Masters in Engineering at the Ecole Polytechnique de Bruxelles (Brussels School of Engineering)
BEING AN ENGINEER MEANS...
Innovating, thinking outside the box, adopting an applied scientific approach, designing original solutions, going beyond norms and constraints when the situation demands and developing socially responsible professional practices.

The versatility of engineers comes from their acquiring, during their studies, of skills combining technical expertise, autonomy, a capacity for analytical and thorough reasoning, creativity, decision-making and team-leading.

The professional life of an engineer is full of exciting challenges and experiences. As players within a rapidly changing society, engineers operate in diverse sectors of activity: construction and architecture, chemistry and materials science, the environment, physics, computing and management, electro-mechanical, biomedical, electronics and telecoms.

The Ecole polytechnique de Bruxelles, which has already trained nearly 150 classes of civil engineers, now organises 9 Master's courses to actively prepare tomorrow's engineers: men and women who will more than ever play the challenging, but also inspiring, role of reconciling technical innovation, sustainable development and the advancement of society. Becoming an engineer means wanting to contribute to building our shared future.
Since 2002, the Ecole polytechnique de Bruxelles has adopted a teaching approach of active, project-based training. Every year, students must therefore complete projects in teams or individually, under the supervision of a professor or a researcher. These projects may be very practical, such as the designing of a hot air balloon, a telescope, or a breathalyzer, or consist of research work in a laboratory. Their aim is to create a clear link between theory and practice and develop both skills (such as proactiveness, autonomy and creativity) and knowledge. Students are also invited to actively contribute to the life and management of the School.

Cooperation for Development
The main purpose of the Cellule de coopération de l’Ecole polytechnique de Bruxelles (CoDePo – Brussels Polytechnic School Cooperation Unit) is to offer Master’s students a first chance to become involved in a cooperation for development project. The unit is managed by professors and researchers from the School. Every year, around 20 students go abroad, as part of a project, to participate in the development of processes in the areas of food preservation, telemedicine, renewable energy and the promotion of biodiversity in the Southern hemisphere. www.codepo.be

Eco-marathon
Designing a vehicle able to cover as many kilometres as possible using the energy contained in a single litre of petrol is the challenge set by the Belgian Eco-Marathon Challenge. This is a competition for students from all backgrounds and where completely different energy strategies may be devised. The Eco-Marathon, which is supervised by a researchers and professors from the Ecole polytechnique de Bruxelles, is a unique opportunity to invest in an inspiring project requiring expertise in areas as diverse as mechanical engineering, electronics, materials science and electrical engineering. The project also offers a chance to develop skills that are vital for teamwork, communication and the management of constraints. www.site.be/ecomarathon/index-2.html

Internship in Industry
At the start of the second year of the Master’s programme, students are given the possibility of completing a three-month internship in industry. This enables them to develop specific skills, such as managing a schedule, organising effective meetings or working within an organisational structure. The experience is supervised at two levels: an internship supervisor guides students through their induction into the company and is responsible for technical monitoring, and a professor from the School supervises skill development. The Bureau d’Appui Pédagogique (Pedagogical Support Office) of the Ecole polytechnique de Bruxelles also assists and supports students throughout their internship, from the first covering letter to the final appraisal. The internship may also be combined with the Master’s thesis, so that the two together take 6 months.

Board of European Students of Technology (BEST)
International exchanges and communication: the Board of European Students of Technology network is made up of more than 70 engineering schools, including the Ecole polytechnique de Bruxelles, in nearly 30 European countries. Its main purpose is to organise courses lasting one to two weeks, on issues relevant to engineering. These courses are available for a limited cost. BEST Brussels informs the School’s students about the possibilities offered and also organises a course every year. Helping to run BEST Brussels provides an opportunity to develop project management skills. www.BEST.eu.org/BrusselsULB

Bureau des étudiants de polytechnique (BEP – Polytechnic Students’ Office)
The Bureau des Étudiants of the Ecole polytechnique de Bruxelles (BEP) represents students in governing bodies, such as the Conseil de l’Ecole polytechnique (Polytechnic School Council) and various committees, and in dealings with professors. The BEP’s door is open to all students, ensuring communication with professors and defending students’ interests. It also stores course notes and test answer keys to make them accessible to all. Students actively involved with the BEP learn to structure their thoughts and present arguments to represent and defend their peers. The BEP is available to answer any questions from future students (bep@bepolytech.be). www.bepolytech.be
RESEARCH

There are many opportunities to get involved in current research at the École polytechnique de Bruxelles, whether through laboratory projects, Master’s or PhD thesis.

