

Master of Science in Chemical and Materials Engineering



120 ECTS







Tackle environmental challenges and help build a sustainable future

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Engineers in chemistry and materials science play a unique role in sustainable development. They manage resources, energy and the environment to develop and produce novel materials and chemical commodities. This master's programme prepares you to face the demands of the modern technological employment field. With English as the working language, you are ready to start an international career and help shape the future.

MASTER OF SCIENCE IN CHEMICAL AND MATERIALS ENGINEERING

INTEGRATION OF PROCESS TECHNOLOGY AND MATERIALS

This master's programme aims to train students to become engineers who shape the transition towards a sustainable society, in fields such as the petrochemical and materials industry, pharmaceutical industry, food industry, biotechnology, advanced materials processing, and the recycling industry. The master's programme encompasses two distinct profiles: 'Process Technology' and 'Materials'. In the 'Process Technology' profile, the student is trained in the sustainable design and operation of productions units and the unit operations involved, for jobs in chemical industry, consultant engineering firms, and the environmental sector. The 'Materials' profile prepares its graduates for designing, analysing and selecting novel and sustainable materials and their processing methods, for jobs in research and development, material processing, or application environments. The master's programme has a common core of 56 ECTS, ensuring strong mutual interaction and integration between both profiles. The development of environmentally friendly and safe production processes for sustainable materials, the shaping and processing of materials into intermediate or finished products, and the optimal integration of materials in other disciplines are strongly related to the optimisation of environmentally friendly chemical processes in general.

COMBINE SCIENTIFIC AND TECHNOLOGICAL SKILLS

Scientific and technological efficiency is key in the Master of Science in Chemical and Materials Engineering. It is an academic programme, which implies a close link with scientific research in the related fields. The programme offers a balance between scientific and technological knowledge, skills that are useful for both industrial and scientific careers. And the programme provides you with plenty of other skills, from management techniques, to communication and social skills. In all situations, we foster independence, creativity, inventiveness and critical thinking. These skills will help you shape the technology of tomorrow.

EXPERTS FROM BOTH WORLDS

The master's programme 'Chemical and Materials Engineering' is a Bruface collaboration between the two largest education institutes of engineering in Brussels: the Vrije Universiteit Brussel and the Université libre de Bruxelles. Together, we offer you the best of both worlds: a worlds: a high-level education in a fully Englishtaught master's programme, by highly qualified academic staff with a large international network, state-of-the-art research facilities, and all of this in an internationally oriented city. And on top of that, you will receive a joint diploma from VUB and ULB.

INTERNSHIP

The programme offers the opportunity to put these skills into practice through a two- or threemonth internship at the beginning of the second year. The internship gives you a good opportunity to be actively involved in the professional world and gain engineering competences in real-life situations. You can take on an internship in a company in or outside Belgium, or in a laboratory or research institute outside Belgium. And what's more, your master's thesis can be carried out with the company, lab or research institute you are working at.

ENTREPRENEURSHIP

You can take up entrepreneurship-related courses, which are complementary to your education. During these courses, you will be introduced to business and economics, frameworks and tools for general management, human resource management, communication and teambuilding, marketing, and accounting. In short, everything a student with a nose for business initiatives needs.

STUDY ABROAD: MOBILITY WINDOW

Fancy an international career? This mobility window offers extra freedom and flexibility to tune the content of your curriculum with additional courses and research projects without delaying your study. It also gives you the chance to work with experts from other universities for your thesis research. Our collaboration with T.I.M.E. (Top Industrial Managers for Europe), a network of engineering schools and universities in Europe, gives you the opportunity to study abroad. There are possible destinations inside and outside Europe, including Japan, China and Australia. Broaden your horizons personally as well as professionally, and graduate with a degree from both VUB and ULB, and the hosting institution.



PROGRAMME

Master year 1	ECTS
Common core I: 41 ECTS	
Molecular Structural Characterisation and Analysis	5
Electrochemistry	4
Parameter Estimation and Modelling	5
Microstructural Design and Characterisation of Inorganic Materials	6
Surface Treatment: Processing and Analysis	4
Organic Chemistry: Reactions and Mechanisms	4
Polymer Materials	6
Unit Operations	7
Project: 5 ECTS	
Profile Materials I: 14 ECTS	
Ceramics	4
Mechanics of Materials	3
Production of Metals	3
Advanced Materials	4
Profile Process Technology I: 14 ECTS	
Sustainable Chemical Processes	4
Modelling and Design of Multiphase Systems and Reactors	6
Heterogeneous Catalysis	4
Total	60

Materials

The 'Materials' profile thoroughly prepares you for a job in the materials technology sector of metals, polymers, ceramics and composites. You will be trained to become a creative engineer, capable of designing sustainable and multifunctional materials for future and high-tech applications in civil, mechanical, and biomedical engineering fields. You will also develop skills to engineer intermediate or finished products with these materials, using environmentally friendly and safe production processes.

