

COURSE OUTLINE

1. GENERAL

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| SCHOOL | School of Environment and Agricultural Engineering | | |
| ACADEMIC UNIT | Department of Natural Resources Development and Agricultural Engineering | | |
| LEVEL OF STUDIES | Postgraduate | | |
| COURSE CODE | 630039 | SEMESTER | 1o |
| COURSE TITLE | Numerical Analysis | | |
| INDEPENDENT TEACHING ACTIVITIES <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> | WEEKLY TEACHING HOURS | CREDITS | |
| Lectures | 3 | 5 | |
| Laboratory exercises | 2 | | |
| <i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i> | | | |
| COURSE TYPE <i>general background, special background, specialised general knowledge, skills development</i> | Special background, specialized knowledge, skills development | | |
| PREREQUISITE COURSES: | Numerical Analysis (undergraduate) | | |
| LANGUAGE OF INSTRUCTION and EXAMINATIONS: | Greek | | |
| IS THE COURSE OFFERED TO ERASMUS STUDENTS | Yes (in English) | | |
| COURSE WEBSITE (URL) | http://openeaclass.aaugr | | |

2. LEARNING OUTCOMES

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| <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>With the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Use numerical methods to solve fundamental mathematical problems with applications in engineering and agriculture. • Utilize computational programming packages to implement theoretical methods, resulting in the representation of data and graphical displays. • Analyze the properties of approximate solutions, such as error and stability. |

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?

Search for, analysis and synthesis of data and information, with the use of the necessary technology

Adapting to new situations

Decision-making

Working independently

Team work

Working in an international environment

Working in an interdisciplinary environment

Production of new research ideas

Project planning and management

Respect for difference and multiculturalism

Respect for the natural environment

Showing social, professional and ethical responsibility and sensitivity to gender issues

Criticism and self-criticism

Production of free, creative and inductive thinking

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Others...

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- Search for, analysis and synthesis of data and information, with the use of the necessary technology.
- Decision making.
- Working independently.
- Production of free, creative and inductive thinking.

3. SYLLABUS

Theory (3 ECTS)

- Elements of mathematical analysis: Matrices, vectors, and determinants. Approximation and error analysis of solutions.
- Numerical solution linear equations/systems: Stability and rank of the matrix, eigenvalues. Factorization methods and iterative methods.
- Numerical solution of nonlinear equations/systems: Newton-type iterative methods and regularization methods.
- Numerical differentiation and integration.
- Numerical solution of differential equations: Galerkin-type methods, finite differences, and elements.

Lab (2 ECTS)

- Introduction to Octave/Matlab.
- Matrices, vectors: Examples and exercises.
- Solution of linear equations/systems: Examples and exercises.
- Solution of nonlinear equations/systems: Examples and exercises.
- Numerical differentiation and integration: Examples and exercises.
- Numerical solution of differential equations: Examples and exercises.

4. TEACHING and LEARNING METHODS - EVALUATION

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| DELIVERY <i>Face-to-face, Distance learning, etc.</i> | Face-to-face | |
| USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i> | <ul style="list-style-type: none"> • Use of ICT in teaching, laboratory education and communication with students • Use of programming software | |
| TEACHING METHODS <i>The manner and methods of teaching are described in detail.</i> <i>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> <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> | Activity | Semester workload |
| | Lectures | 39 hours |
| | Laboratory | 26 hours |
| | Study | 60 hours |
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| | Course total <i>(25 working hours per ECTS)</i> | 125 hours |
| STUDENT PERFORMANCE EVALUATION <i>Description of the evaluation procedure</i> <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> <i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i> | Final exam that might contain multiple choice questions, short-answer questions, open-ended questions and problem solving. | |

5. ATTACHED BIBLIOGRAPHY

- *Suggested bibliography (in Greek):*

- Αριθμητική Ανάλυση με εφαρμογές σε Matlab και Mathematica. Γ.Σ. Παπαγεωργίου και Χ.Γ. Τσίτουρας. Εκδόσεις ΤΣΟΤΡΑΣ ΑΘΑΝΑΣΙΟΣ, 2015. Κωδικός Βιβλίου στον Εύδοξο: 50658287.
- Αριθμητικές Μέθοδοι και Εφαρμογές για Μηχανικούς, Σαρρής Ι. Καρακασίδης Θ., Εκδόσεις ΤΖΙΟΛΑ, 2017, Κωδικός Βιβλίου στον Εύδοξο: 68373915
- Εισαγωγή στην Αριθμητική Ανάλυση, Ακρίβης Γ. Δουγαλής Β., Πανεπιστημιακές Εκδόσεις Κρήτης, 2015, Κωδικός Βιβλίου στον Εύδοξο: 59366700.