

Microtransducers

Number of ECTS credits: 3

Coefficient: 3

Description:

This course describes the modeling of active materials and illustrates it by concrete cases of micro-actuators and micro-sensors

Notions of crystallography - point group - tensors rank 2, 3 and 4 and illustration by physical problems: deformation, stress, conductivity, piezoelectricity, elasticity. Relationship between physical properties

Application to the piezoresistive acceleration sensor and to the piezoelectric actuator. Dynamic modeling of transducers using a reduced order model with localized parameters.

Pedagogical objectives:

Know how to solve physical problems in the case of anisotropic materials or media.

Know how to reproduce the design approach of a piezoresistive sensor for stress, force or acceleration applications. Know how to implement an acceleration measurement with a capacitive sensor

Know the principle of electrostatic actuation and be able to design, dimension this type of actuator

Know how to analyze a piezoelectric micro-actuator

Be able to establish a dynamic model by circuit elements and study the approximate dynamic behavior.

Bibliography: Prerequisite:

Vectors, matrices, basic physics

Lectures Hours: 10.5

Tutorials Hours: 10.5

Labs Hours: 8

Knowledge monitoring modalities: 100% continuous assesement

Assesement: Reports of labs, 1 mini-project, 1 exam

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