UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2023/2024
BACHELOR'S DEGREE (BSC)	BUILDING ENGINEERING, INNOVATION AND RETROFITTING
INTEGRATED COURSE	MATHEMATICAL ANALYSIS - INTEGRATED COURSE
CODE	19109
MODULES	Yes
NUMBER OF MODULES	2
SCIENTIFIC SECTOR(S)	MAT/05
HEAD PROFESSOR(S)	TORNATORE ELISABETTA Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	TORNATORE ELISABETTA Professore Associato Univ. di PALERMO
CREDITS	12
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	MATHEMATICAL ANALYSIS - MODULE 1 - Corso: ENVIRONMENTAL ENGINEERING FOR SUSTAINABLE DEVELOPMENT MATHEMATICAL ANALYSIS - MODULE 1 - Corso: INGEGNERIA AMBIENTALE PER LO SVILUPPO SOSTENIBILE
YEAR	1
TERM (SEMESTER)	Annual
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**TORNATORE ELISABETTA** Tuesday 9:30 10:30 Studio del docente

DOCENTE: Prof.ssa ELISABETTA TORNATORE

PREREQUISITES	Typical high school sillabus
LEARNING OUTCOMES	-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.
ASSESSMENT METHODS	The final exam consists of two parts one written and one oral. The final written exam and the written test in progress are evaluated in the following form : A, B, C, D, E, F. The final oral exam consists of questions and proofs on the theory presented in the course. In addition, based on the written exam, we can be required clarifications on errors and resolutions of exercises. The final vote will be given in thirtieths. (rating 30-30L): Excellent knowledge of subjects and theories addressed in the course; excellent level of awareness and autonomy in the application of theories to solve problems; (rating 26-29) : Good knowledge of subjects and theories addressed in the course; good degree of awareness and autonomy in the application of theories to solve problems; (rating 24-25): Good knowledge of subjects and theories addressed in the course; fair degree of awareness and autonomy in the application of theories to solve problems; (rating 21-23); fair knowledge of subjects and theories addressed in the course; sufficient degree of awareness and autonomy in the application of theories to solve problems; (rating 18-20): sufficient knowledge of subjects and theories addressed in the course; sufficient degree of awareness and autonomy in the application of theories to solve problems;
TEACHING METHODS	The course is, divided into two modules, taking place in the two teaching periods of the first year. Teaching is provided through lectures and exercises. At the end of each teaching module there is a written test in progress, . Passing these tests in progress can exempt the student completely or only partially, from final written test.

MODULE
MATHEMATICAL ANALYSIS 1

Prof.ssa ELISABETTA TORNATORE

SUGGESTED BIBLIOGRAPHY

M. Bertsch, R. Dal Passo, L. Giacomelli, Analisi Matematica (2Ed) McGraw-Hill
ISBN 978 -88- 386- 6894-4

Per Approfondimenti:
C. Canuto, .A. Tabacco Mathematical Analysis I, Springer 2008 ISBN 978-88-470-0875-5
M. Bramanti, C. Pagani, S. Salsa Analisi Matematica I, Zanichelli ISBN 978-88-080-6485-1

P. Marcellini, C. Sbordone , Elementi di Analisi Matematica I. Zanichelli ISBN 978-88-207-3383-4

Per le esercitazioni:
C. Marcelli, Analisi matematica 1 esercizi con richiami di teoria, Pearson. ISBN 978-88-919-0489-8

AMBIT	50106-Formazione scientifica di base
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52

EDUCATIONAL OBJECTIVES OF THE MODULE

This module is aimed to the acquisition of the fundamental aspects of differential and integral calculus for real functions and to develop capacity to apply the
techniques learned to second module and in scientific contexts

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
4	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.

Hrs	Practice
3	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.

MODULE
MATHEMATICAL ANALYSIS 2

Prof.ssa ELISABETTA TORNATORE

SUGGESTED BIBLIOGRAPHY

M. Bertsch, R. Dal Passo, L. Giacomelli, Analisi Matematica (2Ed) McGraw-Hill
ISBN 978-88-386-6894-4
Per Approfondimenti:

C. Canuto, .A. Tabacco Mathematical Analysis I, Springer 2008 ISBN 978-88-470-0875-5

M. Bramanti, C. Pagani, S. Salsa Analisi Matematica II, Zanichelli ISBN 978-88-08-12281-0

P. Marcellini, C. Sbordone , Elementi di Analisi Matematica I I Zanichelli ISBN 978-88-207-3137-3

AMBIT	50106-Formazione scientifica di base
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52

EDUCATIONAL OBJECTIVES OF THE MODULE

This module is aimed to the acquisition of the fundamental aspects of differential and integral calculus in several real variables and the ability to apply them in a scientific context.

SYLLABUS

Hrs	Frontal teaching
2	Topology of Euclidean spaces.
2	Limits and continuous functions.
4	Differential calculus for real and vectorial functions of several real variables.
4	Applications (geometrical aspects of calculus; maximum and minimum of functions; Taylor formula).
4	Riemann integration.
6	Curves and integration along a path.
6	Differential equations

Hrs	Practice
4	Exercises on continuous and differentiable functions of several real variables.
4	Exercises on geometrical aspects of differential calculus and critical points for functions of several real variables.
6	Exercises on Riemann integration for functions of several real variables. Change of variables.
4	Exercises on curves and integration.
6	exercises on differential equations