COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES			
ACADEMIC UNIT	DEPARTMENT OF MATHEMATICS			
LEVEL OF STUDIES	POSTGRADUATE **Studies in Mathematics**			
COURSE CODE	**B6**	**SEMESTER**	**A**	
COURSE TITLE	STATISTICS			
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**	
		3	10	
COURSE TYPE	SPECIALISED GENERAL KNOWLEDGE			
PREREQUISITE COURSES:	NO			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES			
COURSE WEBSITE (URL)	http://www.math.aegean.gr/index.php/en/academics/undergraduate-programs			

(2) LEARNING OUTCOMES

Learning outcomes
• Become familiar with the fundamental notions and principles of parameter estimation and hypothesis testing encountered in the vast majority of statistical fields. • Discover the inductive character of statistics via making inference about unknown population parameters based on the information conveyed in the sample. • Become aware of the fact that estimators are susceptible to sample variation, therefore point estimation must be accompanied by interval estimation. • Develop the capacity to apply different methods of point estimation, to assess the performance of an estimator and provide comparative results among different estimators on the basis of either finite sample or asymptotic criteria. • Develop the capacity to construct confidence intervals and provide their interpretation. • Become aware of the fact that a confidence interval is more informative than a single hypothesis testing procedure with a two-sided alternative hypothesis. • Acquire a solid mathematical background related to the existence and construction of optimum statistical tests in terms of power. • Develop the capacity to state null and alternative hypothesis appropriate to research question and conjecture, conduct hypothesis testing and draw conclusions based on the data at hand.
General Competences
Development of critical thinking. Decision-making. Working independently.

(3) SYLLABUS

The exponential family of distributions. The concept of point estimation. Mean square error, unbiasedness, (minimal) sufficiency, completeness. Uniformly minimum variance unbiased estimators. Fisher information. The Cramer-Rao inequality. Ancillary statistics and Basu's

theorem. Estimation by the method of moments. Maximum likelihood estimation. Central limit theorem, the delta method, consistency, asymptotic normality, asymptotic efficiency and relative efficiency, asymptotic properties of maximum likelihood estimators. The concept of interval estimation. Construction of confidence intervals based on pivots, of minimum length and equal tails. Hypothesis Testing: error probabilities and power function. The Neyman-Pearson Lemma and most powerful tests. The monotone likelihood ratio property and uniformly most powerful tests. Unbiased and unbiased uniformly most powerful tests. Generalized likelihood ratio tests and asymptotic theory.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Communication with students via e-mail
TEACHING METHODS	***Activity*** / ***Semester workload***
	Lectures: 39
	Independent study: 148,5
	Assignments: 62.5
	Course total (25 per ECTS): ***250***
STUDENT PERFORMANCE EVALUATION	Student evaluation is done in Greek through a written examination which includes short-answer equations and problem solving. For students with disabilities, evaluation takes place via oral exams.

(5) ATTACHED BIBLIOGRAPHY

1. Casella, G. and Berger, R. L. (2002). *Statistical Inference*, 2nd ed., Duxbury Press.
2. Lehmann, E. L. and Casella, G. (1998). *Theory of Point Estimation*, 2nd ed., Springer.
3. Lehmann, E. L. and Romano, J. P. (2005). *Testing Statistical Hypothesis*, 3rd ed., Springer.
4. Van der Vaart, A. W. (1998). *Asymptotic Statistics*, Cambridge University Press.
5. Lehmann, E. L. (1999). *Elements of Large Sample Theory*, Springer.
6. Iliopoulos, G. (2012). *Basic Methods of Estimation*, 2nd ed., A. Stamoulis eds. *(In Greek).*