



KATHOLIEKE UNIVERSITEIT  
**LEUVEN**



**SCORES  
CHEM**  
Knowledge Platform



# Master of Safety Engineering

Options:

- Process Safety
- Prevention

Supported by the essencia Chair Safety Engineering

Faculty of Engineering



# Summary and overview

For more than 25 years, the Faculty of Engineering has offered an advanced Master's programme in safety technology. This programme was intended to prepare participants for the role of safety officer in large industrial plants, as required by Belgian law. The teaching was accompanied by research activities in industrial safety.

In order to meet changing industrial demands and to keep up with major new developments in the field of technical and occupational safety, K.U.Leuven and essenscia (the Belgian umbrella organisation of companies that are active in the field of chemistry and life sciences) joined forces to review and renew the contents of the existing programme.

As a co-funding of the 'Education' component within the SCORES4CHEM platform<sup>1</sup>, the essenscia Chair Safety Engineering was inaugurated at K.U.Leuven in November 2009 (Chair holder Prof. Jan Van Impe). One of the goals of this Chair is the promotion of high quality education in the field of industrial safety. As a result, the renewed and expanded Master of Safety Engineering has a stronger focus on process safety and is more internationally oriented. Prof. Jan Degève is currently the Programme Director.

The structure of the Master of Safety Engineering programme is modular, containing a common compulsory part and a part in which students may choose between two options.

Participants interested in the mainly technical aspects of safety may select the option "Process Safety" which is geared towards the study of safe and reliable plant operation. Teaching will be exclusively in English, opening up the programme to an international audience.

The option "Prevention" also includes non-technical aspects and refers to the local Belgian context. This option leads to the "Certificaat Preventieadviseur Niveau 1" as defined by Belgian law. Part of the teaching will be in Dutch.

The programme comprises a total of sixty credits and requires one year of full-time study. The programme may also be completed on a part-time basis (two years).

The renewed Master of Safety Engineering started in the 2010-2011 academic year.

<sup>1</sup> SCORES4CHEM - Safety, Control and Optimization: Research, Education and Services for the (bio)CHEMical industry. Knowledge Platform initiated by the K.U.Leuven Industrial Research Fund

## Common compulsory courses in English (23 credits)

### Option "Process Safety"

- Compulsory part in English (16 credits)
- Electives in English (6 credits)

### Option "Prevention"

- Compulsory part in Dutch (16 credits)
- Electives in English/Dutch (6 credits)

## Master's thesis (15 credits)



## Admission requirements

### Qualification requirements

- Holders of an academic Master's degree in science (physics, chemistry, biochemistry), a Master's degree in engineering (including architecture) or in bio-engineering, or a Master's degree in nautical sciences are admitted to the programme.
- Others may be admitted based on a review of their academic curriculum and professional experience.
- Candidates choosing the option "Prevention" are required to have a good oral and written knowledge of Dutch.

### Tuition fees

The tuition fee for participants admitted to the programme on a one-year full-time basis amounts to 5 600 Euro.

### Language requirements

- Candidates should have a good oral and written command of English, and (except for native speakers) are required to demonstrate their proficiency when applying to the programme (e.g. by way of an informal interview, or more formally by submitting results of a recognised English language test such as TOEFL (PB 550, CB 213, IB 80), IELTS (6.5) or other equivalent).

Participants who are not active professionally and are applying to the programme no later than two years after obtaining a Master's degree pay a reduced tuition fee of 1 400 Euro.

## Profile

Considering the many different aspects related to safety, quality, reliability, efficiency, technical and regulatory constraints, it is obvious that the correct management of industrial process operations is becoming increasingly complex.

At the same time, our modern society is being confronted with safety related problems in many different areas, such as traffic and transport, logistics, environment, consumer products, etc. There are, moreover, a growing number of rules and regulations on the European level with respect to health and safety issues.



The Master of Safety Engineering programme teaches students how to apply their knowledge and skills to the improvement and realisation of safety in the above-mentioned areas.

After finishing this advanced Master's study programme, the student should:

- have a broadly based knowledge of the different scientific disciplines that are needed to study and analyse the diverse technical and non-technical issues related to safety technology, risk management and loss prevention.
- have acquired the capabilities and competences to perform or co-ordinate a scientifically sound analysis of safety related problems and their solutions within the governing boundary conditions (legal, organisational, technical, environmental, etc.).

To attain the programme's objectives, teaching activities consist of a combination of classroom lectures, practically oriented seminars and site visits. The teachers themselves come from the academic world both inside and outside K.U.Leuven, or have been recruited from reputable industrial companies because of their long-standing expertise and willingness to contribute to teaching and training.

# Programme

## Programme structure

The Master of Safety Engineering is an advanced academic programme comprising a total of 60 credits. The programme consists of a group of common compulsory courses (23 credits). Furthermore, students choose between two options (22 credits each):

- Option Process Safety
- Option Prevention

Each option contains a number of compulsory courses (16 credits) and elective courses (6 credits). In addition, students have to complete a Master's thesis (15 credits).

The whole programme can be completed on a one-year, full-time basis. However, to facilitate the participation of active professionals, the programme can also be followed on a two-year, part-time basis. For the same reason, lectures are planned to take place during the academic semesters only on Wednesday, Friday and Saturday morning.

## Programme content

The common part of the programme contains themes that are of interest to every safety professional. After a general introduction, prevention policy and safety management systems are treated. Safety of products, processes and installations are discussed next and qualitative risk analysis techniques and fire and explosion safety complete this section.

