GBIO2M

2014 - 2015

Master [120] in Biomedical Engineering

At Louvain-la-Neuve - 120 credits - 2 years - Day schedule - In french
Dissertation/Graduation Project : **YES** - Internship : **optional**
Activities in English: **optional** - Activities in other languages : **NO**
Activities on other sites : **optional**
Organized by: **Ecole Polytechnique de Louvain (EPL)**
Programme code: **gbio2m** - European Qualifications Framework (EQF): 7

Table of contents

GBIO2M - Introduction

Introduction

GBIO2M - Teaching profile

Learning outcomes

The Masterâ€™s degree in biomedical engineering aims to train engineers who will be able to meet future technological challenges in the scientific and technical fields relating to biomedical engineering, within an ever-changing European and global context.

Upon graduating, students will have acquired the basics of all the main fields of biomedical engineering : bioinstrumentation, biomaterials, medical imaging, mathematical modelling, artificial organs and rehabilitation, bioinformatics and biomechanics. They will have been given advanced training in one or two of the proposed options.

Thanks to the important amount of time given over to elective courses, students can choose to become anything between « general practitioner » or « specialist » in any given field.

Thanks also to the collaboration between the Louvain School of Engineering and the Medical school, students are assured of an interdisciplinary training, where the art of engineering is applied to the complex and varied biomedical field.

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

démontrer la maîtrise d'un solide corpus de connaissances et compétences en sciences fondamentales et sciences de l'ingénieur, lui permettant d'appréhender et de résoudre des problèmes qui relèvent du génie biomédical (axe 1).

1.1. Identifier et mettre en Œuvre les concepts, lois, raisonnements applicables à une problématique donnée faisant appel à plusieurs disciplines du génie biomédical :

• le développement d'algorithmes et de logiciels, particulièrement pour le traitement de données biomédicales, l'analyse de données biologiques et l'imagerie médicale,

• les biomatériaux (interfaces, biocompatibilité, etc.)

• la biomécanique, le contrôle moteur, et la robotique médicale (pour la chirurgie et la rééducation)

• le génie clinique

1.2. Identifier et utiliser les outils de modélisation et de calcul adéquats pour résoudre des problématiques liées aux disciplines (ci-dessus).

1.3. Vérifier la vraisemblance et confirmer la validité des résultats obtenus au regard de la nature du problème posé, notamment en ce qui concerne les ordres de grandeurs et les unités dans lesquelles les résultats sont exprimés :

• en particulier, valider ou invalider un travail de modélisation en comparant des résultats expérimentaux et théoriques

organiser et mener à son terme une démarche d'ingénierie appliquée au développement d'un produit (et/ou d'un service) répondant à un besoin ou à une problématique particulière dans le domaine du génie biomédical (axe 2).

2.1. Analyser le problème à résoudre ou le besoin fonctionnel à rencontrer, inventorier les fonctionnalités et contraintes, formuler le cahier des charges dans un domaine où les contraintes techniques et économiques sont prises en compte.

2.2. Modéliser le problème et concevoir une ou plusieurs solutions techniques en y intégrant les aspects mécaniques, électriques, électroniques ou informatiques et répondant au cahier des charges.

2.3. Évaluer et classer les solutions au regard de l'ensemble des critères figurant dans le cahier des charges : efficacité, faisabilité, qualité, ergonomie, sécurité dans l'environnement considéré, biocompatibilité, etc.

2.4. Implémenter et tester une solution sous la forme d'une maquette, d'un prototype et/ou d'un modèle numérique.

2.5. Formuler des recommandations pour améliorer une solution technique, soit pour la rejeter, soit pour expliquer les améliorations à y apporter dans la perspective d'en faire un produit opérationnel.

organiser et mener à son terme un travail de recherche pour appréhender un phénomène physique ou une problématique inédite relevant du génie biomédical (axe 3).

3.1 Se documenter et résumer l'état des connaissances actuelles dans le domaine considéré

3.2 Proposer une modélisation et/ou un dispositif expérimental permettant de simuler et de tester des hypothèses relatives au phénomène étudié, en agissant sur les différents paramètres qui le conditionnent

3.3 Mettre en forme un rapport de synthèse rédigé de telle manière que les résultats et productions présentés soient exploitables ultérieurement et par d'autres personnes, expliciter s'il y a lieu les potentialités d'innovation théorique et/ou technique résultant de ce travail de recherche

contribuer, en équipe, à la réalisation d'un projet pluridisciplinaire et le mener à son terme en tenant compte des objectifs, des ressources, allouées et des contraintes qui le caractérisent (axe 4).

4.1 Cadrer et expliciter les objectifs d'un projet compte tenu des enjeux et des contraintes (urgence, qualité, ressources, budget …) qui caractérisent l'environnement du projet. Appréhender les mécanismes principaux qui régissent l'économie des soins de santé et le financement de la sécurité sociale.

4.2 S'engager collectivement sur un plan de travail, un échéancier et des rôles à tenir.

4.3 Fonctionner dans un environnement pluridisciplinaire, conjointement avec d'autres acteurs porteurs de différents points de vue : gérer des points de désaccord ou des conflits.

4.4 Prendre des décisions en équipe lorsqu'il y a des choix à faire, et assumer les conséquences de ces décisions, que ce soit sur les solutions techniques ou sur l'organisation du travail pour faire aboutir le projet.

communiquer efficacement oralement et par écrit (en français et dans une ou plusieurs langues étrangères) en vue de mener à bien les projets qui lui sont confiés dans son environnement de travail (axe 5).

5.1 Identifier les besoins du client : questionner, écouter et s'assurer de la bonne compréhension de toutes les dimensions de sa demande et pas seulement les aspects techniques.
5.2. Argumenter et convaincre en s'adaptant au langage de ses interlocuteurs : médecins, thérapeutes, techniciens, collègues, clients, supérieurs hiérarchiques.
5.3. Communiquer sous forme graphique et schématique ; interpréter un schéma, présenter les résultats d'un travail, structurer des informations.
5.4. Lire, analyser et exploiter des documents techniques (normes, plans, cahier des charges...).
5.5. Rédiger des documents écrits en tenant compte des exigences contextuelles et des conventions sociales en la matière, ainsi que du vocabulaire précis appartenant aux disciplines biomédicales.
5.6. Faire un exposé oral convaincant, en Français ou en Anglais, en utilisant les techniques modernes de communication.

faire preuve de rigueur, d'ouverture, d'esprit critique et d'éthique dans son travail. Tout en tirant parti des innovations technologiques et scientifiques à sa disposition, il prendra le recul nécessaire pour valider la pertinence socio-technique d'une hypothèse ou d'une solution (axe 6).

