M120	**Statistics**	L	P	S	ECTS
		2	2	1	7

Course objectives. Understanding mathematical statistics methods and training them to apply these methods to data analysis.

Prerequisites. Probability.

Course content.

1. Statistical model. (Definition and examples of statistical model, parametric statistical model, identifiability, sample distributions.)
2. The estimator and its properties. (Optimality in estimation (minimax and Bayesian approach), sufficient and complete statistics, results on unbiased estimators of minimum variance, asymptotic properties of estimators.)
3. Parameter estimation methods. (Substitution Principle, Method of Moments, Maximum Likelihood Method).
4. Confidence intervals.
5. Testing statistical hypotheses. (Neyman-Pearson approach, generalized likelihood ratio test, duality of confidence interval and statistical test.)
6. Systematization and application of procedures for statistical inference of a single variable, for comparisons of variables and for analysis of relationships between variables.

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.	Critically study and apply new literature to data analysis.
7.	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	2,5	1-7	Lecture attendance, discussion, team work and independent work on given tasks	Attendance lists, tracking activities	0	5
Homework	0,5	1-6	Solving theoretical and practical problems	Evaluation	0	5
Written exam, theory (Mid-terms)	1	1-5	Preparing for written exam	Evaluation	10	20
Written exam, statistical practice	1	2	Preparing for written exam	Evaluation	10	20

(Mid-terms)						
Seminar	1	1,2,7	Writing seminar, making and preparing presentation	Evaluation of seminar and presentation	10	20
Final exam	1	1-6	Revision	Oral exam	20	30
TOTAL	7				50	100

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. Student may write homework during the course to improve their final grade.

Can the course be taught in English: Yes

Basic literature:

1. John A. Rice, Mathematical Statistics and Data Analysis, Brooks/Cole, Cengage Learning, 2007.
2. L. E. Bain and M. Engelhardt - Introduction to Probability and Mathematical statistics, Brooks/Cole, Cengage Learning, 1992.

Recommended literature:

1. R. Pruim, Foundations and Applications of Statistics. In Introduction Using R, AMS, Providence, 2018.
2. M. J. Crawley, The R Book, J. Wiley & Sons, 2007.
3. K. Knight, Mathematical Statistics, Chapman & Hall/CRC, Boca Raton-Washington, 1999.
4. R. C. Mittelhammer, Mathematical statistics for economics and business, Springer, 1996.
5. E. L. Lehman, Testing Statistical Hypothesis, Springer, 1997.
6. E. L. Lehman, G. Casella, Theory of Point Estimation, Springer, 1998.