

## COURSE OUTLINE

### (1) GENERAL

|                                                                                                                                                                                                                                                                       |                                                                                                         |                              |                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|------------------------------|----------------|
| <b>SCHOOL</b>                                                                                                                                                                                                                                                         | UNIVERSITY OF THESSALY                                                                                  |                              |                |
| <b>ACADEMIC UNIT</b>                                                                                                                                                                                                                                                  | DEPARTMENT OF CIVIL ENGINEERING                                                                         |                              |                |
| <b>LEVEL OF STUDIES</b>                                                                                                                                                                                                                                               | UNDERGRADUATE                                                                                           |                              |                |
| <b>COURSE CODE</b>                                                                                                                                                                                                                                                    | TK0800                                                                                                  | <b>SEMESTER</b>              | 2              |
| <b>COURSE TITLE</b>                                                                                                                                                                                                                                                   | Probabilities and Statistics                                                                            |                              |                |
| <b>INDEPENDENT TEACHING ACTIVITIES</b><br><i>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</i> |                                                                                                         | <b>WEEKLY TEACHING HOURS</b> | <b>CREDITS</b> |
| The main objective is that the student has an advanced knowledge of the principles of probabilities and statistics, to be able to describe simple or more complex mechanical phenomena with those principles.                                                         |                                                                                                         | 4                            | 5              |
|                                                                                                                                                                                                                                                                       |                                                                                                         |                              |                |
|                                                                                                                                                                                                                                                                       |                                                                                                         |                              |                |
| <i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>                                                                                                                                              |                                                                                                         |                              |                |
| <b>COURSE TYPE</b><br><i>general background, special background, specialized general knowledge, skills development</i>                                                                                                                                                | General Background                                                                                      |                              |                |
| <b>PREREQUISITE COURSES:</b>                                                                                                                                                                                                                                          |                                                                                                         |                              |                |
| <b>LANGUAGE OF INSTRUCTION and EXAMINATIONS:</b>                                                                                                                                                                                                                      | Greek                                                                                                   |                              |                |
| <b>IS THE COURSE OFFERED TO ERASMUS STUDENTS</b>                                                                                                                                                                                                                      | Yes                                                                                                     |                              |                |
| <b>COURSE WEBSITE (URL)</b>                                                                                                                                                                                                                                           | <a href="http://eclass.uth.gr/eclass/courses/MHXC204/">http://eclass.uth.gr/eclass/courses/MHXC204/</a> |                              |                |

### (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*

**Have a good notion about / understand the basic elements of probability and statistics.**

- Be able to use the concepts in practical applications (practical sessions).
- Be able to generalize material to a broader variety of practical problems.

#### **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>Project planning and management</i>                                                          |
| <i>Adapting to new situations</i>                                                                           | <i>Respect for difference and multiculturalism</i>                                              |
| <i>Decision-making</i>                                                                                      | <i>Respect for the natural environment</i>                                                      |
| <i>Working independently</i>                                                                                | <i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i> |
| <i>Team work</i>                                                                                            | <i>Criticism and self-criticism</i>                                                             |
| <i>Working in an international environment</i>                                                              | <i>Production of free, creative and inductive</i>                                               |
| <i>thinking Working in an interdisciplinary environment</i>                                                 | <i>.....</i>                                                                                    |
| <i>Production of new research ideas</i>                                                                     | <i>Others...</i>                                                                                |
|                                                                                                             | <i>.....</i>                                                                                    |

### **(3) SYLLABUS**

The concept of probability in technical works. Making decisions under conditions of risk and uncertainty. Probability Theory (Events & Probabilities, Conditional Probability, Total Probability Theorem, Bayes' Theorem). Applications.

Conditional probability, random variables, probability distributions, continuous univariate distributions. Analytical models of random events (random, variables, univariate continuous uniform distributions). Applications.

Multivariate Distributions. Related functions (probability distributions). Statistics and data classification. Frequency distribution. Applications.

Parameter estimation from observed data. The role of statistical inference in the works of engineering, Random sampling. Applications.

Estimation of parameters from observed data (confidence interval calculation, average, standard deviation). Quantitative Problems. Applications.

Distributions theory. Map probability, normal distribution and lognormal distribution. Applications. Frequency distributions, X<sup>2</sup> test, Kolmogorov test, Smirnov test. Applications.

Regression analysis - Basic formulation. Multivariate linear regression, nonlinear regression. Applications. Correlation analysis and estimation of correlation coefficients. Applications.

### **(4) TEACHING and LEARNING METHODS - EVALUATION**

|                                              |              |
|----------------------------------------------|--------------|
| <b>DELIVERY</b>                              | Face-to-face |
| <i>Face-to-face, Distance learning, etc.</i> |              |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                         |                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------|
| <b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b><br><i>Use of ICT in teaching, laboratory education, communication with students</i>                                                                                                                                                                                                                                                                                                                                                                                                          | Examples and exercises. |                          |
| <b>TEACHING METHODS</b><br><i>The manner and methods of teaching are described in detail.<br/> 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.</i><br><br><i>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>                                      | <b>Activity</b>         | <b>Semester workload</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Courses                 | 56 hours                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Exercises Study         | 67 hours                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Exams                   | 3 hours                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                         | 3 hours                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                         |                          |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Course total            | 126 hours                |
| <b>STUDENT PERFORMANCE EVALUATION</b><br><br><b>Description of the evaluation procedure</b><br><br><i>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</i><br><br><i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i> | Written exams 100%      |                          |

#### (5) ATTACHED BIBLIOGRAPHY

*-Suggested bibliography: (In Greek)*

- Στατιστικές Μέθοδοι και Ανάλυση Παλινδρόμησης για τις νέες τεχνολογίες, Φιλιππάκης Μ.
- Εισαγωγή στη στατιστική, Παπαϊωάννου Τάκης, Λουκάς Σωτήρης Β.
- Εφαρμογές πιθανοτήτων και στατιστικής, ANG ALFREDO, TANG WILSON, (μτφ. - επιμ. ΔΗΜ. ΠΑΝΑΓΙΩΤΑΚΟΠΟΥΛΟΣ)
- ΠΙΘΑΝΟΤΗΤΕΣ ΚΑΙ ΣΤΑΤΙΣΤΙΚΗ ΓΙΑ ΜΗΧΑΝΙΚΟΥΣ 5η ΕΚΔΟΣΗ, ΖΙΟΥΤΑΣ ΓΕΩΡΓΙΟΣ
- Εφαρμοσμένη Στατιστική και Πιθανότητες για Μηχανικούς-Με χρήση SPSS και MATLAB, Παπαγεωργίου Έφη, Χαλικιάς Μιλτιάδης