6.1 Appliquer les normes en vigueur dans le génie biomédical (terminologie, unités de mesure, normes de qualité et de sécurité…).
6.2 Trouver des solutions qui vont au-delà des enjeux strictement techniques, en intégrant les enjeux de développement durable et la dimension éthique d'un projet, particulièrement concernant les conséquences sur la pratique du médecin ou thérapeute, la prise en charge du patient, et la relation entre ceux-ci.
6.3 Faire preuve d'esprit critique vis-à-vis d'une solution technique pour en vérifier la robustesse et minimiser les risques qu'elle présente au regard du contexte de sa mise en Œuvre.
6.4 S'auto-évaluer et développer de manière autonome les connaissances nécessaires pour rester compétent dans son domaine (lifelong learning).

Programme structure

The Masterâ€™s curriculum in biomedical engineering will consist of at least 120 credits covering two years, with a minimum of 60 credits per year, and comprising :
- a core curriculum (30 credits)
- a specialization curriculum (30 credits)
- one or more options chosen amongst the suggested options
- elective courses.

The final thesis is generally written during the last year. However, depending on their specific training objectives, students may choose to take any given course in the first or second year, subject to possible prerequisites. This will be the case in particular for students pursuing part of their education abroad.

If, in the course of his (her) former curriculum, a student has already been credited with a subject included in the compulsory core curriculum, or any training deemed equivalent, this subject will be replaced by elective courses, while conforming to imposed constraints. The student is responsible for checking whether the minimum total number of credits has been reached, as well as those of the specialized field, which will appear on the final diploma.

The studentâ€™s curriculum will be submitted for acceptance by the relevant program committee.

Whatever the focus or the options chosen, the programme of this master shall totalize 120 credits, spread over two years of studies each of 60 credits.

> Tronc commun du master ingénieur civil biomédical *[en-prog-2014-gbio2m-lgbio220t.html]*

> Professional focus *[en-prog-2014-gbio2m-lgbio200s]*

Options courses

> Options en génie biomédical *[en-prog-2014-gbio2m-lgbio907r.html]*
- > Option en génie clinique *[en-prog-2014-gbio2m-lgbio221o.html]*
- > Option en traitement de données *[en-prog-2014-gbio2m-lgbio222o.html]*
- > Option expérimentale *[en-prog-2014-gbio2m-lgbio223o.html]*
- > Option en bioinstrumentation et imagerie médicale *[en-prog-2014-gbio2m-lgbio224o.html]*
- > Option en bioinformatique *[en-prog-2014-gbio2m-lgbio225o.html]*
- > Option en biomatériaux *[en-prog-2014-gbio2m-lgbio226o.html]*
- > Option en biomécanique *[en-prog-2014-gbio2m-lgbio227o.html]*
- > Option en modélisation mathématique *[en-prog-2014-gbio2m-lgbio228o.html]*
- > Option en physique médicale *[en-prog-2014-gbio2m-lgbio232o.html]*

> Option en science et technologies du vivant *[en-prog-2014-gbio2m-lgbio233o.html]*
> Option en génie pharmaceutique *[en-prog-2014-gbio2m-lgbio234o.html]*
> Business risks and opportunities *[en-prog-2014-gbio2m-lgbio230o.html]*
> Option en création de petites et moyennes entreprises *[en-prog-2014-gbio2m-lgbio231o.html]*
> Cours au choix *[en-prog-2014-gbio2m-lgbio229o.html]*

GBIO2M Detailled programme

Programme by subject

CORE COURSES

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	++ Two years course

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

L'étudiant sélectionne 30 crédits parmi

						Year 1	2
O LGBIO2990	Graduation project/End of studies project	N.		28 Credits			x

O *Religion courses for student in exact sciences*

The student shall select 2 credits from amongst
The student shall select

⊠ LTECO2100	Questions of religious sciences: Biblical readings	Hans Ausloos	15h	2 Credits	1q	x	x
⊠ LTECO2200	Questions of religious sciences: reflections about Christian faith	Dominique Martens	15h	2 Credits	2q	x	x
⊠ LTECO2300	Questions of religious sciences: questions about ethics	Philippe Cochinaux	15h	2 Credits	1q	x	x

PROFESSIONAL FOCUS [30.0]

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	++ Two years course

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

						Year 1	2
⊠ LGBIO2010	Bioinformatics	Pierre Dupont, Michel Ghislain	30h+30h	5 Credits	2q	x	x
⊠ LGBIO2020	Bioinstrumentation	André Mouraux, Michel Verleysen	30h+30h	5 Credits	1q	x	x

						Year 1	Year 2
⊠ LGBIO2030	Biomaterials	Sophie Demoustier, Christine Dupont, Gaëtane Leloup	30h+30h	5 Credits	1q	x	x
⊠ LGBIO2040	Biomechanics	François Henrotte (compensates Emilie Marchandise), Emilie Marchandise	30h+30h	5 Credits	2q	x	x
⊠ LGBIO2050	Medical Imaging	Anne Bol, John Lee, Benoît Macq, Frank Peeters	30h+30h	5 Credits	1q	x	x
⊠ LGBIO2060	Modelling of biological systems	Philippe Lefèvre	30h+30h	5 Credits	1q	x	x
⊠ LGBIO2070	Artificial organs and rehabilitation	Luc-Marie Jacquet, Philippe Lefèvre, Renaud Ronsse	30h+30h	5 Credits	2q	x	x

OPTIONS

L'étudiant complète son programme avec des options et/ou des cours au choix. Il sélectionne 60 crédits parmi

Options en génie biomédical

> Option en génie clinique *[en-prog-2014-gbio2m-lgbio221o]*
> Option en traitement de données *[en-prog-2014-gbio2m-lgbio222o]*
> Option expérimentale *[en-prog-2014-gbio2m-lgbio223o]*
> Option en bioinstrumentation et imagerie médicale *[en-prog-2014-gbio2m-lgbio224o]*
> Option en bioinformatique *[en-prog-2014-gbio2m-lgbio225o]*
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> Option en création de petites et moyennes entreprises *[en-prog-2014-gbio2m-lgbio231o]*
> Cours au choix *[en-prog-2014-gbio2m-lgbio229o]*

OPTIONS EN GÉNIE BIOMÉDICAL

L'étudiant peut choisir une ou plusieurs options parmi les suivantes. Il sélectionne 15 à 60 crédits parmi

OPTION EN GÉNIE CLINIQUE

Cette option permettra à l'étudiant d'acquérir dans sa formation des compétences spécifiques au génie clinique.

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	⧺ Two years course

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

De 15 à 30 credits parmi

⊠ Formation pratique

Ce stage est conduit au sein d'un hôpital ou d'une clinique. Les étudiants qui le prennent ne peuvent suivre le stage LFSA 2995. Toutefois lorsque ce stage est couplé au travail de fin d'étude, ils choisissent le stage LGBIO 2081 d'une valeur de 5 crédits.

