mathematical modeling and numerical methods

Mathematical models and numerical methods for solving problems in various subject areas.

Models leading to the need for numerical differentiation and integration of functions. The main methods and characteristics of the error.

Models described by ordinary differential equations. Classification, solution methods. Runge-Kutta methods and forecast and correction.

Models described by partial differential equations. Grid solution methods. Projection methods. Projection-mesh methods (finite element method). Standard packages.

Methods of mathematical statistics.

Theme 7. Optimization methods and decision support systems

Optimization as the final stage of a computational experiment. Models and statements of optimization problems in various subject areas. Methods of minimizing functions of one variable. Classification of methods for minimizing the functions of many variables. Conditional optimization methods.

Methods for solving variational problems. Reduction of the variational problem to the problem of minimizing the function of many variables. Decision support systems. The concept of expert systems. Overview and features of existing standard software packages.

EDUCATIONAL-METHODICAL MAP

| Section number, topics, classes | Section title, topics, classes; list of issues under study | Total hours | The number of class hours | | | | The number of hours devoted to independent work of students (including hours allocated for the implementation of the course work / project | Financial support classes (visual, manuals, etc.) | Literature | The forms of knowledge control |
			lectures	practical (seminar) classes	laboratory classes	Independent work of students (CER)				
1	2	3	4	5	6	7	8	9	10	11
Theme 1.	*Modern information technology* History, current status and development prospects of computer technology. Element base, architecture, network layout, performance. The concept of information. Classification and types of information technology. OS. Purpose, classification, current status, familiarity with the possibilities and work in a modern operating system. Programming languages and technologies. History of the development of programming languages.	**2**	**2**					EEMC and online tutorials featured in the local network of the library, testing through distance learning site	[4]	Testing
Theme 2.	*The main software tools of information technology*	**28**	**14**		**14**					
2.1	*Software* *Text editors - Word, PageMaker, etc., their capabilities and purpose.* *Graphic editor. Methods for storing and processing graphic information. Editors PhotoShop, CorelDraw and others. Their capabilities.* *Excel spreadsheets. Appointment, opportunities.* *Service tools: file managers, archivers, electronic dictionaries and translators, text recognition programs.* *Mathematical Computing Systems MathCad, MathLab. Purpose, features, application examples.* *Presentation preparation system. Appointment, opportunities.* *Work in MS PowerPoint.*	*2*	*2*					EEMC and online tutorials featured in the local network of the library, testing through distance learning site	[4]	Testing

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1	2	3	4	5	6	7	8	9	10	11
2.2	*Preparation of documents using the word processor Microsoft Word*	*10*	*4*		*6*			EEMC and online tutorials featured in the local network of the library, testing through distance learning site	[4] [6] [17]	Testing
2.2.1	Overview of the main features of the word processor Microsoft Word. Customize Microsoft Word. Work with documents. Editing a document. Text design		2		2					lab work report
2.2.2	Document processing. Tables. Using the Merge Wizard in preparing documents.		2		4					lab work report
2.3	*Processing information using Microsoft Excel spreadsheets*	*12*	*6*		*6*			EEMC and online tutorials featured in the local network of the library, testing through distance learning site	[4] [7] [10] [17]	Testing
2.3.1	A brief overview of the features. Organization of the system interface. Building a table. Table design. The calculations.		2		2					lab work report
2.3.2	Work with list data. Charts.		2		2					lab work report
2.3.3	Data analysis. Processing of experimental data. Connect Excel with other applications.		2		2					lab work report
2.4	*PowerPoint Presentations* Features of Microsoft PowerPoint. The structure of a typical presentation. Create a presentation. Work with slides. Create notes and handouts. Demonstration slide show.	*4*	*2*		*2*			EEMC and online tutorials featured in the local network of the library, testing through distance learning site	[4] [17]	Testing lab work report
Theme 3.	*Networking and the Internet*	*6*	*2*		*4*			EEMC and online tutorials featured in the local network of the library, testing through distance learning site		Testing

