

5CI013 Material Surfaces at the BioInterfaces									
Mots clés : Surface, Interfaces, Biomolécules coupling, Surface characterization, Nanoparticles, Biosensors, Surface Plasmon Resonance									
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<i>ECTS</i>	<i>Cours (h)</i>	<i>TD (h)</i>	<i>TP (h)</i>	<i>Tutorat (h)</i>	<i>Ecrit (%)</i>	<i>CC (%)</i>	<i>TP (%)</i>	<i>Oral (%)</i>	<i>Eval. répartie</i>
6	24	10		26	30	30	40		non
<i>Descriptif de l'UE</i>									
The surfaces and interfaces of the materials are the main place of their chemical reactivity and, for this reason, govern their multiple applications. This Teaching Unit aims at apprehending material surfaces at the Biological Interfaces with an approach ranging from the design of the material to its application. Therefore, in a first part, the chemical strategies allowing the coupling of biomolecules to material surfaces will be studied together with the experimental techniques allowing the molecular characterization of the resulting biomaterials that will be introduced at fundamental and practical levels. Then, in the second part, the applications and reactivity of these materials will be studied at the bioInterfaces relying on examples in biosensing, biofouling, and bioadhesives.									
<i>Learning Outcomes</i>									
The main objective of this course is to familiarize students with the complexity of the cross-disciplinary field of material surfaces at the bioInterfaces. They will be able to describe physical and chemical properties of material surfaces at complex liquid interfaces and to list the parameters governing their reactivity towards adsorbates. The students will also be capable to identify the techniques allowing the investigation of phenomena occurring at the bioInterfaces. Through original learning methods, they will also develop a critical understanding of scientific communications and produce restitutions. At the end of the semester, the students should acquire the ability to independently investigate a scientific project related to material surfaces at the bioInterfaces and to deal with it competently.									
<i>Prérequis</i>									
This course is intended to be accessible to all the students with a Master 1 in Chemistry or Physics. The course 4C703 (Material, Surfaces and Interfaces) and the Material science interdisciplinary profile will be an advantage. This course is part of the Interdisciplinary International profile Material science and Nanotechnologies at the BioInterfaces (MatNanoBio) in conjunction with NTU (Singapore) with the courses "Biomimetics and Biotechnology" and "Plasmonics and nano-optics for Chemistry & BioInterfaces"									
<i>Langue⁽¹⁾</i>	<i>Cours, TD, TP</i>							<i>Documents</i>	<i>Bibliographie</i>
English	English							English	English

Content

Introduction:

Surface sites, Terminology, Applications, Timeline

Surface Functionalization:

- Surface (planar and nanoparticles) composition, modification, reactivity (adsorption & functionalization)
- Characterization techniques
- Application in biosensing, preventing biofouling, and medicine

Biomolecules on surfaces

- Biomolécules structure
- chemical modification of biomolécules
- coupling, reactions etc.

Polymer coated nanoparticles

- Polymer coating of nanoparticles, stimuli-responsive polymers, self-assembly, drug delivery & biosensing

Nanomaterials applied to BioInterfaces

MASTER

Chimie

Application to medicine and diagnostic