

**Table 5.2.** Course specification

<b>Study program :</b> Advanced Data Analytics in Business
<b>Course title:</b> Transaction-Based Analytics & Recommendation Systems
<b>Teachers:</b> Ronald Hochrajter, Zita Bošnjak, Jason Papatnasiu
<b>Status of the course:</b> Elective
<b>Number of ECTS:</b> 7
<b>Condition:</b> None
<p><b>Goal of the course</b></p> <p>The goal of the course is to enable students to preprocess data sets from the web, which are not in a matrix format ready for modelling (Design Matrix) and to use the prepared data within specific Data Mining tasks and Data Science frameworks.</p>
<p><b>Learning outcome</b></p> <p>The students should understand that in most cases transaction-based data contains more than one dimension of information, e.g. online customer action over time. Also, they should understand when and if a data set is not a Design Matrix ready to be used for Machine Learning (supervised and unsupervised) but rather requires a semi-automatic conversion into e.g. Rating Matrices, which can be binary or integer/real-valued. When a conversion into one (or more) rating matrix/matrices is possible then the students should be able to conduct Association Analysis as well as being able to design Recommender Systems using Collaborative Filtering. The difference between Collaborative Filtering and Content-based Filtering is relevant and students should be able to create hybrid recommenders. Students should be aware of the importance of the excerpt of the data used for modeling (e.g. a certain time-frame or demographic structure). Finally students should be able to conduct Feature Engineering if a semi-automatic conversion is not possible, e.g. a RMF analysis for online store data.</p>
<p><b>Content of the course</b></p> <p><i>Theoretical part</i></p> <p>Week 1 – Machine Learning  Week 2 – CRISP-DM Methodology and Web Usage Mining Methodology  Week 3 – Preprocessing Unstructured Data for Exploratory Data Analysis and Modelling  Week 4 and 5 – Different Types of Transaction-based Data - Market Baskets (User/Product), Matchmaking (User-to-User, Item-to-Item)  Week 6 and 7 – Overview of Recommender-Systems - Content-based filtering, Collaborative Filtering (Demography, Time, Location)  Week 8 – Semi-automatic Conversion of Transaction-based Data - Rating Matrices (Binary, Real-valued)  Week 9 – Association Rules;  Week 10 and 11 – Model-based Recommender Systems and Evaluation;  Week 12 – Feature Engineering  Week 13 – Manual Conversion of Transaction Data – RMF Analysis &amp; Customer Grouping  Week 14 – Evaluating Recommender Systems  Week 15 – Ethical Aspects of Intelligent Data Analysis</p> <p><i>Practical part</i></p> <p>Week 1 – Preprocessing of selected unstructured data sets for exploratory analysis and modeling  Week 2 – Conversion of transaction data into a matrix (or multiple matrices) of ranks  Week 3 – Calculating similarities / customer-customer overlaps in different transaction data sets  Week 4 – Calculating similarities / item-item overlaps in different transaction data sets  Week 5 – Selected case studies on content filtering  Week 6 – Selected case studies on collaborative filtering (Demography, Time, Location)  Week 7 – Preprocessing data for associations mining  Week 8 – Mining association rules, influence of support and confidence parameters, reducing the number of rules  Week 9 – Preprocessing transactional data for modeling - clustering and classification  Week 10 – Design, implementation and evaluation of recommendation systems  Week 11 – Data sampling and manual feature engineering  Week 12 – RMF analysis of online store data  Week 13 – 15 – Presentation and analysis of individual students’ work</p>
<p><b>Literature</b></p> <ol style="list-style-type: none"> <li>1. Aggarwal, Charu C. (2016) Recommender systems: The Textbook, Springer</li> <li>2. Jure Leskovec, Anand Rajaraman, Jeff Ullman (2014) Mining of Massive Datasets, Cambridge University Press</li> </ol>

<b>Number of hours of active teaching</b>	<b>Theoretical teaching: 2</b>	<b>Practical teaching: 2</b>	
<b>Teaching methods</b>			
Classroom lectures (multimedia presentations)			
Practical work in a computer lab (relevant software tools and packages)			
Consultations			
Teaching takes place through lectures, exercises and making two assignments and an independent practical work (data analysis task). Proof of knowledge is in the form of 2 colloquia, presentation of the independent practical work (these are pre-examination obligations) and an oral exam.			
Positively assessed pre-examination obligations and two assignments are all valid in the current academic year.			
<b>Assessment (maximum number of points 100)</b>			
<b>Pre-exam obligations</b>	Points	<b>Final exam</b>	Points
Activities during semester	5	Independent practical work	15
Practical part	5	Oral exam	15
Colloquium	2 times 20 points	.....	
Assignments	2 times 10 points		