UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2022/2023
BACHELOR'S DEGREE (BSC)	DIGITAL ENTERPRISE INNOVATION ENGINEERING
INTEGRATED COURSE	MATHEMATICAL ANALYSIS - INTEGRATED COURSE
CODE	19109
MODULES	Yes
NUMBER OF MODULES	2
SCIENTIFIC SECTOR(S)	MAT/05
HEAD PROFESSOR(S)	DALLA RIVA MATTEO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	DALLA RIVA MATTEO Professore Associato Univ. di PALERMO SCHILLACI CARLO Professore a contratto Univ. di PALERMO
CREDITS	12
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	Annual
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**DALLA RIVA MATTEO** Wednesday 14:30 15:30 da stabilire

DOCENTE: Prof. MATTEO DALLA RIVA

PREREQUISITES	Standard Italian high school mathematics curriculum Algebra and arithmetics. Properties and operations of the integers, rational numbers, and real numbers. Prime numbers. The absolute value. Logarithmic and exponential functions. Integral calculus. Polynomials: operations, factorization. Quadratic and linear equalities and inequalities and reducible higher order equalities. Systems of linear equations. Equalities and inequalities involving quotients, roots, logarithmic functions, and exponentials. 2D and 3D geometry. Segments, angles, lines, planes. Classic geometric figures and their main properties, such as volumes, areas, and perimeters. Basic notions of analytic geometry. Cartesian coordinates. Lines and circles equations, as well as the equations for ellipses, parabolas, and hyperboles. Plane trigonometry. Properties of the sin and cos functions. Main trigonometric formulas for the addition, subtraction, duplication, and bisections of angles. Trigonometric equalities and inequalities. Main properties of a triangle's angles.
LEARNING OUTCOMES	Knowledge and understanding: At the end of the course students will be well acquainted with the basic elements of differential calculus for functions of one or more real variables, with the integration of real functions, and with some rudimental concepts about differential equations. More specifically, they will have a clear idea of the main global and local properties of functions and they will know and understand notions such as those of limit, continuity, derivative, antiderivative, and integral. Ability to apply knowledge and understanding: As a general fact, students will improve their logical reasoning and learn how to address problems in a scientifically rigorous way. In addition, they will learn how to solve problems graphically and qualitatively. More specifically, they will be able to apply calculus techniques to computate limits, study the properties of a function, compute integrals, and solve ordinary differential equations. Making judgements: Students will be able to able to argue both by analogy and by extension. Doing so they will learn how to generalize the ideas and techniques acquired in class to situations and problems that have not been explicitly addressed. They will develop the habit of considering more than one solution to the same problem, and sometimes even more than one point of view. In particular, they will start searching for original solutions. Eventually, they will become more independent in reading mathematic books and they will learn how to acquire new knowledge by themselves. Communication skills: Students will learn how to describe and illustrate problems related to the topics of the course. They will know how to write solutions in rigorous and correct way. Learning skills: As a general fact, students will learn how definitions and theorems raise from the study of specific examples (a process called "inductive logic") and, in turn, how specific cases can be studied under the light of a general theory (the so-called "deductive reasoning"). This training will be of great help when facing more advanced mathematics topics and, more in general, will lead students to the achievement of a complete autonomy and capacity of discernment, a precious toll in their engineering career.
ASSESSMENT METHODS	Written and oral test The written test usually contains 6-7 queries carrying a total of 30 points. Perfect test will receive honors. In the oral test student can expect two or three questions. The oral test will add up to 3/30 points to the written test score. To have more than 25/30 final points students have to: - Pass the written test with more than 25/30 points - Pass the oral test with a positive outcome (anything more than or equal to 1/30 points) Only students that received 25/30 or more points in the written test can take the oral test. If the written test is not taken in presence there will be an oral evaluation with the only reason of assessing the originality of the students' work. If the student taking the test from home will obtain more than 25/30 points he might opt for the standard oral test. Students might opt for one of the following options: - taking a unique written and oral test at the end of the course - taking a written and an oral test at the end of each one of the two parts of the course The rules described above apply to each one of these two solutions. To be admitted to the test on the second part of the course student must pass

	the first part test with at least 18/30 points.
TEACHING METHODS	In case of health emergency, we will abide to the requirements. If everything is fine, we will have class lessons.