						Year 1	Year 2
⊠ LGBIO2080	Stage hospitalier en génie clinique	N.		10 Credits		x	x
⊠ LGBIO2081	Stage hospitalier en génie clinique	N.		5 Credits		x	x
⊠ WSBIM2242	Méthodes quantitatives en soins intensifs et analyses cliniques	N.	30h+15h	4 Credits	△	x	x
⊠ LSTAT2330	Statistics in clinical trials.	Catherine Legrand, Annie Robert	22.5h +7.5h	5 Credits	2q	x	x
⊠ WESP2260	Gestion des ressources humaines et management	John Cultiaux, Christine Franckx, Pierre Meurens (coord.)	50h+20h	7 Credits	2q	x	x
⊠ LGBIO2110	Introduction to Clinical Engineering	Jean-Jacques Orban de Xivry	30h	3 Credits	2q	x	x

OPTION EN TRAITEMENT DE DONNÉES

L'objectif de cette option est de permettre à l'étudiant d'appliquer les connaissances fondamentales du traitement de données au domaine biomédical.

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	⧺ Two years course

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

De 15 à 30 credits parmi

⊠ Formation pratique

Ce stage est conduit au sein d'une entreprise ou d'un centre scientifique ou technologique à l'exclusion de l'UCL. Les étudiants qui le prennent ne peuvent suivre le stage LFSA 2995 . Toutefois lorsque ce stage est couplé au travail de fin d'étude, ils choisissent le stage LGBIO 2091 d'une valeur de 5 crédits.

						Year 1	Year 2
⊠ LGBIO2090	Stage industriel en génie biomédical	N.		10 Credits		x	x
⊠ LGBIO2091	Stage industriel en génie biomédical	N.		5 Credits		x	x
⊠ LELEC2870	Machine Learning : regression, dimensionality reduction and data visualization	John Lee (compensates Michel Verleysen), Michel Verleysen	30h+30h	5 Credits	1q	x	x
⊠ LINMA2370	Modelling and analysis of dynamical systems	Jean-Charles Delvenne, Denis Dochain (coord.)	30h +22.5h	5 Credits	1q	x	x
⊠ LINMA2875	System Identification	Julien Hendrickx	30h+30h	5 Credits	2q	x	x
⊠ WSBIM2243	Digital processing of medical images	Anne Bol, Benoît Macq (coord.)	30h+15h	4 Credits		x	x
⊠ LELEC2885	Image processing and computer vision	Christophe De Vleeschouwer (coord.), Laurent Jacques (compensates Christophe De Vleeschouwer), Benoît Macq	30h+30h	5 Credits	1q	x	x
⊠ LINGE1222	Multivariate Statistical Analysis	Johan Segers	30h+15h	4 Credits	2q	x	x

OPTION EXPÉRIMENTALE

Cette option permettra à l'étudiant d'acquérir des compétences spécifiques à la réalisation d'expériences dans le domaine du génie biomédical.

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	⧺ Two years course

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

De 15 à 20 credits parmi

						Year 1	2
⊠ LELEC2753	Electrical Power Systems: in-depth questions	Emmanuel De Jaeger	30h+15h	5 Credits	2q	x	x
⊠ LMAPR2019	Polymer Science and Engineering	Sophie Demoustier, Alain Jonas, Evelyne Van Ruymbeke	45h+15h	5 Credits	1q	x	x

⊠ Formation pratique

Ce stage est conduit au sein d'une entreprise ou d'un centre scientifique ou technologique à l'exclusion de l'UCL. Les étudiants qui le prennent ne peuvent suivre le stage LFSA 2995 . Toutefois lorsque ce stage est couplé au travail de fin d'étude, ils choisissent le stage LGBIO 2091 d'une valeur de 5 crédits.

⊠ LGBIO2090	Stage industriel en génie biomédical	N.		10 Credits		x	x
⊠ LGBIO2091	Stage industriel en génie biomédical	N.		5 Credits		x	x

OPTION EN BIOINSTRUMENTATION ET IMAGERIE MÉDICALE

Cette option permettra à l'étudiant d'acquérir des compétences spécifiques aux mesures et au traitement de signaux biomédicaux.

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	⧺ Two years course

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

De 15 à 30 credits parmi

						Year 1	2
⊠ LELEC2531	Design and Architecture of digital electronic systems	Jean-Didier Legat	30h+30h	5 Credits	1q	x	x
⊠ LELEC2795	Radiation and communication systems	Christophe Craeye, Danielle Janvier, Jérôme Louveaux, Claude Oestges, Luc Vandendorpe	30h+30h	5 Credits	1q	x	x
⊠ LELEC2103	Project in Electricity 3 : Electronic systems	Jean-Didier Legat, Jérôme Louveaux, Luc Vandendorpe	75h	5 Credits	1 + 2q	x	x
⊠ LELEC2900	Signal processing	Benoît Macq, Luc Vandendorpe	30h+30h	5 Credits	2q	x	x
⊠ LELEC2870	Machine Learning : regression, dimensionality reduction and data visualization	John Lee (compensates Michel Verleysen), Michel Verleysen	30h+30h	5 Credits	1q	x	x
⊠ LELEC2885	Image processing and computer vision	Christophe De Vleeschouwer (coord.), Laurent Jacques (compensates Christophe De Vleeschouwer), Benoît Macq	30h+30h	5 Credits	1q	x	x
⊠ WSBIM2243	Digital processing of medical images	Anne Bol, Benoît Macq (coord.)	30h+15h	4 Credits		x	x

OPTION EN BIOINFORMATIQUE

Cette option permettra à l'étudiant d'acquérir des compétences spécifiques à l'outil informatique.

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	⧺ Two years course

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

De 15 à 30 credits parmi

						Year 1	2
⊠ LINGI2132	Languages and translators	Pierre Schaus	30h+30h	6 Credits	2q	x	x
⊠ LINGI1341	Computer networks: information transfer	Olivier Bonaventure	30h+30h	6 Credits	1q	x	x
⊠ LINGI2251	Software engineering: development methods	Charles Pecheur	30h+30h	5 Credits	2q	x	x
⊠ LINGI2255	Software development project	Kim Mens	15h+45h	6 Credits	1q	x	x
⊠ LINGI2261	Artificial intelligence: representation and reasoning	Yves Deville	30h+30h	6 Credits	1q	x	x
⊠ LINGI2262	Machine Learning :classification and evaluation	Pierre Dupont	30h+30h	5 Credits	2q	x	x

OPTION EN BIOMATÉRIAUX

Cette option permettra à l'étudiant d'acquérir des compétences spécifiques à la physique et la chimie appliquées.

