

# Molecular Nanosystems: from principles to applications

## Lecturer

Gilles BRUYLANTS (Coordinator)

## Course mnemonic

CHIM-H518

## ECTS credits

3 credits

## Language(s) of instruction

English

## Course period

Second term

## Campus

Solbosch

## Course content

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.

## Objectives (and/or specific learning outcomes)

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.

## Teaching method and learning activities

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 and validation of the test.

Students will have to prepare a oral presentation for their colleagues presenting 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 to the teaching profile

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

## References, bibliography and recommended reading

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

## Course notes

Université virtuelle

## Other information

## Place(s) of teaching

Solbosch

## Contact(s)

Prof. Gilles Bruylants : 02/650 3586; e-mail: [gilles.bruylants@ulb.be](mailto:gilles.bruylants@ulb.be); bureau P2.2.110

## Evaluation method(s)

Oral presentation and Group work

### Evaluation method(s) (additional information)

Presentation:

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

Written report:

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

- > Bibliography

### Determination of the mark (including the weighting of partial marks)

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

### Main language(s) of evaluation

English

## Programmes

### Programmes proposing this course at the Brussels School of Engineering

MA-IRMA | Master of Science in Chemical and Materials Engineering | finalité Professional/unit 2 and MS-NATE | Specialized Master in Nanotechnology | unit U

