

IDENTIFICATION

Course code : E1CP10I3
ECTS : 1

DURATION

Lectures : 4
Tutorial classes : 12
Labs : 0
Total : 16

Project :
Personnal work :

ASSESSMENT

Written exam : 2.0h - Coefficient : 1.0
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TEACHING MATERIALS

Materials available on the Moodle platform.

LANGUAGE

English

CONTACT

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UE : OUTILS

COURSE : Metrology

SCOPE OF THE COURSE

OBJECTIVES

To be able to present the result of a measurement while indicating the confidence that can be placed in the measurement process

COMPETENCE AND SKILLS

- Know the units of the International System of Units (SI).
- Know the symbols of SI units and dimensions.
- Know the symbols of dimensions.
- Know how to write a dimensional equation.
- Know how to verify the validity of a relationship up to a constant.
- Know the multiples and submultiples of the SI and their symbols.
- Know how to perform conversions between multiples and submultiples.
- Know the definitions of common units.
- Know how to perform unit conversions.
- Know how to interpret a scale indication.
- Know how to choose an appropriate scale for plotting a graph.
- Know how to use scientific notation.
- Know how to identify the number of significant figures.
- Know how to identify the term "reference value."
- Know how to define accuracy, precision, and trueness.
- Know how to identify random and systematic errors.
- Know how to define uncertainty and confidence level.
- Know how to validate a measurement process by comparison to a standard.
- Know how to discuss a result in comparison to an interval.
- Know how to read values from a .csv file.
- Know how to process values from a .csv file.
- Know how to plot a graph from .csv data.
- Know how to insert a trend line.
- Know how to understand a sorting algorithm.
- Know how to write a sorting algorithm.
- Know how to numerically compute an integral.
- Know how to numerically compute a derivative.
- Know how to solve a differential equation using Python.
- Know how to compare two numerical integration methods.
- Know how to compare two methods for solving differential equations.
- Understand the steps of the Monte-Carlo algorithm.
- Know how to write a Monte-Carlo uncertainty propagation algorithm.
- Know how to compute a mean and standard deviation using Python.

PROGRAM

1. Units and Dimensions

- The International System of Units (SI).
- Dimensional equations.
- Multiples, submultiples, and conversions.
- Common units.

2. Uncertainties

- Measurement.
- Measurement errors and uncertainties.
- Method for evaluating the standard uncertainty.
- Expanded uncertainty and confidence interval.
- Presentation of a result.

3. Numerical Data Handling

- Using Python and `csv` files for data manipulation.
- Calculating mean and standard deviation.
- Uncertainty propagation using the Monte-Carlo method.

BIBLIOGRAPHY

REQUIREMENTS