

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF MATHEMATICS		
LEVEL OF STUDIES	UNDERGRADUATE PROGRAM		
COURSE CODE		SEMESTER	G
COURSE TITLE	SCIENTIFIC CALCULATION		
INSTRUCTOR			
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
		4	6
COURSE TYPE	Special background		
PREREQUISITE COURSES:	NO		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	http://www.math.aegean.gr/index.php/en/academics/undergraduate-programs		

(2) LEARNING OUTCOMES

Learning outcomes
On the completion of this course the students should be able to use numerical and computational techniques in order to solve a big variety of mathematical problems which are encountered in applications and in diverse area of scientific topics. Also, the students should be able to familiarize themselves with the use of computers and modern mathematical software which are required for this purpose.
General Competences
Working independently. Team work. Working in an interdisciplinary environment.

(3) SYLLABUS

<p>Newton's method for solving systems of non-linear algebraic equations.</p> <p>Efficient numerical solution of systems of linear equations with triangular matrices. Cholesky analysis for real symmetric and positive definite matrices.</p> <p>Polynomial interpolation with linear and cubic splines. Cubic splines of Hermite. Padé-type approximants.</p> <p>Best approximation of continuous functions. Legendre and Chebyshev orthogonal polynomials. Fourier series. Best approximation of discrete functions with respect to the Euclid norm.</p> <p>Numerical integration using open and closed Newton-Cotes formulas. Gaussian integration (Gauss-Legendre and Gauss-Chebyshev).</p> <p>Numerical integration of initial value problems in ordinary differential equations. The Taylor and explicit Euler method. The Euler and trapezoidal implicit methods. Runge-Kutta and predictor-corrector methods.</p>	
TEACHING MATERIAL DISTRIBUTION	The teaching material of the course is uniformly distributed during the semester.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	<ul style="list-style-type: none">• Communication with students via e-mail• Uploading course material on moodle system.	
TEACHING METHODS	Activity	Semester workload
	Lectures	39
	Laboratory practice	13
	Independent study	98
	Course total (25 per ECTS)	150
COURSE COMMITMENTS	Attending course is not obligatory.	
STUDENT PERFORMANCE EVALUATION	Student's evaluation is done in Greek through a written examination which includes short-answers questions, problem solving and laboratory work. For students with disabilities, evaluation takes place via oral exams.	

(5) ATTACHED BIBLIOGRAPHY

1. Introduction to numerical analysis, F.B. Hildebrand, Dover, 1956.
 2. Theory and applications of numerical analysis, G.M. Philips & PJ Taylor, 2nd ed., 1996.
- Related academic journals: SIAM Journal on Numerical Analysis.