■ CC32 - Introduction to Numerical Analysis

GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	MATHEMATICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	CC32	**SEMESTER**	C
COURSE TITLE	INTRODUCTION TO NUMERICAL ANALYSIS		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Lectures	4	7

COURSE TYPE	Scientific Field
PREREQUISITE COURSES	Introduction to Computer Programming
LANGUAGE OF TEACHING AND EXAMINATIONS	Greek/English
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://eclass.uowm.gr/

LEARNING OUTCOMES

Learning Outcomes
Upon successful completion of the course, the students will be able to: • know computer arithmetic, • approximate functions with polynomial interpolation, • apply numerical integration formulas for the approximation of integrals, • apply the basic methods for solving non-linear equations, study their convergence and distinguish them in terms of speed, • apply the basic direct and iterative methods for the solution of linear systems, • implement the above methods in MATLAB.

General Competencies

- Search for, analysis and synthesis of data and information, with the use of the necessary technology.
- Making decisions.
- Production of free, creative and inductive thinking, which is based on mathematical processes.

CONTENT OF THE COURSE

Computer arithmetic and errors. Polynomial interpolation. Lagrange interpolating polynomial. Divided and Finite Differences. Newton interpolating polynomial Hermite interpolating polynomial.
Numerical differentiation. Numerical integration. Integration rules rectangle, trapezium, Simpson, 3/8. Adaptive quadrature. Gaussian integration.
Numerical solution of non-linear equations. Bisection method, regula falsi. fix point iteration methods, Newton-Raphson method, secant method, the Halley method.
Numerical solution of Linear Systems: Direct methods (Gauss Elimination, LU factorization), Iterative methods (Jacobi, Gauss-Seidel).

TEACHING AND LEARNING METHODS - EVALUATION

TEACHING METHOD	In the classroom.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	MATLAB. e-Lectures. Use of e-class.
TEACHING ORGANIZATION	

Activity	Semester Workload
Lectures	52 hours
Programming Tasks	48 hours
Individual Study	75 hours
Course Total (25 hours per ECTS)	175 hours

STUDENT EVALUATION	Programming tasks (MATLAB) 30%. Written final examination 70%.

RECOMMENDED BIBLIOGRAPHY

1. M.N. Vrachatis, Numerical Analysis, Kleidarithmos pub., 2012. (Greek)

2. G. Papageorgiou, Ch. Tsitouras, Numerical Analysis with applications to MATLAB and MATHEMATICA, Tsotras pub., 2015. (Greek)
3. M Gousidou-Koutita, Numerical Analysis, Kyriakidis pub., 2017 (Greek)
4. I. Th, Famelis, Computational Mathematics, Kritiki pub., 2021
5. N. Misyrlis, Numerical Analysis: an algothmic approach, Tsotras pub., 2022 (Greek)
6. G.D. Akrivis-V.A. Dougalis, Introduction to numerical analysis, Crete University Publications, 2017 (Greek).