

NANO2MC

2013 - 2014

Advanced Master in Nanotechnology

At Louvain-la-Neuve - 1 year - Day schedule - In frenchDissertation/Graduation Project : **YES** - Internship : **NO**Activities in English: **optional**Activities on other sites : **optional**Main study domain : **Sciences de l'ingénieur**Organized by: **Ecole Polytechnique de Louvain (EPL)**Programme code: **nano2mc** - European Qualifications Framework (EQF): 7**Table of contents**

| | |
|--|---|
| Introduction | 2 |
| Admission | 3 |
| Information | 4 |
| - Learning outcomes | 4 |
| - Teaching method | 5 |
| - Evaluation | 5 |
| - Mobility and/or Internationalisation outlook | 5 |
| - Possible trainings at the end of the programme | 5 |
| Contacts | 6 |
| Detailed programme | 7 |
| - Programme structure | 7 |
| - Programme by subject | 7 |

NANO2MC - Introduction

Introduction

The programme trains in the multidisciplinary aspect of nanotechnologies and offers five specialisations:

- nanophysics: quantum phenomena, molecular transports, spintronics, simulation, physical characterisations, etc.;
- nanochemistry: synthesis of nanoparticles, chemical and physico-chemical characterisation, quantum chemistry, etc.;
- nanoelectronics: micro- and nanoelectronics, MEMS, NEMS, electronic characterisation, etc.;
- nanomaterials: nanocomposites, nanothreads, nanotubes, polymers, etc.;
- nanobiotechnologies: biomaterials, biophysics, nanomedicine, biosensors, etc.

Your profile

This programme is accessible to:

- holders of a master (120) in engineering sciences;
- holders of a master degree (120) in agronomic sciences and bioengineering, sciences, biomedical and pharmaceutical sciences, as well as holders of the academic degree of master in Business Engineering: upon application for admission;
- holders of Belgian and foreign second-cycle degrees: upon application for admission.

Your programme

In each of the specialisations, the training programme is composed of at least 60 credits.

This programme includes:

- a common core of 30 credits including a research work (thesis) done in a laboratory of one of the six institutions organising the Master (27 credits), transversal seminars and a personnel work (3 credits);
- a specialised training (8 to 15 credits);
- options in the form of courses of your choice (15 to 22 credits).

NANO2MC - Admission

For the specific conditions of this program : refer to the French version

Decree of March 31st 2004 defining higher education, favoring its integration in the European framework of higher education and refinancing universities.

The admission requirements have to be met at the time of enrolment at the university.

All information can be obtained from the [University's Enrolment Office \(Service des inscriptions – SIC\)](#).

The following students, after meeting the conditions set by the academic authorities, have access to the complementary Master's degree with the aim of obtaining the grade that these studies sanction:

- An academic Master's degree within the same field allowing 2nd-cycle studies, including at least 120 credits
- An academic Master's degree, following a decision by the academic authorities, under the complementary conditions that they set and as a result of a motivated decision by the jury
- An academic grade which is similar to those mentioned above, issued by the Flemish Community, the German Community or the Royal Military Academy, under the same conditions
- A foreign academic grade that has been acknowledged as being equivalent to those mentioned above, in application of this decree, a European-level directive or an international convention, under the same conditions
- Under the same conditions, one or several titles or academic grade issued by the Flemish Community, the German Community or the Royal Military Academy, sanctioning 2nd-cycle studies and valued at least 300 credits by the jury, or sanctioning 2nd-cycle studies and valued at least 240 credits completed of 60 credits, the all that must be valued by the jury according to the decree of March 31st, 2004 (art 54, 5 °)

In the event of the divergence between the different linguistic versions of the present conditions, the French version shall prevail

NANO2MC - Information

Learning outcomes

The Advanced Master in Nanotechnology offers holders of a basic second cycle degree complementary and/or advanced second cycle training in the fields of nanoscience and nanotechnology. It is intended for, on the one hand, those who do not have any training in this field and who wish to specialise in it, or on the other hand, for those who have already taken an option in this field during their Master's and who wish to further their training with a specialisation in another area of nanotechnology, e.g. an electrical engineer wanting to further his/her training in nano-biotechnology.

