Stampare su carta intestata del CdS

General information	
Academic subject	***MATHS***
Degree course	Nautical Science and Maritime Management
Academic Year	*I*
European Credit Transfer and Accumulation System (ECTS)	11
Language	*Italian*
Academic calendar (starting and ending date)	*I year – I semester*
Attendance	*No, but attendance is strongly recommended*

Professor/ Lecturer	
Name and Surname	Fernando Carta
E-mail	Fernando.carta30@gmail.com
Telephone	+393393303035
Department and address	Mariscuola Taranto
Virtual headquarters	
Tutoring (time and day)	

Syllabus	
Learning Objectives	Provide students with a good foundation of theoretical, methodological and application skills in the fundamental areas of mathematical analysis and analytical geometry. Abilities of analysis and synthesis, individual learning, problem solving, understanding and use of mathematical models of both scientific and economic interest will be developed.
Course prerequisites	*Literal calculation, solution of algebraic equations and systems of second degree algebraic equations and special cases of higher degree than the second. Basic elements of Euclidean geometry.*
Contents	*1. Elements of set theory. Logical symbols. Operations on subsets of a set, relations, functions. Rational numbers e irrational numbers. The set R of real numbers. Axioms and properties of real numbers, completeness. Density of the set Q in R.* *2. Cartesian plane. Vectors in the plane, scalar product. Basics on a line, circumference, ellipse, hyperbola, parabola. Basics of trigonometry. Complex numbers.* *3. Vectors in Euclidean space, scalar and vector product, equation of the plane, equations of the line in space.* *4. Real sequences, limit of a sequence, boundedness of sequences convergent, regularity of monotonous sequences. Limitation, monotony of the sequence (1 + 1 / n) ^ n and its convergence to Napier's number.* *5. Real functions of a real variable, restrictions, extensions, functions injective, surjective, bijective. Reverse function. Compound function. Even, odd, periodic, monotone functions. Elementary functions, polynomials and properties. Equations and inequalities. Limited and not limited functions (below, above). Extremes of a function.* *6. Limits of the real functions of a real variable, link between limits of*

	functions and limits of sequences, limits from left and right. Nature local of the notion of limit, uniqueness of the limit. Regularity of monotone functions. The permanence of the sign theorem. Theorems comparison. Forced convergence theorem. Operations on limits. Limits of elementary functions. Indeterminate forms. Limits notable. Infinitesimal and infinite, orders of infinitesimal and infinity, infinitesimal and infinite equivalents. Notion of asymptote. *7. Notions of continuity in a point and in an interval. Continuity of elementary functions. Continuity of compound functions, of combinations linear, product and quotient of continuous functions.* *Discontinuity of I, II and III species. Zero theorem. Bolzano theorem. First and second Weierstrass theorem.* *8. Notion of derivative in a point and relative geometric meaning, continuity of differentiable functions. Derivative of linear combination, of the product, of the relationship of derivable functions. Derivative of the function composed of differentiable functions. Derivative of the inverse of a differentiable function. Derivatives of elementary functions. Relative extremes and points of relative extreme of a function. Stationary points.* *Fermat's, Rolle's, Lagrange's theorems and consequences. Theorem of Cauchy. The theorems of de L'Hospital. Monotony and tightness criteria monotony.* *9. Higher order derivatives, Taylor's formula, search criteria of the relative extreme points. Convex functions in an interval. Points of inflection. Criteria for the local study of a stationary point.* *Study of a function. Calculation of limits by the use of Taylor's formula.* *10. Definite integral. Additivity and linearity of the definite integral. Comparison of integrals. Integral mean theorem. Definite integral of piecewise continuous functions. Integrability of continuous functions in an interval. Fundamental theorem and formula (Torricelli's theorem) of integral calculus. Notion of primitive.* *11. Properties of the primitives of a function in an interval. indefinite integral, Immediate indefinite integrals. Integration by decomposition in sum, by parts, by replacement. Integration of continuous functions and monotone functions.* *G*eneralized integrals. *12. Notion of numerical series, convergence, divergence and non-regularity. Necessary condition of convergence. Harmonic and geometric series.* *Series in terms of constant sign and in terms of definitive sign constant. Asymptotic criterion of the comparison. Ratio test and root test. Series with alternating terms, Leibnitz criterion. Series and generalized integrals.*
Books and bibliography	*Bertsch, Dal Passo, Giacomelli (2011). Analisi Matematica. Milano: McGraw-Hill*
Additional materials	

