Obuda University John von Neumann Faculty of Informatics			*Institute of Applied Mathematics*	
Name and code: Probability theory and the basics of mathematical statistics NMXVS1PMNE			**Credits*: 3*** *2022/23 year I. semester*	
Subject lecturers: István Mező				
Prerequisites (with code):				
Weekly hours:	Lecture: 2	Seminar.:1	Lab. hours: 0	Consultation:0
Way of assessment:	exam			

Course description:

Goal: To lay the foundations of probability theory and statistics

Course description: Kolmogorov probability space; law of total probability; conditional probability; Bayes' theorem; probability distribution function; expectation, variance and moments; special distributions (Poisson, uniform, etc.). Moment generating function, characteristic function. Joint distributions; random vectors; independence; covariance matrix. General definition and properties of conditional expectation; law of total expectation. Types of convergence; Borel-Cantelli lemmas; laws of large numbers; sums of random variables; central limit theorems. Statistical space; sample; statistics; ordered sample; empirical distribution function; Glivenko-Cantelli theorem. Estimation techniques, maximum-likelihood estimation, method of moments, method of least squares. Hypothesis testing; confidence intervals. Parametric and nonparametric tests.

Lecture schedule	
Education week	*Topic*
1.	Kolmogorov probability space and related notions. Examples.
2.	Law of total probability; conditional probability, Bayes' theorem. Random variables and their properties. Probability distribution function; expectation, variance and moments
3.	Special discrete and continuous random variables and their properties (Poisson, uniform distributions, etc.)
4.	Continuation of lecture 3 plus moment generating functions, characteristic function
5.	Joint distributions; random vectors; independence; covariance matrix.
6.	General definition and properties of conditional expectation; law of total expectation.
7.	Types of convergence; Borel-Cantelli lemmas; laws of large numbers; sums of random variables; central limit theorems.
8.	Continuation of lecture 7.
9.	Statistical space; sample; statistics; ordered sample; empirical distribution function; Glivenko-Cantelli theorem.
10.	Continuation of lecture 9.
11.	Estimation techniques, maximum-likelihood estimation, method of moments, method of least squares.
12.	Hypothesis testing; confidence intervals
13.	Parametric and nonparametric tests
14.	Summary

Midterm requirements: written exam

Education week	Topic
7.	First 6 weeks
14.	8-13 weeks

Final grade calculation methods

Achieved result	Grade
89%-100%	excellent (5)
76%-88<%	good (4)
63%-75<%	average (3)
51%-62<%	satisfactory (2)
0%-50<%	failed (1)

Type of exam: written exam

Type of replacement: cf. TVSZ

References

Mandatory: https://www.math.ucdavis.edu/~gravner/MAT135A/resources/lecturenotes.pdf

Recommended:
Gut, A.: An Intermediate Course of Probability, 2nd ed.; Springer; 2009.
Gut, A.: Probability: A Graduate Course; Springer; 2005.