

DATA ANALYTICS AND VISUALIZATION

Course code	<i>FUN137</i>
Compulsory in the programmes	<i>Entrepreneurship and Innovation</i>
Level of studies	<i>Undergraduate</i>
Number of credits	<i>6 ECTS (48 in-class hours, 4 hours of examination, 4 hours of consultations, 106 hours of self-study)</i>
Course coordinator (title and name)	<i>Kristina Aldošina</i>
Prerequisites	<i>Computer Programming</i>
Language of instruction	<i>English</i>

THE AIM OF THE COURSE

This course explores how to use statistics and Python to turn data into meaningful insight. The course emphasizes thinking statistically about uncertainty, patterns, and relationships in real-world data, and using Python as a practical tool to implement that thinking. Students learn to move from questions to analyses to visual narratives that clearly communicate evidence and conclusions. By the end, they will be comfortable using Python-based workflows to support data-driven reasoning and decision-making.

MAPPING OF COURSE LEVEL LEARNING OUTCOMES (OBJECTIVES) WITH DEGREE LEVEL LEARNING OBJECTIVES (See Annex), ASSESMENT AND TEACHING METHODS

Course level learning outcomes (objectives)	Learning objectives for BSc in Business Management	Assessment methods	Teaching methods
CLO1. To understand the basic terminology and principles used in data analytics	BLO1.1, BLO1.2	Midterm exam 1, midterm exam 2, group project	Lectures, seminars
CLO2. To understand the basic concepts of data gathering, wrangling, cleaning, and statistical analysis	BLO1.1, BLO1.2, BLO3.2	Midterm exam 1, midterm exam 2, group project	Lectures, seminars
CLO3. Ability to perform seamless and meaningful data analysis using Jupyter Notebook and Python modules	BLO1.2, BLO3.2	Group project	Lectures, seminars, self-studies

ACADEMIC HONESTY AND INTEGRITY

The ISM University of Management and Economics Code of Ethics, including cheating and plagiarism are fully applicable and will be strictly enforced in the course. Academic dishonesty and cheating can and will lead to a report to the ISM Committee of Ethics.

COURSE OUTLINE

Topic	In-class hours	Readings
<i>Course orientation.</i> 1. All about data: data types, data analysis steps, visualizations. Jupyter notebook.	4	<u>Data</u> , <u>data types</u> , <u>data analysis</u> , <u>visualizations</u> , <u>Jupyter notebook code cells</u> , <u>Jupyter notebook markdown cells</u>
2. Numpy module. Data arrays and vectorized operations.	4	[1] ch. 4
3. Pandas module (1). Series, DataFrame. Retrieving data from files. Slicing and sorting. Automatic descriptive analysis.	4	[1] ch. 5 – 8, 10
4. Pandas module (2). Filtering. Aggregations. Grouping. Missing values. Adding custom columns.	4	
5. Pandas module (3). Combining data from multiple files.	4	
6. Visualizations. Plots with pandas, matplotlib, and seaborn modules.	4	<u>Pandas</u> , <u>matplotlib</u> , <u>seaborn</u>
Midterm exam 1	2	
7. Descriptive statistics. Measures of central tendency (mean, median, mode), measures of location and variability. <i>Modules:</i> numpy, pandas, matplotlib, seaborn.	4	[2] ch.1.2, 2.1, 2.2
8. Introduction to hypothesis testing. Comparison of means (one-sample t-test, independent-samples t-test, paired-samples t-test, ANOVA). Visualization of mean differences. <i>Modules:</i> numpy, pandas, scipy.stats, matplotlib, seaborn.	4	[2] ch. 5.1 – 5.3, 7.1, 7.2, 7.5
9. Correlation analysis. Categorical data analysis. Visualization of dependencies. <i>Modules:</i> numpy, pandas, matplotlib, seaborn.	4	[2] ch. 2.2, 6.1 – 6.4, 8.1, 8.2
10. Regression analysis. Simple and multiple regression. Dummy variables, interaction terms, visualization of marginal effects. <i>Modules:</i> numpy, pandas, sklearn, matplotlib, seaborn.	4	[2] ch. 8.1 – 8.4, 9.2, 9.3
11. Logistic regression. Prediction and classification. <i>Modules:</i> numpy, pandas, sklearn, matplotlib, seaborn.	4	[2] ch. 9.5
Midterm exam 2	2	
Total:	48	
Defense of group projects	4	

