COURSE DESCRIPTION – ACADEMIC YEAR 2024/2025

Course title	**Laboratory of Mathematics**
Course code	42601
Scientific sector	MAT/07
Degree	Professional Bachelor in Wood Technology (LP-03)
Semester	1
Year	1
Credits	4
Modular	No

Total lecturing hours	
Total lab hours	40
Attendance	Attendance is not compulsory but recommended.
Prerequisites	Strong mathematical basis.
Course page	Microsoft Teams and https://ole.unibz.it/

Specific educational objectives	The course aims at reinforcing and deepen the mathematical skills acquired by students in the high school, from the theoretical and practical points of view. In particular, the focus is given to the concepts of function and equation, the main notions from differential and integral calculus, an introduction to differential equations and the basis of linear algebra.

Lecturer	Dr. Ivano Colombaro
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Scientific sector of lecturer	MAT/07
Teaching language	English
Office hours	By appointment, to arrange beforehand via email.
List of topics	**Functions**: Definitions, notation y=f(x). Table and graph of a function. Domain and range, simple examples, recall of integer and fractional equations and inequalities of I, II degree. Injective functions. Polynomial functions of I and II degree. Functions xn, n-th root, sinx, cosx. Complex numbers. Range of rational fractional functions. **Derivatives and integrals**: Derivative of a function, incremental ratio and tangent line. Numerical examples. Derivatives of the elementary functions, of products and ratios. Derivative of function of function. Physical notation "dy/dx", chain rule dy/dx=(dy/du)(du/dx). Maxima, minima, and horizontal inflection points. Simplified scheme for studying the graph of a function (without asymptotes and convexity). Examples of functions containing roots and logarithms. Indefinite integrals. Elementary primitives. Integration rules. Applications to kinematics: uniform and accelerated motion. Definite integrals. Geometrical meaning. Application to dynamics: work of an elastic force. Fundamental theorem of the integral calculus.

	Integration by parts and by substitution. Rotation integrals. Multiple integrals and partial derivatives. **Function analysis**: Taylor polynomials. Convexity, second derivatives. Inverse functions and their graphs. Inverse of the elementary functions. Restrictions of the domain. Relationship between the range of a function and the domain of its inverse. Derivative of the inverse function. Limits at finite and infinite. Limits of the elementary functions. Determinate and indeterminate forms. Elimination of the indetermination. Limits of rational functions. Horizontal and vertical asymptotes. Rule of de l'Hopital. **Differential equations**: concept of differential equation of the I order. Direct verification of the solutions. Equations with separation of variables. Logistic equation. Linear equations of the I order. Linear and quadratic interpolation. Problems of forecasting. **Linear Algebra**: introduction to vectors and matrices. Operations between vectors and matrices and linear systems. Practical applications.
Teaching format	Lecture-based exercises and practical activities.

Learning outcomes	Knowledge and understanding: • Knowledge of the main mathematical concepts and formalism of calculus and linear algebra. • Proficiency in the techniques of integral and differential calculus, and the linear algebra. Applying knowledge and understanding: • Ability in solving problems concerning function analysis by means of the calculus tools. • Ability to apply mathematical techniques and methods learned in the course. • Ability to adopt the mathematical formalism in problem solving. Making judgments • Efficiency in recognizing the right approach and convenient tools, to suitably deal with mathematical problems and questions. Communication skills • Proficiency to use English at an advanced level, especially in reporting on the calculations in a clear and effective way, by means of the written production and oral presentations. Learning skills • Ability to deal with problems in an appropriate way and to apply the suitable techniques. • Capability in abstracting and generalizing problems, using the suitable scientific formalism and methods.

Assessment	The exam consists in the preparation of a presentation, which must be handed in and orally presented. Furthermore, homework and class participation will be evaluated.

Assessment language	English
Assessment Typology	
Evaluation criteria and criteria for awarding marks	Laboratories are graded on a pass/fail basis.

Required readings	Lecture notes.
Supplementary readings	Any book of "Calculus" in the Library reserve collection.
Software used	