1	2	3	4	5	6	7	8	9	10	11
3.1	**Computer networks** *Seven-level model of the structure of communication protocols. The organizational structure of the Internet. Internet protocols (TCP and UDP). The main Internet services (DNS, FTP, HTTP, SNMP, POP3, SNTP).*		*1*						[2] [15] [18] [19] [20	
3.2	**Scripting programming languages** *Scripting programming languages (Java, Perl, HTML, XML). Tools for creating web servers and web sites (PHP, ASP NET, Delphi). Web Design Basics*		*1*		*4*				[9] [11]	lab work report
Theme 4.	*Database management systems*	**12**	**6**		**6**			EEMC and online tutorials featured in the local network of the library, testing through distance learning site	[3] [5] [8] [5] [15]	Testing
4.1	**Database management systems** *Data structure, data models, creating a database and tables. Access, Oracle, MySQL, Foxpro, dBase, SQL Server, and other databases. SQL language basics and building SQL queries.*	*2*	*2*							
4.2	**Microsoft Access - Relational Database Management System**	*10*	*4*		*6*					
4.2.1	*Assigning core components to an Access database. Creating tables and data schemas. Work with data.*		2		2					lab work report
4.2.2	*Using queries to work with data. Creating forms and reports. Automate your Microsoft Access application using macros. Service features.*		2		4					lab work report
Theme 5.	**Information security** *Methods and means of information protection. Encoding and decoding of information. Protection against unauthorized access to data. Security classes of computer systems. Electronic signature. Legal and organizational aspects of information protection and copyright*	**2**	**2**					EEMC and online tutorials featured in the local network of the library, testing through distance learning site		Testing
Theme 6.	**Mathematical modeling and numerical methods** *Mathematical models and numerical methods for solving problems in various subject areas.* *Models leading to the need for numerical differentiation and integration of functions. The main methods and characteristics of the error.* *Models described by ordinary differential equations. Classification, solution methods. Runge-Kutta methods and forecast and correction.* *Models described by partial differential equations. Grid solution methods. Projection methods. Projection-mesh methods (finite element method). Standard packages.* *Methods of mathematical statistics.*	**2**	**2**					EEMC and online tutorials featured in the local network of the library, testing through distance learning site		Testing

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1	2	3	4	5	6	7	8	9	10	11
Theme 7.	*Optimization methods and decision support systems*	**20**	**12**		**8**			EEMC and online tutorials featured in the local network of the library, testing through distance learning site	[1] [14] [16]	Testing
7.1	*Optimization as the final stage of a computational experiment. Models and statements of optimization problems in various subject areas. Methods of minimizing functions of one variable. Classification of methods for minimizing the functions of many variables. Conditional optimization methods. Methods for solving variational problems. Reduction of the variational problem to the problem of minimizing the function of many variables. Decision support systems. The concept of expert systems. Overview and features of existing standard software packages.*		2							
1	2	3	4	5	6	7	8	9	10	11
7.2	The concept of the model. Basic principles of modeling		2							
7.3	Static Data Analysis Methods		2		4					lab work report
7.4	Experiment Planning Methods		2							
7.5	Optimization methods		2		4					lab work report
7.6	Expert Analysis Methods		2							
	Preparing for differential credit	**36**					**36**			
	Total	**108**	**40**		**32**		**36**			

INFORMATION AND METHODOLOGICAL PART

Monitoring the academic achievements of undergraduates

For current monitoring of academic achievements of undergraduates, tests, multilevel control tasks, oral questioning during classes and other diagnostic tools are used. The final assessment of academic achievement is carried out on the exam. For this, criteria approved by the Ministry of Education of the Republic of Belarus are used.

Sample list of questions for the final control

1. Tell us about data collection methods.
2. Tell us about the methods of data reduction in tables and their graphical display.
3. List descriptive statistics.
4. Explain the need for statistical indicators.
5. Tell us about the use of statistical indicators in the evaluation of commercial information.
6. Explain the use of the basic rules for determining probability.
7. Tell us about the use of the decision tree when making business decisions.
8. What constitutes a discrete and continuous distribution.
9. Tell us about the use of confidence limits in determining significance.
10. Tell us about the application of hypothesis testing criteria based on the mean values.
11. Tell us about the analysis of the relationship between two variables using graphical methods.
12. Tell us about the calculation of correlation coefficients in order to determine the strength of dependence.
13. Tell us about using regression methods to get simple predictions.
14. Explain the differences between linear and non-linear relationships.
15. Tell us about the use of dependence in economic situations when making management decisions.
16. Tell us about the use of various methods for calculating the amount of interest payable.
17. Explain the use of interest rate calculations for depreciation and discounting.
18. Tell us about the use of methods for evaluating and comparing investment offers based on the values of the net present value and internal rate of return.
19. Tell us about calculating the value of investments, such as annuity and repayment fund.
20. Explain the use of indexes in business activities.
21. Tell us about the methods for calculating indices.
22. Explain the weighting methods in compiling the indices.
23. Explain methods for calculating price and quantity indices.
24. Tell us about the use of indexes in conducting comparative analysis of data.
25. List the main methods for predicting business activity.
26. Explain how various possible forecasting models are analyzed.
27. Tell us how forecasting is changing in commercial activities.

