

Educational establishment
«Belarus State Economic University»

APPROVED

Rector of Educational establishment
«Belarus State Economic University»

 V.Y. Shutilin

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Registration No UD 4039-19 / st.

TECHNOLOGIES OF INTELLECTUAL DATA ANALYSIS

Syllabus for Master's program

1-25 80 01 «Economy»,

1-25 80 02 «World Economy»

MINSK 2019

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RECOMMENDED FOR APPROVAL BY:

Department of Economic Informatics of educational establishment «Belarus State Economic University»

(minutes № 13 on «29» 05 2019);

The scientific-methodical Council of the educational establishment «Belarus State Economic University»

(minutes № 6 on «25» 06 2019).

EXPLANATORY NOTE

Under the conditions of a new digital economy the preparation of masters in economics requires the forming of competences in the use of new intellectual methods of analysis of a continuously growing stream of structured, semi-structured and unstructured data arising in the process of economic activity. Unlike statistical methods these ones and related technologies can describe a priori dependencies and relationships between data as well as discover them. Thus the use of data mining technologies allows to improve the quality of management decisions and the efficiency of organizations.

The syllabus for academic discipline "Data Mining Technologies" is designed for master's students in 1-25 80 01 Economics (profiling: State regulation of National and regional economy, Economics and management of real estate market, Organizational Development, Economics of entrepreneurship and electronic business, "Green" Economy and management of resource saving activities, Economics of innovations and development of business, Economic and antitrust regulation, Economic informatics, Analytical economics and economic policy, Economics and management of business processes in food systems) and 1-25 80 02 The World Economy (profiling: International business, International economy and commercial diplomacy). The academic discipline refers to the subjects "Information technologies in economics" of the institution of higher education.

The knowledge and skills in "Computer Information Technologies" acquired in the undergraduate programs are actively used.

The study of this academic discipline provides training of economic specialists possessing theoretical knowledge and practical skills in the application of modern data mining technologies in their subject area.

Lectures reveal the main issues on each topic of the program. Laboratory lessons are devoted to the topics that require the acquisition of skills to use the appropriate software, consolidate the theoretical knowledge derived from lectures and independent work on educational material.

The purpose of the academic discipline is to acquire theoretical knowledge in the application of methods of data mining in economics, skills in the use of technologies and data mining tools that enable the master's students to apply their knowledge and skills competently to improve business performance.

Tasks of academic discipline:

- acquisition of knowledge of the methods of data mining used in solving professional problems of economics;
- mastering the technologies used for various types of data;
- acquisition of practical skills of using the appropriate software;
- consolidation of the theoretical knowledge derived from lectures and independent work on educational material.

As a result of studying this academic discipline the competence PC-5 is formed: to carry out data analysis for solving economic, managerial and research problems.

As a result of studying this academic discipline master student must **know:**

- basic principles and objectives of data mining;
- theoretical foundations of methods of data mining;
- basic concepts of artificial neural networks, genetic algorithms, Bayesian methodology;

be able to:

- professionally and competently handle the basic terms and concepts used in data mining;
- to participate in the policy-making process of the organization (enterprise) in the field of application of intelligent information technologies;

have:

- skills of application of methods and technologies of intellectual analysis in the professional activities.

The effective pedagogical methods and technologies of teaching the academic discipline that contribute to the involvement of master students in the search for knowledge, the acquisition of experience of independently solving various problems include:

- technologies of problem-modular training;
- technologies of teaching and research activities;
- project training technologies.

The assessment of master students' knowledge is based upon the surveys, checking the results of laboratory works and defending the developed projects.

The independent work involves the study of theoretical material based on the references, preparation for laboratory works and tests.

In accordance with the curriculum the academic discipline consists of 100 academic hours, including 42 hours in the class. Distribution by occupation is the following: lectures – 18 hours; laboratory classes – 24 hours. Form of the current certification is a credit.

THE CONTENT OF EDUCATIONAL MATERIAL

Topic 1. INFORMATION AND ANALYTICAL SYSTEMS

The basic principles of architecture of information and analytical systems. The principles of building of information warehouse. Improving the quality of information under collecting it in the information warehouse.

Topic 2. INTELLECTUAL ANALYSIS IN BUSINESS

The concept of Data Mining (DM). Types of patterns are identified in the data mining technology. Algorithms and methods used to solve DM-problems. Data visualization.

Topic 3. INTELLECTUAL ANALYSIS OF TEXTS

The concept of Text Mining (TM). Goals of TM. Specifics of TM-methods. The concept of WEB-Mining. Goals and steps of WEB-Mining. Social Mining – analysis of information flows in social networks.

Topic 4. MODELING, FORECASTING AND ANALYSIS BASED ON ARTIFICIAL NEURAL NETWORKS

Basic concepts of artificial neural networks (ANN). Architecture of ANN. Prediction and output solutions in the ANN. Learning algorithms for ANN

Topic 5. GENETIC ALGORITHMS

The basic principles of the genetic algorithm. Holland's algorithm. Application of genetic algorithms.

Topic 6. BAYESIAN DECISION THEORY

General principles of Bayesian methodology. Application of the Bayesian Approach to the intellectual data analysis.

