COURSE OUTLINE

Ημερομηνία: 8 Νοε 2022

A. INFORMATION FOR THE COURSE

A1. School	School of Science and Technology of Information
A2. Department	Department of Statistics
A3. Master Programme	
A4. Course Code	6058
A5. Title of the Course	STATISTICAL METHODS FOR THE ENVIRONMENT AND ECOLOGY

Lecturers

Name	Rank	Specialization
BESBEAS PANAGIOTIS	Associate Professor	Applied Statistics

B. TYPE OF COURSE

B1. Year of Study	4
B2. Semester	8th
B3. Level of Course (if applicable)	1st Cycle
B4. Type of course	Elective
B5. Field	Scientific Field
B6. ECTS credits allocated (ECTS)	8.00
B7. Is the Course in the Syllabus?	Yes
B8. If yes, which is the reference Page?	29-68
B9. Is there a site for the course?	No https://www.dept.aueb.gr/el/stat-courses

C. INSTRUCTION

C1. Lectures Include:	Classroom lectures: Yes Distance learning lectures: No Seminars: No Laboratory exercises: No Field training exercise: No Literary analysis: Yes Tutorial: No Interactive teaching: No Educational visits: No Project: No Essays/reports: No Independent study: Yes Lectures given by scientists: No Internship: No
C2. Scheduled Hours for Lectures per week	4.00
C3. Scheduled Hours for Tutorials per week	2.00
C4. Scheduled Hours for Workshops per week	
C5. Scheduled Hours for Case Studies per week	
C6. Scheduled Hours for Other Activities per week	
C7. Scheduled Hours for Lectures per semester	52
C8. Scheduled Hours for Tutorials per semester	26
C9. Scheduled Hours for Workshops per semester	
C10. Scheduled Hours for Case Studies per semester	
C11. Scheduled Hours for Other Activities per semester	
C12. Mode of Delivery	Face to Face
C13. Student’s Evaluation	Written examination at the end of the semester: Yes Oral examination: No Midterm exam: No Homework: No Project: Yes Public Presentation: No Laboratory exercises: No Practical exercises: No Exempt work: No

C14. Language of Instruction	Greek

D. PREREQUISITE COURSES

Πιθανότητες Ι, Πιθανότητες ΙΙ, Στοχαστικές Διαδικασίες Ι

E. COURSE CONTENTS (Syllabus)

General overview of topics and problems of interest in environmental statistics and ecology. Criteria used for the setting of environmental standards. Stochastic models applied in assessing compliance to or violation of statistically verifiable ideal standards (SVIS) for the environment. Statistical analysis and stochastic modeling of extreme values (e.g. Peaks Over Threshold models). Natural processes of diffusion and dispersion of pollutants, Plume model of the spatio-temporal distribution of a pollutant's concentration. Theory of successive stochastic dilutions and asymptotic lognormal diffusion processes for modeling concentration of pollutants at a fixed location. Introduction to methodology of spatial statistics, modeling and estimation of spatial dependence by the semi-variogram function, regression by ordinary Kriging applied to spatial prediction and stochastic interpolation.
Data types from studies of biological organisms and examples. Preliminary analysis of characteristic data sets. Sampling distributions and models appropriate for special characteristics, such as truncation, inflation, mixing. Models appropriate for overdispersion and underdispersion effects. Individual heterogeneity models. Model fitting based on maximization of their likelihood using numerical methods and statistical packages (e.g. R). Estimation of population size and dispersion. 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.

F. LEARNING OUTCOMES

After successfully completing the course, students should be able to: distinguish between realizable and ideal criteria combined in setting statistically verifiable ideal standards (SVIS) for the environment, apply such environmental standards (SVIS) to stochastic models for processes counting violations of a given pollution threshold, assess compatibility between realizable and ideal components of an environmental SVIS based on the probability of the realizable standard under a suitable stochastic model complying to the ideal standard, determine the (spatio-temporal) distribution of pollutants concentration (produced with constant rate over time by a source at fixed location) based on a stochastic model of diffusion with dispersion of the pollutant to the environmental medium, determine probability distribution of the pollutant's concentration at any fixed point in space based on the theory of successive stochastic dilutions, apply stochastic models of population dynamics to estimating population size based on sampling data with various sampling methods (census, survival, distance sampling, capture-recapture sampling).

G. LITERATURE

G1. Use of Multiple Literature	Yes
G2. Recommended or required reading	Yes