

COURSE OUTLINE

1. GENERAL

SCHOOL	AGRICULTURAL SCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	FST_X16	SEMESTER OF STUDIES	Winter
COURSE TITLE	Advanced Statistics		
INDEPENDENT TEACHING ACTIVITIES σε περίπτωση που οι πιστωτικές μονάδες απονέμονται σε διακριτά μέρη του μαθήματος π.χ. Διαλέξεις, Εργαστηριακές Ασκήσεις κ.λπ. Αν οι πιστωτικές μονάδες απονέμονται ενιαία για το σύνολο του μαθήματος αναγράψτε τις εβδομαδιαίες ώρες διδασκαλίας και το σύνολο των πιστωτικών μονάδων	TEACHING HOURS PER WEEK	ECTS CREDITS	
Lectures	2		
Exercises	2		
Total	4	5	
<i>Προσθέστε σειρές αν χρειαστεί. Η οργάνωση διδασκαλίας και οι διδακτικές μέθοδοι που χρησιμοποιούνται περιγράφονται αναλυτικά στο 4.</i>			
COURSE TYPE <i>Υποβάθρου, Γενικών Γνώσεων, Επιστημονικής Περιοχής, Ανάπτυξης Δεξιοτήτων</i>	Elective Field of Science		
PREREQUISITE COURSES:	Typically, there are not prerequisite course. Essentially, the students should possess knowledge provided through the previously taught course of: "Mathematics" and "Statistics".		
TEACHING AND ASSESSMENT LANGUAGE:	Greek.		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/		

2. LEARNING OUTCOMES

<p>Learning outcomes</p> <p><i>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.</i></p> <p><i>Consult Appendix A</i></p> <ul style="list-style-type: none"> • <i>Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</i> • <i>Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</i> • <i>Guidelines for writing Learning Outcomes</i> <p>This course builds on the knowledge and skills acquired in the course "Statistics" and contribute to the acquisition of advanced and highly specialized knowledge in the scientific field of Statistics. It aims at presenting and understanding by students the concepts of dependence, correlation, statistical and inference design and analysis of experiments By the end of this course the student will be able to:</p> <ul style="list-style-type: none"> • understand the concepts of dependence, correlation, design and analysis of

- experiments and time series analysis
- apply the former concepts to real problems from the field of agronomic sciences and food science, but also from their everyday life
- know in-depth the basic theoretical knowledge about the subject
- use knowledge and understanding acquired in a manner that indicates a professional approach to their work or profession
- have competences typically demonstrated by developing and supporting arguments and solving problems within their field of knowledge
- communicate information, ideas, problems and solutions to both specialist and non-specialist public
- develop knowledge acquisition skills needed to continue to post graduate studies with a high degree of autonomy
- gather and interpret relevant data (in their knowledge field) to form judgments that include reflection on relevant scientific issues

General Competences

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?

<i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i>	<i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i>
<i>Adapting to new situations</i>	<i>Adapting to new situations</i>
<i>Decision-making</i>	<i>Decision-making</i>
<i>Working independently</i>	<i>Working independently</i>
<i>Team work</i>	<i>Team work</i>
<i>Working in an international environment</i>	<i>Working in an international environment</i>
<i>Working in an interdisciplinary environment</i>	<i>Working in an interdisciplinary environment</i>
<i>Production of new research ideas</i>	<i>Production of new research ideas</i>

- By the end of this course the student will, furthermore, have developed the following skills (general abilities):
- Searching, analysis and synthesis of facts and information, as well as using the necessary technologies
 - Adaptation to new situations
 - Decision making
 - Autonomous (Independent) work
 - Promotion of free, creative and inductive thinking

3. COURSE CONTENT

This course builds on the knowledge and skills acquired in the course “Statistics” and contribute to the acquisition of advanced and highly specialized knowledge in the scientific field of Statistics.

