UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

DIPARTIMENTO DI SCIENZE AGRO-AMBIENTALI E TERRITORIALI
DEPARTMENT OF AGRICULTURAL AND ENVIRONMENTAL SCIENCE

Corso di Laurea in Scienze e Tecnologie del territorio e dell'Ambiente Agro-Forestale – Classe L25
Bachelor's Degree in Land and Environmental Science and Technology

General information	
Academic subject	Algebraic Modeling of Biosystems
Degree course	*Land and Environmental Science and Technology*
Academic Year	*1*
European Credit Transfer and Accumulation System (ECTS)	6
Language	*Italian*
Academic calendar (starting and ending date)	*1° semester (18/10/2021-28/01/2022)*
Attendance	*optional*

Professor/ Lecturer	
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Department and address	*Agricultural and Environmental Science, Via Amendola 165/A - Bari*
Virtual headquarters	*f62vai7*
Tutoring (time and day)	Every Friday 10.30 – 12.30 according to an established appointment requested by phone or e-mail. Tutoring could be also on e-learning platforms

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Syllabus	
Learning Objectives	*The teaching, with an applicative slant, aims to provide the knowledge concerning the basic mathematics. Starting from the definitions on numbers, the equations and inequalities of 1st and 2nd degree are analyzed and the elementary concepts of analytical geometry and trigonometry are illustrated. The concept of function is then studied, examining its field of existence, continuity and differentiability with the search for relative maximums and minimums up to the study of the relative graph.*
Course prerequisites	*Basic elements of mathematics*
Contents	*Flat geometry and geometric transformations.* *Natural numbers. Rational numbers. Irrational numbers. Real numbers.* *Polynomials. Definition. Operations.* *Algebraic equations. Definition. First degree equations. Quadratic equations.* *Inequalities. Integer rational inequalities. Rational first degree inequalities.* *Rational quadratic inequalities. Fractional rational inequalities.* *Notice about the matrix.* *Principles connected to the coordinates. Lines and segments. Abscissa on the line.* *Elementary measurement of the angles. Directed bundles of straight lines.* *Measurements of directed angles. Cartesian coordinates of the plane. Distance between two points. Coordinates of the midpoint of a segment.* *Principles of trigonometry.* *Equation of a straight line. Cartesian equation of a straight line. Explicit equation of a straight line. Bundle of straight lines passing through a point. Bundle of parallel straight lines. Equation of a straight line passing through a point and parallel to another given straight line. Condition of perpendicularity. Geometric significance of slope of a line.* *Algebraic quadratic curves. Cartesian equation of the circumference. Ellipse. Hyperbola. Parabola.* *Notice about numerical sets. Numerical set. Intervals. Neighborhood of a number. Real function of one real variable. Domain of a function. Geometric representation of a function.*

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	Limits of one variable function. Statement of the limit of function as x approaches a (a finite). Right and left limit of a function. Statement of the infinite limit of function as x approaches a (a finite). Statement of the limit of function when x increases without bound. Operations with limits. Monotonic functions. *Continuous functions. Continuous function as x approaches a (a finite). Examples of continuous functions. Continuous function over a range. Function of a function. Inverse function. Inverse functions of circular functions. Natural logarithms.* *Derivatives of one variable functions. Statement of the derivative and its geometric significance. Derivatives of some elementary functions. The derivatives of the functions of a function. Higher derivatives.* *Fundamental theorems related to differential calculus. Rolle's theorem. Lagrange's theorem or mean value theorem.* *Relative and absolute maximum and minimum.* *Study of the y=f(x) function graph. Concavity, convexity and flex of the plane curves. Asymptotes.* *Undefined integrals, definite integrals and differential equations.* *The sets and the logic. The representations of a set, the subsets, the operations with the sets, the logical propositions and the logical connectives and the expressions.* *Elements of computer science. Numbers and digital information, problems and algorithms, basic functions of Excel.*
Books and bibliography	*o BERGAMINI Massimo – BAROZZI Graziella – TRIFONE Anna, MATEMATICA.BLU (seconda edizione), Editore: ZANICHELLI.* *o G. Zwirner, Istituzioni di matematiche, CEDAM Editore, Padova 1994* *o BALLATORI Enzo – Ferrante Luigi, INTRODUZIONE ALLA BIOMATEMATICA, Editore: Margiacchi – Galeno*
Additional materials	

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
150	*32*	*28*	*90*
ECTS			
10	*4*	*2*	*4*

Teaching strategy	*The topics of the course will be treated with the help of Power Point presentations and exercises will be performed at the blackboard.* *All students will be able to receive a copy of the Power Point presentations used during lectures.*
Expected learning outcomes	
Knowledge and understanding on:	○ Knowledge of mathematical concepts and use of software for mathematical modelling needed for other disciplines such as mechanics, constructions, agronomy economics, etc.
Applying knowledge and understanding on:	○ Ability to apply mathematical algorithms for solving typical problems of a graduate in STAF
Soft skills	• Making informed judgments and choices ○ Ability to evaluate and choose the most appropriate algorithms and methodologies for solving math problems connected to biosystems

	• Communicating knowledge and understanding
	  ○ Ability to explain the chosen and employed resolution methods
	• Capacities to continue learning
	  ○ Ability to learn new mathematical concepts related to the new mathematical modelling software based on the knowledge gained during the course.
	The expected learning outcomes in terms of knowledge and abilities are reported in Annex A of the Academic Regulations (expressed through the European descriptors pertinent to the degree program)

Assessment and feedback	
Methods of assessment	*A partial check (so called "in itinere test") is planned for students ongoing with the course year in which the teaching is carried out. This check consists of an oral test pertinent to topics developed during the theoretical lessons and exercise carried out until the date of the check. The outcome of this check contributes to the evaluation of the final attainment and is valid for one academic year. The evaluation of the students' accomplishment is expressed by a vote of thirty. The partial check is passed with a vote of at least 18/30.*

Evaluation criteria	• *Knowledge and understanding*
	  ○ The knowledge and understanding of the math and logic concepts explained during the Course will be the basic elements for the student's assessment.
	• *Applying knowledge and understanding*
	  ○ An additional element of assessment will be the ability to apply the theoretical concepts for solving exercises and operative problems
	• *Autonomy of judgment*
	  ○ The ability to choose the most appropriate methodologies for solving math problems will be another essential element of assessment.
	• *Communicating knowledge and understanding*
	  ○ A further element of assessment will be the student's ability to explain and motivate the chosen and employed resolution methods
	• *Communication skills*
	  ○ The ability of the student to communicate his skills for the solution of mathematics problems connected to biosystems will be an additional element of evaluation
	• *Capacities to continue learning*
	  ○ The ability to learn new mathematical concepts based on the knowledge gained during the course will finally highlight the highest level of learning

Criteria for assessment and attribution of the final mark	*The final exam consists of a written test concerning the topics developed during the theoretical and practice lessons. The evaluation of the students' accomplishment is expressed by a vote of thirty. The final exam is passed with a vote of at least 18/30.* *For students who were undergone the partial check, the final evaluation is expressed by the average of the votes obtained in the two oral tests. A first class degree can be attributed in the case of top vote (30/30).* *The evaluation of the student's attainment is in agreement with pre-established criteria, as detailed in Annex A of the Academic Regulations for the Agricultural Technologies and Science Degree Course.*
Additional information	

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