The Curriculum   
Of Business Intelligence

**Polkowice, August 2016**

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“Developing the innovative methodology of teaching Business Informatics”, performed within the Erasmus+ program KA2 – Cooperation for innovation and the exchange of good practices; project number: 2015-1-PL01-KA203-0016636*

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Developing the innovative methodology of teaching Business Informatics

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# General information

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| --- | --- |
| Level of module | Bachelor, master |
| Faculty | Informatics |
| Language of instruction | English |
| Number of teaching hours | 20 |
| Number of ECTS credit allocated | 2 |
| Mode of delivery | face-to-face, team work, Lecture, labs, own work |

# Prerequisites and co-requisites

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| **Prerequisites and co-requisites** | |
| 1 | Basic knowledge in MS Excel |
| 2 | Foundation of databases |
| 3 | Basic knowledge and skills related to ICT, BI and Social Media. |

# The content of the subject

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Name of the teaching units (modules)** | **Hours** | **ECTS** |
| 1 | Types of BI systems in ERP and CRM context | 2 | 0,2 |
| 2 | Business intelligence with statistical software | 4 | 0,4 |
| 3 | Neural networks and decision tree | 4 | 0,4 |
| 4 | Self Service Business Intelligence Theoretical and practical aspects | 6 | 0,6 |
| 5 | Web 2.0 and BI | 2 | 0,2 |
| 6 | SOA and BI | 2 | 0,2 |
| Total | | 20 | 2 |

# Description of the teaching units (modules)

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| --- |
| **Types of BI systems in ERP and CRM context** |
| The module concerns clarifying the purpose of BI systems and characteristics of BI solutions in CRM and ERP contexts. During classes students learn: (1) how to define what BI is, (2) how to identify information resources in the organisation, (3) how to choose a proper tool for BI, (4) what the nature of scorecards and dashboards is, (5) how to build a dashboard in MS Excel using Pivot table tools. The aim of the module is to teach students how to easily analyze big datasets and find dependencies that are not clear with simple reporting. During the course a real dataset is used (provided by IBM) which is imported in MS Excel. Students get new skills in business intelligence – applying contemporary methods for solving business questions. This course helps students to understand how easy the developing of BI dashboard could be for the needs of management. |

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| **Business Intelligence with statistical software** |
| The module concerns the use and the implementation of solving business questions with open source statistical software. During classes students learn: (1) how to define business questions, (2) how to choose the appropriate statistics method, (3) how to analyze big datasets, (4) how to use open source statistical software, (5) how to interpret the result and (6) how to publish the result within a scientific article. The aim of the module is to teach students how to easily analyze big datasets and find dependencies that are not clear with simple reporting. During the course a real dataset is used (provided by IBM) and PSPP (open source statistical software) is used. Students get new skills in business intelligence – applying contemporary methods for solving business questions. According to the opinion of most of the students, statistics is one of the most difficult disciplines. This course helps students to understand statistical methods and gives them skills to apply them in practice. Further on the same dataset is used in the other modules of the ISP – for creating Pivot tables, neural networks and decision trees – using other software products. |

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| **Neural networks and decision tree** |
| The module aims to improve students’ knowledge about neural networks and the software product Alyuda Neurointelligence and the possibilities for application in data mining. Students acquire knowledge about the types of data in the spreadsheets used with neural networks and their preparation for creating a neural network. The evaluation of the best rest of network training is dependent to the training error and the validation error. When the neural network is well trained, dependencies between the input and output variables may be found, which are indeed the searched for result. The module for data mining is basic in the architecture of business intelligence systems. Knowledge of the method neural networks for data mining facilitate the better quality of a business intelligence system. Neural networks are used to find implicit dependencies.  Using open source software – Rapid Miner, the dataset is used to create decision trees. These trees are transformed later on in rules. These rules are a component of the knowledge database. Dependencies between variables may be clearly defined.  Further on the same dataset is used in the other modules of the ISP – for creating Pivot tables, and statistical software – using other software products. |

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| **Self Service Business Intelligence Theoretical and practical aspects** |
| The module concerns the evolution of Business Intelligence systems and focuses on the modern approach to satisfy the analytical needs of organizations by implementation of Self Service Business Intelligence solutions.  The course covers both theoretical aspects and practical ones. The main part of the course is presentation of selected IT technologies and a practical usage of selected IT tools. During the course students define the requirements and build Business Intelligence solutions fulfilling the user’s needs. Students also discuss the pros and cons of the selected approach and validate the benefits of implemented solutions. All considerations are related to real business scenarios. |

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| **Web 2.0 and BI** |
| The module concerns the use and implementation of BI, especially using Web 2.0. The course is a response to the nature of contemporary business management, with the constantly increasing amount of work, bureaucracy and the necessity to travel on business combined with the need to manage the company while away. The aim of the module is to test the effectiveness of the available BI solutions which use Web 2.0. Therefore, our purpose is to prepare a study on real-life solutions. Apart from the educational value of the course, the unique, dual perspective assumed by the students participating in it provides them with a practical insight and skills to better understand the conditions of using BI based on Web 2.0 . |

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| **SOA and BI Module** |
| The module concerns the use and implementation of BI, especially using SOA (Service Oriented Architecture). The course is a response to the nature of contemporary business management, with the constantly increasing amount of work, bureaucracy and the necessity to travel on business combined with the need to manage the company while away. The aim of the module is to test the effectiveness of the available BI solutions which use SOA. Therefore, our purpose is to prepare a study on real-life solutions. Apart from the educational value of the course, the unique, dual perspective assumed by the students participating in it provides them with a practical insight and skills to better understand the conditions of using BI based on SOA. |

# Goals of the subject

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| --- | --- |
| **Goals** | |
| Goal ID | Description of a Goal |
| G\_S1 | Developing knowledge on working with real life dataset. |
| G\_S2 | Developing knowledge on defining business questions. |
| G\_S3 | Developing knowledge on solving business questions with business intelligence methods. |
| G\_S4 | Development of knowledge related to the aims of Business Intelligence. |
| G\_S5 | Presentation of modern technologies, tools and solutions concerning Self Service Business Intelligence. |
| G\_S6 | Development of practical skills related to implementing Business Intelligence solutions by using a methodological approach, modern technologies and IT Tools, and the validation of proposed solutions. |
| G\_S7 | Developing knowledge on BI and Social Media. |
| G\_S8 | Presenting some examples of BI solutions using Web 2.0. |
| G\_S9 | Developing knowledge on trends related to BI and Web 2.0. |
| G\_S10 | Developing knowledge on BI and Social Media. |
| G\_S11 | Presenting some examples of BI solutions using SOA. |
| G\_S12 | Developing knowledge on trends related to BI and SOA. |

# Planned effects, knowledge

|  |  |
| --- | --- |
| Effect ID | Knowledge type |
| K\_S1 | Knowledge about work with MS Excel and Pivot tables. |
| K\_S2 | Gained knowledge about types of information resources and their usability in BI. |
| K\_S3 | Knowledge to solve complex business questions. |
| K\_S4 | Knowledge about work with MS Excel and PSPP. |
| K\_S5 | Gained knowledge about statistical methods. |
| K\_S6 | Knowledge to solve complex business questions. |
| K\_S7 | Knowledge about work with Alyuda Neurointelligence and Rapid Miner. |
| K\_S8 | Gained knowledge about intelligence methods for data analysis. |
| K\_S9 | Knowledge to solve complex business questions. |
| K\_S10 | Knowledge related to foundations of Business Intelligence in modern companies. |
| K\_S11 | Knowledge related to the process of Business Intelligence implementation in SME. |
| K\_S12 | Knowledge about modern technologies and IT tools supporting Business Intelligence |
| K\_S13 | Basic functions and role of Social Media in economy. Web 1.0, Web 2.0, Web 3.0, Web 4.0, Web5.0 |
| K\_S14 | Gained knowledge about available BI solutions using Web 2.0. |
| K\_S15 | Trends and recommendations concerning BI and Web 2.0. |
| K\_S16 | Definitions and role of SOA in the economy. |
| K\_S17 | Difference between traditional and SOA approach. |
| K\_S18 | Gained knowledge about available BI solutions using SOA and trends in this context. |

