COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_ST302	**SEMESTER OF STUDIES**	5th
COURSE TITLE	STATISTICAL INFERENCE I		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures and Tutorials	5	8
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Core course of a scientific subject area
PREREQUISITE COURSES:	Recommended prerequisite knowledge: CALCULUS I and II, PROBABILITY I
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/MATH1114/

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

With this course a student acquires the ability to apply several techniques for estimating the unknown parameters. He/she will deal with the estimators as mathematical objects (statistics) which obey probability rules (distributions). He/she demonstrates understanding of the role of Probability Theory (and the properties of probability distributions) as foundation for Statistical Inference and becomes able to use their relevant knowledge acquired to compare estimators through specific criteria.

On successful completion of the course a student will be able to: understand the principles underlying Statistical Inference; demonstrate knowledge of statistical models in common use; construct estimators, derive their properties and study their characteristics.

General Abilities

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*Others…*
Production of new research ideas	

- Adaptation to new situations.
- Decision making.
- Autonomous Work.
- Work in an interdisciplinary environment.
- Exercise of criticism and self-criticism.
- Promotion of free, creative and inductive thinking.

3. COURSE CONTENT

(i) Concepts of sample, unknown population parameters and statistics. **(ii)** Introduction to point estimation theory. **(iii)** Optimality criteria: Mean Squared Error, unbiasedness. **(iv)** Information Inequality, Cramér-Rao variance lower bound and Fisher information. **(v)** Sufficient statistics and completeness, Uniformly Minimum Variance Unbiased Estimators (UMVUE). **(vi)** Estimation in an exponential family of distributions. **(vii)** Basu's Theorem, independence of the sample mean and the sample variance in a normal population. **(viii)** Sampling distributions (X^2, t, F). **(ix)** Point Estimation procedures: Maximum Likelihood Estimation (MLE), the method of moments. **(x)** Statistical decision procedures, Bayes and Minimax estimators. **(xi)** Confidence Interval Estimation.

In order to highlight the special educational and didactical aspects of a course, special emphasis is given on the historical evolution and scientific development of the subject as well as on its applications in technology and/or other sciences.

4. TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING METHOD *Face-to-face, Distance learning, etc*	Lectures (face to face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *Use of ICT in teaching, laboratory education, communication with students*	• In-class slides • Post-class support of the course via the web page and the online platform (*eClass*) of the Department of Mathematics
TEACHING ORGANIZATION *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	
STUDENT ASSESSEMNT *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	**Assessment Language:** Greek **Assessment Language for Erasmus students:** English **Assessment methods** Final exams (100%) that includes ✓ Theory ✓ Exercises Minimum passing grade: 5 Maximum passing grade: 10

Activity	*Semester workload*
Lectures	39
Tutorials	26
Solving suggested exercises	65
Hours of personal study by the student	67
Final examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***200***

5. RECOMMENDED LITERATURE

(in Greek)

- Δαμιανού Χαράλαμπος και Κούτρας Μάρκος. *Εισαγωγή στη Στατιστική. ΜΕΡΟΣ Ι.* Εκδόσεις Συμμετρία, 2003.
- Ηλιόπουλος Γιώργος. *Βασικές Μέθοδοι Εκτίμησης Παραμέτρων.* 2η έκδοση, Εκδόσεις Σταμούλη, 2012.
- Κολυβά-Μαχαίρα Φωτεινή. *Μαθηματική Στατιστική.* Εκδόσεις Ζήτη, 1998.
- Παπαϊωάννου Τάκης και Κοσμάς Φερεντίνος. *Μαθηματική Στατιστική.* 2η έκδοση, Εκδόσεις Σταμούλη, 2000.
- Κουρούκλης Σταύρος, Πετρόπουλος Κωνσταντίνος και Πιπερίγκου, Βιολέττα. *Θέματα Παραμετρικής Στατιστικής Συμπερασματολογίας*: *Εκτιμητική και Διαστήματα Εμπιστοσύνης*. (e-book). Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. Αποθετήριο "Κάλλιπος", 2015.

(*in English*)

- Hogg Robert V. , McKean Joseph W. and Craig Allen T. *Introduction to Mathematical Statistics*. 8th ed., Pearson, 2018.
- Lehmann Erich L. and Casella George. *Theory of Point Estimation.* 2nd ed., Springer, 1998.