Master year 2	ECTS
Common core II: 10 ECTS	
Environmental Technology	3
Biotechnology	3
Reliability and Risk Analysis of Industrial Installations	4
Profile Materials II: 13 ECTS	
Forming of Metals	4
Polymers: Rheology and Processing	4
Sustainability of Materials	5
Profile Process Technology II: 13 ECTS	
Design of Chemical Plants	5
Simulation and Design Tools	4
(Bio)Chemical Process Design and Control	4
Profile Process Technology II: elective course ECTS	of 3
Options: 10 ECTS	
Option 1: Internship	
Option 2: Elective courses	
Option 3: Entrepreneurship	
Master's thesis: 24 ECTS	
Total	60

Students must select one profile: Profile 'Materials', Profile 'Process Technology', and one option.



The programme is subject to change. Check www.vub.be/en/chemical-andmaterials-engineering for the latest information about the programme.

Process Technology

The 'Process Technology' profile prepares you to become an engineer who can be employed to design and manage production units (operation and optimisation of production facilities) in chemical and environmental industries. Alternatively, you could work in an engineering group, where you would develop new sustainable production processes that meet performance specifications. The profile mainly focuses on the chemical industry, but also connects with biotechnology and the food industry. You will be trained in identifying opportunities and finding solutions for making processes more sustainable and for preventing environmental problems.



STUDY IN BRUSSELS

STUDY AT THE HEART OF THE EU

Brussels appeals to a lot of international students, and each year about 70.000 students seek higher education here. This should not come as a surprise.

Belgian education is internationally renowned for its high standard, and Brussels is a multicultural cosmopolitan city. It is a hub for cultural activities with numerous international institutions, companies and embassies. Brussels is the sixth leading European business city, according to property consultants 'Cushman & Wakefield'. This means studying Chemical and Materials Engineering at VUB opens up a world of opportunities for your career.

The short travel times by high-speed train to cities like Amsterdam (2h) or London (2h) or Paris (1h30) place Brussels at the heart of Europe. There is no better location for you to study and start your career.

BRUFACE: BEST OF BOTH INSTITUTIONS

'Brussels Faculty of Engineering', is a cooperation of the Vrije Universiteit Brussel (VUB) and Université libre de Bruxelles (ULB). The two universities in the city of Brussels join forces to offer English-taught programmes in the field of engineering.

Bruface offers you the opportunity to study in an international context and to make use of the best facilities of both universities. But most of all, this cooperation allows for expertise of both universities to be at your disposal.

High-level education is within reach, at a reasonable tuition fee. At the end of the programme, you even take home a joint degree from VUB and ULB.

For more information, please visit www.bruface.eu.

NUMEROUS FIELDS OF EXPERTISE

Expertise from VUB and ULB is gathered to offer you the best education and research possibilities. Therefore, a broad variety of fields of research is at your feet. Our research groups boast a large portfolio with Belgian, European and international projects.

On the materials side, our research groups work on, among others, sustainable materials like bio-based and self-healing polymers or nontraditional cements; solid-state batteries for renewable energy storage; novel processing methods like the additive manufacturing of metals, polymers and even concrete; materials' degradation monitoring as well as prediction and corrosion protection; and least but not least on high technology glasses and ceramics.

On the processing technology side, topics range from research on transport processes in cell membranes and fundamental studies on the behaviour of fluids, over the development of highly advanced (bio-)analytical separation methods, microfluidics and microreactor technology; to the development of sustainable chemical processes for the production of renewable chemicals or CO₂ capture and conversion, or for the food processing industry.

In both fields, the research is supported by a strong activity in numerical modelling, going from the level of molecular interactions, to the simulation of large-scale reactors and processes.

These research topics are closely related to the needs of the industry such as automotive and aerospace, 'green' energy and chemical process industry and biomedical materials or devices, answering the call for a sustainable engineering future with a high societal, environmental and economic impact on a global scale.

SOME RECENT SUCCESS STORIES THAT STARTED IN OUR LABORATORIES

SPIN-OFF COMPANY: PHARMAFLUIDICS

PharmaFluidics is a spin-off of the Chemical Engineering Department developing a novel technology to perform liquid chromatography separations, an analytical separation technology with an annual multibillion dollar turnover. After decades of incremental improvement, this technology is reaching its limits. PharmaFluidics' pillar array chromatography introduces a paradigm shift by fundamentally rethinking the type of stationary phase used to achieve separations by introducing perfect order.