# Planned effects, skills

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| --- | --- |
| Effect ID | Skill type |
| S\_S1 | Skills in analyzing big datasets |
| S\_S2 | Skills in defining meaningful business questions |
| S\_S3 | Skills in solving the business questions with Dashboard implemented with Pivot table in MS Excel |
| S\_S4 | Skills in solving the business questions with open source statistical software |
| S\_S5 | Skills in defining goals and requirements related to Business Intelligence solutions and business cases requiring support of BI tool. |
| S\_S6 | Skills in implementing Business Intelligence solutions using selected Self Service BI technologies. |
| S\_S7 | Skills in evaluating the usefulness of the implemented tool in real business scenarios. |
| S\_S8 | Skills in solving the business questions with the open source software Rapid Miner |
| S\_S9 | Skills in using BI solutions thanks to Web 2.0 technology. |
| S\_S10 | Is able to prepare and create Web 2.0 environment for BI analysis. |
| S\_S11 | Organizes means for communication in a team. |
| S\_S12 | Skilled in using BI solutions thanks to SOA technology. |
| S\_S13 | Is able to prepare and create SOA environment for BI analysis. |
| S\_S14 | Organize means for communication in a team. |

# Planned effects, social competences

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| --- | --- |
| Effect ID | Competence type |
| C\_S1 | Understanding strengths and weakness of BI solutions and propagating them to the management. |
| C\_S2 | Good personal time management |
| C\_S3 | Student can define the goals of teamwork. |
| C\_S4 | Student works in a group to build Business Intelligence solutions. |
| C\_S5 | Student can validate his work and the work of other team members. |
| C\_S6 | Performing projects in a team. |

# The cards of teaching units

## Types of BI systems in ERP and CRM contexts

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| Agenda of a Module | |
| Module title | **Types of BI systems. ERP and CRM context** |
| Level of module | Bachelor, master |
| Faculty | Informatics |
| Language of instruction | English |
| Number of teaching hours | 4 |
| Number of ECTS credit allocated | 0,4 |
| Mode of delivery | face-to-face, team work |

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| **Module description** |
| The module concerns clarifying the purpose of BI systems and characteristics of BI solutions in CRM and ERP contexts. During classes students learn: (1) how to define what BI is, (2) how to identify information resources in the organisation, (3) how to choose the proper tool for BI, (4) what the nature of scorecards and dashboards is, (5) how to build a dashboard in MS Excel using Pivot table tools. The aim of the module is to teach students how to easily analyze big datasets and find dependencies that are not clear with simple reporting. During the course a real dataset is used (provided by IBM) which is imported in MS Excel. Students acquire new skills in business intelligence – applying contemporary methods for solving business questions. This course helps students to understand how easy the development of BI dashboard for the needs of management could be. |

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| **Prerequisites and co-requisites** | |
| 1. | Basic knowledge in MS Excel |

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| **Goals** | |
| GoalID | Description of a Goal |
| G1 | Developing knowledge on working with real life dataset |
| G2 | Developing knowledge on defining business questions |
| G3 | Developing knowledge on solving business questions with business intelligence methods |

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| --- | --- | --- |
| **Planned effects** | | |
| Knowledge | | |
| Effect ID | Knowledge type | Goal ID |
| K1 | Working with MS Excel and Pivot tables | G1,G2 |
| K2 | Gained knowledge about types of information resources and their usability in BI | G2,G3 |
| K3 | Knowledge to solve complex business questions | G2,G3 |
| Skills | | |
| Effect ID | Skill type | Goal ID |
| S1 | Skills in analyzing big datasets | G1,G3 |
| S2 | Skills in defining meaningful business questions | G2,G3 |
| S3 | Skills in solving the business questions with Dashboard implemented with Pivot table in MS Excel | G2,G3 |
| Social competences | | |
| Effect ID | Competence type | Goal ID |
| C1 | Team work | G1,G2,G3 |
| C2 | Understanding strengths and weakness of BI solutions and propagating them to the management. | G2, G3 |

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| **Realized topics** | | | | | | | |
| **ID** | **Topic** | **Hours** | | | | **Goals** | **Effects** |
| L | LAB | EX | OTH |  |  |
| **1.** | Defining business questions | 0,5 |  |  |  | G1 | K1 |
| **2.** | Preparing big datasets for analysis |  |  | 0,5 |  | G1 | K1 |
| **3.** | Choosing appropriate BI tools | 0,5 |  |  |  | G2,G3 | K2,K3 S1,S2 S3 |
| **4.** | Working with Pivot tables, pivot charts and slicers |  |  | 1,5 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **5.** | Interpreting the result |  |  | 0,5 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **6.** | Performing tasks personally during the classes – solving other business questions alone and in teams |  |  | 0,5 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **Total** | | 1 |  | 3 |  |  |  |

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| --- | --- | --- | --- | --- |
| **Topics for individual work** | | | | |
| ID | Topic | Effects ID | Goals ID | Hours |
| 1. | Defining new research questions | K2,K3 S1,S2 S3, C1,C2 | G2,G3 | 1 |
| 2. | Choosing the appropriate BI tools | K2,K3 S1,S2 S3 | G2,G3 | 0,5 |
| 3. | Working with Pivot tables | K2,K3 S1,S2 S3 | G2,G3 | 1,5 |
| 4. | Interpreting the result | K2,K3 S1,S2 S3 | G2,G3 | 0,5 |
| 5. | Preparing the result for presentation to the management | K2,K3 S1,S2 S3 | G2,G3 | 0,5 |
| Total hours | | | | 4 |

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| **Expected student involvement** | | |
| ID | Type of student’s activity | Hours |
| 1. | Classes | 4 |
| 2. | Individual work | 4 |
| 3. | Getting familiar with core literature related to the course and prepared course materials | 1 |
| 4. | Preparation for laboratories | 1 |
| 5. | Preparation of own projects | 1 |
| 6. | Preparation to exam | 0 |
| 7. | Preparation of final projects | 1 |
| Total | | 12 |

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| **Verification of expected effects** | | | | | | |
| **ID** | **Description** | **Exam** | **Project** | **Activity** | **Own work** | **Other\*** |
| K1 | Working with MS Excel and Pivot tables | - | + | + | + | + |
| K2 | Gained knowledge about types of information resources and their usability in BI | - | + | + | + | + |
| K3 | Knowledge to solve complex business questions | - | + | + | + | + |
| S1 | Skills in analyzing big datasets | - | + | + | + | + |
| S2 | Skills in defining meaningful business questions | - | + | + | + | + |
| S3 | Skills in solving the business questions with Dashboard implemented with Pivot table in MS Excel | - | + | + | + | + |
| C1 | Team work | - | + | + |  | + |
| C2 | Understanding strengths and weakness of BI solutions and propagating them to the management. | - | + |  | + | + |
| Wages in overall verification of expected effects in %  (Total 100%) | | Team work | 50% | 10% | 20% | 20% |

\* Other methods of verification are described in the section “Description of traditional and innovative methods of teaching” of this document.

