COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	1st Cycle (UNDERGRADUATE)		
COURSE CODE	**6058**	**SEMESTER**	**8th**
COURSE TITLE	**Statistical Methods for the Environment and Ecology**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures		4	8
Workshops		2	
Labs			
COURSE TYPE	Elective – Scientific Field		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS			
COURSE WEBSITE (URL)	https://www.dept.aueb.gr/en/stat/content/statistical-methods-environment-and-ecology-8-ects		

(2) LEARNING OUTCOMES

Learning outcomes
After successfully completing the course, students should be able to: distinguish between deterministic and statistical criteria for weighing/ evaluating environmental contamination, apply contamination weighing criteria in stochastic models of enumerating violations of contamination threshold, compare the compatibility between keeping the statistical criterion and probability of violating the corresponding contamination threshold, determine the (spatial and temporal) distribution of pollutants concentration (produced at a constant rate at a constant source) based on a stochastic model of molecular diffusion – transmission of the pollutant to the environmental medium, determine probability distribution for pollutant concentration in a fixed point in space based on the theory of consecutive stochastic diffusions, apply stochastic models of population dynamics in estimating the population size based on sampling data with various methods (inventory, survival, distance, retrieval).
General Competences
• Search, analysis and synthesis of data and information, using the necessary technologies • Adaptation to new situations • Decision-making

- Autonomous work
- Working in an international environment
- Working in an interdisciplinary environment
- Promotion of free, creative and inductive thinking

(3) SYLLABUS

General overview of topics and problems of interest in environmental statistics and ecology. Criteria of weighing environmental pollutants. Applications of stochastic models in checking the keeping or violation of weighing criteria. Statistical analysis and modeling of extreme values (for example, exceeding the pollutant concentration threshold). Natural process of pollutant diffusion and dilution, and the Plume model of spatial and time distribution of pollutant concentration. The theory of stochastic dilution and asymptotic lognormal diffusion processes for modeling point concentration of pollutants. Introduction to spatial statistics methods, models and estimating the function of spatial scatter (variogram) and the Kringing regression.

Data types from studies of biological organizations and examples. Preliminary analysis of characteristic data sets. Special characteristics of sample distributions and the appropriate models, such as truncated, inflated, mixed. Overdispersion, underdispersion and appropriate models. Individual heterogeneity models. Model fit using maximum likelihood through arithmetic methods and the use of statistical packages (R). Estimating population size and variance. Methods of census and distance sampling. Capture – Recapture methodologies for closed and open populations. Ecological time series and their characteristics. Stochastic models of population dynamics: state – space models and models for simultaneous analyses of survival and census. Examples and applications.

Knowledge of Probability I and II and Stochastic Procedures I, will be useful.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>YES</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>80</td></tr>
<tr><td>Studying and Analyzing Bibliography</td><td>20</td></tr>
<tr><td>Self Study</td><td>100</td></tr>
<tr><td>Course Total</td><td>200</td></tr>
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<tr><td>STUDENT PERFORMANCE EVALUATION
.</td><td>Written examination at the end of the semester: 90%
Written Assignment (Project): 10%

Information is available at eclass, study guide, Teams.</td></tr>
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(5) ATTACHED BIBLIOGRAPHY

- Ott, W. R. (1995): Environmental Statistics and Data Analysis, CRC Press, Inc.
- Barnett, V. (2004): Environmental Statistics: Methods and Applications, Wiley.
- Le, N.D. and Zidek, J.V. (2006): Statistical Analysis of Environmental Space-Time Processes, Springer.
- Williams, K., Nichols, J. and Conroy, M. J. (2002): Analysis and Management of Animal Populations. Academic Press, San Diego, California.
- Μπεσμπέας, Π. (2010): Στατιστικές Μέθοδοι στην Οικολογία, Πανεπιστημιακές Σημειώσεις
- Καρανδεινός Γ. Μ. (2007): Ποσοτικές Οικολογικές Μέθοδοι, Πανεπιστημιακές Εκδόσεις Κρήτης
- Σαϊτάνης Κ., Καρανδεινός Γ.Κ. (2010): Πληθυσμιακή οικολογία - δυναμική πληθυσμών. Έμβρυο.