The Advanced Master in Nanotechnology is a program of 60 credits organised around five main areas of specialisation:

- nanophysics: quantum phenomena, molecular transportation, spintronics, simulation, physical characterisations ...
- nanochemistry: synthesis of nanoparticles, chemical and physico-chemical characterisation, quantum chemistry
- nanoelectronics: micro and nanoelectronics, MEMS, NEMS, electronic characterisation ...
- nanomaterials : nanocomposites, nanofils, nanotubes, nanomedicine, biocaptors ...

This program is also intended to train students in the multidisciplinary aspect of nanotechnology. To this end it puts the accent on the different approaches used in these fields : knowledge of basic phenomena at the nano level, nanomanufacturing or the synthesis of nanostructures, the characterisation of nanostructures and the modelling and numeric simulation at the nano level

It also aims to make students aware of the impact on society of nanotechnology by way of interdisciplinary seminars on the following themes : ethics, economic perspectives, applications of nanotechnology, toxicity of nanomaterials ...

On successful completion of this programme, each student is able to :

1. mener à son terme une démarche multidisciplinaire de recherche appliquée à la conception et à la fabrication d'un objet fonctionnel dont la taille se situe entre 1 et 100 nm et notamment d'être en mesure d'appliquer au moins deux des quatre compétences suivantes :

- 1.1. utilisation des notions de phénomènes fondamentaux à l'échelle nanoscopique en vue de concevoir des objets et de matériaux aux propriétés nouvelles,
- 1.2. synthèse de nanomatériaux ou fabrication de nanostructures fonctionnelles en laboratoire,
- 1.3. caractérisation des nanostructures pour en connaître la structure et/ou des propriétés fonctionnelles,
- 1.4. modélisation ou simulation numériquement à l'échelle nanoscopique, en utilisant des outils non-conventionnels, pour prédire des propriétés de l'objet, du matériau ;

2. appliquer la démarche complète de recherche au développement d'un objet fonctionnel dans l'un des domaines suivants : nanophysique, nanochimie, nanoélectronique, nanomatériaux, nanobiotechnologies ;

/

3. estimer l'impact des nanotechnologies sur l'environnement, la santé, le développement économique, l'emploi ;

/

4. organiser son travail de recherche, en équipe de laboratoire, pour le mener à bien

- 4.1. formuler le cahier des charges du nanomatériau ou du nanodispositif,
- 4.2. se documenter et résumer l'état des connaissances actuelles dans le domaine de recherche en nanotechnologie,
- 4.3. mettre en forme un rapport de synthèse visant à expliciter les nouvelles propriétés de l'objet, du matériau, son domaine d'application,
- 4.4. communiquer oralement et par écrit (sous forme d'article scientifique) les résultats de sa recherche à une équipe d'experts dans le domaine des nanotechnologies.

Teaching method

The Advanced Master in Nanotechnology is a resolutely multidisciplinary program, the objective of which is to train students in both theoretical, and experimental and applied approaches in the field of nanotechnology.

By its structure of leaving a very wide choice of courses, this program allows students to construct a program to suit them and their personal needs.

To minimise students' travelling, distance-learning (video-learning) accompanied by supervision will be progressively established.

A variety of the learning structures and scientific approaches is provided by the inter-university organisation of the program.

Evaluation

The learning activities are evaluated according to the regulations in force at the university (see the examination regulations), viz. written and oral examinations, laboratory examinations, individual or group assignments, public presentations of projects, thesis.

Mobility and/or Internationalisation outlook

To allow access to the Master's program to non-French speaking students, a major part of the program will be given in English.

Most of the laboratories of the teachers involved in the Master's program belong to European networks of excellence (FAME, SINANO, NANOSIL, ...), and international research programs.

Possible trainings at the end of the programme

The Advanced Master in Nanotechnology is intended in particular for holders of a degree in civil engineering, bioengineering, a master's in biology, chemistry, physics, biomedical science or management, wishing to specialise in this field, or advance their training in it. It is characterised by a global approach to the field of nanotechnology, and offers a deliberately multidisciplinary program.

The program is organised conjointly by six universities : FPMs, FUNDP, UCL, ULB, ULg et UMH; the courses are given in these universities. The research work is carried out in one of the laboratories of these universities which is active in the field of nanotechnology.

These laboratories are members of the Walloon association of nanotechnology (NanoWal). This association also includes research centres and companies active in this field. The students taking the Master's will also have the opportunity to study and carry out research in a resolutely multidisciplinary environment in laboratories which have a strong tradition of collaboration.