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| **Core literature** | |
| 1. | Exercises and lectures in electronic format |
| 2. | Gorham, R. (2016) Power Pivot for IT Students, CreateSpace Independent Publishing Platform, p.84 |

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| --- | --- |
| **Further reading** | |
| 1. | Hill, T. (2012)Excel 2013 Pivot Tables. Questing Vole Press, Oct 11, 2012 |
| 2 | Parenteau, J et. all. Magic Quadrant for Business Intelligence and Analytics Platforms (2016) https://www.gartner.com/doc/reprints?id=1-2XXET8P&ct=160204 |

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| **Description of traditional and innovative methods of teaching** |
| One of the most important components of the educational process is the teachingmethods. They define the overall activity of professors and students and give shape to the whole educational process.  The innovative methods of this module include:  1) Brainstorming - used to stimulate the creative activity of students on a given topic or issue, discussion is aimed to develop communication and language skills, and demonstration is an essential part of every practical training.  2) Students play a role and try to simulate their practical work in business situations. Depending on the task they have to be in a particular situation and fulfil a role with certain characteristics. The main objective of this method is to comprehend the problem through students’ own experience.  3) The software tools used to conduct exercises include presentation software and software for screen sharing of students’ workstation and/or remote control by the professor. This reduces time for assisting students who have problems with their exercises which gives the possibility for conducting more and more complex tasks. |

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| **Remarks** |
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## Business intelligence with statistical software

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| Agenda of a Module | |
| Module title | **Business intelligence with statistical software** |
| Level of module | Bachelor, master |
| Faculty | Informatics |
| Language of instruction | English |
| Number of teaching hours | 4 |
| Number of ECTS credit allocated | 0,4 |
| Mode of delivery | face-to-face, team work |

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| **Module description** |
| The module concerns the use and the implementation of solving business questions with open source statistical software. During classes students learn: (1) how to define business questions, (2) how to choose the appropriate statistics method, (3) how to analyze big datasets, (4) how to use open source statistical software, (5) how to interpret the result and (6) how to publish the result within a scientific article. The aim of the module is to teach students how to easily analyze big datasets and find dependencies that are not clear with simple reporting. During the course a real dataset is used (provided by IBM) and PSPP (open source statistical software) is used. Students acquire new skills in business intelligence – applying contemporary methods for solving business questions. According to the opinion of the most of the students, statistics is one of the most difficult disciplines. This course helps students to understand statistical methods and gives them skills to apply in practice. Further on the same dataset is used in the other modules of the ISP – for creating Pivot tables, neural networks and decision trees – using other software products. |

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| **Prerequisites and co-requisites** | |
| 1. | Basic knowledge in MS Excel |

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| **Goals** | |
| GoalID | Description of a Goal |
| G1 | Developing knowledge on working with real life dataset |
| G2 | Developing knowledge on defining business questions |
| G3 | Developing knowledge on solving business questions with business intelligence methods |

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| --- | --- | --- |
| **Planned effects** | | |
| Knowledge | | |
| Effect ID | Knowledge type | Goal ID |
| K1 | Working with MS Excel and PSPP | G1,G2 |
| K2 | Gained knowledge about statistical methods | G2,G3 |
| K3 | Knowledge to solve complex business questions | G2,G3 |
| Skills | | |
| Effect ID | Skill type | Goal ID |
| S1 | Skills in analyzing big datasets | G1,G3 |
| S2 | Skills in defining meaningful business questions | G2,G3 |
| S3 | Skills in solving the business questions with open source statistical software | G2,G3 |
| Social competences | | |
| Effect ID | Competence type | Goal ID |
| C1 | Team work | G1,G2,G3 |
| C2 | Good personal time management | G2, G3 |

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| **Realized topics** | | | | | | | |
| **ID** | **Topic** | **Hours** | | | | **Goals** | **Effects** |
| L | LAB | EX | OTH |  |  |
| **1.** | Defining business questions | 0,5 |  |  |  | G1 | K1 |
| **2.** | Preparing big datasets for analysis |  |  | 0,5 |  | G1 | K1 |
| **3.** | Choosing appropriate statistical methods | 0,5 |  |  |  | G2,G3 | K2,K3 S1,S2 S3 |
| **4.** | Working with PSPP |  |  | 1,5 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **5.** | Interpreting the result |  |  | 0,5 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **6.** | Performing tasks personally during the classes – solving other business questions alone and in teams |  |  | 0,5 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **Total** | | 1 |  | 3 |  |  |  |

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| --- | --- | --- | --- | --- |
| **Topics for individual work** | | | | |
| ID | Topic | Effects ID | Goals ID | Hours |
| 1. | Defining new research questions | K2,K3 S1,S2 S3, C1,C2 | G2,G3 | 1 |
| 2. | Choosing the appropriate statistical methods | K2,K3 S1,S2 S3 | G2,G3 | 0,5 |
| 3. | Working with PSPP | K2,K3 S1,S2 S3 | G2,G3 | 1,5 |
| 4. | Interpreting the result | K2,K3 S1,S2 S3 | G2,G3 | 0,5 |
| 5. | Preparing the result for publishing in scientific journals | K2,K3 S1,S2 S3 | G2,G3 | 0,5 |
| Total hours | | | | 4 |

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| --- | --- | --- |
| **Expected student involvement** | | |
| ID | Type of student’s activity | Hours |
| 1. | Classes | 4 |
| 2. | Individual work | 4 |
| 3. | Getting familiar with core literature related to the course and prepared course materials | 1 |
| 4. | Preparation for laboratories | 1 |
| 5. | Preparation of own projects | 1 |
| 6. | Preparation to exam | 0 |
| 7. | Preparation of final projects | 1 |
| Total | | 12 |

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| --- | --- | --- | --- | --- | --- | --- |
| **Verification of expected effects** | | | | | | |
| **ID** | **Description** | **Exam** | **Project** | **Activity** | **Own work** | **Other\*** |
| K1 | Working with MS Excel and PSPP | - | + | + | + | + |
| K2 | Gained knowledge about statistical methods | - | + | + | + | + |
| K3 | Knowledge to solve complex business questions | - | + | + | + | + |
| S1 | Skills in analyzing big datasets | - | + | + | + | + |
| S2 | Skills in defining meaningful business questions | - | + | + | + | + |
| S3 | Skills in solving the business questions with open source statistical software | - | + | + | + | + |
| C1 | Team work | - | + | + |  | + |
| C2 | Good personal time management | - | + |  | + | + |
| Wages in overall verification of expected effects in %  (Total 100%) | | Team work | 50% | 10% | 20% | 20% |

\* Other methods of verification are described in the section “Description of traditional and innovative methods of teaching” of this document.