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	⧺ Two years course

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

De 15 à 30 credits parmi

						Year 1	2
⊠ LMAPR2011	Methods of Physical and Chemical Analysis	Arnaud Delcorte, Jacques Devaux	30h+30h	5 Credits	1q	x	x
⊠ LMAPR2013	Physical Chemistry for Metals and Ceramics	Pascal Jacques	30h+30h	5 Credits	1q	x	x
⊠ LMAPR2014	Physics of Functional Materials	Xavier Gonze, Luc Piraux, Gian-Marco Rignanese	37.5h +22.5h	5 Credits	1q	x	x
⊠ LMAPR2019	Polymer Science and Engineering	Sophie Demoustier, Alain Jonas, Evelyne Van Ruymbeke	45h+15h	5 Credits	1q	x	x
⊠ LMAPR2481	Deformation and fracture of materials	Thomas Pardoen	30h+30h	5 Credits	1q	x	x
⊠ LMAPR2631	Solid surface analysis and treatment	Arnaud Delcorte, Bernard Nysten	37.5h +15h	5 Credits	2q	x	x
⊠ LCHM2261	Polymer Chemistry and Physico-Chemistry	Charles-André Fustin, Jean-François Gohy, Alain Jonas	45h+15h	5 Credits	1q	x	x

⊠ *Approfondissement*

L'étudiant qui a suivi au minimum 2 cours dans la liste de base de cette option peut compléter son programme dans la liste suivante

⊠ LMAPR1805	Introduction to materials science	Jean-Christophe Charlier, Bernard Nysten, Thomas Pardoen	30h	4 Credits	2q	x	x
⊠ LMAPR1230	Organic chemistry	Sophie Demoustier, Benjamin Elias	30h+15h	3 Credits	2q	x	x
⊠ LMAPR1491	Statistical & quantic physics	Jean-Christophe Charlier, Xavier Gonze, Luc Piraux, Gian-Marco Rignanese (coord.)	30h+30h	4 Credits	1q	x	x
⊠ LMAPR2012	Macromolecular Nanotechnology	Sophie Demoustier, Karine Glinel, Jean-François Gohy, Bernard Nysten	45h+15h	5 Credits	2q	x	x
⊠ LMAPR2010	Polymer Materials	Christian Bailly, Bernard Nysten	45h+15h	5 Credits	1q	x	x
⊠ LELEC2560	Micro and nanofabrication techniques	Vincent Bayot, Laurent Francis, Benoît Hackens, Jean-Pierre Raskin	30h+30h	5 Credits	2q	x	x
⊠ LBIR1321	Biochemistry II : metabolic pathways and their regulation	Michel Ghislain (coord.), Yvan Larondelle	30h+15h	3 Credits	1q	x	x
⊠ LBIRC2101A	Analyse biochimique et notions de génie génétique: analyse biochimique	Marc Boutry, François Chaumont, Pierre Morsomme	18.5h +22.5h	4 Credits	1q	x	x
⊠ LBIO1321	Molecular genetics	Bernard Hallet	35h+10h	4 Credits	1q	x	x
⊠ LBIO1335	Immunology	Jean-Paul Dehoux	25h+15h	3 Credits	1q	x	x
⊠ LCHM2170	Introduction to protein biotechnology	Pierre Morsomme, Patrice Soumillion	22.5h +7.5h	3 Credits	1q	x	x

OPTION EN BIOMÉCANIQUE

Cette option permettra à l'étudiant d'acquérir des compétences spécifiques à la mécanique appliquée.

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	⧺ Two years course

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

De 15 à 30 credits parmi

						Year 1	Year 2
⊠ LMECA1120	Introduction to finite element methods.	Vincent Legat	30h+30h	5 Credits	2q	x	x
⊠ LMECA2170	Numerical Geometry	Vincent Legat, Vincent Legat (compensates Jean-François Remacle), Jean-François Remacle	30h+30h	5 Credits	1q	x	x
⊠ LMECA2300	Advanced Numerical Methods	Christophe Craeye, Jonathan Lambrechts, Vincent Legat, Vincent Legat (compensates Jean-François Remacle), Jean-François Remacle	30h+30h	5 Credits	2q	x	x
⊠ LMECA2355	Mechanical design in biomedical engineering	Olivier Cartiaux, Benoît Herman, Emilie Marchandise, Benoît Raucent, Khanh Tran Duy	30h+30h	5 Credits	1q	x	x
⊠ LMECA2660	Numerical methods in fluid mechanics.	Grégoire Winckelmans	30h+30h	5 Credits	2q	x	x
⊠ LMECA2755	Industrial automation.	Bruno Dehez, Paul Fisette, Renaud Ronsse	30h+30h	5 Credits	1q	x	x
⊠ LMECA2802	Mechanics of robots and multibody systems.	Paul Fisette	30h+30h	5 Credits	2q	x	x
⊠ LMECA2840	Mechanical construction project II.	Bruno Dehez, Benoît Herman (compensates Benoît Raucent), Benoît Raucent, Renaud Ronsse	45h+30h	6 Credits	1 + 2q	x	x
⊠ LELEC2753	Electrical Power Systems: in-depth questions	Emmanuel De Jaeger	30h+15h	5 Credits	2q	x	x
⊠ LINMA1510	Linear Control	Denis Dochain	30h+30h	5 Credits	2q	x	x

OPTION EN MODÉLISATION MATHÉMATIQUE

Cette option permettra à l'étudiant d'acquérir des compétences spécifiques à la théorie des systèmes et à la modélisation.

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	⧺ Two years course

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

De 15 à 30 credits parmi

						Year 1	2
⊠ LINMA2471	Optimization models and methods	François Glineur	30h +22.5h	5 Credits	1q	x	x
⊠ LINMA2370	Modelling and analysis of dynamical systems	Jean-Charles Delvenne, Denis Dochain (coord.)	30h +22.5h	5 Credits	1q	x	x
⊠ LINMA1510	Linear Control	Denis Dochain	30h+30h	5 Credits	2q	x	x
⊠ LINMA2875	System Identification	Julien Hendrickx	30h+30h	5 Credits	2q	x	x
⊠ LINMA2361	Nonlinear dynamical systems	Pierre-Antoine Absil	30h +22.5h	5 Credits	1q	x	x
⊠ LMECA1901	Continuum mechanics.	Philippe Chatelain, Issam Doghri (compensates Emilie Marchandise), Emilie Marchandise	30h+30h	5 Credits	1q	x	x
⊠ LMECA1120	Introduction to finite element methods.	Vincent Legat	30h+30h	5 Credits	2q	x	x
⊠ LELEC2870	Machine Learning : regression, dimensionality reduction and data visualization	John Lee (compensates Michel Verleysen), Michel Verleysen	30h+30h	5 Credits	1q	x	x
⊠ LINGI2262	Machine Learning :classification and evaluation	Pierre Dupont	30h+30h	5 Credits	2q	x	x

OPTION EN PHYSIQUE MÉDICALE

Cette option permettra à l'étudiant d'acquérir des compétences spécifiques en physique médicale, particulièrement utiles pour le travail en milieu hospitalier (radioprotection).

