

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	1st Cycle (UNDERGRADUATE)		
COURSE CODE	9079	SEMESTER	1ST
COURSE TITLE	STATISTICS I: PROBABILITIES AND ESTIMATION		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	6
Labs		1	
COURSE TYPE	Elective		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://eclass.aueb.gr/courses/ERASMUS141/		

(2) LEARNING OUTCOMES

Learning outcomes
<p>Through the teaching of this course, students will understand fundamental concepts, theorems, and applications of probability and statistics, so that they will be able, among other things:</p> <ul style="list-style-type: none"> • to clearly describe the concepts of the sample space, random experiment, and random variable, • to distinguish between various discrete and continuous distributions and solve related problems, • to assess whether an estimator is unbiased, consistent, and sufficient, • to successfully apply various methods for parameter estimation (e.g., the method of maximum likelihood, the method of moments, etc.), • to correctly construct confidence intervals for various parameters of interest.
General Competences
<ul style="list-style-type: none"> • Adaptation to new situations

- Decision-making
- Promotion of free, creative, and inductive thinking

(3) SYLLABUS

Random Experiment. Sample Space. Kolmogorov axiom, Probabilities Properties. Law of total Probability. Bayes formula. Discrete and continuous random variables. Mean and variance of random variables. Binomial Distribution. Geometrical Distribution. Poisson Distribution. Hypergeometric Distribution. Uniform Distribution. Exponential Distribution. Normal Distribution. Central Limit Theorem. Law of the large numbers. Estimating an unknown parameter. Unbiased estimator. Consistent estimator. Adequate Estimator. Rao-Blackwell Theorem. Cramer-Rao lower bound. Maximum Likelihood Method. Moments Method. Confidence intervals for a normal population with known and unknown variance. Confidence intervals for the difference of normal populations means. Confidence intervals for ratios. Confidence intervals for a normal population's variance.

Prerequisite knowledge: Calculus

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Teaching support through an e-learning platform (e-class) Use of statistical software packages Communication with students via ICT (Information and Communication Technologies)	
TEACHING METHODS	Activity	Semester workload
	Class lectures	40
	Lab Exercise	10
	Written assignments	20
	Self-Study	80
	Course total	150
STUDENT PERFORMANCE EVALUATION	Written final exam and assignments. Grading policy: 80% Final examination and 20% homework assignments	

(5) ATTACHED BIBLIOGRAPHY

- 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