Technological innovation through research is one of the main goals of the École polytechnique, which has more than 300 dynamic researchers. The School has decided to organise its research around two major areas: engineering and healthcare and sustainable development against a backdrop of expertise in design engineering. The School’s researchers are therefore tackling the major challenges facing the world of tomorrow.

The School’s research units are organised around large laboratories, staffed by 10 to 60 people, and provide an environment that is ideally designed to receive new researchers. Many of the School’s laboratories have an international reputation, for example in the fields of artificial intelligence, quantum cryptography, bioinformatics, physical chemistry and robotics.

MASTER’S THESIS

In the second year of the Master’s programme, all students must produce a thesis in one of the School’s laboratories. The thesis is a personal research project through which students show that they are able to discuss and develop a subject within their speciality. It demonstrates their ability to apply the knowledge and methods acquired during their studies, based on a reasoned, logical and coherent approach. The thesis also provides excellent research-based training, through which students come into contact with the best specialists in their field and learn how to use cutting-edge experimental, numerical and theoretical tools.

PhD THESIS

A PhD thesis is a 3- or 4-year research project at the end of which a PhD in engineering sciences is awarded. During this project, young researchers, often working as part of a multi-disciplinary team, have the opportunity to acquire many new skills, such as diligence, autonomy and teamwork. Their goal is to achieve significant advances in a given field. The PhD theses offered by the École polytechnique’s laboratories are often completed in collaboration with industrial partners, which means that their results can be quickly applied.

www.polytechniquebruxelles.be
AT THE HEART OF EUROPE

BRUSSELS, ONE OF THE WORLD’S MOST COSMOPOLITAN CITIES
As a hub and meeting place, where different nationalities, cultures, languages and professionals rub shoulders as a matter of course, Brussels feels the constant benefit of its exceptional location.

One of the major advantages of the Ecole polytechnique de Bruxelles campus is its location at the heart of the Belgian capital. Close to the city centre and easily accessible on public transport, the campus is close to the Bois de la Cambre. Students are able to enjoy a wide range of cultural activities (theatre, concerts, exhibitions), and take part in many sports at all levels.

THE UNIVERSITÉ LIBRE DE BRUXELLES: AN ALL-ROUND UNIVERSITY
As part of the Université libre de Bruxelles (ULB), the Ecole polytechnique de Bruxelles is developing its teaching by stepping up its cooperation with the ULB’s other faculties:
- Cooperation with the Faculty of Sciences in the training of bioengineers.
- Joint organisation of biomedical engineering training with the Faculty of Medicine.
- Training in how to protect intellectual property and benefit from research with the Faculty of Law.
- Joint organisation of a Master in management and technologies with the Solvay Brussels School of Economics and Management.

BRUSSELS FACULTY OF ENGINEERING
The Brussels Faculty of Engineering (Bruface) is an initiative of the Ecole polytechnique de Bruxelles and its Dutch-speaking sister institution, at the Vrije Universiteit Brussel. By combining their strengths, these two Schools now offer 5 of their Master’s programmes on an entirely joint basis and in English. These Master’s courses include engineering and architecture, construction engineering, electro-mechanical engineering, electrical engineering and chemical and materials engineering. These Master’s programmes are therefore accessible to foreign students, offering a unique opportunity to study in a multi-cultural environment.

www.bruface.eu
MASTER OF SCIENCE IN ARCHITECTURE AND ENGINEERING

Architect engineers bring a dual architectural and engineering approach to the construction process: they design meaningful places and construct buildings that are complex in their structures, equipment and technologies. As they design, coordinate and complete major projects as part of a multi-disciplinary team, their approach combines scientific diligence and sensitivity, mastery of the art of building and communication with all of the participants in the construction and management of the built space. Their skills structure the design of the space, the bringing of inventive solutions to construction problems, and the optimising of the environmental, cultural and heritage aspects of the town and the landscape.

PROGRAMME

The architectural course is the central discipline throughout the training, accounting for 25% of the programme. It deals with both architectural and construction-related themes. The course is aimed towards sustainable urban architecture and an integrated vision of architecture and architectural engineering. It therefore brings together all of the disciplines taught and makes use of the knowledge acquired for architectural design and mastery of the art of building. This last aspect draws on teaching of construction engineering. This teaching covers sustainable construction, building project management, structural engineering, materials engineering, geotechnical engineering and modelling and simulation. An in-company internship is possible in the second year of the Master’s programme. Finally, all students conclude their studies by producing a thesis.

