



VRIJE  
UNIVERSITEIT  
BRUSSEL

Joint programme with



MASTER  
OF SCIENCE IN  
**CHE  
MICAL  
& MA  
TERIALS  
ENGI  
NEERING**

[www.vub.ac.be/chemical-materials-engineering](http://www.vub.ac.be/chemical-materials-engineering)  
[www.bruface.eu](http://www.bruface.eu)

**120**  
**ECTS**

**2018-2019**



# WHY VUB

## **VUB education delivers strong individuals, critical minds and world citizens**

Vrije Universiteit Brussel (VUB) offers high-quality English-taught programmes, supported by outstanding research. Being a student at VUB means learning in an open atmosphere of tolerance and diversity, as well as growing into an independent and critical-thinking individual.

All fields of study are offered on four student-friendly campuses in the cosmopolitan city of Brussels. At VUB, students have easy access to their lecturers and assistants. Faculty members are available and open to answer questions; small group workshops are used to ensure close interaction and hands-on experience.

VUB is a dynamic and modern university with almost two centuries of history. We welcome 15.000 students, 21% of which are international students from more than 120 different countries.

## **The basis of our academic success**

Vrije Universiteit Brussel was founded on the principle of 'free inquiry' as formulated by the French mathematician and philosopher of science Henri Poincaré (1854-1912): *"Thinking must never submit itself, neither to a dogma, nor to a party, nor to a passion, nor to an interest, nor to a preconceived idea, nor to anything whatsoever, except to the facts themselves, because for it to submit to anything else would be the end of its existence."*

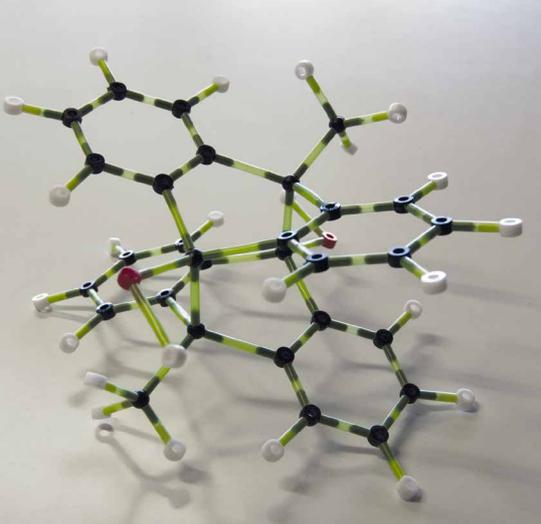
Personal growth, with a positive and critical attitude, in addition to a sense of responsibility and open-mindedness are characteristics that you will encounter in everyone at the university: from professors and researchers to students and staff members. It lies at the heart of our academic success.





### **Tackle environmental challenges and help build the future**

Engineers in chemistry and materials sciences 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 employable in fields such as the petrochemical and polymer industry, pharmaceutical industry, food industry, biotechnology, inorganic bulk chemistry, extractive metallurgy 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 to operate in production units, consultant engineering firms and the environmental sector. The Materials profile covers production and development facilities for different types of materials. The master's programme has a common core of 56 ECTS, ensuring a strong mutual interaction and integration between both profiles. The development of environmentally friendly and safe production processes for 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.

## Bruface: best of both worlds

Bruface, short for Brussels Faculty of Engineering, is a cooperation of the Vrije Universiteit Brussel (VUB) and Universit  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.

## Entrepreneurship

You can take up entrepreneurship-related courses, which are complementary to your education. During these courses, you'll 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 initiative needs.

## Internship

The internship is a 40- or 60-day period of training that offers students the chance 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 thesis research can be carried out with the company, lab or research institute you're working at.

## Study abroad: mobility window

The VUB curriculum of the first semester of the second master year can be replaced by an alternative programme worth 30 ECTS at a university abroad. 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.



