

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	1st Cycle (UNDERGRADUATE)		
COURSE CODE	6178	SEMESTER	8 th
COURSE TITLE	Special Topics in Statistics and Probability (STSP): Decision Theory		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
Lectures		4	7
COURSE TYPE		Elective	
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:		GREEK	
IS THE COURSE OFFERED TO ERASMUS STUDENTS		NO	
COURSE WEBSITE (URL)		https://www.dept.aueb.gr/en/stat/content/special-topics-statistics-and-probability-stsp-decision-theory	

(2) LEARNING OUTCOMES

Learning outcomes
<p>Upon successful completion of the course, students will be able to:</p> <ul style="list-style-type: none"> • Find the optimal decision based on the Bayes criterion. • Calculate and compare classical risk and Bayes risk in different scenarios. • Make decisions based on classical Statistical principles and apply randomized rules. • Understand and apply utility theory and the loss function for decision making. • Use standard loss functions to model decision-making situations. • Calculate prior and posterior distributions and understand the differences between them. • Recognize and use conjugate families of distributions, such as the conjugate model of normal - inverse Gamma distribution. • Apply inference methods to derive estimates and calculate credible intervals. • Understand Bayesian decision theory and make posterior decisions. • Calculate Bayes estimators and perform Bayesian hypothesis testing. • Conduct simple null hypothesis tests and choose between two competing models.
General Competences
<ul style="list-style-type: none"> • Search, analysis, and synthesis of data and information, using the necessary technologies. • Decision-making.

- Development of critical thinking.

(3) SYLLABUS

Basic concepts, classical risk and Bayes risk, decisions based on classical statistical principles, randomized rules, utility and loss, elements of utility theory, loss function, standard loss functions, Bayesian statistics, prior distribution, non-informative prior distributions, posterior distribution, conjugate families, the conjugate model of normal - inverse Gamma distribution, inference, estimation, credible intervals, Bayesian decision theory, posterior decisions, Bayes estimators, Bayesian hypothesis testing, simple null hypothesis testing, selection between two competing models.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	Face-to-face	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	YES	
TEACHING METHODS	Activity	Semester workload
	Class lectures	200
		200
STUDENT PERFORMANCE EVALUATION	Written exam at the end of the semester.	

(5) ATTACHED BIBLIOGRAPHY

- P. Papastamoulis, Elements of Decision Theory, Notes, 2019.
- J. O. Berger, Statistical Decision Theory and Bayesian Analysis, Springer, 1985.