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| **Core literature** | |
| 1. | Exercises in electronic format <http://users.ue-varna.bg/vasilev/isp/> |
| 2. | Foundation, F.S., 2016. PSPP - GNU Project. Available at: <https://www.gnu.org/software/pspp/>. |
| 3. | Hadzhiev, V. et. al, 2009. Statistical and econometric software, Varna: Science and economics. |
| 4. | Pallant, J., 2011. SPSS SURVIVAL MANUAL : A step by step guide to data analysis using SPSS, Allen and Unwin.<http://spss.allenandunwin.com.s3-website-ap-southeast-2.amazonaws.com/> |
| 5. | Vasilev J. and Atanasova T. Parallel Testing of Hypotheses with Statistical and Artificial Intelligence Methods: A Study on Measuring the Complacency from Education. Computer Science and Applications, Vol. 2, Num. 5, 2015, pp. 206-211. <http://www.ethanpublishing.com/index.php?m=content&c=index&a=show&catid=224&id=518> |

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| **Further reading** | |
| 1. | Gujarati, D. Basic econometrics. https://docs.google.com/file/d/0B61KSjKBWIfscmdkSVF6VF9ONjA/edit |
| 2 | Vasilev, J. Data mining of transactional data for sales of dairy products. Theoretical and Applied Economics, Vol. 21, No 12, 2014, p. 3-12. http://store.ectap.ro/articole/1041.pdf |
| 3. | Vasilev, J. Evaluating the Impact of a New Product on the Sales of Other Products. Journal of Economics and Business Research, ISSN: 2068 - 3537, E – ISSN (online) 2069 – 9476, ISSN – L = 2068 – 3537Year XX, No. 2, 2014, pp. 7-20. http://www.uav.ro/jour/index.php/jebr/article/download/369/pdf\_131 |

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| **Description of traditional and innovative methods of teaching** |
| In the classes with students during the ISP they acquire new skills in business intelligence using sample datasets, applying statistical methods and using open source statistical software.  Traditional methods of teaching include describing methods, writing with complex formulas, using proprietary statistical software and giving theoretically oriented examples.  The innovative methods of this course include:  1) using real life examples (provided online as sample datasets)  2) defining meaningful business (research) questions by looking at the column names of the dataset  3) choosing the appropriate statistical methods  4) implementing these methods in open source software solutions  5) interpreting the output of the statistical software. Making conclusions.  6) preparing the results of the analysis for publishing in scientific journals  The same dataset is used in other modules of the course for analyzing the same business (research) questions using Pivoting techniques, decision trees and neural networks.  Students overcome the fear of statistics. They acquire new skills in analyzing real life datasets. They get skills in writing correctly the result of the analysis within scientific papers. |

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| **Remarks** |
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## Neural networks and decision tree

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| Agenda of a Module | |
| Module title | **Business intelligence with statistical software** |
| Level of module | Bachelor, master |
| Faculty | Informatics |
| Language of instruction | English |
| Number of teaching hours | 4 |
| Number of ECTS credit allocated | 0,4 |
| Mode of delivery | face-to-face, team work |

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| **Module description** |
| The module aims to improve students’ knowledge about neural networks and the software product AlyudaNeurointelligence and the possibilities for applying in data mining. Students acquire knowledge about the types of data in the spreadsheets used with neural networks and their preparation for creating a neural network. The evaluation of the best rest of network training is dependent to the training error and the validation error. When the neural network is well trained, dependencies between the input and output variables may be found, which are indeed the searched for result. The module for data mining is basic in the architecture of business intelligence systems. Knowledge of the method neural networks for data mining facilitate the better quality of a business intelligence system. Neural networks are used to find implicit dependencies.  Using open source software – Rapid Miner, the dataset is used to create decision trees. These trees are transformed later on in rules. These rules are a component of the knowledge database. Dependencies between variables may be clearly defined.  Further on the same dataset is used in the other modules of the ISP – for creating Pivot tables, and statistical software – using other software products. |

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| **Prerequisites and co-requisites** | |
| 1. | Basic knowledge in MS Excel |

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| **Goals** | |
| GoalID | Description of a Goal |
| G1 | Developing knowledge on working with real life dataset |
| G2 | Developing knowledge on defining business questions |
| G3 | Developing knowledge on solving business questions with business intelligence methods |

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| **Planned effects** | | |
| Knowledge | | |
| Effect ID | Knowledge type | Goal ID |
| K1 | Working with AlyudaNeurointelligence and Rapid Miner | G1,G2 |
| K2 | Gained knowledge about intelligence methods for data analysis | G2,G3 |
| K3 | Knowledge to solve complex business questions | G2,G3 |
| Skills | | |
| Effect ID | Skill type | Goal ID |
| S1 | Skills in analyzing big datasets | G1,G3 |
| S2 | Skills in defining meaningful business questions | G2,G3 |
| S3 | Skills in solving the business questions with open source software Rapid Miner | G2,G3 |
| Social competences | | |
| Effect ID | Competence type | Goal ID |
| C1 | Team work | G1,G2,G3 |
| C2 | Good personal time management | G2, G3 |

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| **Realized topics** | | | | | | | |
| **ID** | **Topic** | **Hours** | | | | **Goals** | **Effects** |
| L | LAB | EX | OTH |  |  |
| **1.** | Defining business questions | 0,5 |  |  |  | G1 | K1 |
| **2.** | Preparing big datasets for analysis |  |  | 0,5 |  | G1 | K1 |
| **3.** | Choosing appropriate methods and operators | 0,5 |  |  |  | G2,G3 | K2,K3 S1,S2 S3 |
| **4.** | Working with AlyudaNeurointelligence and Rapid Miner |  |  | 1,5 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **5.** | Interpreting the result |  |  | 0,5 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **6.** | Performing tasks personally during the classes – solving other business questions alone and in teams |  |  | 0,5 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **Total** | | 1 |  | 3 |  |  |  |

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| **Topics for individual work** | | | | |
| ID | Topic | Effects ID | Goals ID | Hours |
| 1. | Defining new research questions | K2,K3 S1,S2 S3, C1,C2 | G2,G3 | 1 |
| 2. | Choosing the appropriate methods and operators | K2,K3 S1,S2 S3 | G2,G3 | 0,5 |
| 3. | Working with AlyudaNeurointelligence and Rapid Miner | K2,K3 S1,S2 S3 | G2,G3 | 1,5 |
| 4. | Interpreting the result | K2,K3 S1,S2 S3 | G2,G3 | 0,5 |
| 5. | Preparing the result for publishing in scientific journals | K2,K3 S1,S2 S3 | G2,G3 | 0,5 |
| Total hours | | | | 4 |

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| **Expected student involvement** | | |
| ID | Type of student’s activity | Hours |
| 1. | Classes | 4 |
| 2. | Individual work | 4 |
| 3. | Getting familiar with core literature related to the course and prepared course materials | 1 |
| 4. | Preparation for laboratories | 1 |
| 5. | Preparation of own projects | 1 |
| 6. | Preparation to exam | 0 |
| 7. | Preparation of final projects | 1 |
| Total | | 12 |

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| **Verification of expected effects** | | | | | | |
| **ID** | **Description** | **Exam** | **Project** | **Activity** | **Own work** | **Other\*** |
| K1 | Working with AlyudaNeurointelligence and Rapid Miner | - | + | + | + | + |
| K2 | Gained knowledge about intelligence methods for data analysis | - | + | + | + | + |
| K3 | Knowledge to solve complex business questions | - | + | + | + | + |
| S1 | Skills in analyzing big datasets | - | + | + | + | + |
| S2 | Skills in defining meaningful business questions | - | + | + | + | + |
| S3 | Skills in solving the business questions with open source software Rapid Miner | - | + | + | + | + |
| C1 | Team work | - | + | + |  | + |
| C2 | Good personal time management | - | + |  | + | + |
| Wages in overall verification of expected effects in %  (Total 100%) | | Team work | 50% | 10% | 20% | 20% |

\* Other methods of verification are described in the section “Description of traditional and innovative methods of teaching” of this document.