With its training and research components, the Advanced Master in Nanotechnology also prepares students for the PhD program. Most of the teachers involved in the Master's are members of the thematic doctoral school MAIN (Science et Ingénierie des Matériaux, des Interfaces et des Nanostructures) which can supervise students wishing to do a PhD.

NANO2MC - Contacts

Curriculum Managment

Entite de la structure BSMA

| | |
|--------------|---|
| Acronyme | BSMA |
| Dénomination | Bio and soft matter |
| Adresse | Croix du Sud, 1 bte L7.04.02 1348 Louvain-la-Neuve |
| Secteur | Secteur des sciences et technologies (SST) |
| Institut | Institute of Condensed Matter and Nanosciences (IMCN) |
| Pôle | Bio and soft matter (BSMA) |

Academic Supervisor : [Bernard NYSTEN](#)

Jury

Président du Jury : **Piotr SOBIESKI**

Secrétaire du Jury : **Bernard NYSTEN**

Usefull Contacts

NANO2MC - Detailed programme

Programme structure

In each of the areas of specialisation, the program involves a minimum of 60 credits. This program comprises :

- a core curriculum of 30 credits consisting of
 - . a research work (thesis) carried out in a laboratory of one of the six institutions organising the Master's (27 credits)
 - . interdisciplinary seminars and an individual assignment (3 credits) : students follow seminars common to the various streams and do an assignment on some interdisciplinary themes such as ethics, economic perspectives, applications of nanotechnology, toxicity of nanomaterials ... ; these seminars are organised in turn by the program partners in the form of thematic days ; the interdisciplinary seminars are compulsory for all the streams and involve all the Master's students.
- specialised training (8 to 15 credits) made up of four basic courses in each of the four disciplines (basic phenomena, nanomanufacturing or nanosynthesis, characterisation of nanostructures and simulation at the nano level) : several basic courses are offered for each of the disciplines, in each of the areas of specialisation, adapted to the previous knowledge of the students ; students will be obliged to choose at least one course in each of the four disciplines
- options in the form of electives (15 to 22 credits)

. in function of their previous studies, students will be able to take general courses (maximum 9 credits), in particular in the chemistry and physics of solids, the chemistry and physics of macromolecules, biochemistry and biophysics ...

. students will specialise in one of the five research or application areas while following specialised courses ; they will devise a multidisciplinary training program in function of the topic of their research work.

Within the area of specialisation, students will, with the assistance of an adviser, devise a coherent program which is adapted to their previous knowledge. With the agreement of their adviser, it is possible to take electives outside the area of specialisation, even out of the Master's program. If during their previous studies students have already taken a particular course or one deemed equivalent, they cannot include this in their program.

Whatever the area of specialisation, the program will comprise a minimum of 60 credits. It may be raised to 75 credits if intensive upgrading courses are considered necessary by the committee responsible for the program in function of the student's previous studies (see admission conditions). The program thus constituted will be submitted for approval to the inter-academic committee responsible for the Master's.

Core study

[> Programme détaillé du master complémentaire en nanotechnologie](#) [en-prog-2013-nano2mc-lnano202t.html]

Programme by subject

Core courses

Le programme de ce master est interuniversitaire. Dans les listes de cours repris ci-dessous, les intitulés des cours sont suivis de leur code UCL s'ils sont organisés par l'UCL ou de l'abréviation d'une autre université s'ils sont enseignés ailleurs. Si le cours est organisé à l'UCL, il est conseillé d'aller en vérifier les attributs (volume horaire, poids ECTS, nom des enseignants, semestre d'enseignement...) en tapant le sigle UCL dans le moteur de recherche par cours disponible sur la page de garde de ce programme. Pour les autres, il faut se référer au site de l'université d'origine du cours.

Par ailleurs, les cours sont également suivis de l'indication suivante entre parenthèses " (P, C, B, E, M) " où une ou plusieurs lettres peuvent être manquantes et remplacées par des tirets "-". Les lettres P, C, B, E, M indiquent les filières auxquelles ces cours peuvent être rattachés. Pour en comprendre le fonctionnement, il faut se référer aux règles de composition du programme expliquées

dans le chapitre "structure du programme" (cfr. supra). Elles signifient respectivement Nanophysique, Nanochimie, Nanobiologie, Nanoélectronique et Nanomatériaux."

- Mandatory
 △ Courses not taught during 2013-2014
 ⊕ Periodic courses taught during 2013-2014
 ⊗ Optional
 ⊙ Periodic courses not taught during 2013-2014
 † Two years course

Click on the course title to see detailed informations (objectives, methods, evaluation...)

