PHYSICAL MEASUREMENTS, COMPUTING AND SCIENTIFIC CULTURE 1_11 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

Numerical analysis

Introducing

Description

The course covers the following topics: numerical errors, solving non-linear equations, numerical integration, direct solutions of linear systems, matrix norms and conditioning, iterative methods for solving linear systems, least squares methods, and ordinary differential equations.

Objectives

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

Some notions of numerical analysis and scientific computing.
The student should be able to:

Choose an appropriate method for solving a mathematical problem.
Use the Python language to implement numerical analysis methods.

Necessary prerequisites

Mathematical concepts are based on undergraduate linear algebra and analysis. Practical work is based on relatively simple programming.

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Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Programming in C

Introducing

Description

The student will be able to elaborate simple program illustrating algorithmic problems, but also more complex programs requiring a good knowledge of specific notions (pointer, etc.). Usual notions of programming languages (such as variables, types, control flow instructions) are presented as well as notions more specifically associated with the C language (generalized use of pointers, function parameters, input/outputs functions, etc.).

Objectives

This course aims at presenting to students the fundamental notions of the C programming language so that they can be autonomous with this language.

Necessary prerequisites

bases on Unix and computer organisation are necessary.

Évaluation

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Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Experimental physics and stochastic modelling

Introducing

Description

Programme (detailed contents):
Experimental section :
- 5 lab sessions (7h30) chosen from the following: Temperature sensors, Vacuum technologies, Lasers, Extensometers, Thin films, Optical Measurement.
- Each practical deals with different sensors, how do they work, how to use them, how to analyse the results ?
- Statistics section:
Random modeling of measurements: systematic error, random error, confidence intervals.
Linear model: least squares adjustment, prediction intervals, model validation, model choice.
Introduction to experimental planning: optimality criteria, estimation of main effects and interaction effects of different factors.
Organization (progress):
The documents (course handout, tutorial statements, exam subjects) are available on Moodle and distributed to students.
The practical work will be carried out using a data processing tool (Excel, Python, etc.)

Objectives

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

- Operation of the different sensors used during the lab sessions. They will know how to use them in order to solve a problem and view the results critically.
- Stochastic modelling of measurements, confidence intervals, statistical hypothesis tests, linear models.

The student will be able to build a data acquisition system starting from different sensors, to analyse the result and quantify the various components in measurement errors, to build a statistical model from observations.

Necessary prerequisites

Probabilities ans Statistics (Second year - IMACS - I2MADOPOMS20)

Évaluation

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Practical info

Location(s)

Toulouse

Ecological Transition, GHG Reduction, Responsibility and Environment (EARTH)

Introducing

Description

The teaching includes a "2 tonnes" workshop, which provides a fun way of understanding the orders of magnitude linked to the objectives of carbon neutrality in 2050. It also includes assignments on the following topics: housing; electricity production; inequalities and responsibilities; mobility; the climate inaction debate; agriculture and food; and aeronautics. Students also work on a complex problem linked to ecological issues, starting their reflections from an everyday object or service.

Objectives

At the end of this module, the student will be able to:

- Be comfortable with the fundamental concepts related to greenhouse gas emissions, and be able to make simple calculations on this subject.
- Know the order of magnitude of important quantities.
- Be able to fetch emission values from the ADEME database and use them appropriately.
- Think about ecological issues in all their complexity and study a specific problem
- Have an understanding of life cycle analysis and how to apply it
- Be able to research scientific literature
- Be able to understand and analyse figures/data
- Draw political conclusions from scientific facts and one's own values
- Debate, discuss and confront points of view.

Necessary prerequisites

Basic knowledge on energy.

Évaluation

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Practical info

Location(s)

Toulouse