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| **Core literature** | |
| 1. | Fayyad, M., Piatetsky-Shapiro and Smyth, P. From Data Mining to Knowledge Discovery in Databases. AI Magazine 17(3), 1996 p. 37-54, https://www.aaai.org/ojs/index.php/aimagazine/article/viewFile/1230/1131, 10/6/2016 |
| 2. | Singh, P., Husain, M. Methodological study of opinion mining and sentiment analysis techniques. International Journal on Soft Computing (IJSC), 5(1)/2014, p. 11-21 |
| 3. | Vasilev J. and Atanasova T. Parallel Testing of Hypotheses with Statistical and Artificial Intelligence Methods: A Study on Measuring the Complacency from Education. Computer Science and Applications, Vol. 2, Num. 5, 2015, pp. 206-211. http://www.ethanpublishing.com/index.php?m=content&c=index&a=show&catid=224&id=518 |
| 4. | Thearling, K. An introduction to data mining. http://www.thearling.com/ |

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| **Further reading** | |
| 1. | Ankitkumar, D., Badre, R., Kinikar, M. A Survey on Sentiment Analysis and Opinion Mining, International Journal of Innovative Research in Computer and Communication Engineering. 2 (11)/2014, p. 6633-6639 |
| 2 | Atanasova, T. et al. A Research on the Influence of Some Factors on the GPA of Students. ICAICTSEE proceedings, 2015 (http://icaictsee.unwe.bg/proceedings/) |

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| **Description of traditional and innovative methods of teaching** |
| In the classes with students during the ISP they acquire new skills in business intelligence using sample datasets, applying intelligence methods and using open source business intelligence software.  Traditional methods of teaching include describing methods, using proprietary business intelligence software and giving examples.  The innovative methods of this module include:  1) using real life examples (provided online as sample datasets)  2) defining meaningful business (research) questions by looking at the column names of the dataset  3) choosing the appropriate intelligence methods  4) implementing these methods in open source software solutions  5) interpreting the output of software. Making conclusions.  6) preparing the results of the analysis for publishing in scientific journals  The same dataset is used in other modules of the course for analyzing the same business (research) questions using Pivoting techniques and statistical software.  They acquire new skills in analyzing real life datasets. They get skills in writing correctly the result of the analysis within scientific papers. |

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| **Remarks** |
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## Self Service Business Intelligence: Theoretical and practical aspects

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| Agenda of a Module | |
| Module title | **Self Service Business Intelligence: Theoretical and practical aspects** |
| Level of module | Bachelor |
| Faculty | Computer Science |
| Language of instruction | English |
| Number of teaching hours | 8 |
| Number of ECTS credit allocated | 0,8 |
| Mode of delivery | Lecture, labs, own work, team work |

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| **Module description** |
| The module concerns the evolution of Business Intelligence systems and focuses on the modern approach to satisfy the analytical needs of organizations by implementation of Self Service Business Intelligence solutions.  The course covers both theoretical aspects and practical ones. The main part of the course is the presentation of selected IT technologies and a practical usage of selected IT tools. During the course students define the requirements and they build Business Intelligence solutions fulfilling the user’s needs. Students also discuss the pros and cons of the selected approach and validate the benefits of implemented solutions. All considerations are related to real business scenarios. |

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| **Prerequisites and co-requisites** | |
| 1. | Foundation of databases |

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| **Goals** | |
| GoalID | Description of a Goal |
| G1 | Development of knowledge related to the aims of Business Intelligence. |
| G2 | Presentation of modern technologies, tools and solutions concerning Self Service Business Intelligence. |
| G3 | Development of practical skills related to implementing Business Intelligence solutions by using the methodological approach, modern technologies and IT Tools, and the validation of proposed solutions. |

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| **Planned effects** | | |
| Knowledge | | |
| Effect ID | Knowledge type | Goal ID |
| K1 | Knowledge related to the origins of Business Intelligence in modern companies. | G1 |
| K2 | Knowledge related to the process of Business Intelligence implementation in SME. | G2,G3 |
| K3 | Knowledge about modern technologies and IT tools supporting Business Intelligence solution implementation. | G2,G3 |
| Skills | | |
| Effect ID | Skill type | Goal ID |
| S1 | Student can define goals and requirements related to Business Intelligence solutions and business cases requiring support of BI tool. | G1, G2,G3 |
| S2 | Student is able to implement Business Intelligence solution using selected Self Service BI technologies. | G2,G3 |
| S3 | Student is able to evaluate the usefulness of the implemented tool in real business scenarios. | G2,G3 |
| Social competences | | |
| Effect ID | Competence type | Goal ID |
| C1 | Student can define the goals of teamwork. | G1,G2,G3 |
| C2 | Student works in a group to build Business Intelligence solutions. | G2, G3 |
| C3 | Student can validate his work and the work of other team members. | G2, G3 |

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| **Realized topics** | | | | | | | |
| **ID** | **Topic** | **Hours** | | | | **Goals** | **Effects** |
| L | LAB | EX | OTH |  |  |
| **1.** | Presentation of the evolution of Business Intelligence technologies and common challenges. | 0,5 |  |  |  | G1 | K1 |
| **2.** | Presentation of the technology stack addressing Self Service Business Intelligence. | 0,5 |  |  |  | G1,G2 | K1 |
| **3.** | Presentation of scenarios of BI implementation related to real business cases. | 0,5 |  |  |  | G1, G2 | K1,K2 S1,S2 S3 |
| **4.** | Presentation of features of selected IT tools. | 1,0 |  |  |  | G2,G3 | K2,K3 S1,S2 S3 |
| **5.** | Own exercise including goals and requirements, definition and design of the BI solution |  | 0,5 |  |  | G2,G3 | K2,K3 S1,S2 S3 |
| **6.** | Own – exercise: Connection to various data sources, data transformations, model building, visualization creation. |  | 2 |  |  | G2,G3 | K2,K3 S1,S2 S3 |
| **7.** | Using the Software as a Service solution to gather various data sets and to share the results of work with other team members. |  | 2 |  |  | G2,G3 | K2,K3 S1,S2 S3 |
| **8.** | Evaluation of prepared solutions, discussion of pros and cons, discussing business scenarios. |  | 1 |  |  | G3 | K2,K3 S1,S2 S3 |
| **Total** | | 2,5 | 5,5 |  |  |  |  |

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| **Topics for individual work** | | | | |
| ID | Topic | Effects ID | Goals ID | Hours |
| 1. | Requirements definition related to BI system implementation | K1, S1 | G2,G3 | 0,5 |
| 2. | Business Intelligence solution implementation according to the presented scenario in presented technologies. | K2,K3 S2 | G2,G3 | 2 |
| 3. | Evaluation of developed solution | K3 S3 | G2,G3 | 0,5 |
| Total hours | | | | 3 |

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| **Expected student involvement** | | |
| ID | Type of student’s activity | Hours |
| 1. | Classes | 8 |
| 2. | Individual work | 3 |
| 3. | Getting familiar with core literature related to the course and prepared course materials | 1 |
| 4. | Preparation for laboratories | 1 |
| 5. | Preparation of own projects | 0 |
| 6. | Preparation to exam | 0 |
| 7. | Preparation of final projects | 1 |
| Total | | 14 |

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| **Verification of expected effects** | | | | | | |
| **ID** | **Description** | **Exam** | **Project** | **Activity** | **Own work** | **Other\*** |
| K1 | Business Intelligence in modern companies. | + | - | - | - | - |
| K2 | Process of Business Intelligence implementation in SME | + | + | + | + | - |
| K3,S2 | Implementation of Business Intelligence solutions using selected Self Service BI technologies. | - | + | + | + | - |
| S1 | Definition of goals and requirements related to Business Intelligence solutions and business cases requiring support of BI tool | - | + | + | + | - |
| S3 | Evaluation of usefulness of the implemented tool in real business scenarios. | - | + | + | + | - |
| C1 | Ability to work in groups . | - | + | + |  | - |
| C2 | Performing projects in teamwork. | - | + |  | + | - |
| Wages in overall verification of expected effects in %  (Total 100%) | | 30% | 50% | 10% | 10% | 0% |

\* Other methods of verification are described in the section “Description of traditional and innovative methods of teaching” of this document.