○ Tronc commun du master complémentaire en nanotechnologie

Les étudiants réalisent un travail de recherche dans un labo d'une des 6 institutions organisant le Master. Ils suivront des séminaires communs aux différentes filières et réaliseront un travail sur un des thèmes transversaux tels que l'éthique, les aspects socio-économiques, les applications des nanotechnologies et la toxicité des nanomatériaux

| | | | | | |
|-------------|---|----|----|------------|--|
| ○ LNANO2991 | Séminaires sur les aspects éthiques et socio-économiques des nanotechnologies | N. | | 3 Credits | |
| ○ LNANO2990 | Travail de fin d'études | N. | 1h | 27 Credits | |

○ -

En fonction de la filière de spécialisation choisie, l'étudiant suivra au moins un cours de formation de "base" dans chacune des 4 disciplines (phénomènes fondamentaux, nano-fabrication, caractérisation des nanostructures et simulation à l'échelle nanoscopique) pour un volume de De 8 à 15 crédits parmi

⊗ -

| | | | | | |
|-------------|---|----|---------|-----------|----|
| ⊗ LNANO2103 | Nano-électronique (UCL, cours LELEC 2710) | N. | 30h+30h | 5 Credits | 1q |
| ⊗ LNANO2104 | Physique des nanostructures (P,-,-,E,M) (MAPR 2015) | N. | 1h | 5 Credits | 1q |
| ⊗ LNANO2010 | Physical properties of nanoparticles and nanostructures | N. | | 4 Credits | |
| ⊗ LNANO2011 | Nanochemistry and Nanotechnology (ULB, cours CHIM-Y080) | N. | 24h+24h | 2 Credits | 1q |
| ⊗ LNANO2012 | Nanophysique (P,-,-,E,M) (ULB) | N. | 1h | 3 Credits | 2q |
| ⊗ LNANO2013 | Moteurs moléculaires et processus stochastiques (P,C,B,-,M) (ULB) | N. | | 3 Credits | |
| ⊗ LNANO2014 | Chimie des macromolécules biologiques (-,C,B,-,M) (ULG) | N. | 1h | 2 Credits | 2q |
| ⊗ LNANO2015 | Nano-électronique / Opto-électronique (P,-,-,E,M) (ULG) | N. | 1h | 5 Credits | 2q |
| ⊗ LNANO2016 | Physique de la matière molle (P,C,B,-,E,M) (UMH) | N. | 1h | 2 Credits | |

⊗ Finalité spécialisée en nano-fabrication, nano-manipulation ou nano-synthèse du master complémentaire en nanotechnologie

| | | | | | |
|-------------|--|----|----|-----------|----|
| ⊗ LNANO2105 | Techniques de micro et nanofabrication (P,-,-,E,M) (ELEC 2560) | N. | 1h | 5 Credits | 2q |
| ⊗ LNANO2017 | Matériaux nanostructurés (-,C,-,-,M) (ULB) | N. | 1h | 2 Credits | 1q |
| ⊗ LNANO2018 | Physico-chimie des nanostructures (P,C,B,E,M) (ULG) | N. | 1h | 2 Credits | 1q |
| ⊗ LNANO2019 | Nanomatériaux : méthodes de synthèse et applications (-,C,B,-,M) (ULG) | N. | 1h | 2 Credits | 2q |
| ⊗ LNANO2020 | Matériaux nanocomposites polymères (-P,C,-,-,M) (UMH) | N. | 1h | 2 Credits | |

⊗ Finalité spécialisée en caractérisation des nanostructures du master complémentaire en nanotechnologie

| | | | | | |
|-------------|---|----|----|-----------|----|
| ⊗ LNANO2106 | Caractérisation de surface des matériaux (-,C,-,-,M) (BRNA 2102) | N. | 1h | 5 Credits | 2q |
| ⊗ LNANO2107 | Dispositifs électroniques avancés (-,-,-,E,M) (ELEC 2541) | N. | 1h | 5 Credits | 1q |
| ⊗ LNANO2108 | Analyse et traitement des surfaces solides (P,C,-,-,M) (MAPR 2631) | N. | 1h | 4 Credits | 2q |
| ⊗ LNANO2021 | Microscopie électronique, diffraction et EELS (P,C,B,E,M) (FUNDP) | N. | 1h | 3 Credits | |
| ⊗ LNANO2022 | Microscopie et microanalyse à haute résolution (P,C,B,E,M) (ULB) | N. | 1h | 2 Credits | 2q |
| ⊗ LNANO2023 | Microscopie à force atomique et techniques dérivées (P,C,B,E,M) (ULG) | N. | 1h | 2 Credits | 2q |
| ⊗ LNANO2024 | Microscopie à sonde locale (-,C,B,-,M) (UMH) | N. | 1h | 3 Credits | |

