CE72 - Numerical Solving of Differential Equations II

GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	MATHEMATICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	CE72	**SEMESTER**	G
COURSE TITLE	NUMERICAL SOLVING OF DIFFERENTIAL EQUATIONS II		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Lectures	4	6

COURSE TYPE	Scientific Field
PREREQUISITE COURSES	Numerical Solving of Differential Equations I
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
After successful completion of the course, the students will have acquired a very good knowledge in the subject of numerical solving of differential equations. They will have known the current trends in research in this subject.
General Competencies
• Introduction to scientific research

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

CONTENT OF THE COURSE

With this course students are introduced to scientific research. Numerical Solving of Differential Equations. They will study and present journal articles and write their own small project.
The course contents are Runge-Kutta, Runge-Kutta-Nystrom, Partitioned Runge-Kutta methods. Butcher's theory: class conditions. trees, construction methods. Stability of methods.
Methods for solving problems with specific properties of the solution: exponentially and trigonometrically fitted methods, methods with minimum phase lag, with minimum magnification error.
Two-step hybrid methods, second derivative methods.
Implementation with MATLAB.

TEACHING AND LEARNING METHODS - EVALUATION

TEACHING METHOD	In the classroom.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Software 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	Project 50%. Written final examination 50%.

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.
4. J. Buthcer, Numerical Methods for Ordinary Differential Equations. Wiley & Sons Publications, 2016.
5. J.R. Dormand, Numerical Methods for Differential Equations: A computational approach. CRC Press, 1996, (ebook 2017).