MASTER YEAR 1	ECTS	MASTER YEAR 2	ECTS
<b>Compulsory courses</b>	<b>41</b>	<b>Compulsory courses</b>	<b>10</b>
Common Core I		Common Core II	
Molecular structural characterization and analysis		Environmental Technology	
Electrochemistry		Biotechnology	
Parameter Estimation and Modelling		Reliability and risk analysis of industrial installations	
Microstructural design and characterization of inorganic materials		<b>Profile: compulsory courses</b>	<b>13</b>
Surface treatment: Processing and Analysis		Profile 'Materials'	
Organic Chemistry: Reactions and Mechanisms		Profile 'Process Technology'	
Polymer Materials		<b>Profile: elective courses</b>	<b>3</b>
Unit operations		<b>(students must select one course in each profile)</b>	
<b>Project</b>	<b>5</b>	Profile 'Materials'	
<b>(students must select one project)</b>		Profile 'Process Technology'	
Project: Process technology		<b>Master Thesis</b>	<b>24</b>
Project: Multifunctional Materials		<b>Options</b>	<b>10</b>
<b>Profile: compulsory courses</b>	<b>14</b>	<b>(students must select one option)</b>	
<b>(students must select one profile)</b>		Option 1: Internship	
Profile 'Materials'		Option 2: Elective courses	
Profile 'Process Technology'		Option 3: Entrepreneurship	

The programme is subject to change. Check [www.vub.ac.be/en](http://www.vub.ac.be/en) for the latest information about the programme.

ECTS (European Credit Transfer System): 1 credit represents 25-30 hours of study activity.

### PROCESS TECHNOLOGY

The Process Technology profile prepares you to become an engineer who can be employed in, for example, production units (operation and optimisation of production facilities). Alternatively, you could work in an engineering group, where you'd develop new production processes that meet performance specifications. The profile mainly focuses on the chemical industry, but also looks at biotechnology and the food industry. You'll be trained to identify, solve and avoid environmental problems.

### MATERIALS

The Materials profile thoroughly prepares you for a job in the materials technology sector of metals, polymers, ceramics and composites. You'll be trained to become a creative engineer, capable of designing sustainable and multi-functional materials for specific applications. You'll also develop skills to engineer intermediate or finished products with these materials, using environmentally friendly and safe production processes.

# RESEARCH @ VUB

## ELECTROCHEMICAL AND SURFACE ENGINEERING: SURF

SURF, the research centre of electrochemical and surface engineering, combines expertise in electrochemical methods, in-situ and ex-situ surface analytical techniques and computational software with a multidisciplinary focus on four cross-linked research domains:

- **Electrochemical and surface processes**  
Electrochemical processes directly impact the surface of materials; the surface of materials can in turn be altered, functionalised and optimised by electrochemical processes.
- **Electrochemical modelling**  
In-house software is developed and applied for the simulation of electrochemical processes. Applications are focused on production processes (high speed plating, mainly electrochemical machining), durability of materials (corrosion prediction, quantification, visualization and protection methods), use of energy (battery modelling).
- **Corrosion technology**  
Development and refinement of surface treatments and coatings to protect metals against corrosion, including self-healing concepts; fundamental research to determine corrosion mechanisms; development of corrosion sensors; rapid screening of corrosion performance.
- **Multifunctional surfaces and new materials**  
Design and synthesis of a new generation of better performing and multifunctional materials – up to the nanometre scale.

## PHYSICAL CHEMISTRY AND POLYMER SCIENCE: FYSC

The research of FYSC is focused on molecular and supramolecular structure–processing–property relations in synthetic, bio-based or natural polymers for developing sustainable materials with improved performance. A unique collection of physicochemical analytical techniques,



30 students in master year 1



Full English-taught programme



Joint degree from 2 universities



characterisation and modelling procedures is available for this purpose. Novel macromolecular materials are designed by polymer synthesis, either in-house or with external partners. Main research topics are self-healing polymers, polymers for energy applications (organic solar cells, fuel cells), geopolymers, nanostructured (hybrid) polymers (polymer nanofibres, nanocomposites, thin polymer films on 'solid' substrates), stimuli-responsive systems (hydrogels, drug delivery systems) and reacting polymers (thermosets, kinetics and modelling).

