



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Matematica e Informatica		
ACADEMIC YEAR	2022/2023		
BACHELOR'S DEGREE (BSC)	MATHEMATICS		
SUBJECT	MATHEMATICAL ANALYSIS 3		
TYPE OF EDUCATIONAL ACTIVITY	B		
AMBIT	50198-Formazione Teorica		
CODE	01246		
SCIENTIFIC SECTOR(S)	MAT/05		
HEAD PROFESSOR(S)	TRAPANI CAMILLO	Professore Ordinario	Univ. di PALERMO
OTHER PROFESSOR(S)			
CREDITS	6		
INDIVIDUAL STUDY (Hrs)	94		
COURSE ACTIVITY (Hrs)	56		
PROPAEDEUTICAL SUBJECTS	01250 - MATHEMATICAL ANALYSIS 2		
MUTUALIZATION			
YEAR	3		
TERM (SEMESTER)	1° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	TRAPANI CAMILLO Wednesday 14:30 - 16:30 Studio del docente: Dipartimento di Matematica e Informatica, Via Archirafi 34, 1° Piano, Ufficio 115b		

DOCENTE: Prof. CAMILLO TRAPANI

PREREQUISITES	Differential and integral calculus for real-valued functions of one or several real variables.
LEARNING OUTCOMES	<p>KNOWLEDGE AND UNDERSTANDING: Comprehensive and theoretical knowledge within the theory of the measure and the Lebesgue integral, the L^p spaces and outlines of the Banach spaces theory. The knowledge involves a critical understanding of theories and principles in the field of study.</p> <p>APPLYING KNOWLEDGE AND UNDERSTANDING: The educational goals are achieved by solving specific problems involving the use of logical, intuitive and creative thinking.</p> <p>MAKING JUDGEMENTS: Autonomous thinking is acquired by developing logical arguments with precise hypothesis and thesis.</p> <p>COMMUNICATION: The students should acquire the capacity of exposing rigorously the methods and the ideas of the involved topics.</p> <p>LIFELONG LEARNING SKILLS: Students should be capable of finding information and deepen topics exposed in books of Mathematical Analysis and ready to attend higher level courses in Analysis.</p>
ASSESSMENT METHODS	A 3-hours written examination (discussion/solution of 2 theoretical questions and the solution of 2 exercises) which allows to evaluate the mastery of the course topics, language skills and the ability of the student to solve problems by using the acquired knowledge. The oral exam consists of the discussion of the written tests. The exam assessment is on a scale of 30 corresponding about the following results: - excellent (30 - 30 e lode): excellent mastery of the topics and language skills, very good analytical skills and ability to solve problems by using the acquired knowledge; - very good (26 - 29): very good mastery of the topics and language skills, ability to solve problems by using the acquired knowledge; - good (24 - 25): good knowledge of the main topics, reasonable language skills, satisfying ability to solve problems by using the acquired knowledge; - acceptable (21- 23): reasonable knowledge of the main topics, acceptable language skills, sufficient ability to solve problems by using the acquired knowledge; - passing (18 - 20): basic knowledge of the main topics and limited language skills, limited ability to solve problems by using the acquired knowledge. - poor: lack of understanding of basic subjects, very poor knowledge of the course program.
EDUCATIONAL OBJECTIVES	The course is aimed to introduce students to measure and Lebesgue integral theory, to L^p spaces and to the basic aspects of Banach spaces.
TEACHING METHODS	Frontal lectures and class exercises. There are also two intermediate (not compulsory) written tests (each of them consists in solving one theoretical problem and one exercise). In case of positive evaluations of the intermediate written tests, the student can be directly admitted to the final oral exam.
SUGGESTED BIBLIOGRAPHY	C. Trapani, Appunti del Corso, Disponibile sul portale d'Ateneo G. de Barra - Teoria della misura e dell'integrazione, L'Arciere editore, 1987 A. Brezis – Analisi funzionale, Liguori Editore, 1986 88-207-1501-5 W. Rudin - Analisi reale e complessa, Bollati-Boringhieri, 1996, 97-88-339-5342-4

SYLLABUS

Hrs	Frontal teaching
8	Lebesgue measure in \mathbb{R} and in \mathbb{R}^n - Measurable functions and their properties - Lusin's Theorem and Egoroff's Theorem - Integrability of measurable functions. - The Lebesgue integral- Fatou Lemma - Monotone convergence Theorem - Dominated convergence Theorem
8	Comparison between the Riemann integral and the Lebesgue integral - Abstract integration in measure spaces - Product measures - The Tonelli and the Fubini Theorems.
8	Differentiation of monotone functions - Fundamental Theorem of Calculus - Functions of bounded variation - Differentiation of an integral - Absolutely continuous functions and Radon-Nikodym Theorem.
8	Normed spaces - Banach spaces - L^p spaces - Holder and Minkowski inequalities.
Hrs	Practice
6	Class exercises on measure spaces, measurable functions, L^p spaces and passage to the limit under an integral sign.
6	Class exercises on product measures and Tonelli and Fubini Theorems
6	Class exercises on functions of bounded variation and on absolutely continuous functions
6	Class exercises signed measures and Radon-Nikodym theorem