**EDUCATIONAL-METHODICAL DISCIPLINE MAP «TECHNOLOGIES OF INTELLECTUAL DATA ANALYSIS»
FOR THE FULL-TIME FORM MASTER'S PROGRAM**

Topic's number	Topic	The number of classroom hours					Other*	Form of the knowledge control	
		Lectures	Practical lessons	Seminars	Laboratory lessons	The number of control independent work hours			
						Lectures			Laboratory lessons
1	INFORMATION AND ANALYTICAL SYSTEMS	2			6		2	[1,2]	
2	INTELLECTUAL ANALYSIS IN BUSINESS	6			8		4	[1,2]	Survey, defending the project
3	INTELLECTUAL ANALYSIS OF TEXTS	2						[1,2]	
4	MODELING, FORECASTING AND ANALYSIS BASED ON ARTIFICIAL NEURAL NETWORKS	4			4			[1,2]	defending the project
5	GENETIC ALGORITHMS	1				1		[1,2]	essay
6	BAYESIAN DECISION THEORY	1				1		[1,2]	essay
	Total hours	16	0		18	2	6		Credit

* section «Other» consists of references in square brackets.

**EDUCATIONAL-METHODICAL DISCIPLINE MAP «TECHNOLOGIES OF INTELLECTUAL DATA ANALYSIS»
FOR THE PART-TIME MASTER'S PROGRAM**

Topic's number	Topic	The number of classroom hours					Other*	Form of the knowledge control
		Lectures	Practical lessons	Seminars	Laboratory lessons	The number of control independent work hours		
						Lectures		
1	INFORMATION AND ANALYTICAL SYSTEMS	0,5			2		[1,2]	
2	INTELLECTUAL ANALYSIS IN BUSINESS	1			4		[1,2]	Survey, defending the project
3	INTELLECTUAL ANALYSIS OF TEXTS	0,5					[1,2]	
4	MODELING, FORECASTING AND ANALYSIS BASED ON ARTIFICIAL NEURAL NETWORKS	1					[1,2]	
5	GENETIC ALGORITHMS	0,5					[1,2]	
6	BAYESIAN DECISION THEORY	0,5					[1,2]	
	Total hours	4			6			Credit

* section «Other» consists of references in square brackets.

INFORMATIONAL AND METHODOLOGICAL PART

Methodical recommendations on the organization of master students independent work in academic discipline «Technologies of intellectual data analysis»

An important stage of the studying of the academic discipline is the independent work of master students. Budget of the time for independent work is recommended as, on average, 1,5-2 per 2-hours classroom lesson.

The main directions of the master student independent work are:

- Initially a detailed acquaintance with the program of the academic discipline;
- acquaintance with the list of recommended references on the academic discipline in general and its sections, the study of necessary literature on the topics of the syllabus, the selection of necessary information in additional literature;
- study and expansion of the lecture material due to the special literature and consultations;
- preparation for laboratory exercises in accordance with specially developed plans and using basic and additional references;
- preparation for the implementation of diagnostic monitoring forms (control practical tasks, tests);
- preparation for credit.

References

Basic:

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2. Paklin, N.B. Business intelligence: from data to knowledge: a tutorial. / N.B. Paklin, V.I. Oreshkov. – 2nd edition, correct. – SPb.: Piter, 2013. – 701 p. [in Russian]
3. Musaev, A.A. Data MINING: A TUtorial. /A.A. Musaev. – SPb.: SPbGTI(TU), 2018. – 176 p. [in Russian]
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5. Stankevich, L.A. Intellectual systems and technologies: textbook and practical work for bachelor and master programs: / L. A. Stankevich. – M.: Yurayt, 2017. – 394 p. [in Russian]

Additional:

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7. Grinchuk, A.V. Data mining: for graduate students in the specialty 1-26 81 01 "Business Administration": [lecture notes] / A.V. Grinchuk. – Minsk: Institute of Business and Technology Management of BSU, 2015. – 67 p.
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9. Abbakumov, V.L. Business analysis information. Statistical methods: [textbook]. / V.L. Abbakumov. – M.: Economy, 2009. – 373 p.
10. Franks, B. The taming of big data. How to extract knowledge from data arrays using deep analytics / B. Franks. – M: Mann, Ivanov and Ferber, 2014. – 349 p.
11. Romanov, V.P. Intellectual information systems in economics: study guide / edited by N.P. Tikhomirov. – 2nd edition. – M.: Exam, 2007. – 494 p.
12. Gluhih, I.N. Intellectual information systems: studies. Manual / I.N. Gluhih. – M: Academy, 2010. – 109 p.

MINUTES OF SYLLABUS ENDORSEMENT

Title of the academic discipline with the current discipline should be endorse	Department	Suggestions of changes in the syllabus content	Decision of the department (with the number and date of the minutes)
			Minutes № <u>13</u> « <u>29</u> » <u>05</u> 2019_

SYLLABUS ADDITIONS AND CHANGES

in ____ / ____ academic year

№	Additions and changes	Reasons

Syllabus is re-considered and approved on the meeting of the department of _____
(minutes № ____ on _____ 20__)

Head of the department

APPROVE

Director of the Institute
of Masters Programs
