

# **Universiteit Gent**

## Master of Science in Fire Safety Engineering

27 January 2015

Initial accreditation

Panel report

## Table of contents

<b>1</b>	<b>Executive summary</b>	<b>3</b>
<b>2</b>	<b>Description of the programme</b>	<b>6</b>
2.1	Overview	6
2.2	Profile of the institution	6
2.3	Profile of the programme	6
<b>3</b>	<b>Assessment per standard</b>	<b>8</b>
3.1	Intended exit level (generic quality standard 1)	8
3.2	Teaching and learning process (generic quality standard 2)	10
3.3	Evaluation (generic quality standard 3)	15
<b>4</b>	<b>Discipline-specific learning outcomes (domeinspecifieke leerresultaten)</b>	<b>17</b>
<b>5</b>	<b>Assessment procedure</b>	<b>18</b>
5.1	The procedure	18
5.2	Panel report	19
<b>6</b>	<b>Overview of the assessments</b>	<b>20</b>
	<b>Annex 1: General information institution and programme</b>	<b>21</b>
	<b>Annex 2: Discipline-specific learning outcomes (domeinspecifieke leerresultaten)</b>	<b>23</b>
	<b>Annex 3: Composition of the panel</b>	<b>24</b>
	<b>Annex 4: Schedule of the site visit</b>	<b>25</b>
	<b>Annex 5: Documents reviewed</b>	<b>26</b>
	<b>Annex 6: List of abbreviations</b>	<b>27</b>

## 1 Executive summary

The Accreditation Organisation of the Netherlands and Flanders (NVAO) received a request for an initial accreditation procedure regarding the Master of Science in Fire Safety Engineering programme of Ghent University. NVAO convened an expert panel, which studied the information available and discussed the programme with the institution's and programme's representatives. In this executive summary, the panel will give their main considerations and conclusions on the three standards of the NVAO Assessment framework for the initial accreditation of higher education programmes in Flanders.

In the panel's opinion, the programme's objective to educate students to become experts in the fire safety engineering field is sound and realistic. The programme's discipline-specific learning outcomes are in line with this objective, comprising all elements, which graduates may need to attain this objective. The learning outcomes have been converted into a wide range of competencies. These specify in considerable detail the competencies the graduates are to master, such as in-depth knowledge about fire safety engineering, scientific skills, communication and cooperation skills, awareness of social and ethical aspects and specific capabilities in the engineering field. The programme meets the master's level, as the programme's intended learning outcomes conform to the official requirements of the Master of Science in Engineering Sciences (in Dutch: Master of Science in de Ingenieurswetenschappen) programmes in Flanders and to the dominant features of the Master of Science in Engineering Sciences-programmes of Ghent University. The panel regards the programme's focus on the performance-based design approach in fire safety engineering as a major contribution to the profile of the programme and as being proof of its innovative nature. In this respect, the programme will be very much comparable to other important programmes in the world in this domain. The programme definitely is of an academic level, stressing the scientific approach to subjects and problems in the fire safety engineering field. The support for the programme on the part of the professional field is very strong, so the panel observed. The panel welcomes this support, as it is an important sign of the relevance of the programme for the professional practice.

The panel regards the programme's organization to be solid and welcomes in particular the prominent role of the programme steering committee, which advises the programme director and monitors the contents and the delivery of the programme.

The programme's entry requirements and admission procedure are appropriate, but ought to be communicated more precisely. The programme management ensures the students, having different backgrounds, to have attained the same level after the first basic courses.

The curriculum not only matches the intended learning outcomes, but also is very relevant for the study of the fire safety engineering field. The curriculum focuses on core courses to acquaint students with the essentials of this discipline. In addition, the programme management has succeeded in constructing a predominantly academic programme, leaving ample space for professional aspects. The structure of the curriculum is adequate, leading the students from basic courses to advanced courses in fire safety engineering, culminating in the course Performance-Based Design and the Master's thesis. Lecturers meet on a regular basis, discuss the gaps between and the overlap of their courses and, in this way, ensure the coherence of the curriculum. The panel likes to add a few recommendations in

this respect. Firstly, the electives should be oriented more towards those, relevant for this programme and the number of English-spoken electives ought to be increased. Secondly, information about the usefulness of taking internships ought to be intensified. Thirdly, the panel suggests to complete the course descriptions and scrutinize them for misplaced parts.

The teaching methods in the programme are suitable, being in line with the University's policy. As formal ex cathedra lectures are the dominant teaching method in the first year, the panel suggests to introduce more variation in teaching methods, to promote the students' active participation.