MODULE
MATHEMATICAL ANALYSIS - MODULE 2

Prof. CARLO SCHILLACI

SUGGESTED BIBLIOGRAPHY

• Testo di riferimento (main textbook): M. Bertsch, R. Dal Passo, L. Giacomelli, Analisi Matematica, seconda edizione, McGraw-Hill, Milano, 2011 (ISBN:978-8838662812).
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• Eventuale libro di esercizi (facoltativo) [Possible excercise book (optional)]: P. Marcellini - C. Sbordone, Esercizi di Matematica, Volume I e Volume II, Liguori, Napoli, 2009.

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

EDUCATIONAL OBJECTIVES OF THE MODULE

To develop a knowledge of the mathematical concepts that support engineering disciplines, such as differential calculus, calculus of simple integrals and ordinary differential equations.

SYLLABUS

Hrs	Frontal teaching
5	Indefinite integrals
6	Riemann integrals
6	Ordinary differential equations
10	Differential calculus for functions of several variables

Hrs	Practice
7	Indefinite integrals
4	Riemann integrals
6	Ordinary differential equations
10	Differential calculus for functions of several variables

MODULE
MATHEMATICAL ANALYSIS - MODULE 1

Prof. MATTEO DALLA RIVA

SUGGESTED BIBLIOGRAPHY

• Testo di riferimento: M. Bertsch, R. Dal Passo, L. Giacomelli, Analisi Matematica, seconda edizione, McGraw-Hill, Milano, 2011.
ISBN: 978-88-386-6894-4
• Eventuale libro di esercizi (facoltativo): P. Marcellini - C. Sbordone, Esercizi di Matematica, Primo Volume Parte 1, Liguori, Napoli, 2013.
ISBN: 978-88-207-6351-0
• Eventuale libro di esercizi (facoltativo): P. Marcellini - C. Sbordone, Esercizi di Matematica, Primo Volume Parte 2, Liguori, Napoli, 2017.
ISBN: 978-88-207-5252-1

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

EDUCATIONAL OBJECTIVES OF THE MODULE

Knowledge and understanding: At the end of the course students will be well acquainted with the basic elements of differential calculus for functions of one real variable. More specifically, they will have a clear idea of the main global and local properties of functions and they will know and understand notions such as those of limit, continuity and derivative.

Ability to apply knowledge and understanding: As a general fact, students will improve their logical reasoning and learn how to address problems in a scientifically rigorous way. In addition, they will learn how to solve problems graphically and qualitatively. More specifically, they will be able to apply calculus techniques to computate limits and study the properties of a function.

Making judgements: Students will be able to able to argue both by analogy and by extension. Doing so they will learn how to generalize the ideas and techniques acquired in class to situations and problems that have not been explicitly addressed. They will develop the habit of considering more than one solution to the same problem, and sometimes even more than one point of view. In particular, they will start searching for original solutions. Eventually, they will become more independent in reading mathematic books and they will learn how to acquire new knowledge by themselves.

Communication skills: Students will learn how to describe and illustrate problems related to the topics of the course. They will know how to write solutions in rigorous and correct way.

Learning skills: As a general fact, students will learn how definitions and theorems raise from the study of specific examples (a process called "inductive logic") and, in turn, how specific cases can be studied under the light of a general theory (the so-called "deductive reasoning"). This training will be of great help when facing more advanced mathematics topics and, more in general, will lead students to the achievement of a complete autonomy and capacity of discernment, a precious toll in their engineering career.

SYLLABUS

Hrs	Frontal teaching
3	real numbers
8	real functions
8	limits and continuous functions
8	one-dimensional differential calculus

Hrs	Practice
1	real numbers
6	real functions
10	limits and continuous functions
10	one-dimensional differential calculus