Data Analytics and Visualization

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| Course code | *FUN137* |
| Compulsory in the programmes | *…* |
| Level of studies | *Undergraduate* |
| Number of credits | *6 ECTS (48 in-class hours + 6 consultation hours + 2 exam hours, 104 individual work hours)* |
| Course coordinator (title and name) | *Assist. Prof. Dr. Simonas Čepėnas* |
| Prerequisites | *None* |
| Language of instruction | *English* |

**THE AIM OF THE COURSE:**

The course aims to (1) familiarize students with the basics of data analytics, (2) concepts of data types, data gathering, wrangling, and cleaning, (3) linear regression and time-series modeling, and (4) R programming, which will be used to analyze and visualize data, models and forecasts. By the end of the course students will have empirical tools at their disposal to analyze real world problems.

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

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| 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, final exam, seminars | Lecture, Seminars |
| CLO2. To understand the basic concepts of data gathering, wrangling, and cleaning | BLO1.1., BLO1.2., BLO3.1. | Midterm, final exam, seminars, problem set | Lectures, Seminars |
| CLO3. Introduce students to key concepts of statistics. | BLO1.1., BLO1.2. | Midterm, final exam, seminars, problem set | Lectures, Seminars |
| CLO4. To understand the basics of linear regression. | BLO1.1., BLO1.2., BLO3.1. | Final exam, seminars, problem set | Lectures, Seminars |
| CLO5. To learn about forecasting using time-series data. | BLO1.1., BLO1.2., BLO3.1. | Final exam, seminars, problem set | Lectures, Seminars |
| CLO6. Visualize data, models, and forecasts. | BLO1.1., BLO1.2., BLO3.1., BLO3.2., BLO4.1. | Seminars, problem set, final exam. | Lectures, Seminars |
| CLO7. To learn about R programming and tools that make it more efficient, such as R Studio, and R Markdown. | BLO1.2., BLO3.1., BLO3.2. | Seminars, problem set, final exam | Lectures, Seminars |

**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**

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| **Topic** | **In-class hours** | **Readings** |
| 1. What is science? How social sciences differ from natural sciences? | 4 | Daniel E Lieberman, [Upending the Expectations of Science](https://www.nytimes.com/2002/07/14/opinion/upending-the-expectations-of-science.html); |
| 2. Introduction to R programming and main concepts: objects, vectors, lists, datasets | 4 | Grolemund, G., & Wickham, H [Ch. 2, 26] |
| 3. Data and its characteristics: normality, population and sample, descriptive statistics | 4 | TBA |
| 4. Datasets and R: gathering, wrangling, and cleaning of data | 4 | Grolemund, G., & Wickham, H [Ch. 4, 5, 6, 11] |
| 5. Introduction to GGPLOT and data visualization | 4 | Grolemund, G., & Wickham, H [ Ch. 3] |
| 6. Midterm examination | 4 |  |
| 7. Hypothesis testing: variance, correlation, t-test | 4 | TBA |
| 8. Hypothesis testing in R: analysis and visualization | 4 | Grolemund, G., & Wickham, H [Ch. 22, 23, 24] |
| 9. Introduction to regression analysis | 4 | TBA |
| 10. Linear regression in R: analysis and visualization | 4 | Grolemund, G., & Wickham, H [Ch. 25] |
| 11. Time series models and forecasting | 4 | TBA |
| 12. Time series in R: analysis and visualization | 4 | TBA |
|  | **Total: 48 hours** |  |
| CONSULTATIONS | 6 |  |
| FINAL EXAM | 2 |  |

**FINAL GRADE COMPOSITION**

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| **Type of assignment** | **%** |
| **Individual assignments** | 100% |
| Attendance | 10% |
| Problem Sets | 20% |
| Midterm examination | 35% |
| Final examination | 35% |
| **Group assignments** | 0% |
| **Total:** | **100** |

**DESCRIPTION AND GRADING CRITERIA OF EACH ASSIGNMENT**

*(Provide short descriptions and grading criteria of each assignment)*

Attendance is extremely important for this class: we will study fundamental concepts and R programming, which means that even a single missed class will likely result in a significant knowledge gap. To incentivize your attendance, it makes up 10% of your grade.

Problem set will facilitate your learning of R programming and constitute 20% of your final grade. This will be a semester long homework assignment.

Midterm exam will consist of multiple-choice and modeling questions. It will comprise 35% of the final grade. The midterm will be based on topics 1-5.

During the final exam you will use R programming language to answer open-ended questions, clean the data, run statistical models, and visualize the results. It will make-up 35% of the final grade. The exam will be based on topics 6-12.

**RETAKE POLICY**

*(Provide short description and percentage of the final grade)*

In case of a negative final grade, students can sit for a retake exam. Such an exam will cover all course material. The weight of a retake is 70%. Grades from attendance and problem sets are not subject to a retake but their evaluation (if positive) will count towards the final grade with the retake exam.

**ADDITIONAL REMARKS**

The syllabus is subject to small changes. Specific chapters from the books are TBA. All readings will be available online on the course website.

**READINGS**

Grolemund, G., & Wickham, H. (2017). *R for Data Science*. O’Reilly Media.

**ADDITIONAL READINGS**

TBA

**ANNEX**

**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*

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| **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*

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| --- | --- |
| **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 |