

UE Microscale mechanics and fluidics II: Fluidics



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:** 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 ; Helmholtz-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"

Tabelling "Introduction to microfluidics"

Course parts

TP	Practical work (TP)	10h
UE Microfluidics - CM	Lectures (CM)	14h

Period : Semester 9

Useful info

Place

> Grenoble

Campus

> Grenoble - University campus