Country BULGARIA	Institution Vasil Levski National Military University	Course **Data Mining Software**	ECTS **3.0**
Service **All**	Minimum Qualification for Lecturers • English: Common European Framework of Reference for Languages (CEFR) Level B2 or NATO STANAG 6001 Level 2. • Adequate physical training and medical condition. • Adequate pedagogical and psychological competences. • Thorough knowledge of the topic taught.		
Languages **English, Bulgarian**			

Prerequisites
for international participants:

- English: Common European Framework of Reference for Languages (CEFR) Level B1 or NATO STANAG Level 2.
- The end of the 1st year of national (military) higher education.
- Adequate physical and psychological preparation and good medical condition.

Goal of the Course:

The capabilities of both generating and collecting data have been increasing rapidly in the last several decades- from the end of 20th century up to now. They include the widespread use of bar codes for most commercial products, the computerization of many business, and advances in data collection tools ranging from scanned texture and image platforms, scientific and government transactions and managements, to on-line instrumentation in manufacturing and shopping, and to satellite remote sensing systems. Besides that, popular use of the World Wide Web as a global information system has flooded us with a tremendous amount of data and information. This rapid growth in stored data has generated an urgent need for new techniques and software that can assist us in transforming the data into useful information and knowledge.

This course explores the concepts and techniques of data mining and new database applications. Data mining, referred to as knowledge discovery in databases (KDD), is the automated extraction of patterns representing knowledge stored in massive information repositories. Data mining is a multidisciplinary field, drawing work from areas including database technology, artificial inintelligence, machine learning, neural networks, statistics, pattern recognition, information retrieval, and data visualization.

In the European Union, universities from France, Italy, Spain and Romania are trained in a Master's degree in Data Mining and Knowledge Management. Many other universities have one-year courses or separate courses on Data Mining and Knowledge Management.

Practical orientation of the current curriculum

The "Data Mining Software" course is aimed at provoking reflection in learners and gives feedback. It can be used to further study of proposed topics and giving personal opinion. The following topics are included:

– Pivot table management;
– Data processing with solver;
– Linear regression and correlation analysis;

	– Classification task and decision tree; – Clustering task with self-organizing maps with neurons sets; – Receiving association rules. This topics can realized with spreadsheet as Excel, OpenOffice Calc and others which are school purposes good. They are more easy than specialized software. From other side can use specialized software about each task or software platform such as RapidMiner that provides an integrated environment for data preparation, machine learning, deep learning, text mining, and predictive analytics.

Learning outcomes	Know-ledge	As a result of the training under this program, learners should acquire new knowledge about: 2.2.1. Data mining task and basic principles 2.2.2. Data mining methodology 2.2.3. Data mining basic concepts 2.2.4. Data mining software 2.2.5. Data classification basic 2.2.6. Data clustering basic 2.2.7. Basic of prognosis 2.2.8. Association rules basic 2.2.9. Spheres of data mining using
	Skills	As a result of the exercises foreseen in the program, learners should build new skills: 2.3.1. To create and analyze pivot tables and create scenarios with different input data 2.3.2. To use data classification software and create a solution tree 2.3.3. To work with data clustering software and create self-organizing maps using neurons sets 2.3.4. To do prognosis using regression and correlation analysis 2.3.5. To create association rules using set conditions
	Competences	The accumulation of a large amount of data and the need for their processing and analysis is a prerequisite about the data mining software course aims to give learners basic ideas and knowledge in the field, skills to work with relevant software and interpret the results.

Verification of learning outcomes

The main academic methods of giving knowledge are lectures and exercises, which are held in mix training courses of both students and cadets.

Evaluation on results of the course is built on the current curriculum. For this purpose, it is provided a semester examination with a preparation course project on a topic of curriculum.

Module Details		
Main Topic	**Recommended WH**	**Details**
Topic One Methodology of Data Mining	2	The first topic views the Data Mining methodology as: essence of data mining; data mining basic principles; data mining tasks; approach of solving; data, information and knowledge terms; stages of data mining; classification of data mining methods; preparation input data; data mining software; spheres of data mining using. DISCUSSION AND WORK TASKS
Topic Two: Basic Concepts	2	The main task in topic two is to involve basic concepts needed further as basic concepts of Boolean logic, sets and probabilities, entropy, measuring, scales, international system measurement, data normalization, metrics space. DISCUSSION AND WORK TASKS
Topic Three: Electronic Tables, Prognosis	6	This topic discusses and solves the tasks of data mining summarization and prognosis by using spreadsheet software or the other like. Here discuss questions as: data filtering, pivot table management, tasks solving and processing with a solver, a general task of linear programming, creating scenarios. Besides that, here are include basic of linear regression and correlation analysis, creating regression model, trend line, prognosis and spheres of using. DISCUSSION AND WORK TASKS
Topic Four: Data Classification. Decision Tree.	8	Here is decided the data mining main task - data classification. The classification task, classification terms, general principles of decision tree, construction of decision tree, its construction stages, advantages of using decision tree, spheres of using decision tree, id3 and c5 algorithm, improving the criterion for splitting data, missing data, classification software and spheres of classification using are learn. DISCUSSION AND WORK TASKS
Topic Five: Data Clustering	8	Data clustering is the next main task of data mining. The basic of data clustering, its essence, mathematical treatment, data clustering methods, data clustering stages, neurons sets, Kohonen self-organizing maps, clustering software and spheres of classification using are learn. DISCUSSION AND WORK TASKS
Topic Six: Association Rules	4	Association Rules concern the relevant objects. The basic of association rules, their essence, mathematical treatment, receiving association rules and spheres of their using are discus. DISCUSSION AND WORK TASKS
Academic hours	30/15/15	
Additional hours to increase the learning outcomes		
Self-Study	10	• Enhancing knowledge as a self-preparation on a particular subject for the final exam.

		• Reflection of the topics issued.
Total	40	

Main available resources:
/in English/

1. Shterev, Y. Synchronized Performance of Processes, XVI Internatational Science Technical Conference trans&MOTAUTO'09, V2, "Technics. Technologies, "Bulgaria, 2009, p. 117-119, Publisher Scientific-technical union of mechanical engineering, ISSN: 1313-5031.
2. Shterev, Y., Banabakova, V., Application of Association Rules in the Market Basket Analysis MATTEX 2010, ШУ University of Shumen "Bishop *Konstantin Preslavsky"* , 2010, p.6, 244-249, University Publishing House "Bishop Constantine Preslavski".
3. Shterev, Y., Demo: Using RapidMiner for Text Mining, Digital Preservetation and Presentation of Cultural and Scientific Heritage, International Conference, Veliko Turnovo, Bulgaria, 2013, p. 254-256, Institute of Mathematics and Informatics, ISSN:1314-4006.
4. MOHAMMED J. ZAKI, Rensselaer Polytechnic Institute, Troy, New York, WAGNER MEIRA JR., Universidade Federal de Minas Gerais, Brazil, DATA MINING AND ANALYSIS - Fundamental Concepts and Algorithms, Cambridge University Press, 2014.