

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF MATHEMATICS		
LEVEL OF STUDIES	UNDERGRADUATE PROGRAM		
COURSE CODE		SEMESTER	F
COURSE TITLE	MATHEMATICAL MODELLING		
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
Knowledge and understanding of the notion of mathematical modelling and of the basic steps for deriving mathematical models as well as of the derivation of the basic equations of mathematical physics. Knowledge and ability to apply the basic methods of mathematical modelling such as perturbation methods and dimensional analysis.
General Competences
Search for, analysis and synthesis of data and information, with the use of the necessary technology. Working independently. Team work. Working in an interdisciplinary environment. Production of free, creative and inductive thinking.

(3) SYLLABUS

<p>Basic Principles.</p> <p>Derivation of simple mathematical models. Pollution in a lake. Models for population dynamics. The logistic equation. Diffusion of technological innovations. Kinetics of chemical reactions. A model for a chemical reactor.</p> <p>Methods of Mathematical Modelling. Dimensional analysis. The Buckingham π theorem. Scaling. Perturbation Methods. Regular perturbation methods. The Poincaré–Lindstedt method. Elements of asymptotic analysis. Boundary layer theory.</p> <p>Derivation of basic PDE's. Diffusion Equation. Heat Equation. Laplace equation. Wave equation.</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	Communication with students via e-mail

TEACHING METHODS	<i>Activity</i>	<i>Semester workload</i>
	Lectures	52
	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 and problem solving. For students with disabilities, evaluation takes place via oral exams.	

(5) ATTACHED BIBLIOGRAPHY

1. Mathematical Models in Applied Mechanics - A. B. Tayler, Oxford Uni. Press
2. Jerald L. Schnoor - Environmental Modeling: Fate and Transport of Pollutants in Water, Air, and Soil, Wiley, John & Sons.
3. Applied Mathematics, J.D. Logan, Wiley, John & Sons.