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| **Core literature** | |
| 1. | Webb Christopher, Power Query for Power Bi and Excel, Springer, 2014 |
| 2. | Alberto Ferrari, Marco Russo,The Definitive Guide to DAX: Business intelligence with Microsoft Excel, SQL Server Analysis Services, and Power BI (Business Skills), Microsoft Press, 2015 |
| 3. | Kimball R., Ross M. , The Data Warehouse Toolkit. The Complete Guide to Dimensional Modeling, Wiley&Sons, 2002 |

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| **Further reading** | |
| 1. | [Online], PowerBI Documentation, https://powerbi.microsoft.com/en-us/documentation/powerbi-landing-page/[Aug 2016]. |

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| **Description of traditional and innovative methods of teaching** |
| During classes teachers  provide concrete, real-world examples to demonstrate useful (practical) ideas and then allow the students to work independently and collaboratively to solve the proposed problem. The intended result is that students will make intuitive or global observations about the assigned subject, then use deductive reasoning to provide answers. Moreover. the learning environment embraces the use of [technology in the classroom](http://www.weareteachers.com/blogs/post/2015/04/03/10-rules-for-a-successful-one-to-one-classroom). The teacher selects a specific device, then issues the device to students and educators. Everyone uses a similar device and all are equipped with similar software and features, so maintaining and managing them is fairly simple. Class instruction and activities are designed around the use of these tools.  This model requires districts to  shell out a sizeable sum for startup and maintenance. If a university isn’t equipped to take on such a feat, you can use the concept through **BYOD (Bring Your Own Device)[[1]](#footnote-1)** pedagogy, where students can use their personal devices for classroom use. However, the lecturer has to be inclusive, and though it certainly seems like it, not every student is sure to own a mobile device. If this is the case, students can perform tasks and activities in groups.  That approach, known as **collaborative learning**, refers to a variety of teaching methods that involve groups of students or students and teachers working together on a class project. Many university districts across the world are adopting this new method.  Collaborative learning can occur between two students or in larger groups. Students discuss concepts or solve problems. The benefits of collaborative learning include:  Development of higher-level thinking, oral communication, self-management, and leadership skills.  Increase in student retention, self-esteem, and responsibility.  Exposure to and an increase in understanding of diverse perspectives.  Preparation for real life social and employment situations.[[2]](#footnote-2)  During activities in this module the use of **personalized learning is assumed**. **Personalized learning**[[3]](#footnote-3) is one of the top buzzwords in education nowadays. It suggests a host of different learning methods that are typically institution-driven. Personalized learning is, and will continue to be learner-driven where learners control their learning and become not just consumers of content but active creators of content, building knowledge through collaboration and connectivity via smart phone apps. Students will be in control not only of when they learn, but will demand that they contribute to their learning through discussions and collaboration, creating content while doing so. This student-driven phenomenon suggests that universities will need to respond and acknowledge that the learner is seeking this kind of personalized learning experience.  During the course students use modern IT tools delivered in SaaS model, test them and evaluate them.  The selected IT tools allow the building of complex implementation in a limited amount of time (during classes and own work). |

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| **Remarks** |
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## Web 2.0 and BI

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| Agenda of a Module | |
| Module title | **Web 2.0 and BI** |
| Level of module | bachelor |
| Faculty | Computer Science |
| Language of instruction | English |
| Number of teaching hours | 2 |
| Number of ECTS credit allocated | 0,2 |
| Mode of delivery | face-to-face, team work |

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| **Module description** |
| The module concerns the use and implementation of BI, especially using Web 2.0. The course is a response to the nature of contemporary business management, with the constantly increasing amount of work, bureaucracy and the necessity to travel on business combined with the need to manage the company while away. The aim of the module is to test the effectiveness of the available BI solutions which use Web 2.0. Therefore, our purpose is to prepare a study on real-life solutions. Apart from the educational value of the course, the unique, dual perspective assumed by the students participating in it, provides them with a practical insight and skills to better understand the conditions of using BI based on Web 2.0 . |

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| **Prerequisites and co-requisites** | |
| 1. | Basic knowledge and skills related to ICT, BI and Social Media. |

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| **Goals** | |
| Goal ID | Description of a Goal |
| G1 | Developing knowledge on BI and Social Media. |
| G2 | Presenting some examples of BI solutions using Web 2.0. |
| G3 | Developing knowledge on trends related to BI and Web 2.0. |

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| **Planned effects** | | |
| Knowledge | | |
| Effect ID | Knowledge type | Goal ID |
| K1 | Basic functions and role of Social Media in economy. Web 1.0, Web 2.0, Web 3.0, Web 4.0, Web5.0 | G1 |
| K2 | Gained knowledge about available BI solutions using Web 2.0. | G2,G3 |
| K3 | Trends and recommendations concerning BI and Web 2.0. | G2,G3 |
| Skills | | |
| Effect ID | Skill type | Goal ID |
| S1 | Skilled in using BI solutions thanks to Web 2.0 technology. | G2,G3 |
| S2 | Is able to prepare and create Web 2.0 environment for BI analysis. | G2,G3 |
| S3 | Organizes means for communication in a team. | G2,G3 |
| Social competences | | |
| Effect ID | Competence type | Goal ID |
| C1 | Ability to work in a group. | G1,G2,G3 |
| C2 | Performing projects in a team. | G2, G3 |

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| **Realized topics** | | | | | | | |
| **ID** | **Topic** | **Hours** | | | | **Goals** | **Effects** |
| L | LAB | EX | OTH |  |  |
| **1.** | Presenting management functions: planning, organizing, leading and controlling. | 0,5 |  |  |  | G1 | K1 |
| **2.** | The role of Social Media in the economy. | 0,5 |  |  |  | G1 | K1 |
| **3.** | Use of Internet services and social media in business |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **4.** | Using and implementing BI based on Web 2.0 technology. |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **5.** | Information on emerging tools and describing the basic function of each type. |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **6.** | Combining data from multiple services to provide more valuable information by Mashup. |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **7.** | Examples of Mashups. |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **8.** | Creating Web 2.0 environment for BI. |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **9.** | Presentation of examples of BI using Web 2.0 technology. |  |  |  | 0,25 | G2,G3 | C1,C2 |
| **10.** | Organizing means for communication in a team. |  |  |  | 1,25 | G2,G3 | C1,C2 |
| **Total** | | 1 |  | 1,5 | 1,5 |  |  |

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| **Topics for individual work** | | | | |
| ID | Topic | Effects ID | Goals ID | Hours |
| 1. | Analysis and selection of social media solutions for business | K2,K3 S1,S2 S3, C1,C2 | G2,G3 | 0,5 |
| 2. | Analysis and selection of social media solutions for BI | K2,K3 S1,S2 S3 | G2,G3 | 0,5 |
| 3. | Analysis of a selected BI system dedicated for Web 2.0 technology | K2,K3 S1,S2 S3 | G2,G3 | 1 |
| 4. | Analysis of selected Mashup solutions | K2,K3 S1,S2 S3 | G2,G3 | 1 |
| 5. | Analysis of trends related to BI using Web 2.0 technology | K2,K3 S1,S2 S3 | G2,G3 | 0,75 |
| Total hours | | | | 3,75 |

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| **Expected student involvement** | | |
| ID | Type of student’s activity | Hours |
| 1. | Classes | 4 |
| 2. | Individual work | 3,75 |
| 3. | Getting familiar with core literature related to the course and prepared course materials | 1 |
| 4. | Preparation for laboratories | 1 |
| 5. | Preparation of own projects | 1 |
| 6. | Preparation to exam | 0 |
| 7. | Preparation of final projects | 1 |
| Total | | 11,75 |

