



2EL1820 – Biomechanics and life materials

Instructors: Elsa Vennat

Department: DÉPARTEMENT MÉCANIQUE ENERGÉTIQUE PROCÉDÉS

Language of instruction: FRANCAIS

Campus: CAMPUS DE PARIS - SACLAY

Workload (HEE): 60

On-site hours (HPE): 35,00

Elective Category : Engineering Sciences

Advanced level : Yes

Description

The link between mechanics and life is much stronger than we might think at first glance. Did you know that our bone tissue evolves and adapts according to the mechanical load it is subjected to? This is important in our daily life (regular moderate physical activity leads to better bone quality) but also in medical care (how to replace or regenerate bone tissue after an accident?).

In this course we will discuss the links between mechanics and life, from biomechanics to mechanobiology.

Tools will first be put in place to describe, model and solve a mechanical problem where living materials are involved: reminders of Continuous Media Mechanics, anisotropy of natural composites, viscoelasticity of soft tissues, introduction and application of the finite element method to solve problems of increasing complexity.

In a second phase, these tools will be used to characterise and model a living material of your choice (bone, tooth, cells, wood...) in a series of numerical and experimental assignments. Living materials are by nature multi-scale. A complete approach will be taken to characterise and model the chosen living material in three stages:

- Bibliographic research (presentation of tools and research by group)
- Observations at the various relevant scales: observation of samples under the microscope, three-dimensional visualisation of the microstructure, image processing and analysis.
- Experimental study of material's behaviour (cells under stress, tissues under loading, etc.), finite element modeling and critical analysis

All practical work can be switched to distance learning if needed.

Quarter number

SG8

Prerequisites (in terms of CS courses)