UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria		
ACADEMIC YEAR	2023/2024		
BACHELOR'S DEGREE (BSC)	ELECTRONIC ENGINEERING		
INTEGRATED COURSE	MATHEMATICAL ANALYSIS - INTEGRATED COURSE		
CODE	19109		
MODULES	Yes		
NUMBER OF MODULES	2		
SCIENTIFIC SECTOR(S)	MAT/05		
HEAD PROFESSOR(S)	NASTASI ANTONELLA	Ricercatore a tempo determinato	Univ. di PALERMO
OTHER PROFESSOR(S)	NASTASI ANTONELLA	Ricercatore a tempo determinato	Univ. di PALERMO
CREDITS	12		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	1		
TERM (SEMESTER)	1° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	**NASTASI ANTONELLA** Thursday 10:00 11:00 Ex dipartimento di Metodi e modelli Matematici, secondo piano		

DOCENTE: Prof.ssa ANTONELLA NASTASI

PREREQUISITES	Classical knowledge of the concepts of mathematical logic. Solution of equation, system of equation, inequalities, system of inequalities. Basic knowledge of trigonometry. Basic knowledge of trigonometry
LEARNING OUTCOMES	Knowledge and Understanding The student, at the end of the course, will have acquired knowledge and methodologies to address and solve problems of differential and integral calculus. The student must also know and understand the theorems and their proofs on the above topics. Applying knowledge and understanding The student must be able to use the differential and integral calculus in order to solve mathematical problems arising also from classical mechanics. Making judgements The student will develop a critical ability in characterizing the suitable and relevant solution to the proposed problem. The student will acquire the ability to formalize and analyze new problems in full autonomy, both in qualitative way and in rigorous way. The formative objectives will be reached using frontal lessons and problems and exercises solved in classroom. The attainment of the objectives is verified by written test and oral examination. Communication skills The student will acquire the ability to expose in clear and rigorous way, using adequately the disciplinary lexicon, the results of the characterized qualitative solution and problem analysis. The communication abilities will be verified in the oral examination. Learning skills The student will acquire the ability to contextualize own knowledges, eventually adapting in an independent way, in wide and multidisciplinary area of interests.
ASSESSMENT METHODS	The knowledge and the understanding of the student about the contents of the course will be verified through a written test (2 hours) and an oral discussion. In the written test the resolution of four exercises is demanded. The exercises will be structured in several questions in order to determine whether the student has gained knowledge and understanding of the proposed arguments The final evaluation will be scaled according to the following conditions: 30-30 with honors optimal knowledge of the contents of the course, optimal property of language, very good analytic abilities and competence in problem solving; 26-29 good mastery of the contents of the course, very good property of language, good competence in problem-solving ; 24-25 knowledge of base treated contents, discrete property of language, with limited ability to independently apply the competence to solve the proposed problems; 21-23 not have full mastery of the main contents of the course but possesses knowledge, satisfactory property of language, insufficient ability to independently apply the acquired knowledge; 18-20 minimal base knowledge of the contents of the course and of the technical language, most insufficient or null ability to independently apply the acquired knowledge ; no sufficient does not possess an acceptable knowledge of the contents of the presented topics (no sufficient);
TEACHING METHODS	The course consists of frontal lessons and discussion in which illustrative problems are resolved.

MODULE
MATHEMATICAL ANALYSIS - MODULE 1

Prof.ssa ANTONELLA NASTASI

SUGGESTED BIBLIOGRAPHY

M. Bertsch, R. Dal Passo, L. Giacomelli, Analisi Matematica (2Ed) McGraw-Hill ISBN-10 8838662819
M. Bramanti, C. Pagani, S. Salsa Analisi Matematica 1 Zanichelli ISBN: 9788808254214
P. Marcellini, C. Sbordone , Elementi di Analisi Matematica I Liguori Editori ISBN: 9788820733834

AMBIT	50283-Matematica, informatica e statistica
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54

