



## MATIÈRE MOLLE : NANOSYSTÈMES ET INTERFACES BIOLOGIQUES

### SOFT MATTER

Lecturers: Denis MAZUYER

| Lecturers : 16.0 | TC : 0.0 | PW : 4.0 | Autonomy : 0.0 | Study : 8.0 | Project : 0.0 | Language : MI

### Objectives

Many complex molecular systems (synthetic or natural) are used, in very low concentration, to control functions such as detergency, coating capability, anti-icing, therapeutic targeting, ... by giving a very strong response to a very weak control signal (mechanical, electrical, mechanical, thermal). These technologies are based upon of a strong state of division of matter which leads to the creation of large interfaces between immiscible liquids or between solid and liquids. At these submicrometric scales, the force balances prevailing at the macroscopic level are completely changed and the surface forces govern directly the physics of these nano-systems, which makes them difficult to stabilize and therefore to condition. The aim of the course is to present the fundamental

**Keywords :** Wetting, adhesion, rheology, colloids, biotechnology, physico-chemistry of interfaces, solution of polymers, self-assembly

### Programme

The colloidal state

- Definition, classification, main properties and characterization methods
- Self-assembled molecular systems

Colloidal physico-chemistry

- Dispersions, emulsions and biomedical aspects
- Colloids for diagnosis and in biotechnology

Wetting and capillarity

### Learning outcomes

- To estimate the influence of the structure of soft materials on their properties and to modify surfaces to impart a desired functionality to them
- To obtain a theoretical understanding of the physics of soft condensed matter
- To design microscopic materials made from colloidal building blocks, stable emulsions and dispersions
- To obtain an insight of some experimental techniques that are relevant for investigating soft material physics.

### Independent study

Objectifs :

Méthodes :

### Core texts

P.-G. de Gennes, F. Brochard, D. Quéré, *GOUTTES, BULLES, PERLES ET ONDES*, Belin, 2001  
P. Coussot, J.-L. Grossiord *COMPRENDRE LA RHÉOLOGIE*, EDP Sciences, 2002  
D. Tabor *GASES, LIQUIDS, SOLIDS AND OTHER STATES OF MATTER*, Cambridge University Press, 1991

### Assessment

Final mark = 2/3 Knowledge + 1/3 Know-how

Knowledge = 50% final exam + 50% continuous assessment