PHYSICAL MEASUREMENTS, COMPUTING AND SCIENTIFIC CULTURE 2 FIELD_8 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

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Structure of solids

Introducing

Description

Crystal structure
Part 1. Geometric crystallography
Part 2. Symmetries in crystals
Part 3. X-ray crystallography

Part 1. Description of crystalline solids:
- The perfect crystal: definition and description of typical ionic and covalent structures.
- Point lattice : unit cell, Miller indices, lattice planes, interplannar spacing ;
- Crystallographic asymmetric unit;
- Reciprocal lattice: definition and properties

Part 2. Crystal symmetry
- Definitions of symmetry elements, notions of group theory, crystal systems;
- Stereographic projection and point group representations;
- Description of translational symmetry elements, space groups and representations.

Part 3. X-ray crystallography
- X-ray scattering and absorption by atoms ;
- X-ray diffraction: diffraction conditions (Laue conditions, Bragg relation, Ewald sphere), calculation of diffracted intensities (structure factor);
- Main structural characterization methods for crystals, powders and thin films
- Implementation and analysis of powder diffractograms and thin film diffractograms

Objectives

At the end of this module, the student should have understood and be able to explain (main concepts):
- the structure and symmetry of crystalline solids
- X-ray diffraction by crystalline solids

The student should be able to :
- characterize the structure of a crystal, classify crystalline solids by their symmetry, orient a crystal, apply basic X-ray diffraction techniques and analyze the results of a radiocrystallography experiment.

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Applied material physics

Introducing

Description

The experiments seen in practical work are: quantitative metallography, calorimetry, tensile tests, hardness, crystalline defects, crystallization and recrystallization, and anisotropic properties.

The concepts covered are optical microscopy, phase diagrams, image processing, calorimetry, phase transitions, mechanical properties, structural hardening, defects and crystal growth, wave propagation in anisotropic medium.

Objectives

This UF constitutes an experimental approach to the physics of materials. The educational objectives are:
- acquire scientific knowledge relating to the techniques used in material science
- acquire practical skills on these techniques,
- acquire an experimental work method in physics (how to choose the experimental parameters, carry out the experiment, analyze the results)

The student should be able to:
- reproduce and apply techniques for the development and characterization of materials among the techniques mentioned in the program.

Necessary prerequisites

- Thermodynamic prerequisite : The following notions must be seen before the practicals: enthalpy, heat capacity and phase diagram.

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Practical info

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Scientific project

Introducing

Description

Based on a theme defined by a tutor, generally a teacher from the Physics department, students carry out bibliographic research to develop a better knowledge of the proposed theme.
This project is carried out in support of the physics and materials courses which take place in parallel.

Objectives

The project puts students in a real situation and shows them concrete examples of the physics of materials.
It allows you to carry out scientific research using bibliographic data and to present this research during an oral presentation.

Necessary prerequisites

No specific prerequisites.
The courses taught alongside the semester are sufficient.

Évaluation

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Practical info

Location(s)

Toulouse

Numerical culture and skills 2

Introducing

Description

The flow of Machine Learning
Data preparation
Machine Learning Terminology
Data types
Data visualization, quality and size
Reliability
Some activation functions
Model performance
Environmental impact

Objectives

At the end of this module, which follows the 2A module, the student will have consolidated his knowledge of the field of AI: accuracy, loss function, overfitting, batch size, visualization techniques... He will also have prepared and passed a PIX certification.

Necessary prerequisites

Basics of Python programming

Évaluation

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Practical info

Location(s)

Toulouse