COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING
DEPARTMENT	ENVIRONMENTAL ENGINEERING
LEVEL OF STUDIES	UNDERGRADUATE
COURSE CODE	15ΓΥ2Ν **SEMESTER** 3
COURSE TITLE	APPLIED STATISTICS

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	4	5
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	BACKGROUND
PREREQUISITES:	MATHEMATICS
TEACHING & EXAMINATION LANGUAGE:	GREEK, ENGLISH (FOR ERASMUS STUDENTS)
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.duth.gr/courses/TMC367/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The goal of the course is to familiarize students with the principles of applied statistics in environmental engineering. Students will be able to do a statistical analysis, design an experiment, compare averages and capture data using the correct graphs and tables. Emphasis will be placed on dispersion analysis (ANOVA) techniques for comparing mean values when conducting experiments or field measurements, checking data regularity, modifying data for conversion to normal data, developing statistically significant empirical models from primary data, and correlating variables. Experimental design and social statistics issues will also be taught. The first will help in the design of experiments in the laboratory and analysis of the generated data (however, since a second course specifically on experimental design is offered by me, the material on this topic will be limited). The second will help in matters of social statistics, and especially in matters of interpretation of results that are usually collected from surveys from various social groups. The last part belongs to behavioral statistics and social science.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information, ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas

Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Specialized knowledge on analyzing data using simple spreadsheets

Specialized knowledge on experiment design and analysis of variance

Specialized knowledge on normality check to further select parametric or non-parametric statistical tests

Specialized knowledge of data analysis for social statistics

Specialized knowledge to graph results and interpret data through simple graphs.

3. COURSE CONTENT

1. Introduction: Qualitative, quantitative measurements, Significant digits, Mean value, deviations.

2. Distributions - Normal data: Repeated measurement distributions, Errors, Normality Checks (Anderson-Darling).

3. Repeatability: Confidence limits of the mean value of large samples, confidence limits, t test (independent and in pairs)

4. Graphical representations of data - Data transformations: Presentation of results with graphs. Data transformations.

5. ANOVA test: Comparisons of means, single and double ANOVA

6. ANOVA Test: Tukey Test, Dunnett Test

7. Factorial Experimental Design

8. Variables and linear regression: Regression and correlation

9. Linear regression, Correlations, R^2, Pearson correlation coefficient.

10. Empirical models (I)

11. Empirical models (II)

12. Social statistics: Non-parametric statistical controls (Mann Whitney, Kruskal-Wallis) and correlation of categorical variables

13. Chi-squared test

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT during teaching and communication with students. Use of computer center to perform exercises in simple spreadsheets and other statistical software.

TEACHING ORGANIZATION

The ways and methods of teaching are described in detail.

Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.

Activity	*Workload/semester*
Lectures	100
Design exercises	50
Literature review	0
Individual projects	0
Project presentation	0
Field trips	0
Course total	**150**

STUDENT EVALUATION

Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,

Formative

The evaluation of the course will be realized using 1-2 intermediate exams and then a final examination will be realized. In case the students pass through the intermediate exams, they do not need to participate in the final exam, unless they want to improve their grade. In any case, once a student participates in the

Clinical examination of a patient, Artistic interpretation, Other/Others	final exam, any grade obtained from the midterm exams (even a promotional one) will be canceled.
Please indicate all relevant information about the course assessment and how students are informed	The exams will be done with open notes (in printed form only) without access to the network.

5. SUGGESTED BIBLIOGRAPHY

1. Πειραματικός Σχεδιασμός και Στατιστική Ανάλυση, Δ. Κομίλης, Εκδ. Ζυγός, 2012 (book in Greek)
2. Statistics for Environmental Engineers, Berthouex P, Brown, L, 2nd Ed., CRC Press, 2002
3. Στατιστική: Θεωρία και Πράξη, Γ. Χάλκος, ΔίΣιγμα Εκδόσεις, 2020 (book in Greek)
4. Design and Analysis of Experiments, Montgomery D., 6th edit., Wiley, 2004
5. University notes and exercises uploaded in e-class

ANNEX OF THE COURSE OUTLINE

Alternative ways of examining a course in emergency situations

Teacher (full name):	Dimitrios Komilis
Contact details:	dkomilis@env.duth.gr
Supervisors: (1)	YES
Evaluation methods: (2)	Exams by distance.
Implementation Instructions: (3)	The examination in the course will be initiated with the entrance of all students into the platform and then a multiple-choice test will be realized via eclass. In case an open type exam is realized, students will submit their file with the answers in e-class. The test will be performed using Microsoft Teams and E-class. The link will be sent to students via eclass exclusively to the institutional accounts of those who have registered in the course and have accepted the terms of distance education. Students will have to log into the examination room through their institutional account, otherwise they will not be able to participate. They will also take part in the examination with a camera which they will have it turned on during the whole examination. Before the start of the exam, students will demonstrate their ID card and face to the camera, so that they can be identified by the examiner.

(1) Please write YES or NO

(2) Note down the evaluation methods used by the teacher, e.g.
  ➢ *written assignment* or/and exercises
  ➢ written or oral examination with distance learning methods, provided that the integrity and reliability of the examination are ensured.

(3) In the **Implementation Instructions** section, the teacher notes down clear instructions to the students:

a) in case of **written assignment and / or exercises:** the deadline (e.g. the last week of the semester), the means of submission, the grading system, the grade percentage of the assignment in the final grade and any other necessary information.

b) in case of **oral examination with distance learning methods:** the instructions for conducting the examination (e.g. in groups of X people), the way of administration of the questions to be answered, the distance learning platforms to be used, the technical means for the implementation of the examination (microphone, camera, word processor, internet connection, communication platform), the hyperlinks for the examination, the duration of the exam, the grading system, the percentage of the oral exam in the final grade, the ways in which the inviolability and reliability of the exam are ensured and any other necessary information.

c) in case of **written examination with distance learning methods**: the way of administration of the questions to be answered, the way of submitting the answers, the duration of the exam, the grading system, the percentage of the written exam of the exam in the final grade, the ways in which the integrity and reliability of the exam are ensured and any other necessary information.

There should be an attached list with the Student Registration Numbers only of students eligible to participate in the examination.