**Zagadnienia odpowiadają programom studiów I stopnia z r.ak. 2021/22 oraz programom studiów II stopnia z r.ak. 2022/23 bo te roczniki bronią się wg planu w r.ak. 2023/24 lub później.**
**Please note that the topics correspond to AY 2021/22 1st cycle study programmes and AY 2022/23 2nd cycle study programmes since according to the study plan these students will be defending their theses in AY 2023/24 or later.**

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| Stopień / Cycle | Jęz. / Lang. | Przedmiot / Course | Zagadnienia / Topics | DSBA |
|---|---|---|---|---|
| II | ENG | Applied Microeconomics | Experimental methods in economics | x |
| II | ENG | Applied Microeconomics | Risk and uncertainty | x |
| II | ENG | Applied Microeconomics | Time in economics (time value of money and ergodicity of economic processes) | x |
| II | ENG | Applied Microeconomics | Market mechanism and its testing methods | x |
| II | ENG | Applied Macroeconomics | Equilibrium conditions in a static general equilibrium model | x |
| II | ENG | Applied Macroeconomics | Dynamic general equilibrium: Solow Model | x |
| II | ENG | Applied Macroeconomics | Dynamic stochastic general equilibrium: Real Business Cycles (RBC) model | x |
| II | ENG | Applied Macroeconomics | Dynamic stochastic general equilibrium: New Keynesian model | x |
| II | ENG | Advanced Econometrics | Binary dependent variable models. | x |
| II | ENG | Advanced Econometrics | Models for unordered choice analysis. | x |
| II | ENG | Advanced Econometrics | Methods for ordered choice analysis. | x |
| II | ENG | Advanced Econometrics | Panel data modelling | x |
| II | ENG | Advanced Econometrics | Methods of modelling with censored dependent variable | x |
| II | ENG | Advanced Econometrics | Methods of count data modelling | x |
| II | ENG | Advanced Econometrics | Stationarity and non-stationarity in Time Series Modelling. | x |
| II | ENG | Advanced Econometrics | Time series modelling (ARIMA, (AR)DL and extentions) | x |
| II | ENG | Advanced Econometrics | Methods and criteria of econometric models selection | x |
| II | ENG | Applied Finance | Value-at-Risk: definition, models, testing | x |
| II | ENG | Applied Finance | Path dependent option pricing | x |
| II | ENG | Applied Finance | Statistical tools in algorithmic trading | x |
| II | ENG | Applied Finance | Credit risk modelling - scoring cards and expected loss | x |
| II | ENG | R intro | Types of objects in R | x |
| II | ENG | R intro | Importance of clean code writing and error testing | x |
| II | ENG | R intro | Specificies of open sourse software - relation between base R and packages | x |
| II | ENG | R intro | Role of vectors in R | x |
| II | ENG | R intro | Processing of long vs wide data - transformations and usage | x |
| II | ENG | R intro | Typical data manipulation and cleaning techniques | x |
| II | ENG | Python and SQL | Basic data structures in Python. | x |
| II | ENG | Python and SQL | Relational database management systems | x |
| II | ENG | Python and SQL | Functions and Objects in Python programming | x |
| II | ENG | Python and SQL | Data science libraries in Python | x |
| II | ENG | Python and SQL | Types of tables joining in SQL | x |
| II | ENG | Python and SQL | Role of indexing in SQL | x |
| II | ENG | Algorithms for Data Science | Asympotitc notation: simplification and comparison of given running time functions | x |
| II | ENG | Algorithms for Data Science | Running time analysis and application of the Master Theorem | x |
| II | ENG | Algorithms for Data Science | Recursion with memoization and comparison to dynamic programming | x |
| II | ENG | Algorithms for Data Science | Properties and use cases of classic search and sorting algorithms (binary search, linear search, insertion sort, merge sort, heap sort, counting sort) | x |
| II | ENG | Algorithms for Data Science | Properties and use cases of important data structures (array indexed by keys implementing a dictionary, AVL tree, hash table, heap, stack, queue) | x |
| II | ENG | Algorithms for Data Science | Graph algorithms (Breadth-First Search, Dijkstra's algorithm, Kruskal's algorithm) | x |
| II | ENG | Statistics and Explanatory Data Analysis | Role of Explanatory Data Analysis in modelling process | x |
| II | ENG | Statistics and Explanatory Data Analysis | Data visualization methods depending on variable type and purpose of visualization | x |
| II | ENG | Statistics and Explanatory Data Analysis | Typical challenges with data and methods of data adjustments | x |

