COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_PM437	**SEMESTER OF STUDIES**	7th
COURSE TITLE	SET THEORY		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures and Tutorials	4	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Elective course
PREREQUISITE COURSES:	Recommended prerequisite knowledge: INTRODUCTION TO ALGEBRA AND SET THEORY
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/MATH915/

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning*

and Appendix B

- *Guidelines for writing Learning Outcomes*

With the successful completion of this subject, the students will be able:

- To understand basic notions of Set Theory, for example the notions of binary relations and of functions.
- To realize the axiomatic foundation of Set Theory and the necessity of its enactment for mathematics.
- To realize the foundation of the set of natural, integer and rational numbers and to understand the definitions of basic operations between those numbers.
- To understand the construction of the set of real numbers and to realize the definitions of basic operations between those numbers.
- To understand the notion of countable set through the presentation of examples and properties of countable sets.
- To understand the notion of cardinality, the basic operations between them and to understand the notion of order between them.
- To realize the basic theory of imperative types and of imperative numbers, to become familiar with operations between them, to realize their order and to understand the transfinite induction.
- To realize the Axiom of choice, the consequences of this axiom, the Lemmas of Zorn and Zermelo and the trisect authority.

- To study remarkable subsets of the set of real numbers such as the Cantor set, the Borel sets, the Baire sets e.t.c.
- To realize the breadth and the usefulness of Set Theory in various fields of mathematics.

General Abilities

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*Others…*
Production of new research ideas	

• Search, analysis and synthesis of facts and information using the necessary technologies.
• Decision making.
• Adaptation to new situations.
• Working in an interdisciplinary environment.
• Autonomous Work.
•Teamwork.
• Production of new research ideas.
• Promotion of the free, creative and inductive thinking.

3. COURSE CONTENT

- Elements of Naive Set Theory. Algebra of Boole of subsets. Binary relations. Order relations, Functions.
- Introduction to axiomatic theory of sets. Contradictions. Foundation of natural, integer and rational numbers. Foundation of real numbers using Dedekind cuts and Cauchy sequences of rational numbers. The operations of addition and multiplication between natural, integer, rational and real numbers. Basic properties of these numbers. Order on the sets of natural, integer, rational and real numbers.
- Countable and uncountable sets. Cardinalities. The theorem of Cantor-Berstein. Operations of cardinalities. Order on cardinalities. Continuum hypothesis.
- Imperative types and imperative numbers. Basic theory of imperative types and imperative numbers. Operations between imperative types and imperative numbers. Order between them. Transfinite induction.
- Axiom of choice. Consequences of this axiom. Lemmas of Zorn and Zermelo. Trisect authority.
- Remarkable subsets of real numbers: Cantor set, Borel sets, Baire sets e.t.c.

4. TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING METHOD *Face-to-face, Distance learning, etc.*	Lectures (face to face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *Use of ICT in teaching, laboratory education, communication with students*	Supporting learning through the online platform *eClass,* University of Patras.
TEACHING ORGANIZATION *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	
STUDENT ASSESSEMNT *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	**Assessment Language:** Greek **Assessment Language for Students Erasmus:** English **Assessment methods:** Written Final Course Examination (100%) including ✓ Theory ✓ Exercises Minimum passing grade: 5 Μαximum passing grade: 10

Activity	***Semester workload***
Lectures	52
Solving suggested exercises	30
Hours for private study of the student	65
Final examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***150***

5. RECOMMENDED LITERATURE

(*in Greek*)

- Γεωργίου Δημήτριος και Ηλιάδης Σταύρος. *Θεωρία Συνόλων*. 2η Έκδοση, Εκδόσεις Τζιόλα, 2017.
- Κάλφα Κορνηλία. *Αξιωματική Θεωρία Συνόλων*. Εκδόσεις Ζήτη, 1990.