The lecturers' qualifications are very appropriate for this programme. Not only are they experts in the disciplines they will be teaching but most of them also have ample experience in doing research, having published widely in their discipline. In addition, they have adequate teaching competencies. Though appropriate measures have been taken to select and monitor the large number of visiting professors, the panel advises to remain attentive in this respect.

The panel regards the programme's facilities to be at an international level, allowing the students to gain practical experience. The students tend to visit the laboratories only a few times during their study. The number of computers, including specialized software, available for the students, is satisfactory.

The panel regards the internal quality assurance system, as exemplified by the programme steering committee, the advisory board and the system of students' evaluations to be up to standard. The professional field is adequately represented in the advisory board, meeting regularly with the programme management. The panel feels, however, the evaluations' outcomes could be communicated more effectively among the lecturers.

The University's newly adopted examination policy, which will apply to this programme as well, is a positive step towards improving the examination practice in the University's programmes. As this policy has not yet been fully implemented, the panel advises the programme management to take additional measures to do so. The examination methods have been well chosen, ensuring the matching with the programme's learning outcomes. As a suggestion for further improvement, the panel recommends to specify the examination methods more clearly in the course descriptions. The guidance by the supervisors and promoters in the Master's thesis process is very appropriate, enabling the students to proceed in the right direction. The assessment of the Master's thesis is very adequate as well, as this assessment is in the hands of an examination committee, composed of no less than four or five expert examiners. On the other hand, the panel advises the programme management to complement the thesis assessment form in order to clarify the criteria that allow differentiating between satisfactory, good or excellent.

Given these considerations, the panel advises NVAO to take a positive decision regarding the accreditation of the Master of Science in Fire Safety Engineering programme of Ghent University.

The Hague, 27 January 2015

On behalf of the expert panel convened to assess the Master of Science in Fire Safety Engineering programme of Ghent University,

prof. em. ir. R. Van den Braembussche  
(panel chair)

drs. W.J.J.C. Vercouteren RC  
(secretary)

## 2 Description of the programme

### 2.1 Overview

Country	Flanders (Belgium)
Institution	Ghent University
Programme	Master of Science in Fire Safety Engineering
Specialisations	Not applicable
Language of instruction	English
Level and orientation	Initial master
Number of credits	120 EC
Location	Ghent
Study mode	Full-time
Domain of study	Applied sciences

### 2.2 Profile of the institution

Ghent University is one of the major universities in Flanders. The University has more than 41,000 students and about 9,000 employees. According to the University's website, Ghent University wants to be a socially committed and pluralistic university in a broad international perspective.

The University consists of eleven faculties, which are composed of 117 faculty departments, offering more than 230 programmes in various scientific disciplines, in the exact sciences as well as in the social sciences. The faculties conduct in-depth research from which the programmes benefit. One of the faculties of the University is the Faculty of Engineering and Architecture. This Faculty will be responsible for the proposed Master of Science in Fire Safety Engineering programme.

### 2.3 Profile of the programme

The proposed Master of Science in Fire Safety Engineering programme of Ghent University is an initial master's programme, allowing students with an applicable bachelor's degree to enter the programme. Ghent University intends to offer the programme for the first time in the year 2015/2016.

According to the application file, the proposed programme is a new programme for the institution. The programme is, also, a new programme for the higher education system in Flanders.

The curriculum of the programme consists of the following modules.

Modules	Credits
Introduction to Fire Dynamics	9.0 EC
Thermodynamics, Heat and Mass Transfer	6.0 EC
Basics of Structural Engineering	9.0 EC
Turbomachines	6.0 EC
First year, first semester	30.0 EC

Fluid Mechanics	6.0 EC
Fluid Mechanics Applications in Fire	6.0 EC
Risk Management	6.0 EC
Interaction between People and Fire	6.0 EC
Explosions and Industrial Fire Safety	6.0 EC
First year, second semester	30.0 EC
Computational Fluid Dynamics	3.0 EC
Passive Fire Protection	6.0 EC
Active Fire Protection I: Detection and Suppression	6.0 EC
Active Fire Protection II: Smoke and Heat Control	6.0 EC
Fire Safety and Legislation	3.0 EC
Elective social courses (to be spread over both semester of second year)	6.0 EC
Second year, first semester	30.0 EC
Performance-based Design	6.0 EC
Master's thesis	24.0 EC
Second year, second semester	30.0 EC
Total credits	120.0 EC

### 3 Assessment per standard

This chapter presents the evaluation by the assessment panel of the three standards, which the NVAO Assessment Framework is comprised of. The panel has reproduced the criteria for each standard. For each standard the panel presents (1) a brief outline of its findings based on the programme documents and on documents provided by the institution and the site visit, (2) the considerations the panel has taken into account and (3) the conclusion of the panel. The panel presents a conclusion for each of the three standards.

