■ CE76 - Set Theory

GENERAL

SCHOOL	EXACT SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	CE76	**SEMESTER**	G
COURSE TITLE	SET THEORY		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Lectures	4	5

COURSE TYPE	Scientific Field
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
With a successful attendance of the course, the students: • will understand basic notions of Set Theory such as the notions of set, subset, powerset and operations between sets, • will understand equivalence relations, order relations and functions between sets, • will understand the Axiomatic Foundation of Set Theory, paying attention to the axioms of Zermelo-Fraenkel and the Axiom of Choice, • will understand the foundation of the sets of natural numbers, integers numbers and rational numbers and also the notions of basic operations between these numbers,

- will understand the construction of the set of real numbers as Dedekinds cuts and through Cauchy sequences of rational numbers and also the notions of basic operations between these numbers,
- will understand the notion of countable set and properties of countable sets,
- will understand the notion of cardinal number, basic operations between them and their order,
- will understand the basic theory of ordinal types and ordinal numbers, studying operations between them and their order,
- will understand important subsets of the set of real numbers like the Cantor set, Borel sets and Baire sets,
- will understand the importance of Set theory through its applications in various branches of Mathematics.

General Competencies

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

CONTENT OF THE COURSE

- Set, subset, powerset, operations between sets, like union and intersection, properties of these operations.
- Equivalence relations, equivalence classes, order relations, functions.
- Axiomatic Foundation of Set Theory by Zermelo-Fraenkel.
- Foundation of natural, integers and rational numbers, operations between these numbers, the order relation on the sets of natural, integers and rational numbers.
- Study of the set of real numbers through Dedekind cuts and Cauchy sequences of rational numbers, operations between these numbers, order relation on the set of real numbers.
- Countable and non-countable sets.
- Cardinal numbers, Cantor-Berstein theorem, operations between cardinal numbers, order between cardinal numbers, the continuum hypothesis.
- Ordinal types and ordinal numbers, operations between ordinal types and ordinal numbers, order between them.
- Important subsets of the set of real numbers, like the Cantor set, Borel sets and Baire sets.
- Applications of Set Theory in branches of Mathematics.

TEACHING AND LEARNING METHODS - EVALUATION

TEACHING METHOD	In the classroom.

<table>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>Use of e-class,.
Communication through face-to-face discussions and e-mails.</td></tr>
<tr><td>TEACHING ORGANIZATION</td><td><table>
<tr><th>Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>52 hours</td></tr>
<tr><td>Individual Study</td><td>98 hours</td></tr>
<tr><td>Course Total
(25 hours per ECTS)</td><td>150 hours</td></tr>
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<tr><td>STUDENT EVALUATION</td><td>Written final examination 100%.</td></tr>
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RECOMMENDED BIBLIOGRAPHY

1. D. Georgiou, S. Iliadis, Set Theory, Publications Tziola, 2017 (Greek).
2. K. Kalfa, Axiomatic Set Theory, Publications Ziti, 1990 (Greek).