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|---|---|---|---|---|
| II | ENG | Statistics and Explanatory Data Analysis | Properties of (differences between) central location measures in statistical testing | x |
| II | ENG | Statistics and Explanatory Data Analysis | Association measures (Correlation and alternatives for different type of data) | x |
| II | ENG | Statistics and Explanatory Data Analysis | Normality assumption and central limit theorem in statistical testing | x |
| II | ENG | Statistics and Explanatory Data Analysis | Nominal data testing | x |
| II | ENG | Statistics and Explanatory Data Analysis | Methods of two sample testing | x |
| II | ENG | Statistics and Explanatory Data Analysis | ANOVA testing and its alternatives | x |
| II | ENG | Introduction to Data Science | Importance of soft skills in data science. | x |
| II | ENG | Introduction to Data Science | Applications of datascience. | x |
| II | ENG | Introduction to Data Science | Different types of machine learning. | x |
| II | ENG | Unsupervised Learning | Different concepts of distance measurement (e.g. for quantitative, qualitative, binary data) | x |
| II | ENG | Unsupervised Learning | Clustering with k-means, CLARA, PAM and hierarchical approach | x |
| II | ENG | Unsupervised Learning | Clustering based on density (e.g. DBSCAN) | x |
| II | ENG | Unsupervised Learning | Clustering quality measures | x |
| II | ENG | Unsupervised Learning | Dimensionality reduction with distance-based algorithms (e.g. MDS) | x |
| II | ENG | Unsupervised Learning | Dimensionality reduction with variance-based algorithms (e.g. PCA) | x |
| II | ENG | Unsupervised Learning | Association rules to find co-occurence of features | x |
| II | ENG | Unsupervised Learning | Schemes of cutting variables into intervals in the context of association rules | x |
| II | ENG | Webscraping and Social Media Scraping | Various types of bots | x |
| II | ENG | Webscraping and Social Media Scraping | Tools used for web scraping | x |
| II | ENG | Webscraping and Social Media Scraping | Efficiency of web scraping tools | x |
| II | ENG | Webscraping and Social Media Scraping | Regulatory restrictions on web scraping | x |
| II | ENG | Webscraping and Social Media Scraping | Responsible and polite web scraping | x |
| II | ENG | Webscraping and Social Media Scraping | XML, HTML, tags | x |
| II | ENG | Advanced Programming in R | Types of programming available in R | x |
| II | ENG | Advanced Programming in R | Object-oriented programming paradigm | x |
| II | ENG | Advanced Programming in R | Efficiency of vectorised vs loop-based code in R | x |
| II | ENG | Advanced Programming in R | Importance and types of defensive programming techniques | x |
| II | ENG | Advanced Programming in R | Role of tidyverse for data processing in R | x |
| II | ENG | Advanced Programming in R | Main concepts behind Shiny application | x |
| II | ENG | Advanced Programming in R | Reactive programming concept in Shiny | x |
| II | ENG | Advanced Programming in R | User defined functions in R - creating and testing | x |
| II | ENG | Advanced Visualisation in R | Visualistation techniques for categorical variables | x |
| II | ENG | Advanced Visualisation in R | Visualistation techniques for continuous variables | x |
| II | ENG | Advanced Visualisation in R | Visualistation techniques for 1D distribution | x |
| II | ENG | Advanced Visualisation in R | Visualistation techniques for 2D distribution | x |
| II | ENG | Advanced Visualisation in R | Visualisation techniques for Machine Learning Classification models | x |
| II | ENG | Advanced Visualisation in R | Role of ggplot2 package for data visualisation in R | x |
| II | ENG | Machine Learning I | Feature selection methods | x |
| II | ENG | Machine Learning I | Machine learning algorithms vs traditional econometric models | x |
| II | ENG | Machine Learning I | Cost function, evaluation metrics for regression and classification | x |
| II | ENG | Machine Learning I | Cross-validation, aim and methods | x |
| II | ENG | Machine Learning I | K-nearest neighbours algorithm | x |
| II | ENG | Machine Learning I | Support Vector Machine and Support Vector Regression | x |
| II | ENG | Machine Learning I | Regularization methods: ridge, LASSO, elastic net | x |
| II | ENG | Machine Learning I | Feature engineering | x |

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| II | ENG | Machine Learning I | Rebalancing methods | x |
| II | ENG | Machine Learning II | Metrics to evaluate regression and classification models | x |
| II | ENG | Machine Learning II | The structure of decision tree and its mechanism | x |
| II | ENG | Machine Learning II | Advantages and disadvantages of decision trees | x |
| II | ENG | Machine Learning II | Differences between bagging and boosting techniques | x |
| II | ENG | Machine Learning II | Application of gradient descent concept in machine learning algorithms | x |
| II | ENG | Machine Learning II | Types of ensemble learning | x |
| II | ENG | Machine Learning II | Difference between Gradient boosting and XGboosting | x |
| II | ENG | Machine Learning II | Elements of neural network and its mechanisms | x |
| II | ENG | Machine Learning II | Applications of neural networks and their specificities | x |
| II | ENG | Text Mining and Social Media Mining | Text preprocessing | x |
| II | ENG | Text Mining and Social Media Mining | Regular expressions | x |
| II | ENG | Text Mining and Social Media Mining | Text categorization | x |
| II | ENG | Text Mining and Social Media Mining | Text clustering | x |
| II | ENG | Text Mining and Social Media Mining | Topic modeling | x |
| II | ENG | Text Mining and Social Media Mining | Sentiment analysis | x |
| II | ENG | Text Mining and Social Media Mining | Information diffusion in social networks | x |
| II | ENG | Text Mining and Social Media Mining | Word embeddings | x |
| II | ENG | Text Mining and Social Media Mining | Neural networks in text mining | x |
| II | ENG | Big Data Analytics | Columnar storage - concept, examples, use cases | x |
| II | ENG | Big Data Analytics | MapReduce - concept, examples, use cases | x |
| II | ENG | Big Data Analytics | Fault tolerance & high availability in Big Data - definition, considerations | x |
| II | ENG | Reproducible Research | Differences between repetition, reproduction and replication | x |
| II | ENG | Reproducible Research | General rules of code documentation and clean coding | x |
| II | ENG | Reproducible Research | Version control systems and collaboration - why and how | x |
| II | ENG | Reproducible Research | Reproducible environments - problems and solutions | x |
| II | ENG | Reproducible Research | Common problems with reproducibility and replication | x |
| II | ENG | Reproducible Research | Metaanalysis - reasons and goals | x |