**UNIVERSITY OF ECONOMICS – VARNA**

**FACULTY OF INFORMATICS**

**DEPARTMENT OF INFORMATICS**

**Adopted by the FC (record № 9/24.04.2024)**
**Adopted by the DC (record № 10/16.04.2024)**

**ACCEPTED BY:**
**Dean:**
**(Prof. Vladimir Sulov, PhD)**

# SYLLABUS

**SUBJECT: DATA SCIENCE**

**DEGREE PROGRAMME: Computer Science; MASTER`S DEGREE**

**YEAR OF STUDY: 6 for other field graduates; SEMESTER: 12 for other field graduates**

**TOTAL STUDENT WORKLOAD: 240 hours; incl. curricular 75 hours**

**CREDITS: 8**

**DISTRIBUTION OF STUDENT WORKLOAD ACCORDING TO THE CURRICULUM**

| *TYPE OF STUDY HOURS* | **WORKLOAD, hours** | **TEACHING HOURS PER WEEK, hours** |
|---|---|---|
| CURRICULAR:<br>incl.<br>• LECTURES<br>• SEMINARS / LAB. EXERCISES | <br><br>45<br>30 | <br><br>3<br>2 |
| EXTRACURRICULAR | 165 | - |

**Prepared by:**

1. **……..**
   **(Assoc.Prof. Yanka Aleksandrova, PhD)**
2. **……**
   **(Chief assist. prof. Mariya Armianova, PhD)**

**Head of department**
**of Informatics: ……**
**(Prof. Julian Vasilev , PhD)**

## I. ANNOTATION

*The discipline Data Science introduces some of the main concepts in this interdisciplinary and fast developing field. During study, the students are taught how to extract useful insight and knowledge from data. Covered are some of the most used algorithms, techniques, and methods such as machine learning (decision trees, clustering, association analysis, etc.), big data analytics, data visualization tools, OLAP cubes, exploratory and confirmatory analysis, etc.*

*During the training students acquire the ability to choose and apply a proper set of tools and methods depending on the available data sets and desired outcome. Topics connected to business intelligence are also included within the scope of the course. To achieve the learning objectives students are taught how to use advanced software environments and tools.*

*Students can implement the acquired theoretical knowledge by solving different problems and tasks set by their assignment. By finishing the course students can gain a solid basis for further improvement of their knowledge and skills needed to become data scientists.*

*In the course, the following key competencies are applied and developed, according to the recommendation of the Council of the European Union dated May 22, 2018, namely:*

*• Digital competence. The ability to implement various technologies for building machine learning models and Business Intelligence and analytical applications.*

*• Personal competence, social competences, and the competence to acquire learning skills. The ability to handle complex situations and an uncertain environment. Students acquire skills for identifying, discussing, and exploring opportunities for implementation of data science projects. Data science projects need to be constantly developed, enhanced, and optimized. This requires for the students to acquire abilities for continuous learning.*

*• Entrepreneurial competence. The ability to build, implement and manage data science projects satisfying business users requirements. Students can use the acquired knowledge and skills to build own data science applications.*

## II. THEMATIC CONTENT

| № | TITLE OF UNIT AND SUBTOPICS | NUMBER OF HOURS | | |
|---|---|---|---|---|
| | | **L** | **S** | **L.E.** |
| **Theme 1. Data science – scope, science fields, tasks. The data science process.** | | **4** | | |
| **Theme 2. Business intelligence (BI) systems.** | | **8** | | |
| 2.1. | Nature, architecture, functions of BI systems. | 2 | | |
| 2.2. | Data warehouse architectures. | 3 | | |
| 2.3. | BI tools and methods. OLAP cubes | 3 | | |
| **Theme 3. Business Intelligence and Analytical platforms (BIAP)** | | **16** | **16** | |
| 3.1. | ETL processes. Data modelling. | 6 | 6 | |
| 3.2. | Building BI applications. | 10 | 10 | |
| **Theme 4. Big data analytics.** | | **4** | | |
| **Theme 5. Machine learning (ML).** | | **13** | **14** | |
| 4.1. | Classification of ML algorithms | 2 | | |
| 4.2. | Supervised ML algorithms. | 8 | 8 | |
| 4.3. | Unsupervised ML algorithms. | 3 | 6 | |
| | **Total:** | **45** | **30** | |

## III. FORMS OF CONTROL:

| № | TYPE AND FORM OF CONTROL | Number | extracur-ricular, hours |
|---|---|---|---|
| | | | |
| **1.** | **Midterm control** | | |
| 1.1. | Test | 1 | 20 |
| 1.2. | Practical assignment | 2 | 80 |
| | **Total midterm control:** | **3** | **100** |
| **2.** | **Final term control** | | |
| 2.1. | Examination (test) | 1 | 65 |
| | **Total final term control:** | **1** | **65** |
| | **Total for all types of control:** | **4** | **165** |

## IV. LITERATURE

**REQUIRED (BASIC) LITERATURE:**

1. Jo, T. (2021) Machine Learning Foundations, Supervised, Unsupervised and Advanced Learning, Springer, ISBN 9783030658991
2. Ozdemir, S. (2024) Principles of Data Science, Packt Publishing, ISBN 9781837636303
2. Kolokolov, A., Zelensky, M., Data Visualization with Microsoft Power BI, O'Reilly, 2024, ISBN 978-1-098-15272-7

**RECOMMENDED (ADDITIONAL) LITERATURE:**

1. Faul, A., A Concise Introduction to Machine Learning, CRC Press, 2020 ISBN 0815384106
2. Sirrup, J., Weinandy, T. (2024) Artificial Intelligence with Microsoft Power BI, O'Reilly, ISBN 978-1-098-11275-2