The option **“Process Safety”** provides a detailed knowledge of technical and managerial process safety concepts with regard to the whole life cycle of a production plant from concept to design, construction and operation to decommissioning. Safety concepts of representative units (such as a reactor, distillation column, furnace, etc.) will be presented in a series of case studies. Examples of required safety oriented competences in industrial operations will also be discussed. Risk evaluations and estimates based on qualitative and quantitative methods will be performed. The courses also offer guidelines and training opportunities concerning the structuring, implementation and validation of process safety concepts.

The option **“Prevention”** focuses on occupational safety and related health issues. The courses in this option also discuss non-technical aspects concerning safety. This option is mainly of interest to candidates who, in addition to the Master's degree in Safety Engineering itself, want to obtain the “Certificaat Preventieadviseur Niveau 1”. Depending on the nature of industrial activities and the related risks, Belgian law requires a company to hire or even employ a holder of this certificate in the function of prevention adviser. Because this option is concerned with local Belgian occupational health and safety legislation, the compulsory option courses are taught in Dutch.

## MASTER OF SAFETY ENGINEERING

COURSES

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### Common compulsory courses (English) 23

• Introduction to Safety Engineering: General Introduction to Safety Engineering	3
• Prevention Policy and Safety Management Systems	3
• Safety of Chemical and Biological Products and Chemical Processes	4
• Safety Aspects of Industrial Installations	4
• Qualitative Risk Analysis Techniques	3
• Fire Protection and Building Safety	3
• Explosion Safety	3

### Option Process Safety (English) 16

#### Compulsory:

• Quantitative Risk Analysis Techniques	3
• Statistics for Safety Engineers	3
• Process Control and Safety of Digital Systems	3
• Selected Topics: Safety in Unit Operations	4
• Selected Topics: Competence in Operations	3

### Option Prevention (Dutch) 16

#### Compulsory:

• Inleiding tot de Veiligheidstechniek: Belgische Context en Groepsoverleg	2
• Juridische Aspecten van de Arbeidsveiligheid	3
• Ergonomie en Psychologische Aspecten van Arbeid en Gezondheid	6
• Medische Implicaties van de Veiligheid	5

### Option Process Safety (English) 6

#### Electives:

• Materials Selection	3
• Degradation and Corrosion	3
• Reliability and Safety of Nuclear Power Plants	3
• Advanced Process Control in the (Bio)Chemical Industry	3

### Option Prevention (English/Dutch) 6

#### Electives:

• Quantitative Risk Analysis Techniques	3
• Statistics for Safety Engineers	3
• Process Control and Safety of Digital Systems	3
• Milieubeveiliging (Environmental Safety Management)	3

### Master's Thesis 15

For detailed descriptions of this programme's courses and for the course timetable, please consult [www.kuleuven.be/onderwijs/aanbod/opleidingen/E](http://www.kuleuven.be/onderwijs/aanbod/opleidingen/E)

Within the option “Prevention” there is also an opportunity to obtain official recognition in Flanders as “Milieucoördinator Niveau A” by taking a limited number of extra courses under a credit contract.

It is, moreover, always possible to select a number of individual courses from the present programme to put together a package that responds to the specific needs of students. This way, for example, a well-selected group of courses from the Master of Safety Engineering programme constitutes a unique preparation for becoming an expert in safety reporting.

## Career prospects

In many countries, there is a permanent and growing need for scientists and engineers who are knowledgeable and trained on an academic level in the field of safety engineering and safety management. This is due to the increasing complexity of industrial production processes and the increase of rules and regulations both in Europe and internationally.

Graduates from the Master of Safety Engineering programme fill vacancies in smaller national and large multinational industrial companies at home and abroad, or are employed in private and/or governmental organisations. Such organisations need experts with the ability to conduct research, to carry out analyses, and to perform inspection, monitoring and certification in the broad field of safety.



Moreover, in some countries (including Belgium), companies dealing with specific risks and beyond a certain size are required by law to hire or even

employ a certified prevention adviser. This certification can be acquired through the option “Prevention” of the Master of Safety Engineering (Certificaat Preventieadviseur Niveau 1).

It is also possible for graduates to begin a career as an independent consultant with expertise in safety and environmental areas.

#### Communications Office

Oude Markt 13 box 5005  
BE-3000 LEUVEN, Belgium  
tel. + 32 16 32 40 10 • fax + 32 16 32 40 14  
onderwijscommunicatie@kuleuven.be  
www.kuleuven.be

## More information

[www.kuleuven.be/ma/MSAFETYENG](http://www.kuleuven.be/ma/MSAFETYENG)

### General Information

International programmes: [www.kuleuven.be/internationalprogrammes](http://www.kuleuven.be/internationalprogrammes)

International Office: [www.kuleuven.be/english](http://www.kuleuven.be/english)

### Programme Director

Prof. Jan Degrève

Chemical Engineering Department

tel. + 32 16 32 23 67

[jan.degreve@cit.kuleuven.be](mailto:jan.degreve@cit.kuleuven.be)

[www.kuleuven.be/studieaanbod/manamas/opleidingen/safetyengineering.htm](http://www.kuleuven.be/studieaanbod/manamas/opleidingen/safetyengineering.htm)



[www.scores4chem.be](http://www.scores4chem.be)



[www.essencia.be](http://www.essencia.be)

*This brochure provides the most complete and accurate information available concerning one of the Master's programmes offered at K.U.Leuven. Amendments to the composition of the programmes may, however, be approved at any time. Thus, for example, the study load of many Master's programmes may increase from 60 to 120 credits in the future. Consequently, K.U.Leuven is in no way legally bound by the information provided in this brochure. The most recent information on all our academic programmes may be consulted on [www.kuleuven.be/onderwijs/aanbod/opleidingen/E](http://www.kuleuven.be/onderwijs/aanbod/opleidingen/E)*

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