

Course Title: Statistics I: Probability and Estimation

Course Unit Code: 9079
Level of course: Undergraduate
Year of study: 1st year
Semester/trimester: Winter (1st Semester)
Number of credits allocated: 6 ECTS credits
Name of lecturer: To be announced

Objectives of the course:

The students will be able to compute probabilities of events, expected values and variances of discrete and continuous random variables. They will also be able to apply the central limit theorem and find estimates of unknown parameters. Furthermore, they will have the necessary background for the construction of confidence intervals of the mean value and the variance of a normal population. The students will be able to solve realistic problems that are related with random experiments.

Prerequisites and co-requisites

Knowledge of Calculus

Recommended optional programme components

None

Course contents

Random Experiment. Sample Space. Axioms of Kolmogorov. Properties of Probabilities. Law of total probability. Bayes's Rule. Discrete and Continuous random variables. Expected value and variance of random variables. Binomial distribution. Geometrical Distribution. Poisson Distribution. Hypergeometrical Distribution. Uniform Distribution. Exponential Distribution. Normal Distribution. Central Limit Theorem. Law of Large Numbers. Estimator of unknown parameter. Unbiased Estimator. Consistent Estimator. Sufficient Estimator. Rao-Blackwell Estimator. Cramer-Rao lower bound. Method of maximum likelihood. Methods of moments. Confidence Intervals for the Normal mean when (i) the population variance is known and (ii) when the population variance is unknown. Confidence Intervals for the difference of means of Normal populations. Confidence intervals for ratios. Confidence Intervals for the variance of a Normal distribution.

Recommended or required reading

- S. M. Ross, "A first course in Probability", 8th Edition, 2010, Prentice Hall.
- S. M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, 2004, Elsevier.
- G. G. Roussas, "A Course in Mathematical Statistics", 2nd Edition, 1997, Academic Press.

Planned learning activities and teaching methods

Teaching in Class

Assessment methods and criteria

Written final exam, Assignments