CAREER PROSPECTS

Chemical and materials engineers bring a dual architectural and engineering approach to the construction process: they design meaningful places and construct buildings that are complex in their structures, equipment and technologies. As they design, coordinate and complete major projects as part of a multi-disciplinary team, their approach combines scientific diligence and sensitivity, mastery of the art of building and communication with all of the participants in the construction and management of the built space. Their skills structure the design of the space, the bringing of inventive solutions to construction problems, and the optimising of the environmental, cultural and heritage aspects of the town and the landscape.

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CAREER PROSPECTS

Master of Science in Chemical and Materials Engineering

Chemical and materials engineers are responsible for bringing to market chemical and pharmaceutical compounds, foods and materials that meet increasingly demanding specifications, for a wide variety of applications. They play a growing role in the development of new technologies that meet the challenges of today’s and tomorrow’s world. Their know-how is required at every stage of product development: from research and development to the design and the management of production lines. Their work involves dealing with economic, safety and environmental issues.

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In the second year of the Master’s programme, a Master’s thesis must be completed in one of the School’s labs. Students have the possibility of doing a 3-month internship in industry.

Studying chemical and materials engineering at ULB gives students a high-level, multi-purpose degree that opens the door to opportunities in sustainable development, nanotechnology and biotechnology. The programme prepares future graduates to work effectively with scientists from other fields by exposing them to cutting-edge research and involving them in industrial projects, giving them the requisite skills to work either in research or in industry. Contact with industry is given priority in the programme and is promoted through plant visits, the internship in industry and the Master’s thesis.

www.bruface.eu for more information and the full programme.

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Electro-mechanical engineers possess a wide range of technical skills in energy, electricity, engines, mechanics, fluid mechanics, mechatronics, transport and industrial process control. They are also able to deal with the various aspects of the complex systems with which they are faced and to manage industrial projects.

**PROGRAMME**

During the first year of the Master’s programme, students broaden their knowledge of electricity, mechanical design, engines and turbomachinery, with a major focus on process automation and numerical signal processing. This first year also includes a personal project in the field of electromechanics.

Four specialisations are available: aeronautics (construction, operation and maintenance of aircraft and spacecraft), energy (transmission, distribution, and electronic conversion of energy, sustainable energy, rational use of energy and energy management), mechatronics-construction (design, production, maintenance and application of complex electro-mechanical systems) and vehicle technology and transport (design of systems in which the transportation of people and goods are central).

The second year of the Master’s course offers students an opportunity to come into close contact with the industrial world during an optional 3-month internship in industry, a design office or a research centre, either in Belgium or abroad. A Master’s thesis must be completed in one of the School’s labs during this second year. During the rest of the year students are able to broaden their technical skills through optional courses.

**CAREER PROSPECTS**

Electro-mechanical engineers find career opportunities in design offices, industry, the public sector, research and higher education, and the service sector. While there are a large number of openings in companies specialised in process automation, electricity, aeronautics and energy, the majority of companies in other sectors (chemical, petrochemical, metallurgy, etc.) also have a growing need for skilled and versatile electro-mechanical engineers.

The deregulation of the electricity and telecommunications markets, the adaptation of energy supply strategies and the plethora of high-tech start-ups have created a need for technology consultants and entrepreneurs with expert knowledge of both advanced technologies and management techniques. Electro-mechanical engineers specialised in management and technologies are experts able to bridge the gap between technology and business.

The programme is extremely multi-faceted, enabling students to take a large number of general courses while broadening their knowledge in management techniques, and benefiting from the proximity of the Solvay Business School.

**CAREER PROSPECTS**

The advantage of this Master’s course is the combining of key core skills that prepare engineers for work in design and management. Electro-mechanical engineers find career opportunities in design offices, industry, the public sector, research and higher education, and the consultancy sector. While there are a large number of openings in companies specialised in process automation, electricity, aeronautics and energy, the majority of companies in other sectors (chemical, petrochemical, metallurgy, etc.) also have a growing need for skilled and versatile electro-mechanical engineers.

This Master’s course is organised with the Solvay Brussels School of Economics and Management. It is taught in French and English.

**PROGRAMME**

This Master’s course, which is the result of a cooperation agreement between the Ecole polytechnique de Bruxelles and the Solvay Brussels School of Economics and Management, gives students a unique opportunity to gain expert knowledge of both technology and management, which is a key competence when it comes to working for a technology consultancy or setting up and managing high-tech companies.

In the first year of the Master’s programme, students focus on logistics, management and entrepreneurship, and technology.