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
275	*60*	*28*	*187*
ECTS			

11	*7*	*4*	

Teaching strategy	Frontal lessons in which the disciplinary contents are exposed with proofs of theorems and examples. Relevant part will have the presentation of the resolution of exercises chosen in order to both exemplify the theory and provide the basics of practical applications.
Expected learning outcomes	
Knowledge and understanding on:	○ Knowledge of the definitions and theorems provided by the program ○ Knowledge of the solving methods of the exercises. ○ Understanding of the contents and ability to carry out demonstrations independently. ○ Ability to solve problems using the results covered in the course
Applying knowledge and understanding on:	○ Understanding of mathematical modelling methods in various fields ○ Ability to solve application problems with the methods of mathematical analysis ○ Knowing how to analyze the results obtained
Soft skills	• *Making informed judgments and choices* At the end of the course, the student must be able to ○ Explain the mathematical analysis topics covered in the course, proving that they have understood the logical approach and purpose. ○ Demonstrate knowledge of the solution methods for solving application problems ○ Knowing how to model a problem using the methods of mathematical analysis, knowing how to solve the related equations and critically interpret the results. • *Communicating knowledge and understanding* ○ Knowing how to clearly and rigorously present the proof of a theorem or any content learned. ○ Knowing how to discuss the procedure adopted to solve a problem • *Capacities to continue learning* ○ Knowing how to research, understand and apply new contents and methods

Assessment and feedback	
Methods of assessment	Written test and oral test
Evaluation criteria	• Knowledge and understanding ○ Conscious knowledge of the definitions, theorems and proofs provided by the program. • Applying knowledge and understanding ○ Understanding of mathematical modelling methods, ability to use them independently in problem solving. • Autonomy of judgment ○ Ability to present both written and oral contents of the course, demonstrating that they have consciously acquired the fundamentals of mathematical analysis • Communication skills ○ Knowing how to clearly and rigorously explain the theoretical contents and approaches adopted in solving a problem.

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- Capacities to continue learning
  - Evidence of active understanding the disciplinary contents, ability to accurately identify appropriate solution approaches.

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<tr><td>Criteria for assessment and attribution of the final mark</td><td>

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<tr><th>Grade</th><th>Descriptor</th></tr>
<tr><td>< 18 insufficient</td><td>Fragmented and superficial knowledge of the contents, errors in applying the theoretical results in solving exercises, lack of exposure.</td></tr>
<tr><td>18 - 20</td><td>Knowledge of the contents just sufficient but general, simple exposition, uncertainties in the application of the theory in solving the exercises.</td></tr>
<tr><td>21 - 23</td><td>Appropriate but not in-depth knowledge of contents, ability to apply theoretical concepts, ability to present contents in a simple way.</td></tr>
<tr><td>24 - 25</td><td>Knowledge of content appropriate and extensive, discreet ability to apply knowledge in exercise resolution, ability to present contents in an articulated way.</td></tr>
<tr><td>26 - 27</td><td>Precise and complete knowledge of contents, good ability to apply knowledge, analytical skills, clear and correct presentation.</td></tr>
<tr><td>28 - 29</td><td>Wide, complete and in-depth knowledge of contents, good application of contents, good ability to analyze and synthesize, safe and correct exposure</td></tr>
<tr><td>30

30 with lode</td><td>Very broad, complete and in-depth knowledge of the contents, well-established ability to solve problems using the results of The theory, excellent analysis and synthesis skills, mastery of exposure</td></tr>
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<tr><td>Additional information</td><td></td></tr>
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