



# UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Agrarie, Alimentari e Forestali		
ACADEMIC YEAR	2022/2023		
BACHELOR'S DEGREE (BSC)	AGRICULTURAL SCIENCES AND TECHNOLOGIES		
SUBJECT	MATHEMATICS		
TYPE OF EDUCATIONAL ACTIVITY	A		
AMBIT	50117-Matematiche, fisiche, informatiche e statistiche		
CODE	16127		
SCIENTIFIC SECTOR(S)	MAT/07		
HEAD PROFESSOR(S)	SCIACCA MICHELE	Professore Associato	Univ. di PALERMO
OTHER PROFESSOR(S)			
CREDITS	8		
INDIVIDUAL STUDY (Hrs)	132		
COURSE ACTIVITY (Hrs)	68		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	1		
TERM (SEMESTER)	1° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	<b>SCIACCA MICHELE</b> Monday 08:30 11:00 sede del corso di Studi in Viticoltura ed Enologia Wednesday 12:00 14:00 Studio del docente - Edificio 8 - Dip. Ingegneria - Ex Dip. Metodi e Modelli Matematici (primo piano)		

DOCENTE: Prof. MICHELE SCIACCA

<b>PREREQUISITES</b>	<ol style="list-style-type: none"><li>1. Knowledge of numerical sets <math>N</math>, <math>Z</math>, <math>Q</math>, <math>R</math> and operations with these numbers.</li><li>2. Equations and inequalities in <math>N</math>, <math>Z</math>, <math>Q</math>, <math>R</math>.</li><li>3. Powers and properties.</li><li>4. Logarithms and properties.</li><li>5. Main topics on: straight line, circle, parabola, ellipse and hyperbola.</li></ol>
<b>LEARNING OUTCOMES</b>	<ol style="list-style-type: none"><li>1. Knowledge and understanding: Acquiring the basic mathematical instruments for the topics that will be proposed during the studies in agriculture. Knowledge of the terminology and how to use it. Handling several mathematical expressions (text, graph, diagram, formula);</li><li>2. Implementation of the knowledge: Recognizing the graph of the elementary functions, knowing how to plot the graph of a function and to calculate the area of flat figures. Apply the mathematical concepts to own job.</li><li>3. Making judgement: Being able to evaluate the implications and the analytical results.</li><li>4. Communicative skills: Ability to articulate clearly the knowledge gained during the course, using the specific language.</li><li>5. Learning capacity: Ability to use the knowledge gained during the course, to analyze and solve problems from mathematical point of view.</li></ol>
<b>ASSESSMENT METHODS</b>	<p>Mid-term written test (90 minutes) and final evaluations (written of 90 minutes and oral) of the program are provided for.</p> <p>The written tests (the first in the middle of the course and the second at the end) want to examine the student's skills, capacity and expertise provided by the course. Their structure includes: a) exercises, also applied to arguments related to the degree in Science and Agriculture Technology; b) 4 applied and theoretical questions (input) necessary to measure the knowledge gained, the capacity for summarizing and processing, and the acquisition of the required expertise.</p> <p>The admission to the oral exam requires the minima expected knowledges. The oral exam then consists in analyzing the written tests in order to assess the degree of acquired expertise and the possession of adequate capacity to explain and to deal with the content of the course.</p> <p>Criteria for the minimum: essential knowledge of the basic topics of the course and of the mathematical language, and minimal abilities to applications. The achievement of the minimum is evaluated 18/30. The maximum evaluation (30 or 30 with honors) is for students achieving excellent results in the written tests and the oral exam, according with the Learning Outcomes. The achievement of intermediate outcomes in all the exams is gradually evaluated from 18/30 to 30/30. The evaluation is expressed in thirtieths.</p>
<b>EDUCATIONAL OBJECTIVES</b>	<p>The main objective of the course is to provide students with the main instruments for analyzing problems from mathematical point of view. Therefore, the educational objectives will be:</p> <ol style="list-style-type: none"><li>1. to promote the intuitive and logical abilities;</li><li>2. to acquire skills for abstracting and formalizing;</li><li>3. to develop the abilities for critical examination and to outline logically the knowledge gained;</li><li>4. to be familiar with the application of analyzing and drawing together to some concrete situations;</li><li>5. to be familiar with looking for alternative constructive solutions;</li><li>6. to be familiar with generalizing the solution to a specific problem in algorithms;</li><li>7. to improve the ability to use methods, instruments and mathematical models in different situations;</li><li>8. to promote the comprehension of the cross-cutting concepts in order to grasp analogies between different fields.</li></ol>
<b>TEACHING METHODS</b>	Traditional classes and exercises.
<b>SUGGESTED BIBLIOGRAPHY</b>	<ol style="list-style-type: none"><li>1. L. Saluto, M. Sciacca, Matematica applicata, in preparazione.</li><li>2. C.Sbordone, F. Sbordone - Matematica per le scienze della vita - Ed. Edises.</li><li>3. G. Zwirner - Istituzioni di Matematiche - Ed.Cedam, Padova.</li><li>4. P. Marcellini, C.Sbordone - Istituzioni di Matematica ed applicazioni - Ed. Liguori, Napoli.</li><li>5. P. Marcellini, C.Sbordone - Calcolo - Ed. Liguori, Napoli.</li><li>6. P. Marcellini, C.Sbordone - Esercitazioni di Matematica - Ed. Liguori, Napoli.</li></ol>

## SYLLABUS

Hrs	Frontal teaching
2	An overview on: numerical sets $N$ , $Z$ , $Q$ , $R$ ; powers and properties; logarithms and properties; equations and inequalities. Applications.

## SYLLABUS

Hrs	Frontal teaching
4	FUNCTION OF REAL VARIABLE: Definition, domain and codomain of a real function. Operations with the functions. Graph of a function. Isometric and homothetic transformations in the plane. Maximum and minimum of a function. Monotone functions. Symbols of infinity. Applications in agriculture.
3	An overview on: straight line, circle, parabola, ellipse and hyperbola. Plots and properties.
6	LIMIT AND CONTINUITY OF A FUNCTION: Definition of limit and continuity of real-valued functions. Operations with limits. List of limits. Properties of continuous functions on an interval. Points of discontinuity and their classification.
10	DIFFERENTIAL CALCULUS: Derivative and differential of a function. Point of non-differentiability. Operations differentiable. The derivative of composite functions and inverse functions. Fundamental theorems of differential calculus (Fermat's theorem, Rolle's theorem, Lagrange's theorem) and their consequences. Characterization of monotone functions with derivative. Maximum and minimum of a differentiable function. Higher order differentiability of functions. Characterization of convexity of functions with second order derivative sign. Asymptote. Plot of a function graph. Taylor's formula. Applications in agriculture.
5	INTEGRAL CALCULUS: Primitive and indefinite integral of a function. Properties of integrals. Methods of integration: integration by parts formula and change of variable formula. Riemann integral. Riemann integrable functions. Properties of integrable functions. Fundamental theorem of calculus. Calculation of plane areas.
6	DIFFERENTIAL EQUATIONS AND MATHEMATICAL MODELS: First order differential equations (linear, Bernoulli). Cauchy problems. Method of separation of variables. Some examples of mathematical models in agriculture.
4	Vectors and operations with vectors.
8	Mechanics of the material point. Strength. Work and energy. Elements of analysis of data.
Hrs	Practice
20	Exercises on the proposed topics.