COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF MATHEMATICS		
LEVEL OF STUDIES	UNDERGRADUATE PROGRAM		
COURSE CODE		**SEMESTER**	**A**
COURSE TITLE	SETS AND NUMBERS		
INSTRUCTOR	Charalambos Kornaros		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
		6	9
COURSE TYPE	General knowledge		
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
Logic as mathematical tool to analyze and describe mathematical arguments. Use basic Set Theory to describe memberships of sets, the relations between sets and the Fundamental Axioms of Mathematics. Recognize the basic number systems (natural numbers, integers, rationals and reals). Gain familiarity with abstract mathematical concepts of Calculus and Algebra. Upon completion of the learning process, the student will have acquired the ability to handle basic mathematical notions and understand the different types of numbers as well as make rigorous mathematical proofs.
General Competences
Working independently. Team work. Working an interdisciplinary environment.

(3) SYLLABUS

1. Elements of Logic. Introduction to Propositional Logic, definitions and examples (negation, conjunction, disjunction, implication, logical equivalence). De Morgan's Laws in Logic. Quantifiers in Logic and their use. Examples. Laws of reasoning (reductio ad absurdum, induction, contraposition). Examples.
2. The notion of a set. Two ways of describing or specifying the members of a set: using a rule and listing each member of the set. Subsets, Complement, Union, Intersection, set-theoretic difference. Examples. De Morgan's laws in Set theory. Cartesian product. Types of Relations: Equivalence Relations, Ordering Relations). Types of Functions: one to one, onto. Inverse functions. Examples. Composition of two functions. Image and inverse image of a set. The notion of a sequence. Basic properties. Operations and their properties. Examples.
3. The set of Natural Numbers. Peano Axioms. The least number principle and its relation to the mathematical induction. The Integers and the basic properties of Integer Divisibility. Rational Numbers.
4. Real numbers. A dialogue concerning the need for the real number system. The notion of the

least upper bound and greatest lower bound of a set. The Axiom of Completeness. The existence of roots of positive reals, for example: the square root of 2. The Archimedean property. Operations in Reals and their ordering. 5. Sequences of real numbers and their properties (brief discussion). Cauchy sequences. Consequences of the axiom of Completeness: Convergence of monotone sequences. A bounded sequence converges if and only if it is Cauchy. Bolzano-Weierstrass theorem. 6. Complex Numbers. Basic notions and operations. Complex conjugate, magnitude (length) or absolute value. Trigonometric inequality. The Complex plain. Polar form of Complex numbers. n-th roots of complex numbers. Euler's and De Moivre's formulas. Applications in trigonometry.	
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 • Uploading course material on moodle system
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 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. Antonis Tsolomitis, "Sets and Numbers", (in Greek) Leader Books (2004), ISBN:960-7901-47-9.
2. Panagiotis Tsamatos, "Fundamendal notions of Mathematical Analysis" (in Greek), Published by Tziola (2015), ISBN 978-960-418-195-7.