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| **Verification of expected effects** | | | | | | |
| **ID** | **Description** | **Exam** | **Project** | **Activity** | **Own work** | **Other\*** |
| K1 | Basic functions and role of Social Media in the economy. | - | + | + | + | + |
| K2 | Gained knowledge about available BI solutions using Web 2.0. | - | + | + | + | + |
| K3 | Trends and recommendations concerning BI and Web 2.0. | - | + | + | + | + |
| S1 | Skilled in using BI solutions thanks to Web 2.0 technology. | - | + | + | + | + |
| S2 | Is able to prepare and create Web 2.0 environment for BI analysis. | - | + | + | + | + |
| S3 | Organizes means for communication in a team. | - | + | + | + | + |
| C1 | Ability to work in a group . | - | + | + |  | + |
| C2 | Performing projects in a team. | - | + |  | + | + |
| Wages in overall verification of expected effects in %  (Total 100%) | | - | 50% | 10% | 20% | 20% |

\* Other methods of verification are described in the section “Description of traditional and innovative methods of teaching” of this document.

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| **Core literature** | |
| 1. | [Yahya Al Sharji](https://www.amazon.com/s/ref=dp_byline_sr_book_1?ie=UTF8&text=Yahya+Al+Sharji&search-alias=books&field-author=Yahya+Al+Sharji&sort=relevancerank)(2011), A framework for the influencing factors in the adoption of ICT in SMEs: Adoption factors in determining successful usage of ICT in Small and Medium Enterprises, LAP LAMBERT Academic Publishing |
| 2. | Kenneth C. Laudon and Jane P. Laudon (2009), Essentials of business information systems, seventh edition, Prentice-Hall, NY, 2006 |
| 3. | Benito-Osorio D., Peris-Ortiz M., Rueda Armengot C.,Colino A., Web 5.0: the future of emotional competences in higher education, 7 July 2013, International Network of Business and Management, 2013 |
| 4. | Flat World Business,Web 1.0 vs Web 2.0 vs Web 3.0 vs Web 4.0 vs Web 5.0 – A bird’s eye on the evolution and definition, [Online], Available at https://flatworldbusiness.wordpress.com/flat-education/previously/web-1-0-vs-web-2-0-vs-web-3-0-a-bird-eye-on-the-definition/, Accessed [24 July 2016]. |
| 5. | Lach J. Defining Business Intelligence 3.0, YellowFin, 10 April 2014, [Online],  Available at: https://www.yellowfinbi.com/blog/2014/04/yfcommunitynews-defining-business-intelligence-3-0-159445, Accessed[24 July 2016]. |

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| **Further reading** | |
| 1. | Whatisrss, What is RSS, [Online], Available at: http://www.whatisrss.com, Accessed [24 Aug 2016] |
| 2. | Tutorial Point, Internet Services, [Online],  Available at:https://www.tutorialspoint.com/internet\_technologies/internet\_services.htm, Accessed [24 July 2016] |
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| **Description of traditional and innovative methods of teaching** |
| During classes teachers provide concrete, real-world examples to demonstrate useful (practical) ideas and then allow the students to work independently and collaboratively to solve the proposed problem. The intended result is that students will make intuitive or global observations about the assigned subject, then use deductive reasoning to provide answers. Moreover, the learning environment embraces the use of [technology in the classroom](http://www.weareteachers.com/blogs/post/2015/04/03/10-rules-for-a-successful-one-to-one-classroom). The teacher selects a specific device, then issues the device to students and educators. Everyone uses the similar device and all are equipped with the similar software and features, so maintaining and managing them is fairly simple. Class instruction and activities are designed around the use of these tools.  This model requires districts to shell out a sizeable sum for startup and maintenance. If a university isn’t equipped to take on such a feat, you can use the concept through **BYOD (Bring Your Own Device)[[4]](#footnote-4)** pedagogy, where students can use their personal devices for classroom use. However, the lecturer has to be inclusive, and though it certainly seems like it, not every student is sure to own a mobile device. If this is the case, students can perform tasks and activities in groups.  That approach, known as **collaborative learning**, refers to a variety of teaching methods that involve groups of students or students and teachers working together on a class project. Many university districts across the world are adopting this new method.  Collaborative learning can occur between two students or in larger groups. Students discuss concepts or solve problems. The benefits of collaborative learning include:  Development of higher-level thinking, oral communication, self-management, and leadership skills.  Increase in student retention, self-esteem, and responsibility.  Exposure to and an increase in understanding of diverse perspectives.  Preparation for real life social and employment situations.[[5]](#footnote-5)  During activities in this module the use of **personalized learning is assumed**. **Personalized learning**[[6]](#footnote-6) is one of the top buzzwords in education nowadays. It suggests a host of different learning methods that are typically institution-driven. Personalized learning is, and will continue to be learner-driven where learners control their learning and become not just consumers of content but active creators of content, building knowledge through collaboration and connectivity via smart phone apps. Students will be in control not only of when they learn, but will demand that they contribute to their learning through discussions and collaboration, creating content while doing so. This student-driven phenomenon suggests that universities will need to respond and acknowledge that the learner is seeking this kind of personalized learning experience. |

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| **Remarks** |
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## SOA and BI

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| Agenda of a Module | |
| Module title | **SOA and BI** |
| Level of module | bachelor |
| Faculty | Computer Science |
| Language of instruction | English |
| Number of teaching hours | 2 |
| Number of ECTS credit allocated | 0,2 |
| Mode of delivery | face-to-face, team work |

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| **Module description** |
| The module concerns the use and implementation of BI, especially using SOA (Service Oriented Architecture). The course is a response to the nature of contemporary business management, with the constantly increasing amount of work, bureaucracy and the necessity to travel on business combined with the need to manage the company while away. The aim of the module is to test the effectiveness of the available BI solutions which use SOA. Therefore, our purpose is to prepare a study of real-life solutions. Apart from the educational value of the course, the unique, dual perspective assumed by the students participating in it, provides them with a practical insight and skills to better understand the conditions of using BI based on SOA. |

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| **Prerequisites and co-requisites** | |
| 1. | Basic knowledge and skills related to ICT, BI and Social Media. |

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| **Goals** | |
| Goal ID | Description of a Goal |
| G1 | Developing knowledge on BI and Social Media. |
| G2 | Presenting some examples of BI solutions using SOA. |
| G3 | Developing knowledge on trends related to BI and SOA. |

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| **Planned effects** | | |
| Knowledge | | |
| Effect ID | Knowledge type | Goal ID |
| K1 | Definitions and role of SOA in the economy. | G1 |
| K2 | Difference between traditional and SOA approach. | G2,G3 |
| K3 | Gained knowledge about available BI solutions using SOA and trends in this context. | G2,G3 |
| Skills | | |
| Effect ID | Skill type | Goal ID |
| S1 | Skilled in using BI solutions thanks to SOA technology. | G2,G3 |
| S2 | Is able to prepare and create SOA environment for BI analysis. | G2,G3 |
| S3 | Organizes means for communication in a team. | G2,G3 |
| Social competences | | |
| Effect ID | Competence type | Goal ID |
| C1 | Ability to work in a group . | G1,G2,G3 |
| C2 | Performing projects in a team. | G2, G3 |