The second year of the Master’s course involves the Master’s thesis, and includes a seminar on economics and technology that immerses the future engineer into a realistic environment in keeping with his or her future professional activities. During this second year, an internship in industry or a research centre enables students to gain a realistic insight into their future careers, and often opens up initial opportunities for an entry-level job.
MASTER OF SCIENCE IN ELECTRONICS AND INFORMATION TECHNOLOGY ENGINEERING

Electronics engineers design and develop complex electronics and telecommunications systems in a wide range of fields: multimedia, medicine, internet and networks, transportation, aeronautics, industrial processes, etc. Whether in industry or in our daily lives, the continual growth of multimedia means that content needs to be created, processed and transmitted at high speed, irrespective of the distance and environment. To meet this challenge, electronics engineers require solid skills in electronics and microelectronics, as well as in telecommunications, system automation, real-time IT and multimedia.

PROGRAMME
This Master's programme is based on four disciplines: electronics, automation, telecommunications and multimedia. After a core module in the first half of the first year of the Master's course, students choose between two options. The first option covers nano- and optoelectronics, audio-visual processing and telecommunications, while the second option covers wireless telecommunications, embedded systems and measuring, modelling and control. The first year of the Master's course also includes a personal project in the field of electronics and IT.

The second year of the Master's programme offers an optional 3-month internship in industry, a design office or a research centre, either in Belgium or abroad. A Master's thesis must be completed in one of the School's labs during this second year.

The teaching methods used, such as the integrated project work and the 3-month internship, promote the development of cross-disciplinary skills, such as project management and oral and written communication.

CAREER PROSPECTS
A very wide range of companies have electronic engineering requirements, with at least 600 companies in Belgium alone. Many multinationals have R&D teams in Belgium, working on a wide range of products and processes in fields including telecommunications, electronics, aerospace and automation. The majority of companies in other sectors also have a growing need for engineers skilled in electronics and IT. Electronic engineers will also find career opportunities in the public sector, research and higher education, and the service sector.

This Master's course is taught entirely in English through Bruface.

www.bruface.eu for more information and the full programme.

MASTER OF SCIENCE IN CIVIL ENGINEERING

Construction engineers are able to meet the needs of design offices, conformity assessment agencies, companies, government agencies and research centres, through their knowledge of the properties of different materials and their understanding of structural mechanisms. They have general background knowledge of the art of building.

PROGRAMME
The course programme is designed to develop general skills in the overall field of construction, including such aspects as designing and calculating building structures, working with geometrical and project management. Out of these key areas, the focus is on gaining expert knowledge in tools for modelling structures and materials. Important issues include the optimisation of the structure's shape, the selection of the materials and the construction method in terms of mechanical properties, environmental impact, life cycle cost and sustainability. Both conventional reinforced and pre-stressed concrete and steel structures and systems using new materials (fibre reinforced, cellular, hybrids, etc.) are covered.

Courses are delivered by full-time ULB lecturers and professionals who mostly work for public authorities or for national, foreign or international companies. The teaching methods used emphasise teamwork on specific projects, to develop skills that are vital for a fulfilling a professional career. The programme offers a multi-disciplinary approach that concentrates on practical applications. In-class, practical and lab work are rounded off by numerous projects and a Master's thesis, enabling students to put their knowledge into practice.

CAREER PROSPECTS
The construction sector in Europe is highly diversified, including public works, private (residential) buildings and industrial premises. ULB-trained construction engineers are able to work in a number of fields: site management, design work in design offices, etc. Their multi-disciplinary training also enables them to work in other areas in which their skills are sought, such as mechanical engineering or aeronautics, consulting, various IT sectors, etc.

This Master's course is taught entirely in English through Bruface.

www.bruface.eu for more information and the full programme.
**MASTER OF SCIENCE IN COMPUTER SCIENCE AND ENGINEERING**

Systems engineers are able to design, implement, correct and develop complex IT systems, thanks to their in-depth knowledge of algorithms, software and the underlying hardware. A systems engineer understands the challenges and the technological and industrial constraints in the fields of application in which IT solutions are deployed, ensuring that they match user requirements as closely as possible.

**PROGRAMME**

There are 5 options open to the students:

* The **design of software and critical systems** option covers basic IT concepts and their practical applications, especially in the field of application development.
* The **computer intelligence** option covers various advanced IT technologies such as collective intelligence and biomimetic systems.
* The **multimedia** option covers technologies associated with the acquisition, processing and synthesis of multimedia data, with a special focus on sound, images and video.
* The **optimisation and algorithms** option gives students advanced knowledge of algorithms using statistical methods and technologies, and of operational research.
* The **web and information systems** option looks at information management, structured in databases or semi-structured on the Web.

