Appendix No. 1.5 to the Resolution No. 61/2025
of the Rector of the University of Rzeszów

SYLLABUS

REGARDING THE QUALIFICATION CYCLE FROM 2026 TO 2029
ACADEMIC YEAR 2028/2029

1. BASIC COURSE/MODULE INFORMATION

Course/Module title	Data Analysis in R System
Course/Module code *	
Faculty (name of the unit offering the field of study)	Faculty of Exact and Technical Sciences
Name of the unit running the course	Institute of Mathematics
Field of study	Mathematics
Qualification level	First-cycle studies
Profile	General academic
Study mode	Full-time
Year and semester of studies	Year 3, semester 5
Course type	Specialisation course
Language of instruction	English
Coordinator	Sebastian Wójcik, PhD
Course instructor	Sebastian Wójcik, PhD

* - as agreed at the faculty

1.1.Learning format – number of hours and ECTS credits

Semester (no.)	Lectures	Classes	Laboratories	Seminars	Practical classes	Internships	others	**ECTS credits**
5			45					3

1.2. Course delivery methods

☒ conducted in a traditional way
☐ involving distance education methods and techniques

1.3. Course/Module assessment (exam, pass with a grade, pass without a grade)

Laboratory classes – pass with a grade, lectures – pass without a grade.

2. PREREQUISITES

Knowledge of basic measures of central tendency and dispersion (secondary school level), basics of programming.

3. OBJECTIVES, LEARNING OUTCOMES, COURSE CONTENT, AND INSTRUCTIONAL METHODS

3.1. Course/Module objectives

O1	To familiarize students with selected capabilities of the R environment in the scope of data processing and analysis.
O2	Practicing the skills of efficient use of the R environment in creating various analyses.

3.2. COURSE/MODULE LEARNING OUTCOMES (TO BE COMPLETED BY THE COORDINATOR)

Learning Outcome	The description of the learning outcome defined for the course/module	Relation to the degree programme outcomes
LO_01	The student knows and understands the capabilities of the R environment in the scope of data processing and analysis.	K_W06,K_W07
LO_02	The student is able to apply the R environment to create various analyses in the field of basic statistics, statistical methods and models.	K_U15,K_U22
LO_03	The student is ready to fulfill social obligations resulting from the nature of work typical for graduates possessing skills in data processing and analysis in the R system.	K_K04
LO_04	The student is ready to solve problems and perform tasks in which the R environment is applied.	K_K05
LO_05	The student is ready to responsibly perform professional roles requiring competencies related to the use of the R environment.	K_K07

3.3. Course content (to be completed by the coordinator)

A. Lectures

B. Classes, laboratories, seminars, practical classes

Content outline
Linear models, the ordinary least squares method (OLS), properties of OLS estimators. Building a linear model in R, estimation of model, model statistics and their interpretation. Testing linear models: normality, autocorrelation and heteroscedasticity of residuals. Taxonomic methods: the idea of synthetic indicators, absolute reference method and simple additive ranking. Inequality measures for ordinal and ratio scale data. Measuring inequality using quality of life indicators. Introduction to Machine Learning: clustering objects using the k-means method, classification using the k-nearest neighbors method.

3.4. Methods of Instruction

Computer-based work, practical project work

4. Assessment techniques and criteria

4.1 Methods of evaluating learning outcomes

Learning outcome	Methods of assessment of learning outcomes (e.g. test, oral exam, written exam, project, report, observation during classes)	Learning format (lectures, classes,...)
LO-01	Test	lab
LO-02	Project	lab
LO-03	Project	lab
LO-04	Observation during classes	lab
LO-05	Observation during classes	lab

4.2 Course assessment criteria

The course is assessed based on a computer-based test and a project involving data analysis assigned by the instructor. Passing requires achieving at least a satisfactory grade in both the test and the project. Final grade scale: below 50% – fail 50–59% – satisfactory (3.0)

60–69% – satisfactory plus (3.5) 70–79% – good (4.0) 80–89% – good plus (4.5) 90–100% – very good (5.0)

5. Total student workload needed to achieve the intended learning outcomes – number of hours and ECTS credits

Activity	Number of hours
Course hours	45
Other contact hours involving the teacher (consultation hours, examinations)	2
Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.)	40
Total number of hours	87
Total number of ECTS credits	3

* One ECTS point corresponds to 25-30 hours of total student workload

6. Internships related to the course/module

Number of hours	*Not applicable*
Internship regulations and procedures	*Not applicable*

7. Instructional materials

Compulsory literature: Ott L., An introduction to statistical methods and data analysis / Lyman Ott. - 2 ed. - Boston : Duxbury Press, 1984. Introduction to Econometrics with R / Christoph Hanck, Martin Arnold, Alexander Gerber, and Martin Schmelzer (online https://www.econometrics-with-r.org/) wINEQ: Inequality Measures for Weighted Data / Sebastian Wójcik (online https://cran.r-project.org/web/packages/wINEQ/, vignettes)
Complementary literature: Douglas A., Roos D., Mancini F., Couto A. & Lusseau D. An Introduction to R (online https://intro2r.com/) Introduction to Machine Learning with R. Rigorous Mathematical Analysis / Scott V. Burger, O'Reilly Media Learning RStudio for R Statistical Computing. Learn to effectively perform R development, statistical analysis, and reporting with the most popular R IDE / Mark van der Loo, Edwin de Jonge, Packt Publishing

Approved by the Head of the Department or an authorised person