

UE Microscale mechanics and fluidics II: Fluidics

+5

Level **Baccalaureate** 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: PAX7NFAI

Presentation

Description

Goal: Microfluidics studies the transport of liquids at the scale of some micrometer to the hundred of micrometer, such as the flow of red blood cells in a blood vessel, the transport of polymer chains in a porous medium, or the locomotion of micro-organisms. Nanofluidics studies the flow of liquids at the colloidal scale, that is at distance of the nanometer to the micrometer from a surface. This course introduces the concepts of low Reynolds number flows and surface-driven flows and describes the main properties of flows and transport at the sub-millimeter scale.

Objectives

Content:

- Simple deformations, definition of viscosity
- Lubrication flows ; applications
- Stokes equations ; general properties of low Reynolds number flows
- Diffusion and mixing ; hydrodynamic dispersion ; Peclet number
- Capillary flows ; moving contact lines

- Surface driven flows and coupled transport: Marangoni flows ; electro-osmosis ; Helmoltz-Shmolukovski velocity Exercise session:

Viscous flow around a sphere ; Oseen tensor ; notions on locomotion at low Re







Bibliography:

Guyon, Hulin, Petit "Physical Hydrodynamics" de Gennes, Brochard, Quéré "Bubbles, drops, pearls and waves" Tabeling "Introduction to microfluidics"

Course parts

| ТР | Practical work (TP) | 10h |
|-----------------------|---------------------|-----|
| UE Microfluidics - CM | Lectures (CM) | 14h |
| Period : Semester 9 | | |

Useful info

Place

> Grenoble

Campus

> Grenoble - University campus