⊗ Finalité spécialisée simulation à l'échelle nanoscopique du master complémentaire en nanotechnologie

| | | | | | |
|-------------|--|----|----|-----------|----|
| ⊗ LNANO2109 | Simulations atomistiques et nanoscopies (P,-,-,M) (MAPR 2451) | N. | 1h | 5 Credits | 2q |
| ⊗ LNANO2025 | Multiscale simulations in nanosciences (P,C,-,E,M) (FUNDP) | N. | 1h | 4 Credits | |
| ⊗ LNANO2026 | Méthodes de simulation microscopique (P,-,-,M) (ULB) | N. | 1h | 4 Credits | |
| ⊗ LNANO2027 | Modélisation et simulation par des approches milieux continus en nanomécanique (-,-,-,M) (ULG) | N. | 1h | 3 Credits | 1q |
| ⊗ LNANO2028 | Theory and modeling of biohybrids (P,C,B,E,M) (ULG) | N. | 1h | 3 Credits | |
| ⊗ LNANO2029 | Nanoparticles and low dimensional systems (P,-,-,M) (ULG) | N. | 1h | 3 Credits | 1q |

○ Cours au choix du master complémentaire en nanotechnologie

Le master est organisé en 5 filières ou options de spécialisation : nano-physique, nano-chimie, nano-matériaux nano-électronique et nano-biotechnologie. Les étudiants suivent de 15 à 22 crédits de cours au choix dans leur option de spécialisation, ou éventuellement hors de celle-ci en accord avec leur conseiller.

⊗ Cours de formation générale du master complémentaire en nanotechnologie.

En fonction de sa formation préalable l'étudiant peut suivre une formation générale pour max=9 crédits parmi

| | | | | | |
|-------------|--|----|----|-----------|----|
| ⊗ LNANO2100 | Chimie des solides (BRNA 2103) | N. | 1h | 5 Credits | 2q |
| ⊗ LNANO2101 | Dispositifs électroniques (ELEC 1330) | N. | 1h | 5 Credits | 2q |
| ⊗ LNANO2102 | Optiques et lasers (PHYS 2141) | N. | 1h | 5 Credits | 1q |
| ⊗ LNANO2003 | Polymer Chemistry (ULB) | N. | 1h | 3 Credits | 1q |
| ⊗ LNANO2004 | Physico-chimie des matériaux inorganiques (ULB) | N. | 1h | 3 Credits | 1q |
| ⊗ LNANO2005 | Physique de la matière condensée (ULB) | N. | 1h | 3 Credits | 1q |
| ⊗ LNANO2009 | Nanotechnologie (ULG) | N. | 1h | 3 Credits | 2q |
| ⊗ LNANO2008 | Propriétés fonctionnelles des macromolécules biologiques (ULG) | N. | | 5 Credits | |
| ⊗ LNANO2007 | Chimie des macromolécules biologiques (ULG) | N. | | 9 Credits | |
| ⊗ LNANO2006 | Biochimie (ULG) | N. | | 5 Credits | |

⊗ Cours de formation spécifique du master complémentaire en nanotechnologie.