SPIN-OFF COMPANY: ZENSOR

Having a background in combining material science and advanced sensing techniques, Zensor offers end-to-end monitoring solutions for the state-of-health of industrial production assets and large civil infrastructure. By including advanced data science in the mix of its products, Zensor helps asset owners to predict when preventive maintenance is needed and to estimate the remaining operational life.



HINK CRITICALLY, THINK VUB

You've chosen VUB because the content of the courses appealed to you – but there are so many other factors that will enrich your master's student experience. As an urban engaged university, we care about how you, as a committed global citizen, use your knowledge to make a difference to the world.

STRONG TEACHING, PERSONAL APPROACH

You're taking one of our more than 85 master's courses, which build on ground-breaking research from 150 research groups. That means you're at the cutting edge of the latest developments and technologies. Your professors are leading international scientists with a global network. But their doors are always open for you. You'll find the same personal approach from our study support service.

CRITICAL MIND, WARM HEART

VUB is a young university with a rich tradition of critical thinking. We do not accept absolute truths. We study the ever-changing reality according to the principles of free enquiry: free from religion, ideology and worldview, built entirely on scientific methods.

At VUB, you will learn how to investigate scientific theses and to ask obvious and less obvious questions. We focus on open-minded research and respectful disagreement. With us, you won't simply reproduce opinions, you'll learn ABOUT VUB



to argue your point. You will leave here with your own vision. Those critical thinking skills are a vital asset for a brilliant career and an exciting life.

And all these thinkers form a close-knit community. At VUB, you will find yourself in an open and caring environment. Whoever you are, however you think, together we are VUB. That is a special feeling. We embrace every talent in every situation and want to see everyone succeed, both on campus and in life.

BOUNDLESS AMBITION, CLOSE TIES

It's not only Brussels that has a cosmopolitan atmosphere: our university does too, with students from more than 150 countries studying at VUB every year. And you can realise your foreign dreams with us. Every day, we work with several higher education institutions at home and abroad. There are internship and career opportunities there for the taking, in Belgium and further afield.

What's more, the VUB is proud to be a founding member of EUTOPIA, an alliance of 10 likeminded European universities. With our students, academics and staff, we are all ready to reinvent ourselves. Together we face the immense challenge of building the European university of tomorrow: a university that unites people from all over Europe to design solutions to the great challenges facing our society.

SHORT DISTANCES, EASY ACCESS

You'll find almost all our faculties on the green VUB Main Campus in Elsene. Only Medicine and Pharmacy are on the VUB Health Campus in Jette, in the shadow of our university hospital. Both are easy to reach by bus and tram, and the VUB Main Campus is right next to Etterbeek train station.

AT HOME AT THE VUB

Moving to a dorm in Brussels will only enhance your student experience. You'll feel more connected with the campus, and you'll get to know our fascinating capital in new ways by living here. You can apply for a VUB dorm (a "kot") or choose a private room in the neighbourhood. Apply at www.vub.be/studenthousing



ADMISSION REQUIREMENTS

To start your studies at VUB, you must meet a few academic requirements. After your online application, we verify your diploma and transcripts of records to decide whether you qualify for the programme you selected. Upon application you must be able to prove sufficient knowledge of your programme's language of instruction. For each step of the enrolment process we'll keep you updated via e-mail, so keep an eye on your inbox! How to apply www.vub.be/apply-and-enrol

THE 'V' OF VUB

"Vrijheid" – freedom – is fundamental to the Vrije Universiteit Brussel. In particular, freedom of thought: the right as humans and scientists to question everything critically, without prejudice. The world still needs that freedom. Based on this principle, VUB is open to everyone, regardless of their religion or worldview.

We support all our students to become truly autonomous, responsible and critically thinking world citizens. Equality, openness and tolerance are at the heart of our humanistic vision. Worldview, including religion, can help define your identity as a person. At the VUB, we respect everyone's worldview, but we see it as a personal choice within the private sphere and do not facilitate its practice.

ADMISSION CRITERIA AND LANGUAGE REQUIREMENTS

Applicants for our master's programmes must meet certain academic requirements and demonstrate personal motivation. Specific requirements can be found on each programme's page. For more information on general requirements, please visit our website: www.vub.be/en/admission-language-requirements.

APPLICATION DEADLINE

We strongly encourage candidates to register early, even if they do not yet meet certain admission requirements, such as obtaining a particular diploma. Please see our website for the exact deadlines: www.vub.be/en/application-deadline.

TUITION FEES

VUB offers subsidised tuition fees for most master's programmes. Fees for non-EEA students may be higher. For the exact amounts and to calculate your tuition fees, see our website: www.vub.be/en/study-costs.

MORE INFORMATION

Scan the QR code below for more details about this specific programme. For further inquiries, please contact us via

secretariaat.ingenieurswetenschappen@vub.be or www.vub.be/contact.



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ULB

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www.vub.be/en/chemical-and-materials-engineering

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