

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 ^o
COURSE TITLE	Statistical Decision Theory and Game 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/statdecisiontheory		

(2) LEARNING OUTCOMES

Learning outcomes
Upon successful completion of the course students will be able to: • Use standard loss functions to model decision-making problems. • Make decisions using principles of classical Statistics and apply randomized rules. • Find the optimal decision based on the Bayes criterion. • Compute and compare the classical risk and the Bayes risk. • Understand Bayesian decision theory and make posterior decisions. • Understand the basic principles of game theory. • Analyze game strategies where players interact. • Solve problems under conditions of uncertainty and incomplete information.
General Competences
• Decision-making. • Development of critical thinking

(3) SYLLABUS

Basic concepts, decision rules and loss/risk functions, principles of dominance and admissibility, minimax principle, decision theory via classical statistics, loss functions (squared error, absolute, zero–one), properties of estimators under different loss functions, examples of inadmissible classical estimators, hypothesis tests as decision problems, Bayesian decision theory, prior and posterior distributions, conjugate families of

distributions, Bayes risk and expected posterior risk and loss, Bayes estimators and posterior decision rules, relationship between Bayesian rules and admissibility, interpretation of Bayesian procedures, comparison of classical and Bayesian approaches, elements of game theory, normal-form games and payoff matrices, strategies and best responses, Nash equilibria, cooperative game theory, classic examples of game theory, applied decision theory, decision problems with loss and payoff matrices, case studies from economics, sports analytics, and public policy.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	Face-to-face	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	YES	
TEACHING METHODS	Activity	Semester workload
	Class lectures	175
	Course total	175
STUDENT PERFORMANCE EVALUATION	Written exam at the end of the semester	

(5) ATTACHED BIBLIOGRAPHY

- Berger, J. O. (1985) *Statistical Decision Theory and Bayesian Analysis*. 2nd Edition, Springer, New York (NY). <http://dx.doi.org/10.1007/978-1-4757-4286-2>
- Parmigiani, G. and Inoue, L. Y. T. (2009). *Decision theory: Principles and approaches*. John Wiley & Sons. <https://doi.org/10.1002/9780470746684>
- Παπασταμούλης, Π. (2019). Στοιχεία Θεωρίας Αποφάσεων. Πανεπιστημιακές σημειώσεις ΟΠΑ.
- Osborne, M. J. (2010). *Εισαγωγή στη Θεωρία Παιγνίων*. Εκδόσεις Κλειδάριθμος. Επιμέλεια ελληνικής έκδοσης: Ιωάννης Ρεφανίδης. ISBN: 9789604613939. Κωδικός βιβλίου στον Εύδοξο: 35241.