

M122	<b>Multivariate analysis</b>	L	P	S	ECTS 7
		2	1	1	

**Course objectives.** Understand basic models for statistical inference on a random vector, and apply multivariate analysis methods to data analysis and statistical modelling.

**Prerequisites.** Probability. Statistics.

**Course content.**

1. Multiple linear regression and applications (distribution estimation and theory, hypothesis testing, deviation from classical assumptions, model development, variable selection, variable transformations, categorical independent variables, design matrix, ANOVA).
2. Generalized linear models (Poisson dependent variable, binary (or binomial) dependent variable).
3. Factor analysis.
4. Cluster analysis.

**LEARNING OUTCOMES**

No.	LEARNING OUTCOMES
1.	Apply statistical models covered by course content for statistical inference.
2.	Use computers and appropriate software packages as a tool when analysing data.
3.	To create statistical models for real problems and to judge their suitability.
4.	Analyse the properties of the estimators and the statistical tests they use.
5.	Mathematically prove the validity of the procedures and formulas used in statistical inference.
6.	Present the created models and their application possibilities to laymen and experts.

**RELATING THE LEARNING OUTCOMES, ORGANIZATION OF THE EDUCATIONAL PROCESS AND ASSESSMENT OF THE LEARNING OUTCOMES**

TEACHING ACTIVITY	ECTS	LEARNING OUTCOME **	STUDENT ACTIVITY*	EVALUATION METHOD	POINTS	
					min	max
Attending lectures and exercises	2	1-5	Lecture attendance, discussion, team work and independent work on given tasks	Attendance lists, tracking activities	0	5
Homework	1	5	Solving theoretical and practical problems	Evaluation	0	5
Written exam (Mid-terms)	1	1-5	Preparing for written exam	Evaluation	25	45
Seminar	2	1, 2,6	Writing seminar, making and preparing presentation	Evaluation of seminar and presentation	25	45
<b>TOTAL</b>	<b>7</b>				<b>50</b>	<b>100</b>
Final exam*	5	1-5	Revision	Oral exam	25	50

\* a student who is not released from the oral part of the exam by means of a midterm exam (continuous assessment) has the opportunity to access the oral part of the exam in standard exam periods.

**Teaching methods and student assessment.** Lectures and seminars are obligatory. During the course, statistical software will be used (e.g. R). The final exam is oral, and it is taken after the lectures have been completed, the exercises completed, the minimum number of credits at the midterm examinations, and the completed and defended seminar work. Acceptable results obtained at the midterm tests written by the student during the semester may replace the oral part of the exam. Student may write homework during the course to improve their final grade.

**Can the course be taught in English:** Yes

**Basic literature:**

1. F.E. Harrell, Jr. Regression Modeling Strategies with Applications to Linear Models, Logistic Regression and Survival Analysis, Springer, New York, 2001.
2. A. Basilevsky, Statistical Factor Analysis and Related Models: Theory and Applications, Wiley-Interscience, New York, 1994.
3. J.M. Wooldridge, Introductory Econometrics. A Modern Approach. South-Western, Cengage Learning, Mason, 2013.

**Recommended literature:**

1. Bruce Hansen, Econometrics, University of Wisconsin, <http://www.ssc.wisc.edu/~bhansen/econometrics/>, 2019.
2. Jeffrey M. Wooldridge, Econometric Analysis of Cross Section and Panel Data, The MIT Press, Cambridge, London, 2010.
3. G.A.F. Seber, Linear Regression Analysis, J. Wiley & Sons., New York, 1977.
4. M.J. Crawley, The R Book, J. Wiley & Sons, 2007.
5. L. Fahrmeier, G. Tutz, Multivariate Statistical Modeling Based on Generalized Linear Models, Springer, New York, 2001.
6. P. McCullagh, J.A. Nelder, Generalized Linear Models, CRC Press, 1989.
7. R.L. Gorsuch, Factor Analysis, Lawrence Erlbaum Assoc. 1983
8. K.A. Bollen, Structural equations with latent variables, Wiley-Interscience, 1989