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	⧺ Two years course

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

De 15 à 28 credits parmi

						Year 1	Year 2
⊠ LPHY2236	Ionizing radiation measurement: detectors and Nuclear electronics.	Eduardo Cortina Gil	37.5h +55h	6 Credits	1q	x	x
⊠ LPHY2340	Use, management and control of radio elements	Pascal Froment	22.5h	3 Credits	2q	x	x
⊠ LPHY2360	Physique atomique, nucléaire et des radiations	Krzysztof Piotrzkowski	22.5h	2 Credits		x	x
⊠ WRDTH3120	Dosimétrie en radiothérapie et contrôle de qualité	Stefaan Vynckier	30h	3 Credits		x	x
⊠ WRDTH3131	Radiobiologie	Vincent Grégoire, Pierre Scalliet (coord.)	22.5h	2 Credits		x	x
⊠ WRDTH3160	Dosimétrie informatisée en radiothérapie	Vincent Grégoire, Pierre Scalliet, Stefaan Vynckier (coord.)	30h+60h	5 Credits		x	x
⊠ WRPR2001	Notions de base de radioprotection	Vincent Grégoire (coord.), Patrick Smeesters	10h+5h	2 Credits	2q	x	x
⊠ WRPR2330	Utilisation des radioisotopes et des molécules marquées en biologie	Bernard Gallez (coord.), Thierry Vander Borght	15h+15h	3 Credits		x	x
⊠ WMNUC2100	Master and compelmentary master	François-Xavier Hanin, Thierry Vander Borght (coord.)	15h	2 Credits	1q	x	x

OPTION EN SCIENCE ET TECHNOLOGIES DU VIVANT

Cette option permettra à l'étudiant d'acquérir des compétences spécifiques dans le domaine des biotechnologies.

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	⧺ Two years course

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

De 15 à 30 credits parmi

						Year 1	2
⊠ LBIO1311	Microbiology and virology	Claude Bragard, Pierre Wattiau	40h+15h	4 Credits	1q	x	x
⊠ LBIO1335	Immunology	Jean-Paul Dehoux	25h+15h	3 Credits	1q	x	x
⊠ LBIR1322	General genetics	Philippe Baret	45h+15h	4 Credits	2q	x	x
⊠ LBIR1323	Microbiology	Jacques Mahillon	45h+15h	4 Credits	2q	x	x
⊠ LBIRC2101A	Analyse biochimique et notions de génie génétique: analyse biochimique	Marc Boutry, François Chaumont, Pierre Morsomme	18.5h +22.5h	4 Credits	1q	x	x
⊠ LBIRC2108	Biochemical and Microbial Engineering	Spyridon Agathos	30h +22.5h	5 Credits	2q	x	x
⊠ LBRAL2102	Physiological and nutritional biochemistry	Yvan Larondelle (coord.), Yves-Jacques Schneider	52.5h	5 Credits	1q	x	x
⊠ LBRAL2104	Food microbiology	Jacques Mahillon	30h +22.5h	5 Credits	2q	x	x
⊠ LBRNA2202	Nano-biotechnologies	Yves Dufrêne	30h	3 Credits	2q	x	x
⊠ LBRMC2202A	Cell Culture Technology	N.	15h	2 Credits		x	x
⊠ LBRTE2201	Human and environmental toxicology	Alfred Bernard, Cathy Debier (coord.)	45h+7.5h	5 Credits	1q	x	x
⊠ LBBMC2204A	Pharmacologie cellulaire et moléculaire - concepts de base	Yves-Jacques Schneider	30h	3 Credits	1q	x	x

OPTION EN GÉNIE PHARMACEUTIQUE

Cette option permettra à l'étudiant d'acquérir des compétences spécifiques à la pharmacologie et aux procédés, particulièrement utiles pour l'industrie pharmaceutique.

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	⧺ Two years course

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

De 15 à 30 credits parmi

⊠ Cours de base de l'option

L'étudiant sélectionne au minimum 15 crédits parmi la liste suivante, dont au moins 2 cours WFARM

					Year 1	Year 2
⊠ LMAPR2330	Reactor Design	Juray De Wilde	30h+30h	5 Credits	1q	x	x
⊠ LMAPR2380	Solid-fluid separation	Pierre Adam, Tom Leyssens	30h +22.5h	5 Credits	1q	x	x
⊠ LMAPR2118	Fluid-fluid separations	Patricia Luis Alconero, Denis Mignon	30h +22.5h	5 Credits	2q	x	x
⊠ WFARM1232	General Pharmacology	Emmanuel Hermans	15h+7.5h	2 Credits	1q	x	x
⊠ WFARM1008	Design of the drug	Olivia Dalleur, Véronique Préat (coord.), Françoise Van Bambeke	15h+15h	2 Credits	2q	x	x

⊠ Cours au choix de l'option en génie pharmaceutique

⊠ LINMA1702	Applied mathematics : Optimization I	Vincent Blondel, François Glineur (compensates Vincent Blondel), François Glineur (coord.)	30h +22.5h	5 Credits	2q	x	x
⊠ LINMA2300	Process Control	Denis Dochain	30h+30h	5 Credits	1q	x	x
⊠ LINMA2370	Modelling and analysis of dynamical systems	Jean-Charles Delvenne, Denis Dochain (coord.)	30h +22.5h	5 Credits	1q	x	x
⊠ LINMA2671	Automatic : Theory and implementation	Julien Hendrickx	30h+30h	5 Credits	1q	x	x
⊠ LMAPR2320	Process development in industrial organic chemistry	Juray De Wilde, Patricia Luis Alconero, Denis Mignon	30h+15h	5 Credits	1q	x	x
⊠ LMAPR2430	Inorganic industrial chemical processes	Juray De Wilde, Mark Saeys (compensates Juray De Wilde)	30h +22.5h	5 Credits	2q	x	x
⊠ LBIRC2106	Chemometrics	Bernadette Govaerts	22.5h +15h	3 Credits	1q	x	x
⊠ LBIRC2108	Biochemical and Microbial Engineering	Spyridon Agathos	30h +22.5h	5 Credits	2q	x	x
⊠ LSTAT2310	Statistical quality control.	Bernadette Govaerts	15h+5h	4 Credits	1q	x	x
⊠ LSTAT2320	Design of experiment.	Patrick Bogaert, Bernadette Govaerts	22.5h +7.5h	5 Credits	2q	x	x
⊠ LMECA2645	Major technological hazards in industrial activity.	Denis Dochain, Alexis Dutrieux	30h	3 Credits	2q	x	x
⊠ LELEC2870	Machine Learning : regression, dimensionality reduction and data visualization	John Lee (compensates Michel Verleysen), Michel Verleysen	30h+30h	5 Credits	1q	x	x
⊠ LINGI2262	Machine Learning :classification and evaluation	Pierre Dupont	30h+30h	5 Credits	2q	x	x

⊠ Cours d'intérêt de l'option en génie pharnaceutique

Les cours du programme http://www.uvlouvain.be/291003.htm " certificat universitaire en ingénierie pharmaceutique et technologie industrielle " sont d'intérêt pour l'option, en particulier les 3 cours suivants.

