■ CE78 - Functional Analysis

GENERAL

SCHOOL	EXACT SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	CE78	**SEMESTER**	G
COURSE TITLE	FUNCTIONAL ANALYSIS		

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

COURSE TYPE	Scientific Field
PREREQUISITE COURSES	Topology
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 a successful attendance of the course, the students: • will understand the basic properties of the norm, • will understand the meaning of the completeness, • will learn for the classical Banach spaces and their basic properties, • will learn the basic theory of Hilbert spaces, • will learn the meaning of the bounded linear operators, • will understand the meaning of the binary space and apply related techniques,

- will learn the Hahn-Banach Theorem, Open mapping Theorem and Closed graph Theorem.

General Competencies

- Search for, analysis and synthesis of data and information, with the use of the necessary technology.
- Working in an interdisciplinary environment.
- Working independently for the enhancement of their self-esteem.
- Team Working.
- Creation of new research ideas.
- Production of free, creative and inductive thinking, which is based on mathematical processes.

CONTENT OF THE COURSE

Basic properties of metric spaces. Banach spaces, basic properties and examples. Spaces with norm of finite dimension. Spaces with inner product and Hilbert spaces, basic notions, properties and examples, orthogonality. Bounded linear operators. Bounded linear functionals. Isomorphisms and isometries. Operator norm. The space of bounded operators as a Banach space. Dual space. Hahn-Banach Theorem, Banach-Steinhaus Theorem, Open mapping Theorem, Closed graph Theorem.

TEACHING AND LEARNING METHODS - EVALUATION

TEACHING METHOD	In the classroom.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of e-class. Communication through e-mails.
TEACHING ORGANIZATION	

Activity	Semester Workload
Lectures	40 hours
Lectures of auxiliary exercises	20 hours
Solving of selected exercises	40 hours
Individual Study	50 hours

	Course Total (25 hours per ECTS) — 150 hours
STUDENT EVALUATION	Written final examination (theory and exercises) 100%.

RECOMMENDED BIBLIOGRAPHY

1. S. Negrepontis, Th. Zachariadis, N. Kalamidas, V. Farmaki, General Topology and Function Analysis, Publications Symmetria, 1997 (Greek).
2. C. Karyofyllis, Elements of Functional Analysis, Publications Ziti, 1995 (Greek).
3. E. Kreyszig. *I*ntroductory Functional Analysis. Wiley, 1989.
4. G. F. Simmons. Introduction to Topology and Modern Analysis. Krieger Publishing Company, 2003.