INSTITUTION	NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS						
SCHOOL	SCHOOL OF SCIENCE						
DEPARTMENT	INFORMATICS AND TELECOMMUNICATIONS						
COURSE LEVEL	UNDERGRADUATE						
COURSE TITLE	**Probability and Statistics**						
COURSE CODE	K13		**Semester**	3	**ECTS**	6	
TEACHING HOURS per week	**THEORY**	3	**SEMINAR.**	1	**LABORATORY**	0	
COURSE TYPE	Compulsory (YM)						
URL	https://eclass.uoa.gr/courses/DI442/						
EXPECTED PRIOR KNOWLEDGE/ PREREQUISITES AND PREPARATION:							
TEACHING AND EXAMINATIONS LANGUAGE:	GREEK						
THE COURSE IS OFFERED TO ERASMUS STUDENTS	NO						

COURSE CONTENT

The objective of the course is the cultivation of the mathematical capabilities of the students in the modeling and quantitative study of situations that involve randomness. Moreover, the course comprises an introduction in the classical statistical inference. More specifically, the topics of the course are the following:

- Sample space and events. Axiomatic foundations of Probability Theory.
- Conditional probability.
- Law of total probability and Bayes rule.
- Independence of events.
- Basic enumeration principles. Finite sample spaces and Laplace's definition of probability.
- Discrete random variables: Probability mass function, mean value and variance.
- Multidimensional discrete random variables: Joint probability mass function, conditioning, independence of random variables.
- Continuous random variables: Probability density function, mean value and variance.
- Multidimensional continuous random variables: Joint probability density functions, conditioning, independence of random variables.
- Distributions of random variables.
- Covariance and correlation coefficient.

- Conditional expectation and variance.
- The Law of Large Numbers and the Central Limit Theorem.
- Introduction to Statistical Inference.
- Introduction to point and interval estimation.
- Linear Regression
- Introduction to hypothesis testing.

STUDENT LEARNING OBJECTIVES
Teaching-Learning Goals-Expected Learning Outcomes Upon successful completion of the course the student will be able to: • Describe the concepts of a random experiment, a sample space and an event. • Describe the classical and the axiomatic foundations of Probability Theory and use the main properties of probability measure. • Apply the basic enumeration principles and use the formulas for the number of permutations and combinations of a set of objects. • Describe the concept of conditional probability and of the stochastic independence of events. • Solve probability problems using the total probability theorem, Bayes' formula and the multiplication rule. • Describe the concept of random variable, of distribution function, of probability mass function and of probability density function. • Compute the moments of distributions, in particular the expectations and the variances. • Recognize the most important special discrete and continuous distributions. • Describe the concepts of multidimensional and in particular 2-dimensional random variables, its joint distribution function, joint probability mass function and joint probability density function. • Describe the concept of independent random variables. • Explain the notions of covariance and correlation coefficient and compute them for given pairs of random variables. • Identify the concepts of probability generating functions and moment generating functions and compute them for given random variables. • Explain the Central Limit Theorem and use it for approximate computations of probabilities. • Estimate the unknown parameter of a distribution using the method of maximum likelihood estimates. • Construct confidence intervals for the unknown parameters in the case of normal populations. • Deduce conclusions regarding testing statistical hypotheses in case of normal populations or large sample sizes.

TEACHING AND LEARNING METHODS - ASSESSMENT	
TEACHING METHOD	In Class (Face to Face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Learning process supported by the e-class platform (notes, Announcements, online quiz) Email communication

TEACHING ORGANIZATION

Describe in detail the way and methods of teaching:
Enhanced Lectures,
Online Lectures,
Seminars,
Tutorial,
Laboratory,
Laboratory Exercise,
Study & analysis of literature,
Practice (Positioning),
Interactive teaching,
Developing a project,
Individual / group work
Telework (reference to tools) etc.

Details of the student's study hours for each learning activity and hours of non-guided study are shown to ensure that the total workload at the semester corresponds to the ECTS

Activity	***Student Workload*** *(hours)*
Lectures	52
Tutorial	13
Laboratory	0
Teamwork in a case study	0
Small individual exercises	0
Independent Study	85
Total Course (25 hours of workload per unit of credit)	***150***

ASSESSMENT OF STUDENTS

Description of the assessment process

Assessment Methods, Formative or Concluding, Multiple Choice Test, Quick Response Questions, Test Development Questions, Problem Solving, Written Work, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Other / Other

Fully defined evaluation criteria are mentioned and if and where they are accessible to students.

Describe explicitly methods, evaluation tools and provided feedback.
The table below is supplemented accordingly.

Assessment methods	***Number***	***Percentage***
Written examination	1	100%

LITERATURE AND STUDY MATERIALS / READING LIST

In English:

1. Bertsekas, D.P. and Tsitsiklis J. (2008) J. Introduction to Probability -2nd Edition, Athena Scientific.
2. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K. (2007) Probability and Statistics for Engineers and Scientists, Pearson

In Greek:

1. Δαμιανού, Χ.Χ., Παπαδάτου, Ν.Δ. και Χαραλαμπίδη, Χ.Α.(2010) Εισαγωγή στις Πιθανότητες και τη Στατιστική. Εκδόσεις Συμμετρία, Αθήνα.