⊠ WFAIN2101D	Stérilisation dans les industries pharmaceutiques et apparentées	Anne des Rieux, Philippe Levêque	10h	2 Credits	⊕	x	x

						Year 1	2
⊠ WFAIN2101E	Lyophilisation	N.	10h	2 Credits	⊕	x	x
⊠ WFAIN2102	Traitement de l'air et zones en atmosphère contrôlée	N.	10h	2 Credits	⊕	x	x
⊠ WFARM3339	Environnement règlementaire Européen	N.	10h	2 Credits	2q ⊕	x	x

BUSINESS RISKS AND OPPORTUNITIES

Commune à la plupart des masters ingénieur civil, cette option a pour objectif de familiariser l'étudiant avec les principes de base de la gestion des entreprises.

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	⧺ Two years course

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

De 16 à 20 credits parmi

						Year 1	2
⊠ LFSA2140	Elements of law for industry and research	Fernand De Visscher, Werner Derijcke, Bénédicte Inghels	30h	3 Credits	1q	x	x
⊠ LFSA2230	Introduction to management and to business economics	Benoît Gailly	30h+15h	4 Credits	2q	x	x
⊠ LFSA1290	Introduction to financial and accounting management	Thomas Lambert (compensates Gerrit Sarens), Gerrit Sarens	30h+15h	4 Credits	2q	x	x
⊠ LFSA2202	Ethics and ICT	Maxime Lambrecht, Olivier Pereira	30h	3 Credits	2q	x	x
⊠ LFSA2245	Environment and Business	Thierry Bréchet	30h	3 Credits	1q	x	x
⊠ LFSA2210	Organisation and human resources	John Cultiaux	30h	3 Credits	1q	x	x

⊠ *Alternative to the "Business risks and opportunities" for computer science students*

Computer science students who have already followed various courses of this discipline during their Bachelor's curriculum can select between 16 and 20 credits in the program "mineure en gestion pour les sciences informatiques" http://www.uclouvain.be/xprog-2013-min-lgesc100i

OPTION EN CRÉATION DE PETITES ET MOYENNES ENTREPRISES

Commune à la plupart des masters ingénieur civil, cette option a pour objectif de familiariser l'étudiant ingénieur civil avec les spécificités des P.M.E., de l'entreprenariat et de la création afin de développer chez lui les aptitudes, connaissances et outils nécessaires à la création d'entreprise. L'accès en est réservé uniquement à un nombre restreint d'étudiants sélectionnés sur base d'un dossier de motivation et d'interviews individuelles.

Les dossiers de motivation pour cette filière doivent être introduits avant la rentrée académique de Master1 auprès du :

Secrétariat CPME – Place des Doyens 1

1348 Louvain-la-Neuve (tél 010/47 84 59).

Les étudiants sélectionnés remplaceront le mémoire prévu dans le tronc commun par un mémoire spécifique en création d'entreprise (nombre de crédits inchangé).

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	⧺ Two years course

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

De 20 à 25 credits parmi

O Compulsory courses

						Year 1	Year 2
O LCPME2001	Entrepreneurship Theory (in French)	Frank Janssen	30h+20h	5 Credits	1q	x	
O LCPME2003	Business plan of the creation of a company (in French)	Frank Janssen	30h+15h	5 Credits	2q		x
O LCPME2002	Managerial, legal and economic aspects of the creation of a company (in French)	Régis Coeurderoy, Yves De Cordt	30h+15h	5 Credits	1q	x	x
O LCPME2004	Advanced seminar on Enterpreneurship (in French)	Frank Janssen	30h+15h	5 Credits	2q	x	x

⊠ Prerequisite CPME course

Students who have not taken a management course within their former curriculum shall include LCPME2000 in their current curriculum.

O LCPME2000	Venture creation financement and management I	Régis Coeurderoy, Olivier Giacomin, Paul Vanzeveren	30h+15h	5 Credits	1 + 2q	x	

COURS AU CHOIX

Tous les cours des options du master peuvent être pris comme des cours au choix.

O Mandatory	⊠ Optional
△ Courses not taught during 2014-2015	⊘ Periodic courses not taught during 2014-2015
⊕ Periodic courses taught during 2014-2015	⧺ Two years course

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

						Year 1	2
⊠ LGBIO2220	Seminar on Biomedical Engineering	Sophie Demoustier, Philippe Lefèvre (coord.), Emilie Marchandise, Renaud Ronsse (compensates Emilie Marchandise)	30h	3 Credits		x	x
⊠ LFSA2351A	Group dynamics	Piotr Sobieski (coord.)	15h+30h	3 Credits	1q	x	x
⊠ LFSA2351B	Group dynamics	Piotr Sobieski (coord.)	15h+30h	3 Credits	2q	x	x

⊠ Formation pratique

Ce stage est conduit au sein d'un hôpital ou d'une clinique. Les étudiants qui le prennent ne peuvent suivre le stage LFSA 2995. Toutefois lorsque ce stage est couplé au travail de fin d'étude, ils choisissent le stage LGBIO 2081 d'une valeur de 5 crédits.

⊠ LGBIO2080	Stage hospitalier en génie clinique	N.		10 Credits		x	x
⊠ LGBIO2081	Stage hospitalier en génie clinique	N.		5 Credits		x	x

⊠ Formation pratique

Ce stage est conduit au sein d'une entreprise ou d'un centre scientifique ou technologique à l'exclusion de l'UCL. Les étudiants qui le prennent ne peuvent suivre le stage LFSA 2995 . Toutefois lorsque ce stage est couplé au travail de fin d'étude, ils choisissent le stage LGBIO 2091 d'une valeur de 5 crédits.

⊠ LGBIO2090	Stage industriel en génie biomédical	N.		10 Credits		x	x
⊠ LGBIO2091	Stage industriel en génie biomédical	N.		5 Credits		x	x

⊠ Languages

Students may include in their electives any language course of the Institute of Modern Languages (ILV) for a maximum of 3 credits within the 120 basic credits of their Masters. Their attention is drawn to the following professional insertion seminars:
Students may include in their electives any language course of the Institute of Modern Languages (ILV) for a maximum of 3 credits within the 120 basic credits of their Master?s. Their attention is drawn to the following professional insertion seminars:

⊠ LNEER2500	Professional development seminar: Dutch - intermediate level	Isabelle Demeulenaere (coord.), Mariken Smit	30h	3 Credits	1 ou 2q	x	x
⊠ LNEER2600	Professional development seminar: Dutch - upper-intermediate level	Isabelle Demeulenaere, Marie-Laurence Lambrecht	30h	3 Credits	1 ou 2q	x	x
⊠ LALLE2500	Professional development seminar German	Caroline Klein, Ann Rinder (coord.)	30h	3 Credits	1 + 2q	x	x
⊠ LALLE2501	Professional development seminar-German	Caroline Klein, Ann Rinder (coord.)	30h	5 Credits	1 + 2q	x	x
⊠ LESPA2600	Professional development seminar - Spanish	Isabel Baeza Varela, Carmen Vallejo Villamor	30h	3 Credits	1 ou 2q	x	x
⊠ LESPA2601	Professional development seminar- Spanish	Paula Lorente Fernandez (coord.)	30h	5 Credits	1q	x	x

⊠ Humanities

A list of interesting humanities courses is available at the secretariat of the program committee. Students may choose a maximum of 6 credits. This possibility is however not offerred to students who have chosen to specialize in Management or Company launching.
A list of interesting humanities courses is avaibles at the secretariat of the diploma committee. Students may choose a maximum of 6 credits. This possibility is however not offerred to students who have choose to specialize in Management or Company launching.

