COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
DEPARTMENT	Electrical and Computer Engineering		
LEVEL OF STUDY	Undergraduate		
COURSE UNIT CODE	4.005	**SEMESTER**	4th
COURSE TITLE	Numerical Analysis		

COURSEWORK BREAKDOWN	**TEACHING WEEKLY HOURS**	**ECTS Credits**
Theory (Lectures)	2	3
Tutorial/Exercises	1	1
TOTAL	**3**	**4**

COURSE UNIT TYPE	Specialized general knowledge/Skills development
PREREQUISITES	1.006 Scientific Programming in Python 3.001 Differential Equations and Complex Analysis
LANGUAGE OF INSTRUCTION/EXAMS	Greek
COURSE DELIVERED TO ERASMUS STUDENTS	No
WEB PAGE (URL)	https://eclass.hmu.gr/courses/ECE118/

(2) LEARNING OUTCOMES

Learning Outcomes

The course aims to a critical understanding of arithmetic methods for the purpose of solving problems which do not succumb to analytical methods. Upon successful completion of the course, students will possess the necessary knowledge and skills to competently apply classical methods of arithmetic analysis to handle problems that arise in the fields of science and technology.

Main learning outcomes include:

1. The critical understanding of the different types of errors and their propagation to calculations in order to responsibly select appropriate and stable methods of solution.
2. The competent application of basic numerical methods for solving nonlinear equations.
3. Understanding fundamental methods for solving linear systems and their effectiveness.
4. Competent application of the polynomial interpolation method.
5. Understanding the fundamental methods of numerical integration.

General Skills

- Autonomous work
- Search, analysis and synthesis of data and information, using the necessary technologies
- Decision making
- Promoting creative and inductive/deductive thinking

(3) SYLLABUS

- Floating point & rounding errors and their consequences.
- Numerical solution of nonlinear equations (iterative methods, Newton and intersecting methods).
- Numerical solution of linear systems (Gaussian elimination, LU factorization, Jacobi and Gauss-Seidel methods).
- Polynomial interpolation (Lagrange methods and Newton's split differences).
- Least squares (rectangular polynomials, discrete minimum squares, Householder transformations, special values).

- Numerical integration (trapezoidal rule, Simpson rule).

(4) TEACHING METHODS - ASSESSMENT

MODE OF DELIVERY	In-Class Face-to-Face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	▪ Use of ICTs in lecturing ▪ Use of ICTs for the communication with students via the e-class platform
TEACHING ORGANIZATION	

Method description/Activity	Semester Workload
Lectures	26
Exercises	13
Non-guided personal study	81
Total Contact Hours	**120**

ASSESSMENT METHODS	1. Quizzes including questions and short exercises (20 %) 2. Midterm written examination including short exercises and problem solving (20 %) 3. Final written examination including short exercises and problem solving (60 %) Current course assessment details are posted in eclass.

(5) RECOMMENDED BIBLIOGRAPHY

Relevant English Texts:

- *Numerical Methods for Engineers, S.C. Chapra & R.P. Canale, 7th ed., McGraw Hill, 2015, ISBN: 978-0073397924.*
- *Numerical Computation in Science and Engineering, C. Pozrikidis, 2nd ed., Oxford University Press; 2008, ISBN: 978-0195376111.*