■ CE61 - Numerical Solving of Differential Equations I

GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	MATHEMATICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	CE61	**SEMESTER**	F
COURSE TITLE	NUMERICAL SOLVING OF DIFFERENTIAL EQUATIONS I		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Lectures	4	5

COURSE TYPE	Scientific Field
PREREQUISITE COURSES	Introduction to Numerical Analysis
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
With the successful completion of the course, the students will be able to: • know and apply single step methods, • know and apply multistep methods,, • implement the above methods with their own functions in MATLAB.
General Competencies

- Search, analysis and synthesis of data and information, using the necessary technologies.
- Making decisions.
- Promotion of free, creative and inductive thinking.

CONTENT OF THE COURSE

Introduction to the numerical solution of differential equations, The need and the use of numerical methods.
History of numerical methods for ordinary differential equations, early methods Euler, Heun, Kutta, Adams Bashforth, Numerov.
Systems of first order ODEs.
Taylor method. Runge-Kutta methods.
Multistep methods Adams-Multon, Adams Bashforth.
Special second order ODEs Runge-Kutta-Nystrom methods, Numerov method.
Error analysis, stability analysis, stiff problems, boundary value problems.
Introduction numerical methods for partial differential equations.
Implementation with MATLAB.

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 in MATLAB	26 hours
Individual Study	47 hours
Course Total (25 hours per ECTS)	125 hours

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

RECOMMENDED BIBLIOGRAPHY

1. Z. Kalogiratou, Th. Monovasilis, Numerical Integration of Differential Equations, Kallipos Open Academic Editions, 2024. https://dx.doi.org/10.57713/kallipos-441. (Greek)
2. M. N. Vrachatis, Numerical Analysis: Ordinary Differential Equations, Kleidarithmos Pub. 2012 (Greek)
3. G.D. Akrivis, A.B.Dougalis, Numerical methods for Ordinary Differential Equations, Crete University Publications, 2015.