28. Tell us how the suitability and reliability of the methods used are determined.

29. Tell us how the effectiveness and accuracy of different methods are compared.

30. List the main characteristics of inventory management models.

31. Tell us about determining the optimal order size.

32. Tell us how the effect of discounts on determining the optimal order size is analyzed.

33. Define inventory management policies.

34. Tell us about the use of linear programming methods in the optimization and interpretation of the results.

35. Tell us about the use of modeling in the analysis of decisions on inventory management.

36. Tell us about the use of modeling in solving queuing problems.

37. Tell us about the value of modeling in solving various business problems.

38. Explain the use of networking in project management.

39. Tell us about the application of probabilistic methods in network analysis.

Recommended reading list

1. Delwiche, A. & Ananthanarayanan, V. (2004). Pedagogical Value of PowerPoint – Recommendations. *EDUCAUSE.* Retrieved from http://net.educause.edu/ir/library/pdf/SWR0416.pdf

2. Jardin, X. (2003, December 9). Turning Heads with PowerPoint. *Wired.* Retrieved from http://www.wired.com/culture/lifestyle/news/2003/12/61485

3. Jgavanides. (2007, September 28). *Tablet PC Tip #1 - Annotating PowerPoint* [video file]. Retrieved from http://youtu.be/GeUp38UcbD4

4. Johnson, A.E. (2008). Digital Ink: In-Class Annotation of PowerPoint Lectures. *Journal of Chemical Education*, 85(5), 655-657. Retrieved from http://pubs.acs.org/doi/pdf/10.1021/ed085p655

5. Jones, J.B. (2009, November). Challenging the Presentation Paradigm (in 6 minutes, 40 seconds): Pecha Kucha.

6. *The Chronicle of Higher Education.* Retrieved from http://chronicle.com/blogs/profhacker/challenging-the-presentation-paradigm-in-6-minutes-40-seconds-pecha-kucha/22807

7. Kapterev, A. (2007). *Death by PowerPoint* [slide show]. Retrieved from http://www.slideshare.net/thecroaker/death-by-powerpoint

8. Lessig, L. (2002, July 24). <free culture>. *OSCON Open Source Convention.* Retrieved from http://randomfoo.net/oscon/2002/lessig/free.html

9. Mann, M. (2007, August 23). How I Made My Presentations a Little Better. *43 Folders*. Retrieved from http://www.43folders.com/2007/08/23/better-presentations

10. Reynolds, G. (2005, October 2). The "Monta Method." *Presentation Zen.* Retrieved from http://presentationzen.blogs.com/presentationzen/2005/10/the_monta_metho.html

11. Reynolds, G. (2005, October 7). The "Lessig Method" of presentation. *Presentation Zen.* Retrieved from http://presentationzen.blogs.com/presentationzen/2005/10/the_lessig_meth.html

12.   Reynolds, G. (2005, September 13). Living large: "Takahashi Method" uses king-sized text as a visual. *Presentation Zen*. Retrieved from http://presentationzen.blogs.com/presentationzen/2005/09/living_large_ta.html

13.   Schwartz, M. (2011, July 7). Fun with QR Codes. *LTO Blog*. Retrieved from http://lto.blog.ryerson.ca/2011/07/07/fun-with-qr-codes/

14.   Takahashi, M. *The Takahashi Method*. Retrieved from http://www.rubycolor.org/takahashi/takahashi/img0.html

15.   University of Western Ontario. (2002). *Teaching Large Classes: PowerPoint Primer*. Retrieved from http://www.uwo.ca/tsc/tlc/powerpoint.html

PROTOCOL AGREEMENT CURRICULUM SVR

The name of discipline, which requires approval	Name of department	Proposals for changes in the content of the training on the subject matter under study program	Action taken by the Department, develop training programs (With date and protocol number)
Information support production	Department of Informatics and EMM in AIC	No offers	Considered at the meeting of the department, to Protocol N ° 15 on May 24, 2019
Information marketing	Department of Management, Marketing and Law	No offers	Considered at the meeting of the department, to Protocol N ° 15 on May 24, 2019

ADDITIONS AND CHANGES TO EDUCATIONAL PROGRAM SVR
on _____ / _____ school year

№	Additions and changes	Base

The curriculum is reviewed and approved at a meeting of the department
Informatics and EMM in the AIC (protocol № __ from _____ __ 20__)
(the department name)

Head of Department

Candidate of Physics and Mathematics Sciences, Associate Professor   _____   T.N.Izosimova
(academic degree, academic title)   (signature)   (Initials and Family names)

APPROVED
Dean of the Faculty
Candidate of Economics. Sciences, Associate Professor   _____   A.V. Gribov
(academic degree, academic title)   (signature)   (Initials and Family names)