FINAL GRADE COMPOSITION

Type of assignment	%
Individual assignments	50
Midterm exam 1 (topics 1 – 6)	20
Midterm exam 2 (topics 7 – 10)	30
Group assignments	50
Group project	50
Total:	100

DESCRIPTION AND GRADING CRITERIA OF EACH ASSIGNMENT

The overall assessment of the course (total maximum of 100% is possible) will be composed from evaluations of 3 assignments which are described as follows:

1. **Midterm exams** are written in class closed-book individual examinations that together value **50%** of the final evaluation. Each midterm consists of multiple-choice and open questions both on theory and on code. Duration of each midterm is two academic hours. Students are allowed to use non-text, non-graphical calculators (ones that are suitable for Lithuanian state math exam), and language dictionary (without explanations and definitions).
2. **Group project** is both technical and creative task and values **50%** of the final evaluation. For this project, a group of students will have to complete full analysis: to decide on topic, to find data, to raise hypotheses, to prepare Jupyter notebook corresponding to the given requirements, to present report to the lecturer and groupmates, and to defend it (answer questions). Detailed rules and requirements for this assignment will be announced on e-learning.

RETAKE POLICY

In case of a negative final evaluation, retake is possible. It will cover material of the whole course and will comprise **50%** of the final grade. Marks earned for midterm exams will be annulled, and mark earned for the group project will remain. The retake is 2 academic hours long written in class closed-book individual examination. Students are allowed to use non-text, non-graphical calculators (ones that are suitable for Lithuanian state math exam), and language dictionary (without explanations and definitions).

ADDITIONAL REMARKS

1. During this course, students are expected to use personal computers.
2. Assessment requirements, procedures, and other important regulations may be communicated verbally during lectures. Failure to attend a lecture where such information is provided does not exempt the student from the responsibility to comply with these requirements.
3. Precision of composite evaluations is left intact (up to 2 decimal places) until the end of semester and only the final evaluation will be subject to rounding.
4. If a student doesn't participate in the final project, his/her maximum evaluation for the course can be only 5 out of 10.

READINGS

1. [Python for Data Analysis](#)
2. [OpenIntro Statistics](#)

ADDITIONAL READINGS

1. <https://www.w3schools.com/python/default.asp>
2. <https://infogram.com/blog/storytelling-with-data-visualization-the-ultimate-guide/>
3. <https://www.storytellingwithdata.com/chart-guide>



4. https://datamineaz.org/readings/psds_chp1.pdf
5. <https://greenteapress.com/thinkstats2/thinkstats2.pdf>

DEGREE LEVEL LEARNING OBJECTIVES

Learning objectives for the Bachelor of Business Management

Programmes:

*International Business and Communication,
Business Management and Marketing, Finance,
Industrial Technology Management*

Learning Goals	Learning Objectives
Students will be critical thinkers	BLO1.1. Students will be able to understand core concepts and methods in the business disciplines
	BLO1.2. Students will be able to conduct a contextual analysis to identify a problem associated with their discipline, to generate managerial options and propose viable solutions
Students will be socially responsible in their related discipline	BLO2.1. Students will be knowledgeable about ethics and social responsibility
Students will be technology agile	BLO3.1. Students will demonstrate proficiency in common business software packages
	BLO3.2. Students will be able to make decisions using appropriate IT tools
Students will be effective communicators	BLO4.1. Students will be able to communicate reasonably in different settings according to target audience tasks and situations
	BLO4.2. Students will be able to convey their ideas effectively through an oral presentation
	BLO4.3. Students will be able to convey their ideas effectively in a written paper

Learning objectives for the Bachelor of Social Science

Programmes:

*Economics and Data Analytics,
Economics and Politics*

Learning Goals	Learning Objectives
Students will be critical thinkers	ELO1.1. Students will be able to understand core concepts and methods in the key economics disciplines
	ELO1.2. Students will be able to identify underlying assumptions and logical consistency of causal statements
Students will have skills to employ economic thought for the common good	ELO2.1. Students will have a keen sense of ethical criteria for practical problem-solving
Students will be technology agile	ELO3.1. Students will demonstrate proficiency in common business software packages
	ELO3.2. Students will be able to make decisions using appropriate IT tools
Students will be effective communicators	ELO4.1. Students will be able to communicate reasonably in different settings according to target audience tasks and situations
	ELO4.2. Students will be able to convey their ideas effectively through an oral presentation
	ELO4.3. Students will be able to convey their ideas effectively in a written paper