

IDENTIFICATION

Course code : E1CP1MT1
ECTS : 3

DURATION

Lectures : 20
Tutorial classes : 28
Labs : 0
Total : 48

Project :
Personnal work :

ASSESSMENT

Written exam : 1.0h - Coefficient : 0.5
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TEACHING MATERIALS

Materials available on the Moodle platform.

LANGUAGE

English

CONTACT

DANIEL GOELEVEN
daniel.goeleven@univ-reunion.fr

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UE : MATHEMATIQUES

COURSE : Mathematics for Engineers I-a

SCOPE OF THE COURSE

OBJECTIVES

This course aims to provide students with the fundamental mathematical tools necessary for modeling and solving problems in engineering sciences. It specifically targets :

- mastering trigonometric concepts for the geometric analysis of phenomena ;
- understanding and using matrices to solve linear systems and manipulate transformations ;
- developing the ability to represent and manipulate vectors in the plane and in space ;
- acquiring the basics of calculations with complex numbers, useful for studying dynamic systems and signals.

This course forms an essential foundation for physics, mechanics, automation, and numerical modeling courses.

COMPETENCE AND SKILLS

- Ability to represent a system of equations in matrix form.
- Ability to define a vector relative to a chosen basis.
- Ability to compute a dot product.
- Ability to compute a cross product.
- Ability to define a complex number.
- Ability to use complex notation to solve a physical problem.
- Ability to calculate the modulus and argument of a complex number.
- Ability to perform operations on complex numbers.
- Ability to derive the formulas : $\sin(a + b)$, $\sin(a - b)$, $\cos(a + b)$, $\cos(a - b)$.

PROGRAM

Trigonometry : review of the trigonometric circle, angles, cosine, sine, tangent, expressions for cosine and sine of associated angles, as well as the main trigonometric formulas.

Matrix Calculus : introduction to matrices (definition, notation, types). Fundamental operations on matrices (transpose, addition, subtraction, scalar multiplication). Matrix multiplication (definition, properties, and applications). Determinant and inverse matrix (existence, calculation). Solving linear systems using matrix formulation and the inverse method. Least squares method for over-determined systems.

Vector Calculus in the Plane and in Space : definition and representation of a vector. Representation in a direct orthonormal basis. Dot product and orthogonal projection. Cross product (calculation and properties). Basis change and rotation matrices. Vector functions and vector fields. Velocity and acceleration in a moving basis.

Complex Numbers : definition, notation, and properties of complex numbers. Basic operations (addition, subtraction, multiplication, division). Matrices with

complex coefficients. Functions taking complex values. Trigonometric and exponential forms. Complex exponential and n -th roots. Solving quadratic equations in the set of complex numbers.

BIBLIOGRAPHY

REQUIREMENTS

Prerequisites :

- Basic knowledge of algebra (solving equations, manipulating algebraic expressions).
- Elementary concepts of plane geometry (coordinate systems, vectors).
- Operations on real numbers : basic calculations, powers, roots, fractions.
- Basic knowledge of common functions (linear, affine, simple polynomials, elementary trigonometry).