Year
1 2

General knowledge courses

Students can also include in their curriculum any course given at UCL, KULeuven or Von Karman Institute subject to approval of the program committee.
Students can also include in their curriculum any course given at UCL or FIW / KULeuven subject to approval of the Diploma committee.

LMECA2645	Major technological hazards in industrial activity.	Denis Dochain, Alexis Dutrieux	30h	3 Credits	2q	x	x
LDROP2063	Environmental Law	Nicolas de Sadeleer, Damien Jans	30h	5 Credits	2q	x	x
LECGE1223	Production and Operations Management	Pierre Semal	30h	4 Credits	1q	x	x
LELEC2811	Instrumentation and sensors	David Bol, Laurent Francis	30h+30h	5 Credits	1q	x	x
LINMA2671	Automatic : Theory and implementation	Julien Hendrickx	30h+30h	5 Credits	1q	x	x
LMAPR2018	Rheometry and Polymer Processing	Christian Bailly, Evelyne Van Ruymbeke	30h +22.5h	5 Credits	2q	x	x
LMAPR2510	Mathematical ecology	Eric Deleersnijder, Emmanuel Hanert, Thierry Van Effelterre	30h +22.5h	5 Credits	2q	x	x
LMAPR2648	Sustainable treatment of industrial and domestic waste: Case studies	Spyridon Agathos, Damien Debecker, Olivier Françoisse, Patricia Luis Alconero, Olivier Noiset	30h+15h	5 Credits	1q	x	x
LPHY2150	Physique et dynamique de l'atmosphère et de l'océan I	Michel Crucifix, Thierry Fichefet	45h+9h	6 Credits	1q	x	x
LPHY2153	Introduction à la physique du système climatique et à sa modélisation	Hugues Goosse (compensates Jean-Pascal van Ypersele de Strihou), Hugues Goosse, Jean-Pascal van Ypersele de Strihou	30h+15h	5 Credits	1q	x	x

Short term exchanges

Students may include in their curriculum any BEST or ATHENS cours subject to approval by the Program committee. These courses are worth 2 credits
Students may include in their curriculum any BEST or ATHENS subject to approval by the Diploma committee. These courses are worth 2 credits

Advanced courses

Students should note that any course appearing in the options of their Master -s, but not selected as such, remains a possible elective.
Students should note that any course appearing in the options of their Master -s, but not selected as such, remains a possible elective.

GBIO2M - Information

Admission

General and specific admission requirements for this program must be satisfied at the time of enrolling at the university..

- University Bachelors
- Non university Bachelors
- Holders of a 2nd cycle University degree
- Holders of a non-University 2nd cycle degree
- Adults taking up their university training
- Personalized access

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University Bachelors

Diploma	Special Requirements	Access	Remarks
UCL Bachelors			
Bachelor in engineering [180.0]	Minor in biomedical engineering	Direct access	
Bachelor in engineering [180.0]		Access with additional training	A bachelor in engineering with no minor in biomedical engineering, nor any option deemed equivalent, shall submit an application to the Biomedical engineering program committee, including a detailed past curriculum (courses and grades by year). The committee will propose a customized curriculum by drawing on the volume of elective courses of the Master's in biomedical engineering curriculum.
Bachelor in chemical sciences [180.0] Bachelor in physics [180.0] Bachelor in mathematics [180.0] Bachelor in biology [180.0] Bachelor in geography, main stream [180.0] Bachelor in bioengineering [180.0]	Minor in biomedical engineering	Access with additional training	A student who is not a bachelor in engineering, but with a minor in applied bioengineering, shall submit an application to the Faculty, including a detailed past curriculum (courses and grades by year). The Faculty, after consulting the Biomedical engineering program committee, will decide as to the applicant's admissibility; an admitted student shall complete the workload by adding prerequisites credits, as required by the Biomedical engineering program committee. The student shall add 15 prerequisite credits to the standard 120 credits of the Master's in biomedical engineering curriculum, unless proof can be given of former passed courses deemed equivalent, or in agreement with an advisor who is a member of the Biomedical engineering program committee
Others Bachelors of the French speaking Community of Belgium			

Bachelor in engineering	With specific options in former institution related to biomedical engineering	Direct access	
Bachelor in engineering		Access with additional training	A bachelor in engineering with no former option in biomedical engineering, deemed equivalent to the minor in biomedical engineering, shall submit an application to the Biomedical engineering program committee, including a detailed past curriculum (courses and grades by year). The committee will propose a customized curriculum by drawing on the volume of elective courses of the Master's in biomedical engineering curriculum
Bachelor in chemistry, physics, mathematics, biology or geography Bachelor in bio-engineering	With specific options in former institution related to biomedical engineering	Access with additional training	A student who is not a bachelor in engineering, shall submit an application to the Faculty, including a detailed past curriculum (courses and grades by year). The Faculty, after consulting the Biomedical engineering program committee, will decide as to the applicant's admissibility (the latter bearing solely on the engineering core curriculum) pursuant to regulations governing links between various degrees. If necessary, the committee will propose a customized curriculum by drawing on the volume of elective courses of the Master's in biomedical engineering curriculum and, in certain cases, up to 15 credits of complementary courses.
Bachelors of the Dutch speaking Community of Belgium			
Bachelor in engineering	With specific options in former institution related to biomedical engineering	Direct access	
Bachelor in engineering		Access with additional training	A student with no former option in biomedical engineering shall submit an application to the Biomedical engineering program committee, including a detailed past curriculum (courses and grades by year). The committee will propose a customized curriculum by drawing on the volume of elective courses of the biomedical engineering curriculum, and imposing, if necessary, up to 15 additional credits.
Bachelor's degree equivalent to one of those required from graduates of the French-speaking community	With specific options in former institution related to biomedical engineering	Access with additional training	A student who is not a bachelor in engineering, , shall submit an application to the Faculty, including a detailed past curriculum (courses and grades by year). The Faculty, after consulting the Biomedical engineering program committee, will decide as to the applicant's admissibility (the latter bearing solely on the engineering core

			curriculum) pursuant to regulations governing links between various degrees. If necessary, the committee will propose a customized curriculum by drawing on the volume of elective courses of the Master's in biomedical engineering curriculum and, in certain cases, up to 15 credits of complementary courses.
Foreign Bachelors			
Bachelor in engineering	Bachelors from the Cluster network	Direct access	Conditions imposed on UCL Engineering Bachelor.
Bachelor in engineering	Other institutions	Access with additional training	The student shall submit an application to the Faculty, including a detailed past curriculum (courses and grades by year). The Faculty, after consulting the relevant program committee, will decide as to the applicant's admissibility pursuant to rules relative to links between degrees. If necessary the Faculty can propose a customized curriculum, by drawing on the volume of elective courses of the relevant engineering Master's curriculum and, if necessary, up to 15 additional credits.

