Educational Establishment «Belarus State Economic University»

APPROVED
Vice-Rector for Scientific and
Methodological Work of
Educational Establishment
«Belarus State Economic University»
_____ T.V. Sadovskaya
21. 06. 2023 г.
Registration No. УД 5715-23/уч.

DATA MINING TECHNOLOGIES

The curriculum of the establishment of higher education for the specialties:
7-06-0311-01 «Economics»;

7-06-0311-02 «World Economy»

2023

The curriculum of the establishment of higher education is basis of educational standards, based on the educational plan for the specialty 7-06-0311-01 "Economics", approval date 12/02/2022, registration number No. 7-06-003-002/pr. and in specialty 7-06-0311-02 "World Economy", approval date 12/20/2022, registration number No. 7-06-03-003/pr.

COMPILED BY:

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REVIEWED:

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RECOMMENDED FOR APPROVAL:

Department of Economic Informatics of the Educational Establishment «Belarus State Economic University»
(Minutes №13 on 31.05. 2023);

Scientific and Methodological Council of the Educational Establishment «Belarus State Economic University»
(Minutes №. 7 21.06. 2023).

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 7-06-0311-01 «Economics» and 7-06-0311-02 «The World Economy». The academic discipline refers to the subjects «Information technologies in economics» of the institution of higher education.

The knowledge and skills in «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.

Form of receiving advanced higher education: full-time (full-time).

The total number of hours in the academic discipline is 100, of which 42 are classroom hours, including 18 hours of lectures, 24 hours of laboratory classes.

The form of current assessment is credit in the first year in the 1st semester.

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 «DATA MINING TECHNOLOGIES»
FOR THE FULL-TIME FORM MASTER'S PROGRAM FOR SPECIALTIES:
7-06-0311-01 «ECONOMICS» (profile «Economic Psychology»)
7-06-0311-02 «WORLD ECONOMY» (profile «International Economics and Commercial Diplomacy»)

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**			**4**		**4**	[1, 2, 5]	Test
2	INTELLECTUAL ANALYSIS IN BUSINESS	**4**			**8**	**2**	**4**	[1,2]	Test
3	INTELLECTUAL ANALYSIS OF TEXTS					**2**		[3, 4]	Test
4	MODELING, FORECASTING AND ANALYSIS BASED ON ARTIFICIAL NEURAL NETWORKS				**4**	**4**		[3–5]	Defending the project
5	GENETIC ALGORITHMS					**2**		[3–5]	Test
6	BAYESIAN DECISION THEORY					**2**		[3–4]	Test
	Total hours	**6**			**16**	**12**	**8**		**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 «DATA MINING TECHNOLOGIES»

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.

All necessary materials for mastering the academic discipline, including supervised independent work both in lectures and in laboratory classes, are posted on the educational portal (https://elearning.bseu.by).

References

Basic:

1. Stankevich, L. A. Intelligent systems and technologies: textbook and workshop for universities / L. A. Stankevich. – M.: Yurayt Publishing House, 2020. – 397 p.

2. Bessmertny, I. A. Intelligent systems: textbook and workshop for universities / I. A. Bessmertny, A. B. Nugumanova, A. V. Platonov. – M.: Yurayt Publishing House, 2021. – 243 p.

3. Markova, V.D. Digital economy: textbook / V.D. Markova. – M.: INFRA-M, 2021. – 186 p.

4. Golovenchik, G. G. Digital economy: a textbook for students of higher education institutions in the specialties "World Economy", "Business Administration", "Economics of Electronic Business" / G. G. Golovenchik. - Minsk: Higher School, 2022. - 311 p.

Additional:

5. Andreychikov, A.V. Intelligent information systems and methods of artificial intelligence: textbook / A.V. Andreychikov, O.N. Andreichikova. - Moscow: INFRA-M, 2023. - 530 p. [Electronic resource]. — (Higher education: Master's degree). — DOI 10.12737/1009595. - ISBN 978-5-16-014883-0. - Text: electronic. - URL: https://znanium.com/catalog/product/1900587

6. Tochilkina, T.E., Gromova A.A. Data warehouses and business analytics tools: textbook / T.E. Tochilkina, A.A. Gromova – M.: Financial University, 2017. – 161 p.

7. Cognitive business analytics. Textbook / ed. N.M. Abdikeeva. – M: INFRAM, 2014. – 511 p.

8. Paklin, N.B. Business analytics: from data to knowledge: textbook. allowance. / N.B. Paklin, V.I. Oreshkov. – 2nd ed., rev. – St. Petersburg: Peter, 2013. – 701 p.

9. Musaev, A.A. Data mining: textbook. allowance. / A.A. Musaev. – St. Petersburg: SPbGTI (TU), 2018. – 176 p.

10. Tumanov, V. E. Design of data warehouses for applications of business intelligence systems: textbook. allowance / V. E. Tumanov. – 2nd ed. – M.: INTUIT, 2016. – 957 p.

11. Barseghyan, A.A. Data analysis technologies: Data Mining, Visual Mining, Text Mining, OLAP: textbook. allowance for special / A.A. Barseghyan [and others]. – 2nd ed. – St. Petersburg: BHV-Petersburg, 2007. – 375 p.

12. Shesholko, V.K. Intelligent data analysis: manual / V. K. Shesholko. – Minsk: Academy of Management under the President of the Republic of Belarus, 2019. – 114 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)
Quantitative methods of analysis in business	Statistics	No offers N.V. Agabekova	Minutes № 5 on 16.11.2023

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
Ph.D., Associate Professor _____ A.M. Zenevich

APPROVE
Dean of the Faculty
Graduate School of Management and Business
Ph.D., Associate Professor _____ S.Yu. Krichevsky