A wide range of optional courses are available within these five options.

The second year of the Master’s course offers an optional 3-month internship in industry, a design office or a research centre, either in Belgium or abroad. A Master’s thesis must be completed in one of the School’s labs during this second year.

**CAREER PROSPECTS**

IT technologies have experienced spectacular growth over the last few decades and offer a major opening for engineers. Systems engineers are ideally placed as specialists in the field. The skills acquired through the Master’s programme also enable its graduates to play a leading role in multi-disciplinary projects. Systems engineers have a wide range of careers open to them in sectors directly associated with the transmission of information (data, image and sound); in sectors where the core business involves processing information (banks, insurance companies, government agencies); in the manufacturing industry, where IT requirements are continuing to grow and in new business activities created through information technologies (multimedia, bioinformatics, etc.). Note that there is currently a major shortage of IT specialists throughout Europe, which is projected to grow in the coming years.

This Master’s course is taught entirely in English in conjunction with the Faculty of Sciences at ULB.

www.polytechniquebruxelles.be for more information and the full programme.

**MASTER OF SCIENCE IN BIOMEDICAL ENGINEERING**

Biomedical engineers have a vital role to play in combining the scientific and technical approaches of the engineering and medical spheres. This is a useful discipline given the constant development of medical technologies, including the design of new implants and prostheses, sensors and analytical and diagnostic tools. These technologies benefit from spinoffs and innovations from sectors such as genetics, biochemistry, micro-mechanics, material physics, signal processing, imaging and information technology.

**PROGRAMME**

The combining of multiple skills is vital for the development of biomedical products and projects. Students on this course therefore benefit from close collaboration with the teaching body of the Faculty of Medicine and with the hospitals linked to the ULB, which have cutting-edge technological equipment. The Master’s programme offers two options: **biomechanical engineering and instrumentation** or **biomedical IT and imaging**. In the second year of the Master’s course, students are able to complete a long-term internship in a hospital environment or a biomedical company. This internship is an opportunity for exchanges of views and discussions, immersing future biomedical engineers in their future professional environment.

**CAREER PROSPECTS**

Biomedical engineering is one of the most rapidly expanding fields, with more and more job openings each year, particularly in the innovation sector. New graduates are able to apply to major corporations reputed for their medical equipment development and to the many SMEs working in medical instrumentation or imaging. Biomedical engineers are also sought in R&D departments, to optimise instruments used in biological and pharmaceutical research, and in companies and university labs, where they are able to participate in research projects and complete a PhD.

This Master’s course is taught mainly in French.

www.polytechniquebruxelles.be for more information and the full programme.
Drawing on their in-depth knowledge of the fundamentals of physics and their advanced modelling skills, physics engineers design innovative solutions in highly varied contexts, ranging from fundamental scientific research to high-tech industrial applications, in fields as diverse as nuclear imaging, medical engineering, quantum engineering, laser physics and photonics. This profession requires solid expertise in microscopic physics, entailing the study of the quantum world and its uses in atomic, molecular, nuclear and solid state physics, and in the optical field.

PROGRAMME
The physical engineering course is focused on developing a sophisticated understanding of the physical phenomena on which cutting-edge technologies are based. Applied mathematics are a second vital area of teaching. In the first year of the Master’s programme, introductory courses in atomic and nuclear physics are offered alongside more applied courses such as laser physics, acoustics and nuclear reactor physics. A project is also completed in a company or lab. The second year of the Master’s programme offers students a choice between five options (material physics, photonics, nuclear engineering, radiation protection and biomedical imaging). Students also complete an internship in industry and/or a free choice of courses. The Master’s thesis also provides an introduction to experimental or theoretical research in a wide range of fields. The nuclear engineering course is unique to the ULB and highly sought after in both Belgium and abroad.

CAREER PROSPECTS
The course is focused on developing a sophisticated understanding of the physical phenomena on which cutting-edge technologies are based in order to appropriate and improve them and, above all, innovate. Academic institutions and research centres are therefore a major source of job opportunities. The modelling abilities of physics engineers are in demand wherever physics and applied mathematics are found (telecommunications, medical techniques, environmental technologies, micro-electronics, etc.), as well as in the banking sector, the insurance sector and management consulting. Options may also be taken to allow specialisation in more specific sectors such as nuclear engineering.

This Master’s course is taught mainly in French.

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