

MATHEMATICS AND TRANSFER BASES FIELD_10 ECTS

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Mathematics

Introducing

Description

In the Analysis-Algebra course:

- Laplace transform and application to the resolution of first and second order linear ODEs.
- bilinear algebra: bilinear forms, symmetric bilinear forms, associated quadratic form, scalar product, orthogonality, Gram-Schmidt orthogonalization procedure, orthogonal of a vector subspace, orthogonal projection, norm associated with a scalar product, convergence, continuity, Weierstrass theorem.
- functions of several variables: continuity, partial derivatives, differentiability, local extremum points, multiple integrals.

In the Probabilities section:

- probability space and conditional probabilities, independence of events
- discrete and continuous random variables (law of probability, expectation, variance, etc.)
- couples of random variables
- limit theorems (law of large numbers, central limit theorem)

Objectives

Introduce the Laplace transform and its use to solve certain ordinary differential equations.

Introduce some notions of bilinear algebra, in particular the scalar product and orthogonality.

Introduce concepts of analysis in several variables.

Introduce the basic concepts of probability.

Necessary prerequisites

1st year linear algebra.

1st year analysis: functions of a single variable (continuity, derivative, integrals, local extremum points).

Newton binomial, geometric series, exponential series.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Transfer bases

Introducing

Description

Transport phenomena: Continuum media, concept of shear stress. Statics of fluids. Kinematics of fluids. Principles of conservation of mass, momentum and energy. Writing local equations and the global balances of mass, momentum and energy. Rheological laws (examples of Newtonian fluid and some non-Newtonian fluids).

Boundary conditions.

Exact solutions of some model problems. Analogies of transfers (Newton, Fourier, Fick).

UF “Thermodynamics - Basics and Applications” from the first year of INSA or equivalent.

First-year mathematics (differential and integral calculus, notions of geometry, trigonometry and algebra).

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

- The basics of continuum mechanics
- The concept of balance and the different scales of application

The student will be able to:

- Define a system and its contours, and calculate inlet, outlet and transformation fluxes
- Write local and macroscopic balances of mass, energy and momentum
- Solve analytically simple problems of Newtonian fluid mechanics

Location(s)

 Toulouse

Necessary prerequisites