COURSE OF STUDY: Agricultural Sciences and Technologies (STA)

ACADEMIC YEAR: *2023-2024*

ACADEMIC SUBJECT: Integrated teaching course of Mathematics and Statistics (9 ECTS) Module: MATHEMATICS (6 ECTS)

General information	
Year of the course	*I year*
Academic calendar (starting and ending date)	*October 9, 2023 - January 26, 2024*
Credits (CFU/ETCS):	6 ECTS
SSD	*MAT 05*
Language	*Italian*
Mode of attendance	*optional*

Professor/ Lecturer	
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Department and address	*Dep.t Disspa University of Bari, Via G. Amendola 165/a* *Old complex, rural buildings section, first floor, second door on the right*
Virtual room	*Microsoft Teams code: nxdzt9f*
Office Hours (and modalities: e.g., by appointment, on line, etc.)	*Tuesday and Thursday from 9.00 to 11.00 at the studio and/or online Microsoft Teams by appointment*

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Es. 150	*32*	*16*	*90*
CFU/ETCS			
Es. 6	*4*	*2*	

Learning Objectives	*Acquire an adequate basic knowledge of Mathematics by means of algebraic, matrix, differential, integral calculus, knowledge of trigonometry, the study of real functions in the Cartesian plane.*
Course prerequisites	*Notions of elementary mathematics*

Teaching strategie	*The topics of the course will be covered with the help of Power Point presentations. Upon request, E-learning can be used with public (e.g. Teams) and dedicated (Agripodcast) platforms, such as learning facilities for students with disabilities and for working students, student athletes and students with children Each theoretical part is followed by an exercise part that explains and puts the basic concept into practice in order to understand its usefulness. The possibilities of solving exercises and problems with different methodologies are highlighted. Students are invited to participate in the blackboard exercises to check their preparation or their progress in the study. Students can propose exercises they have done in the individual study hours.*
Expected learning outcomes in	

terms of	
Knowledge and understanding on:	○ Knowledge of mathematical concepts necessary for other disciplines, such as mechanics, construction, economics, agronomy, etc. ○ Knowledge of the rules for carrying out algebraic, differential and integral calculations. ○ Analysis of conic functions and conditions of intersection and tangency with bundles of proper and improper straight lines ○ Knowledge of exponential, logarithmic, inverse, trigonometric functions on the Cartesian plane. ○ Knowledge of theorems to carry out function studies. ○ Concept of limit, derivative and integral of a function.
Applying knowledge and understanding on:	○ Ability to apply mathematical algorithms to solve problems typical of a graduate in Agricultural Science and Technology ○ Ability to carry out the application of the theorems and rules studied ○ Ability to carry out a complete function study and carry out its graphical representation ○ Ability to interpret the graphic meaning of the concept of derivative and definite integral ○ Ability to interpret the trend of experimental values and report them graphically
Soft skills	• *Making informed judgments and choices* ○ Ability to evaluate and choose the most suitable methodologies for solving mathematical problems ○ Use of linear, logarithmic, exponential scales ○ Understand the direct proportional, inverse between quantities, the trends of mathematical functions ○ Transferring points or experimental algorithms to the Cartesian plane. • *Communicating knowledge and understanding* ○ Ability to explain the solution methodologies chosen and used ○ Ability to use mathematical terminology appropriately • *Capacities to continue learning* ○ Learn new mathematical concepts based on the knowledge acquired during the course. ○ Interpret physical laws or experimental phenomena mathematically.
Syllabus	
Content knowledge	*Natural numbers. Rational numbers. Irrational numbers. Real numbers.* *Polynomials. Definition. Operations.* *Algebraic equations. Definition. Equations of 1st and 2nd degree.* *Systems of 1st degree equations* *Integer rational inequalities. Rational inequalities of 1st and 2nd degree.* *Fractional rational inequalities.* *Notes on matrices.* *Coordinate method. Lines and oriented segments. Abscissa on the straight line.* *Basic measurement of angles. Oriented beams of straight lines. Measurement of oriented angles. Cartesian coordinates of the plane. Distance of two points.* *Coordinates of the midpoint of a segment.* *Elements of trigonometry.* *Explicit and implicit Cartesian equation of the straight line. System of 2 lines.* *Bundle of straight lines passing through a point. Bundle of parallel lines. Line*

