

# Molecular Nanosystems: from principles to applications

## Titulaire

Gilles BRUYLANTS (Coordonnateur)

## Mnémonique du cours

CHIM-H518

## Crédits ECTS

3 crédits

## Langue(s) d'enseignement

Anglais

## Période du cours

Deuxième quadrimestre

## Campus

Solbosch

## Contenu du cours

Through the development of a Lateral Flow Assay (LFA) - a test similar to the pregnancy test - different aspects of the development of a molecular sensor are discussed: the synthesis, characterization and functionalization of nanomaterials, the use of biomolecules to provide selectivity, the validation of the test, ...

## Objectifs (et/ou acquis d'apprentissages spécifiques)

Apply all acquired knowledge in chemistry to critically analyse the complex issues related to the production and use of a molecular sensor. In groups, and under the supervision of the teacher, students will have to find in the literature protocols to set up the test and apply them in the laboratory. The obtained results will have to report to the other students as a oral presentation and as a written scientific report.

## Méthodes d'enseignement et activités d'apprentissages

Students will have to work in groups on one of the three following topics:

- > synthesis and characterization of the nanoparticles
- > functionalization of the particles using a selected biomolecule
- > functionalization of the cellulose membrane
- > validation of the test.

Students will have to prepare a oral presentation for their colleagues that includes the requested theoretical concepts and the results that have been obtained experimentally.

The experimental results will also have to be reported as an scientific report to the teacher.

## Contribution au profil d'enseignement

This teaching unit contributes to the following competences:

- > In-depth knowledge and understanding of exact sciences with the specificity of their application to engineering
- > The flexibility and adaptability to work in an international and/or intercultural context
- > An integrated insight in chemical process and materials' technology
- > Ability to reformulate complex engineering problems in order to solve them (simplifying assumptions, reducing complexity)
- > Ability to conceive, plan and execute a research project, based on an analysis of its objectives, existing knowledge and the relevant literature, with attention to innovation and valorization in industry and society
- > Report correctly on research or design results in the form of a technical report or in the form of a scientific paper
- > Present and defend results in a scientifically sound way, using contemporary communication tools, for a national as well as for an international professional or lay audience
- > Collaborate in a (multidisciplinary) team
- > Develop, plan, execute and manage engineering projects at the level of a starting professional
- > Think critically about and evaluate projects, systems and processes, particularly when based on incomplete, contradictory and/or redundant information
- > Adopt a critical attitude towards one's own results and those of others
- > Be conscious of the ethical, social, environmental and economic context of his/her work and strives for sustainable solutions to engineering problems including safety and quality assurance aspects

## Références, bibliographie et lectures recommandées

Chemical and Engineering News (American Chemical Society) - <https://cen.acs.org>

## Support(s) de cours

Université virtuelle

## Autres renseignements

## Lieu(x) d'enseignement

Solbosch

## Contact(s)

Prof. Gilles Bruylants : e-mail: [gilles.bruylants@ulb.be](mailto:gilles.bruylants@ulb.be); bureau P2.2.110

## Méthode(s) d'évaluation

Travail de groupe et Présentation orale

### Méthode(s) d'évaluation (complément)

Presentation:

- > Quality of the presentation
- > Structure of the presentation
- > Scientificité content

Written report:

- > Ability to synthesize
- > Clarity of the reported results
- > Analysis of the results and conclusions
- > Wording, grammar, ease to read

> Bibliography

### Construction de la note (en ce compris, la pondération des notes partielles)

The grade will be the average of the marks given from the group presentation and scientific report.

### Langue(s) d'évaluation principale(s)

Anglais

## Programmes

### Programmes proposant ce cours à l'école polytechnique de Bruxelles

MA-IRMA | Master : ingénieur civil en chimie et science des matériaux | finalité Spécialisée/bloc 2 et MS-NATE | Master de spécialisation en nanotechnologie | bloc U