| | | | | | |
|-------------|--|----|---------|-----------|----|
| ⊗ LNANO2110 | Nanobiotechnologies (-,C,B,-,M) (BRNA 2202) | N. | 1h | 5 Credits | 1q |
| ⊗ LNANO2111 | Dispositifs électroniques spéciaux (P,-,-,E,M) (ELEC 2550) | N. | 1h | 5 Credits | 1q |
| ⊗ LNANO2112 | Design of micro- and nano-systems (-,-,-,E,-) (ELEC 2895) | N. | 1h | 5 Credits | 2q |
| ⊗ LNANO2113 | Nanotechnologie macromoléculaire (P,C,B,-,M) (MAPR 2012) | N. | 1h | 5 Credits | 2q |
| ⊗ LNANO2114 | Phénomènes de transport dans les solides et les nanostructures (P,-,-,E,M) (MAPR 2471) | N. | 1h | 5 Credits | 1q |
| ⊗ LNANO2115 | Diagnostic and Therapeutic Applications of Nanotechnologies (MAPR2475) | N. | 20h+10h | 3 Credits | 1q |
| ⊗ LNANO2116 | Lasers et applications (P,-,-,E,M) (PHYS 2245) | N. | 1h | 6 Credits | 1q |
| ⊗ LNANO2030 | Interactions intermoléculaires (-,C,B,-,-) (FUNDP) | N. | 1h | 2 Credits | 1q |
| ⊗ LNANO2031 | Solides inorganiques et matériaux nanostructurés (-,C,-,-,M) (ULB) | N. | 1h | 2 Credits | 1q |
| ⊗ LNANO2032 | Solides organiques et matériaux nanostructurés (-,C,-,-,M) (ULB) | N. | 1h | 2 Credits | 2q |
| ⊗ LNANO2033 | Structure et réactivité des surfaces (P,C,-,-,M) (ULB) | N. | 1h | 2 Credits | 1q |
| ⊗ LNANO2034 | Théorie quantique des solides et des surfaces (ULB, cours CHIM-F442) | N. | 24h | 2 Credits | 2q |
| ⊗ LNANO2035 | Physique des membranes et des systèmes biologiques (P,C,B,-,M) (ULB) | N. | 1h | 4 Credits | 2q |
| ⊗ LNANO2036 | Surface physics and surface characterization (P,C,-,-,M) (ULB) | N. | 1h | 2 Credits | 2q |
| ⊗ LNANO2037 | Dispositifs et machines moléculaires (-,C,B,-,M) (ULG) | N. | 1h | 2 Credits | 2q |
| ⊗ LNANO2038 | Apport de l'électrochimie à la chimie macromoléculaire (-,C,B,-,M) (ULG) | N. | 1h | 1 Credits | |

| | | | | | |
|-------------|--|----|---------|-----------|----|
| ⊗ LNANO2039 | Application des nanotechnologies au développement de nouveaux médicaments (-,-,B,-,-) (ULG) | N. | 1h | 1 Credits | 1q |
| ⊗ LNANO2040 | Molecular logic (P,C,-,E,M) (ULG) | N. | 1h | 3 Credits | |
| ⊗ LNANO2041 | Functionnal Materials : theory & modeling (ULG, cours PHYS30003-1) | N. | 20h+10h | 3 Credits | 1q |
| ⊗ LNANO2042 | Les grands instruments pour l'étude de la matière : applications aux nanomatériaux (P,C,B,E,M) (ULG) | N. | 1h | 3 Credits | 1q |
| ⊗ LNANO2043 | Introduction aux nanotechnologies (P,C,B,E,M) (UMH) | N. | 1h | 2 Credits | |

⊗ Cours de formation complémentaire du master complémentaire en nanotechnologie.

| | | | | | |
|-------------|---|----|----|-----------|----|
| ⊗ LNANO2117 | Chimiométrie (P,C,B,E,M) (BIRC 2106) | N. | 1h | 3 Credits | 2q |
| ⊗ LNANO2118 | Principes de catalyse hétérogène (-,C,-,-,M) (BRNA 2201) | N. | 1h | 5 Credits | 1q |
| ⊗ LNANO2119 | Contrôle statistique de la qualité (P,C,B,E,M) (STAT 2310) | N. | 1h | 3 Credits | 2q |
| ⊗ LNANO2044 | Ingénierie moléculaire et biomoléculaire (-,C,B,-,-) (ULB) | N. | 1h | 3 Credits | 1q |
| ⊗ LNANO2045 | Procédés de microfabrication (-,-,-,E,M) (ULB) | N. | 1h | 2 Credits | |
| ⊗ LNANO2046 | Composants microtechniques (-,-,-,E,M) (ULB) | N. | 1h | 3 Credits | |
| ⊗ LNANO2047 | Structure et dynamique des macromolécules biologiques (-,C,B,-,M) (ULG) | N. | 1h | 8 Credits | 1q |
| ⊗ LNANO2048 | Proteomics (P,C,B,-,M) (ULG) | N. | 1h | 4 Credits | 2q |
| ⊗ LNANO2049 | Chimie de matériaux inorganiques (-,C,-,-,M) (ULG) | N. | 1h | 2 Credits | 2q |
| ⊗ LNANO2050 | Fluides complexes (P,C,-,-,M) (ULG) | N. | 1h | 3 Credits | 1q |