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| **Realized topics** | | | | | | | |
| **ID** | **Topic** | **Hours** | | | | **Goals** | **Effects** |
| L | LAB | EX | OTH |  |  |
| **1.** | The evolution of the information age | 0,5 |  |  |  | G1 | K1 |
| **2.** | Definition of SOA | 0,5 |  |  |  | G1 | K1 |
| **3.** | The role of SOA in the economy. |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **4.** | Difference between traditional and SOA approach. |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **5.** | Services of SOA - "publish, find, use" |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **6.** | Using and implementing BI based on SOA technology. |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **7.** | Creating SOA environment for BI. |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **8.** | An example of the use of SOA. |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2 S3 |
| **9.** | Presentation of examples of BI using SOA technology. |  |  |  | 0,25 | G2,G3 | C1,C2 |
| **10.** | Organizing means for communication in a team. |  |  |  | 1,25 | G2,G3 | C1,C2 |
| **Total** | | 1 |  | 1,5 | 1,5 |  |  |

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| **Topics for individual work** | | | | |
| ID | Topic | Effects ID | Goals ID | Hours |
| 1. | Analysis and selection of social media solutions for business | K2,K3 S1,S2 S3, C1,C2 | G2,G3 | 0,5 |
| 2. | Analysis and selection of SOA solutions for BI | K2,K3 S1,S2 S3 | G2,G3 | 0,5 |
| 3. | Analysis of a selected BI system dedicated for SOA technology | K2,K3 S1,S2 S3 | G2,G3 | 1 |
| 4. | Analysis of selected SOA solutions | K2,K3 S1,S2 S3 | G2,G3 | 1 |
| 5. | Analysis of trends related to BI using SOA technology | K2,K3 S1,S2 S3 | G2,G3 | 0,75 |
| Total hours | | | | 3,75 |

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| **Expected student involvement** | | |
| ID | Type of student’s activity | Hours |
| 1. | Classes | 4 |
| 2. | Individual work | 3,75 |
| 3. | Getting familiar with core literature related to the course and prepared course materials | 1 |
| 4. | Preparation for laboratories | 1 |
| 5. | Preparation of own projects | 1 |
| 6. | Preparation to exam | 0 |
| 7. | Preparation of final projects | 1 |
| Total | | 11,75 |

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| **Verification of expected effects** | | | | | | |
| **ID** | **Description** | **Exam** | **Project** | **Activity** | **Own work** | **Other\*** |
| K1 | Definitions and role of SOA in the economy. | - | + | + | + | + |
| K2 | Difference between traditional and SOA approach. | - | + | + | + | + |
| K3 | Gained knowledge about available BI solutions using SOA and trends in this context. | - | + | + | + | + |
| S1 | Skilled in using BI solutions thanks to SOA technology. | - | + | + | + | + |
| S2 | Is able to prepare and create SOA environment for BI analysis. | - | + | + | + | + |
| S3 | Organizes means for communication in a team. | - | + | + | + | + |
| C1 | Ability to work in a group . | - | + | + |  | + |
| C2 | Performing projects in a team. | - | + |  | + | + |
| Wages in overall verification of expected effects in %  (Total 100%) | | - | 50% | 10% | 20% | 20% |

\* Other methods of verification are described in the section “Description of traditional and innovative methods of teaching” of this document.

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| **Core literature** | |
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| 2. | Kenneth C. Laudon and Jane P. Laudon (2009), Essentials of business information systems, seventh edition, Prentice-Hall, NY, 2006 |
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| **Further reading** | |
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| 2 | Erl T., Service-Oriented Architecture: Analysis and Design for Services and Microservices, Prentice Hall, Service Technology, ISBN-10: 0133858588, 12 Dec 2016 |
| 3. | Wik P., Service-Oriented Architecture: Principles and Applications, CreateSpace Independent Publishing Platform, ISBN-10: 1523807946, 21 July 2015 |

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| **Description of traditional and innovative methods of teaching** |
| During classes teachers  provide concrete, real-world examples to demonstrate useful (practical) ideas and then allow the students to work independently and collaboratively to solve the proposed problem. The intended result is that students will make intuitive or global observations about the assigned subject, then use deductive reasoning to provide answers. Moreover, the learning environment embraces the use of [technology in the classroom](http://www.weareteachers.com/blogs/post/2015/04/03/10-rules-for-a-successful-one-to-one-classroom). The teacher selects a specific device, then issues the device to students and educators. Everyone uses the similar device and all are equipped with the similar software and features, so maintaining and managing them is fairly simple. Class instruction and activities are designed around the use of these tools.  This model requires districts to  shell out a sizeable sum for startup and maintenance. If a university isn’t equipped to take on such a feat, you can use the concept through **BYOD (Bring Your Own Device)[[7]](#footnote-7)** pedagogy, where students can use their personal devices for classroom use. However, the lecturer has to be inclusive, and though it certainly seems like it, not every student is sure to own a mobile device. If this is the case, students can perform tasks and activities in groups.  That approach, known as **collaborative learning**, refers to a variety of teaching methods that involve groups of students or students and teachers working together on a class project. Many university districts across the world are adopting this new method.  Collaborative learning can occur between two students or in larger groups. Students discuss concepts or solve problems. The benefits of collaborative learning include:  Development of higher-level thinking, oral communication, self-management, and leadership skills.  Increase in student retention, self-esteem, and responsibility.  Exposure to and an increase in understanding of diverse perspectives.  Preparation for real life social and employment situations.[[8]](#footnote-8)  During activities in this module the use of **personalized learning is assumed**. **Personalized learning**[[9]](#footnote-9) is one of the top buzzwords in education nowadays. It suggests a host of different learning methods that are typically institution-driven. Personalized learning is, and will continue to be learner-driven where learners control their learning and become not just consumers of content but active creators of content, building knowledge through collaboration and connectivity via smart phone apps. Students will be in control not only of when they learn, but will demand that they contribute to their learning through discussions and collaboration, creating content while doing so. This student-driven phenomenon suggests that universities will need to respond and acknowledge that the learner is seeking this kind of personalized learning experience. |

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| **Remarks** |
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1. https://www.heacademy.ac.uk/enhancement/starter-tools/bring-your-own-device-byod [↑](#footnote-ref-1)
2. http://digitalhumanlibrary.com/3-effective-teaching-methods-for-new-teachers/

   http://www.valleymorningstar.com/news/local\_news/article\_de0acb2e-1a2a-11e6-91bf-a30730d8c688.html [↑](#footnote-ref-2)
3. https://onlinelearninginsights.wordpress.com/2016/01/10/three-trends-that-will-influence-learning-and-teaching-in-2016/ [↑](#footnote-ref-3)
4. https://www.heacademy.ac.uk/enhancement/starter-tools/bring-your-own-device-byod [↑](#footnote-ref-4)
5. http://digitalhumanlibrary.com/3-effective-teaching-methods-for-new-teachers/

   http://www.valleymorningstar.com/news/local\_news/article\_de0acb2e-1a2a-11e6-91bf-a30730d8c688.html [↑](#footnote-ref-5)
6. https://onlinelearninginsights.wordpress.com/2016/01/10/three-trends-that-will-influence-learning-and-teaching-in-2016/ [↑](#footnote-ref-6)
7. https://www.heacademy.ac.uk/enhancement/starter-tools/bring-your-own-device-byod [↑](#footnote-ref-7)
8. http://digitalhumanlibrary.com/3-effective-teaching-methods-for-new-teachers/

   http://www.valleymorningstar.com/news/local\_news/article\_de0acb2e-1a2a-11e6-91bf-a30730d8c688.html [↑](#footnote-ref-8)
9. https://onlinelearninginsights.wordpress.com/2016/01/10/three-trends-that-will-influence-learning-and-teaching-in-2016/ [↑](#footnote-ref-9)