A contribution to the international progress of advanced thermal analysis for materials' characterisation is aimed at: measuring transitions more sensitively, faster techniques suitable for thin films and ultra-small samples (ultra-fast scanning chip-based method), spatially localized thermal analysis at the micro- and nanometre level, novel in-house developed hyphenated thermal techniques permitting combinations of measurements on a single sample.

### **CHEMICAL ENGINEERING: CHIS**

The CHIS research group studies the most advanced nanostructured porous solids for new or improved separation processes. In pursuit of ever better analytical separation and chromatography systems, the group aims at a better understanding of the methods and systems currently used to conduct (bio-)analytical separations, mainly high-performance liquid chromatography (HPLC) and capillary LC. Combining know-how of chemical engineering, precision and micro-machining technology, the group is ideally positioned to develop novel devices and processes in the area of microfluidics and microreactor technology. The research is supported by activity in the area of numerical modelling, both at the process level, and the mass transfer and reaction level. In recent years, this work has also expanded into the area of data-analysis (QSAR, data fitting) and fundamental thermodynamic relationships for adsorption.

#### **Spin-off company: PharmaFluidics**

Rooted in chemical engineering with advanced know-how in micro-fabrication technology, PharmaFluidics specialises in developing high-quality tailor-made solutions for any problem in the chemical and life sciences industry that would potentially benefit from miniaturization or fine material structuring.

## ADMISSION CRITERIA

Admission is based on the review of each application: proof of meeting academic and language requirements, personal motivation, etc.

### LANGUAGE REQUIREMENTS

Prospective students can provide proof of sufficient knowledge of English as language of instruction by meeting one of the following criteria:

- having successfully completed one of the following language proficiency tests:
  - TOEFL: minimum level: 213 for the computer-based test (CBT); 72 for the internet-based test (IBT); 550 for paper-based test
  - TOEIC: minimum level: 785
  - IELTS: minimum level academic module 6
  - CAE: minimum grade B
  - CPE: minimum grade C
  - ITACE for Students certificate with ERK/CEFR score B2
  - Cambridge English First (FCE)
  - Cambridge English: Business Vantage (BEC Vantage)
  - Cambridge Michigan ECCE
  - Trinity College London: ISE II, GESE Grade 7-9; or ALTE Q mark
  - The Pearson Test of English General (PTE General): minimum level 3
  - The Pearson Test of English Academic (PTE Academic): minimum level 59

- having successfully completed at least one year of secondary education with English as language of instruction, or having successfully completed secondary school in a Belgian institution;
- having successfully completed programme units in higher education with a minimum of 54 ECTS-credits where English was the language of instruction.

For more details on admission requirements and application: [www.bruface.eu](http://www.bruface.eu)

### SPECIFIC ADMISSION CRITERIA

Admission of students from other institutions is evaluated through a complete application file. Students with a bachelor in the same field of study have direct access after the evaluation of their application file. Holders of another engineering degree must be approved by the curriculum council.

### Application deadline

Prospective students are advised to apply as soon as possible, even if they have not yet obtained their degree. Applications need to be submitted only through our website [www.bruface.eu](http://www.bruface.eu)

- Students who require a visa (non-EU/EEA nationals) need to submit their pre-application before March 24th
- Students who do not require a visa must submit their pre-application before September 12th
- Note: if the proof of English proficiency or APS certificate is not ready before the deadline, you can always submit it later instead of missing the deadline

### Tuition fees

Students pay the tuition fee at the institution at which they enrol, in agreement with the institution's legal requirements. The tuition fee for the non-EU students is recalculated yearly and jointly by both institutions, taking into account the legislation in both regions. Indication of tuition fee: 800 - 3000 euro per year. A detailed overview of the tuition fees can be found on [www.bruface.eu](http://www.bruface.eu)

### Contact

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