COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF MATHEMATICS		
LEVEL OF STUDIES	UNDERGRADUATE PROGRAM		
COURSE CODE		**SEMESTER**	**C**
COURSE TITLE	CALCULUS III		
INSTRUCTOR	Christos Nikolopoulos		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
		6	9
COURSE TYPE	General 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

The principal aim of the course is the student's introduction to the fundamental notions of calculus of functions of several variables, as well as, on the elementary topological notions in the Euclidian space. Basic notions and definitions are presented as well as the basic theorems of calculus for functions of multiple variables.

During the course emphasis is given in the demonstration of these notions by a great variety of examples and exercises.

After completing this course, students should demonstrate competency in the following skills:

- To understand and suitably apply the basic notions of calculus for functions of several variables (continuity, differentiation, maxima-minima identification and quantification.
- To be able to apply the above relevant theory for the solution of problems mainly motivated from physics and mechanics, or several optimizations problems.

General Competences

Working independently. Team working. Working in an interdisciplinary environment. Decision-making. Production of free, creative and inductive thinking.

(3) SYLLABUS

1. Vectors and their properties in spaces R^2, R^3 and R^n. Inner product. Cylindrical and spherical coordinates. Elementary Topology of R^n.
2. Real functions in R^n, level sets (level curves and surfaces). Limit and continuity.
3. Generalization of the notion of derivative to functions f: $R^n \rightarrow R$, derivative, differential, and their properties. Forms of the chain rule. Derivative and continuity.
4. Gradient of a function. Directional derivatives. Gradient and level surfaces.
5. Partial derivatives. Taylor's Theorem.

6. Hessian of a function, maxima, minima and saddle points. 7. Lagrange multipliers for maxima and minima. 8. Implicit functions. The implicit and inverse function theorem. 9. Vector functions. Limits, continuity and other properties. Curves. Tangent line of a curve, arc length of a curve. Definition of line integrals of a real function of three variables along a curve. Geometric interpretation. 10. Vector Fields. Curl and Divergence operators of a vector field. Applications.

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 lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	• Communication with students via e-mail. • Potential case studies with suitable symbolic and numerical computations scientific software.
TEACHING METHODS	

Activity	***Semester workload***
Lectures	52
Tutorials	26
Independent study	147
Course total (25 per ECTS)	***225***

COURSE COMMITMENTS	Attending course and tutorial sessions is not obligatory.
STUDENT PERFORMANCE EVALUATION	Student's performance is evaluated in Greek, by a written examination paper which includes short-answer questions and problem solving. Disabled students are evaluated by suitably structured examinations (pending on the disability of the student, e.g., oral exams, etc.).

(5) ATTACHED BIBLIOGRAPHY

1. J. Marsden and A. Tromba. *Vector Calculus.* W. H. Freeman, 6th ed., 2011.
2. Finney R.L., Weir M.D., Giordano F.R. *Calculus. Addison Wesley-Longman, 10th ed.,* 2001.

- Related academic journals: Academic journals focused on Mathematical Analysis.