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Non university Bachelors

Diploma	Access	Remarks
> Find out more about links to the university		
> BA en sciences industrielles - type long	Accès au master moyennant réussite d'une année préparatoire de max. 60 crédits	Type long

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Holders of a 2nd cycle University degree

Diploma	Special Requirements	Access	Remarks
"Licenciés"			
Engineers considered equivalent to the corresponding Bachelor's degree		Direct access	
Masters			
Master in engineering		Direct access	

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Holders of a non-University 2nd cycle degree

Diploma	Access	Remarks

> Find out more about links to the university

> MA en sciences de l'ingénieur industriel (toutes finalités) > MA en sciences industrielles (toutes finalités)	Accès direct au master moyennant ajout éventuel de 15 crédits max	Type long

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Adults taking up their university training

> See the website Valorisation des acquis de l'expérience

It is possible to gain admission to all masters courses via the validation of professional experience procedure.

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Personalized access

Reminder : all Masters (apart from Advanced Masters) are also accessible on file.

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Admission and Enrolment Procedures for general registration

Teaching method

. Features favouring interdisciplinarity :

The Masterâ€™s in biomedical engineering is intrinsically interdisciplinary, since it is located at the interface between engineering and medical sciences. It features a comprehensive base allowing the student to acquire the basics of the main application fields of biomedical engineering, as well as a variety of options in various disciplines.

. Variety of teaching situations :

The pedagogy implemented in the engineering Masterâ€™s curriculum is aligned with that of the engineering Bachelorâ€™s curriculum: active learning, a balanced mix of group and individual work, and substantial time devoted to the development of non-technical competencies. A salient feature of the curriculum is the immersion of students in the research laboratories of the various instructors (during teaching laboratory sessions, case studies, projects and final thesis), which allows them to become familiar with up-to-date methods in the related fields, and to learn through the questioning approach which is inherent to research.

The final project amounts to half the workload of the final year. It offers the opportunity of in-depth analysis of a given topic and, through its sheer size and context, provides a true introduction to the professional life of an engineer or researcher.

. Variety of learning situations :

The student will encounter a variety of pedagogical tools tailored to the various disciplines : formal lectures, individual projects in small groups, tutorials, project-based learning, case studies, experimental laboratory work, computer simulations, teachware, industrial or research training, visits to industries, individual and group work, seminars given by outside scientists, etc.

This variety of situations will help students to build their knowledge in an iterative and progressive manner, while developing their autonomy, organizational skills, time management, and capacity to use various modes of communication, etc.

Learning is acquired via a variety of pedagogical tools, such a training periods, case studies, lectures, project work, and contact with cutting-edge research. This variety of situations will help students to build their knowledge in an iterative and progressive manner.

The option in Company launching follows an interactive approach implementing "problem-based" learning. Throughout the curriculum, students must engage in group work based on multidisciplinary teams. The final project is also designed to be interdisciplinary so as to allow groups of three students, ideally from different faculties, to work on a company launching project.

Evaluation

The evaluation methods comply with the regulations concerning studies and exams. More detailed explanation of the modalities specific to each learning unit are available on their description sheets under the heading “Learning outcomes evaluation method”.

All learning activities are assessed as prescribed by the University internal regulations (see exam regulations), viz. written and oral exams, laboratory exams, individual or group work, public presentation of projects and final thesis.

Mobility and/or Internationalisation outlook

Global framework

The Louvain School of Engineering (LSE) has taken part, since their inception, in all the various mobility programmes which have been set up at both the European and world levels.

The numerous contacts it has with professional circles, notably via its Advisory Board, have demonstrated to what extent employers are favourably impressed by a mobility experience in someone’s CV. The ever-increasing internationalization of research via networks linking laboratories throughout the world, speaks in favour of encouraging this mobility.

Students’ interest is aroused at the end of their Bachelor studies, notably via intensive courses such as those of the ATHENS or BEST networks.

In the course of the two-year Master’s programme, students are encouraged to take part in a 1- or 2-semester exchange scheme

Within Belgium, the LSE is involved in a privileged partnership with the Faculteit Ingenieurswetenschappen of the Katholieke Universiteit Leuven , with whom it has set up an exchange scheme relating to the first year of the Master’s curriculum.

At the European level, the LSE is strongly involved in the CLUSTER excellence network. This network encourages internal mobility, since this is a guarantee of quality as concerns both the level of teaching and the hosting of exchange students. Moreover, Cluster partners have signed an agreement recognizing each other’s Bachelor’s curricula. This agreement stipulates that all Bachelors of network institutions will have access to the Master’s studies in any institution on a par with local students.

Outside Europe, the LSE is a partner in the Magalhaes network , which groups about fifteen European universities together with the best South American science and technology universities.

Besides these network partnerships, the Faculty has also signed a number of individual agreements with various universities in Europe, North America or elsewhere in the world. A list of these agreements may be found on the website of UCL International Relations .

UCL is also a partner in the TIME programme which gives students the opportunity to obtain two engineering degrees, via a specifically tailored curriculum.

International possibilities (for UCL students)

Besides intensive courses which are one component of international relations, LSE students with outstanding results are encouraged to apply for 5- or 10-month exchange programmes.

When taking place during the first Master’s year, exchanges are generally 10 months long. In the second year, they only last for a semester, either as courses or else research in a foreign laboratory as a complement to the final thesis.

Some other more specific exchange programmes have been set up with South America, where the academic year is naturally on an “austral” basis.

Students are informed about the various exchange programmes as from their second Bachelor’s year. They are encouraged to prepare for their exchange in a timely manner, notably by taking language courses at the Modern Languages Institute of UCL.

Partner programmes

TIME programme with :

- Ecole Centrale Paris
- Supaero Toulouse
- Universidad Politecnica de Madrid
- Politecnico di Milano
- Politecnico di Torino

-The LSE has also signed a specific convention with the Institut Français du Pétrole which allows the possibility of combining the second Master’s year with the first year of the complementary programme at IFP.

Possible trainings at the end of the programme

Accessible complementary Masterâ€™s degrees: currently under examination.

Accessible PhD curricula : by virtue of its training towards and via research, the Masterâ€™s in biomedical engineering gives its students an excellent preparation towards PhD studies. Instructors involved in the Masterâ€™s are members of various doctoral schools, which are there to welcome students who wish to further their studies via a PhD.

Contacts

Curriculum Managment

Entite de la structure GBIO

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