

■ CC14 - Fundamental Notions of Mathematics

GENERAL

SCHOOL	EXACT SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	CC14	SEMESTER	A
COURSE TITLE	FUNDAMENTAL NOTIONS OF MATHEMATICS		
INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	ECTS	
Lectures	5	8	
COURSE TYPE	General Background		
PREREQUISITE COURSES	-		
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
<p>Upon successful completion of the course, the students will be in position to:</p> <ul style="list-style-type: none"> • know the basic notions of set theory (operation of sets and properties), along with the concepts of Cartesian product, set of sets, cover and partition, • know the concept of relations and their properties, the concept of composition of relations, along with the notions of equivalencies, orders and bounded sets (supremum, infimum), • know the basic notions of functions, one-to-one, on to, and bijective functions, inverse functions, composite functions, the concepts of image inverse image of a

set through a function, and also the relation between functions and ordered sets, (bounds, monotonicity),

- know the basic notions of propositional calculus and mathematical induction,
- know about the set theoretical construction of the natural numbers and integers, dividability, and the construction of rational numbers and through these of real numbers (Dedekind cuts),
- know the basic notions of complex numbers, their trigonometric form and also know how to apply these in solving equations in the set of complex numbers.

General Competencies

- Analysis and synthesis of data and information.
- Working independently.
- Decision making.
- Creation of new research ideas.
- Promotion of free, creative and inductive thinking.

CONTENT OF THE COURSE

- Elementary set theory. Union, intersection, difference, symmetric difference of sets and related properties. Powerset and complement of a set, Cartesian product, set of sets. cover and partition of a set.
- Relations and their properties. Composition of relations. Equivalencies, classes of equivalence. Orders. Bounds and bounded sets. Supremum, infimum. Well ordered sets.
- Functions, basic concepts. One-to-one, onto, bijective functions. Inverse function. Composite function. Image and inverse image of a set through a function. Functions and ordered sets. Bounds. Monotonicity.
- Elementary notions of propositional calculus. Logical operations. Tautologies.
- Mathematical induction. Mathematical induction and well ordering. Full induction.
- The sets of natural numbers and integers. Dividability. The set of of rational numbers. Construction of real numbers through Dedekind cuts. The set of of irrational numbers. Completeness theorem in the set of real numbers.
- Complex numbers. Second degree equations in the set of complex numbers. Trigonometric form. Equation de Moivre. v -th roots of a complex number. Fundamental Theorem of Algebra. Triangular inequality.

TEACHING AND LEARNING METHODS - EVALUATION

TEACHING METHOD	In the classroom.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	LATEX and Scientific Workplace to prepare the course material. Powerpoint presentations.

	Use of the e-class platform to share notes-exercises-projects, and for communication through e-mails.	
TEACHING ORGANIZATION	Activity	Semester Workload
	Lectures	65 hours
	Individual Study	100 hours
	Solving exercises and projects	35 hours
	Course Total (25 hours per ECTS)	200 hours
STUDENT EVALUATION	Solving exercises and problems 25%. Written final examination 75%.	

RECOMMENDED BIBLIOGRAPHY

1. Tsolomitis A., Sets and Numbers, Publications Leader Books, 2004. (Greek)
2. Tsamatos P., Fundamental Notions of Mathematical Analysis, Publications Tziola, 2009. (Greek)
3. Stewart I., Tall I., The Foundations of Mathematics, Oxford Univ. Press, 2015.