1. **Correlation and Regression:** the fundamental difference between correlation and regression, scatter diagram for investigating the relation between two variables, the Pearson’s and Spearman’s correlation coefficients for measuring linear and monotonic relation respectively and their interpretations, simple linear regression and model specification, interpretation of the regression coefficient, point estimation of the parameters using the method of Ordinary Least Squares (OLS), the standard errors of the estimators, the elasticity of the dependent variable with respect to the explanatory variable, the classical assumptions for “best” estimators using OLS, interval estimation and hypotheses testing, Analysis of Variance for the fit of the model, the coefficient of determination, point and interval estimation and prediction of the individual and mean value of the dependent variable for a given value of the independent variable, diagnostic checking for departures from the classical assumptions using graphical methods.
2. **Statistical Inference:** the approach for the generalization from a sample to the population using sample statistics and sampling distributions, point estimation (the method of maximum likelihood and the criteria for selecting among possible estimators), The Central Limit Theorem, interval estimation and hypothesis testing, estimations and tests for the parameters of a binomial, normal and Poisson population, estimation and test for the difference between two proportions from

independent binomial populations, a test for the equality of variances from two normal populations, estimations and tests for the difference between the means of two independent normal populations, paired-observations comparisons, tests for independence and homogeneity in $r \times c$ contingency tables.

3. **Design & Analysis of Experiments:** the principles of experimentation (experimental units and error, repetition, randomization, blocking and experimental design), the Analysis of Variance and multiple comparisons of means for the completely randomized design, the randomized complete block design, the latin square design, the factorial design, the factorial design in randomized blocks and the split-plot design.

4. TEACHING AND LEARNING METHODS - ASSESSMENT

<p>DELIVERY <i>Face-to-face, Distance learning, etc.</i></p>	Lectures and seminars	
<p>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i></p>	Statistical software R and Python Eclass	
<p>TEACHING METHODS <i>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</i></p>	<p>Activities</p>	<p>Work Load per semester</p>
	Lectures (3 hours per week x 13 weeks)	39
	Seminars (1 hour per week x 13 weeks)	39
	Group work on a case study. Solving operations research problems using linear and integer programming models	20
	Final examination (3 hours)	3
	Hours for private study of the student	49
	<p>Total number of hours for the Course (25 hours of work-load per ECTS credit)</p>	<p>150 hours (total student work-load)</p>
<p>STUDENT PERFORMANCE EVALUATION <i>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.</i></p>	<p>Written examination after the end of the semester (100%) including:</p> <ul style="list-style-type: none"> • Multiple-choice questions • Solving linear programming problems • Solving integer programming problems • Benchmarking theory elements 	

5. RECOMMENDED LITERATURE

1. Witte, Robert S., and John S. Witte. Statistics. Eleventh edition, Wiley, 2017.

2. Statistics for Management and Economics, Gerald Keller, Hardcover: 992 pages, Publisher: South-Western College Pub, 10th edition (Jan. 1 2014), Language: English, ISBN-10: 1285425456.
3. Analyzing Compositional Data with R, van den Boogaart, K. Gerald, Tolosana-Delgado, Raimon, Publisher: Springer-Verlag Berlin Heidelberg, 1st Edition, 2013, ISBN: 978-3-642-36808-0.
4. Statistics for Business and Financial Economics, Lee, Cheng-Few, Lee, John C., Lee, Alice C., Publisher: Springer-Verlag New York, 3rd Edition, 2013, ISBN: 978-1-4614-5896-8.
5. Introduction to Statistics: Fundamental Concepts and Procedures of Data Analysis, Howard M. Reid, Paperback: 632 pages, Publisher: SAGE Publications, Inc; 1 edition (August 28, 2013), Language: English, ISBN-10: 1452271968.
6. Introduction to Statistics and Data Analysis, Heumann, Christian, Schomaker, Michael, Shalabh, Publisher: Springer International Publishing, 1st Edition, ISBN: 978-3-319-46160-1.
7. Introduction to Statistics, Carmine DeSanto, Richard Moscatelli, Rachel Rojas, Mike Totoro, Paperback: 872 pages, Publisher: Pearson Learning Solutions; 10 edition (January 25, 2015), Language: English, ISBN-10: 1323056300.