	through a point and parallel to a given line. Condition of perpendicularity. *Geometric meaning of the angular coefficient of a straight line.* *Cartesian equation of the circle, of the ellipse, of the hyperbola and of the parabola.* *Numerical sets. Intervals. around.* *Real function of a variable of a real variable. Existence set of a function.* *Geometric representation of a function.* *Definition of finite limit for a function in a point. Right and left limit. Definition of infinite limit for a function at a point. Definition of limit for a function at infinity.* *Monotonic functions.* *Continuous functions. Function function. Reverse function. Inverse functions of circular functions. Natural logarithms.* *Derivatives of functions of one variable and its geometric meaning. Derivative of some elementary functions. Derivation of function functions. Higher order derivatives.* *Fundamental theorems of differential calculus: Rolle's theorem; Lagrange or mean value theorem.* *Relative and absolute maxima and minima. Concavity, convexity and inflections of plane curves. Asymptotes. Study of the graph of a function y=f(x).* *Integral of a function, integration rules, integration by parts. Definite integral and graphical meaning.*
Texts and readings	*G. Zwirner, Istituzioni di matematiche, CEDAM Editore, Padova 1994* *G. Malafarina, Matemativa per i precorsi, McGraw Hill, Milano 2010*
Notes, additional materials	*Both texts are of reference, both for the theoretical and practical aspects.*
Repository	*the teaching material consisting of Power Point presentations is available in the files section of the Teams class*

Assessment	
Assessment methods	*An exemption test is required for students enrolled in the year of the course in which the teaching is carried out. The exemption consists of a written test on the topics developed during the hours of theoretical lessons held up to the date of the exemption. The outcome of this test contributes to the assessment of the profit exam and is valid for one academic year. The evaluation of the students' progress is expressed with a vote out of thirty. The exemption test is passed with a vote of at least 18/30. The exam consists of a written test on the topics developed during the theoretical lessons. The evaluation of the students' progress is expressed with a vote out of thirty. The test is passed with a vote of at least 18/30. All written tests have a duration of 2 hours.* *For students who have taken the exemption test, the assessment of the module is expressed as the average of the marks obtained in the two written tests. In case of maximum grade (30/30) honors can be awarded. The overall grade of the exam is given as the weighted average of the grade of the Mathematics and Statistics modules based on the number of credits (2 and 1)* *The oral tests are public. The evaluation of the student's preparation takes place on the basis of pre-established criteria, as detailed in Annex A of the Educational Regulations of the Degree Course in Agricultural Sciences and Technologies. In the exams, the student must highlight all the logical steps that lead to the*

	solution of the exercises and demonstrate knowledge of the theoretical assumptions or the applied rules. The tests are open-ended exercises. The exercises assigned during the tests cover the entire program carried out, during the tests the discussion and the ability to formulate are evaluated, the ability to analyse which leads to solutions through the structuring of the answers. The student can use a calculator during the tests. Disadvantaged students can use forms after agreement with the teacher. The results are published on the S3 Platform. The profit exam for foreign students can be carried out in English.

Assessment criteria	• *Knowledge and understanding*
	  ○ The student must demonstrate an understanding of the relationships between variables expressed in mathematical links
	  ○ The student must demonstrate knowledge of the rules for solving problems related to algebraic, differential and integral calculus.
	  ○ The student must know the behaviour of the elementary functions covered in the course in order to be able to deal with the study of inverse and compound functions
	• *Applying knowledge and understanding*
	  ○ The student must know how to carry out a function study and carry out its graphical representation.
	  ○ The student must know how to apply the rules for solving limits, derivatives and integrals.
	• *Autonomy of judgment*
	  ○ The student must know how to interpret the variability of parameters using mathematical laws.
	  ○ The student must choose the appropriate methodologies to solve mathematical problems.
	• *Communicating knowledge and understanding*
	  ○ The student must be able to carry out a function study and carry out its graphical representation
	  ○ The student must know how to apply the rules to solve limits, derivatives and integrals
	• *Communication skills*
	  ○ The student must use a suitable language for the explanation of mathematical concepts.
	• *Capacities to continue learning*
	  ○ The student must demonstrate knowledge of mathematical rules and extend it to new concepts and theorems

Final exam and grading criteria	*The exams concern the entire program carried out or carried out until the exemption. In the written tests the maximum value of each single exercise is reported in such a way that the student can choose the exercises that allow him to reach the sufficiency. Higher score values are attributed to exercises that require more knowledge and that have a more complex development. In carrying out the tests there may be intermediate evaluations also for exercises that present errors but are correct in the setting and application of the rules.*
Further information	
	Students are advised to attend the course and carry out many exercises during individual study hours also on the basis of previous mathematical knowledge.