

# UE Adhesion, friction, nanomechanics



Level  
Baccalaureate  
+5



ECTS  
3 credits



Component  
UFR PhITEM  
(physique,  
ingénierie, terre,  
environnement,  
mécanique)



Semester  
Automne

- > **Teaching language(s):** English
- > **Open to exchange students:** Yes
- > **Code d'export Apogée:** PAX9NFAF

## Presentation

### Description

*Goal:* Nanomechanics is an important part of applied nanotechnology, This course will provide a working knowledge of nano-mechanics and nano-tribology emphasizing the role of surfaces, interfaces, defects, roughness, and quantum effects. Nano-mechanical measurements techniques and applications in micro-electronic technologies and nano-manufacturing will be developed.

#### I. Overview and preliminaries.

Surface interactions ; Van der Waals long range forces ; Derjaguin approximation, measuring surfaces forces SFA AFM.

#### II. Mechanics of solid contacts.

Single contact: Herz contact ; mechanics of adhesive contacts.

Statistics of contacts: Greenwood-Williamson model ; elasto-plastic contact

#### III. Friction an lubrication

Amonton's law and Coulomb friction ; Tabor 's model of friction. Static and dynamic friction ; stick-slip ; Rice and Ruina law's of friction. Lubrication regimes, Reynolds equation, squeeze film lubrication. Exercice class.

#### IV. Applications in micro-electronics

MEMS & NEMS applications

Direct bonding, wetting ; bonding wave dynamics

Mechanics of fracture ; smartcut process

---

## Course parts

UE Adhesion, friction, nanomechanics - CMTD

Lectures (CM) & Teaching Unit (UE)

22,5h

**Period :** Semester 9

## Useful info

---

### Campus

› [Grenoble - University campus](#)