EDUCATIONAL OBJECTIVES OF THE MODULE

-Knowledge and understanding The student must know and understand the basic concepts of the course. Know and be able to work in different numerical sets, know, understand and be able to apply knowledge relating to succession, elementary functions, limit of sequences and functions, differential and integral calculus. -Applying knowledge and understanding The student will be able to use mathematical language, apply the acquired knowledge in solving proposed problems and generally include the use of mathematical methods in the applied sciences. -Making judgment At the end of the course the student will have specific knowledges in identifying the most relevant technical solutions in relation to different problems. at the same time understand how to use the knowledge acquired in the study of other disciplines. -Communication skill During lectures and exercises the student will be urged to interact with relevant questions to clarify any doubts and to develop capacity to apply the techniques learned to other scientific subjects. -Learning ability Ability to attend, using the knowledge acquired in the course. Knowledge of the differential and integral calculus for functions of one real variables. The student will be able to study of the graphs of elementary functions, to solve integration problems of elementary character, to discuss the nature of numerical sequences, to state and prove basic theorems of Mathematical Analysis.

SYLLABUS

Hrs	Frontal teaching
4	Axioms of real numbers. natural, integers and rational numbers. Set theory. Maximum, minimum, supremum and infimum of a set. Uniqueness of the maximum and minimum of a set. Theorem of existence of the supremum and infimum of a set.
2	Complex numbers
3	Functions of a real variable. Surjective, bijective functions. Composte mappings. Monotonic functions. The exponential and logarithmic functions. Powers functions. The circular functions.
2	real sequences.
4	Limitis and convergence of functions. Monotonic functions. Theorems and properties.
2	Continuous functions. Discontinuities of a function. Properties and theorems of limits of functions. The intermediate value theorem
6	Differentiation at a point. The chain rule theorem. Differentiation of the inverse mapping. Convex functions. Properties of derivatives functions. Local minimum and maximum. Rolle Theorem. Darboux continuity. The mean value theorem. Taylor theorem with Lagrange and Cauchy remainder. Higher derivatives of order n. Convex functions. L'Hopital rule. Taylor espansion
4	Integration and elementary integrals. Upper and lower Riemann integrals. Riemann integrable functions. Algebraic property of integrable functions. Mean value theorem. The fundamental theorem of calculus. Change of variable formula. Integration by parts.
2	Numerical series

Hrs	Practice
2	Exercises on real and complex numbers
3	Functions
6	Exercises on limits of sequences and functions
6	Exercises on continuity and differentiation at a point.
6	Exercises on integrals
2	Exercises on numerical series

MODULE
MATHEMATICAL ANALYSIS - MODULE 2

Prof.ssa ANTONELLA NASTASI

SUGGESTED BIBLIOGRAPHY

M. Bertsch, R. Dal Passo, L. Giacomelli, Analisi Matematica (2Ed) McGraw-Hill ISBN-10 8838662819
M. Bramanti C. Pagani S. Salsa, Matematica. Calcolo infinitesimale e algebra lineare. Zanichelli ISBN: 9788808254214

AMBIT	50283-Matematica, informatica e statistica
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54

EDUCATIONAL OBJECTIVES OF THE MODULE

At the end of the course the student will acquire the knowledge on the main topics, methodologies on infinitesimal differential calculus for functions of two or more variables. In particular, the student will be able to understand the issues arising from the needing to create a rigorous language using the logical-deductive method to deal with intuitively simple math problems. The students will be also able to understand simple physical problems and to convert them in the correct mathematical language, for instance through differential equation.

SYLLABUS

Hrs	Frontal teaching
1	Objectives of the discipline.
2	Sequences of functions. Power series.
2	Topology of the real vector space R^n
6	Differential equations.
6	Limits for functions of multiple real variables: definitions,main properties and theorem. Continuity of a function
15	Differential calculus for functions of multiple real variables
10	Integration theories

Hrs	Practice
2	Sequences of functions. Power series.
3	Differential equations
2	Differential calculus.
2	Integration theories.
3	Conservative and non conservative fields. Work of a conservative field.