COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_PM436	**SEMESTER OF STUDIES**	7th
COURSE TITLE	THEORY OF MEASURE AND INTEGRATION		

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*	Compulsory course for the specialization *Pure Mathematics* Elective course for each of the other specializations
PREREQUISITE COURSES:	Recommended prerequisite knowledge: REAL ANALYSIS II
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.math.upatras.gr/courses/MATHDEP255/

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*

- Ability to understand the proof and the importance of the Theorem of Lebesgue on Riemann integrability.
- Ability to understand the definition of Lebesgue measure on the real line. Ability to understand the basic properties of Lebesgue measure.
- Ability to understand the definition and the importance of measurable sets. Ability to prove that the Borel sets are measurable.
- Ability to understand the definition and the importance of measurable functions. Ability to solve excersices that require deciding whether a function is measurable.
- Ability to understand the Theorems of Egorov and Lusin.
- Ability to understand the definition of the Lebesgue integral. Ability to understand the role of the simple functions in the theory of Lebesgue integration.
- Abiltiy to understand and use the theorems of monotone and dominated convergence. Ability to understand and use Fubini's theorem.
- Ability to calculate Lebesque integrals using the theory of Lebesque integrability or the propositions which connect the Lebesque with the Riemann integral.
- Ability to understand the defintion and the topology of Lp spaces.
- Knowledge of the defintions of general measure theory.

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	

This course helps students

- promote free, creative and inductive thinking
- develop the ability to produce new research ideas
- conduct criticism and self-criticism

3. COURSE CONTENT

Lebesgue theorem on integrability, Lebesgue measure on the real line, σ-algebra of measurable sets, measurable functions, Theorems of Eogrov and Lusin, simple functions, Lebesgue integral and comparison with the Riemann Integral, theorems of monotone and dominated convergence, Fubini's Theorem, introduction to general measure theory and Lp spaces.

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*	The *eClass* platform is used to communicate with the students and to present additional lecture notes and exercises.
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 Erasmus students:** English **Assessment methods:** Written Final Course Examination (100%) including ✓ Theory ✓ Exercises Minimum passing grade: 5 Maximum passing grade: 10

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

5. RECOMMENDED LITERATURE

(*in Greek*)

- Κουμουλλής Γεώργιος Χ. και Νεγρεπόντης Στυλιανός. *Θεωρία Μέτρου*. Εκδόσεις Συμμετρία, 2005.
- Ξενικάκης Πολυχρόνης Ι. *Πραγματική Ανάλυση*. 2η Έκδοση, Εκδόσεις Ζήτη, 1996.

(*in English*)

- Tao Terry. *An Introduction to Measure Theory*. American Mathematical Society; New ed. edition, 2011.