COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MINERAL RESOURCES ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	MRE301	SEMESTER	3
COURSE TITLE	MATHEMATICS III – NUMERICAL ANALYSIS		

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*	WEEKLY TEACHING HOURS	CREDITS
LECTURES	3	
IN-CLASS EXERCISES	2	
COURSE TOTAL	5	5
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*	General background
PREREQUISITE COURSES:	Mathematics II (MRE201)
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.uowm.gr/courses/MRE126/

(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*

The aim of the course is to introduce students to:

- linear systems
- vector and matrice norms
- eigenvalues and eigenvectors
- numerical integration
- numerical analysis methods
- the use of numerical analysis software to solve engineering 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?

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	*……*
Production of new research ideas	*Others…*
	…….

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

(3) SYLLABUS

Numeric computer errors. Linear systems. Gauss elimination method. Norms of vectors and matrices. Stability of linear systems.
Method of least squares. Calculation of eigenvalues and eigenvectors: Method of forces and QR method. Lagrange, Hermite and with splines functions. Numerical integration. Bank and Simpson methods. Nonlinear equations and systems. Dichotomy methods, Newton-Raphson and Cutting. Differential equations. Euler, Taylor and Runge-Kutta methods. Introduction to methods of numerically resolving border value problems. Finite differences and finite elements. Practice in computational packets of numerical analysis.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of a projection system, use of special numerical analysis software, organization and scheduling of the course and communication with students through the asynchronous e-learning platform open eclass.
TEACHING METHODS *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 PERFORMANCE EVALUATION *Description of the evaluation procedure*	Mid-term written exam (40%), final written exam (60%).

Activity	*Semester workload*
Lectures	42
In-class exercises	28
Study of theory and exercises	80
Course total	150

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.*	The evaluation criteria are given on the relevant page of the course on the asynchronous e-learning platform open e-class and are analyzed to the students at the beginning of the semester.

(5) SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:

Πετράκης Α., Πετράκη Δ., Πετράκης Λ., 2016, Αριθμητική Ανάλυση – Υπολογιστικές Μέθοδοι, Θεωρία και Εφαρμογές, Εκδόσεις ΘΑΛΗΣ, 894 pages

- Related academic journals:

SIAM Journal on Numerical Analysis
IMA Journal of Numerical Analysis
Journal of Numerical Mathematics