



Course unit English denomination	Probing molecularly-modified solid/liquid interfaces by electrochemical and spectroscopic techniques
Teacher in charge (if defined)	ANTONELLO Sabrina, BONACCHI Sara, LITTI Lucio
Teaching Hours	24
Number of ECTS credits allocated	3
Course period	06-07/2025
Course delivery method	<input type="checkbox"/> In presence <input type="checkbox"/> Remotely <input checked="" type="checkbox"/> Blended
Language of instruction	English
Mandatory attendance	<input checked="" type="checkbox"/> Yes (70% minimum of presence) <input type="checkbox"/> No
Course unit contents	<p>The engineering of solid surfaces through appropriate modification with organic molecules is crucial both in fundamental and applied science impacting various fields, ranging from molecular electronics to catalysis and sensing. This course primarily focuses on surface modification approaches and on the characterization of the resulting interfaces, with particular emphasis on spectroscopic and electrochemical techniques. Topics covered will include self-assembled monolayers, Langmuir-Blodgett monolayers, 3D monolayers on nanoparticles, conductive polymers and their applications in catalysis, and nanotechnology. UV-Vis-, infrared-, RAMAN-spectroelectrochemistry will be introduced as powerful techniques to gain qualitative and quantitative information about the processes occurring at the interface. A particular focus will be given to atomically precise monolayer-protected nanoclusters for their relevance as model systems helping in rationalizing the role of the ligand shell as a suitable interface to mediate the electronic interaction between the metal core and its environment. Students will be introduced to the fundamental principles governing the formation, stability, and characterization of mono- and multilayers on different substrates, with a focus on electron transfer properties.</p>
Learning goals	<p>Knowledge: comprehensive understanding of organic layers formation on solid surfaces and of selected experimental approaches for their characterization.</p> <p>Skills: Development of the ability to design the chemical modification of a surface to achieve the desired effect and to evaluate the most appropriate characterization techniques to study modified surfaces.</p> <p>Competencies: Synthesize concepts from chemistry, nanotechnology, and surface engineering to design and analyse systems where surface modification plays a crucial role in determining performances.</p>
Teaching methods	Frontal teaching
Course on transversal, interdisciplinary,	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No



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transdisciplinary  
skills

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Available for PhD  
students from other  
courses

Yes

No

Students external to the PhD Course admitted upon evaluation of the CV by the  
teacher(s)

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Prerequisites  
(not mandatory)

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Examination  
methods

Oral presentation in-depth on one of the topics covered in the lessons.

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Study material

Slides/articles provided by the teacher

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Additional  
information  
(not mandatory)

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