#### 3.1 Intended exit level (generic quality standard 1)

*With respect to level, orientation and content, the intended exit level reflects the current requirements that have been set for the programme by the professional field and/or discipline from an international perspective.*

##### *Outline of findings*

The objective of the Master of Science in Fire Safety Engineering programme is to enable students to become recognized experts in the field of fire safety engineering. The graduates may be regarded as experts being able to study fire safety engineering problems from different angles and to come up with answers to these problems

The programme management has drafted the discipline-specific learning outcomes to be attained by the programme's graduates (please refer to Annex 2 of this report for a complete list of these learning outcomes). These learning outcomes have been drawn up by the representatives of this programme, since no discipline-specific learning outcomes for programmes like this one were available in Flanders. These learning outcomes are to be distinguished from the general discipline-specific learning outcomes of Engineering Sciences. In line with Flemish regulations, the learning outcomes were presented to VLUHR, the Flemish Council of Institutions of Higher Education but have thus far not been validated by NVAO.

To be able to specify in more detail the learning goals the graduates of the programme have to meet, the programme management transferred the learning outcomes to a number of competencies the graduates ought to master upon completion of the programme. The competencies have been subdivided into groups, addressing knowledge-oriented, scientific, intellectual, societal and engineering competencies and competencies in cooperation and communication. Within these groups, the distinction has been made between competencies, which apply to all of the Master of Science in Engineering Science programmes of Ghent University and specific competencies, applicable to this programme only. The competencies specify in considerable detail the knowledge and skills the graduates of the programme should have attained at the completion of the programme.

The intended learning outcomes are geared towards the performance-based design approach within the domain of fire safety engineering. This approach is distinct from the older, regulatory approach. Whereas in the latter case fire safety is meant to be ensured by regulations applying to constructions, the performance-based design approach intends to incorporate the fire safety conditions in the design of the construction or building. The regulatory approach is still dominant in most of the countries in Europe. In Great-Britain and



in Scandinavia, however, the performance-based design approach has been introduced and is being implemented as a new and superior method for fire safety engineering. This programme of Ghent University has the intention of familiarizing students with this new approach, thereby promoting the application of innovative methods in fire safety engineering in Flanders. The intended learning outcomes of this programme are in line with those of other programmes in the world, equally adopting the performance-based design approach. The learning outcomes, also, correspond to the framework and model curriculum of the International Association for Fire Safety Science, which serves as a framework for these performance-based design oriented programmes.

Currently, Ghent University participates in a joint-degree programme with Lund University and University of Edinburgh with similar learning outcomes and with a similar curriculum like this programme. One of the reasons to try and offer this programme, is that the tuition fees and the costs for studying one semester abroad of the joint-degree programme are quite considerable. For this programme, lower tuition fees will apply and more students may, therefore, be in a position to take these courses.

The programme management ensured the programme's learning outcomes to conform to the discipline-specific learning outcomes of the Master of Science in Engineering Sciences (in Dutch: Master of Science in de Ingenieurswetenschappen), which have been approved by VLUHR in 2012. In addition, in the programme's competencies the generic competencies of the Master of Science in Engineering Sciences programmes of Ghent University have been incorporated. Therefore, the learning outcomes meet the Flemish Master of Science in Engineering Sciences programmes' requirements and correspond to the master's level.

As the programme management informed the panel, this programme is meant to be much more academic than professional. The intended learning outcomes testify to this claim. The graduates of the programme may continue their careers in the professional field as experts in this domain. They are, also, qualified to become researchers and to enter into a PhD-trajectory. Research in this field may entail the study of new methods and techniques in fire safety engineering.

In the application file, the programme management included a substantial number of letters from organizations working in the fire safety engineering field, supporting the intention of Ghent University to offer this programme. The representatives of the professional field with whom the panel has met, have likewise expressed their support for this programme, emphasizing the importance of the performance-based design approach for the innovation of the fire safety engineering field.

#### *Considerations*

The panel supports the objective of the programme management to educate students to become experts in the fire safety engineering field and is of the opinion this objective is realistic. The discipline-specific learning outcomes, which the programme management has drafted, are in line with this objective, comprising all the elements, which the graduates may need to attain this objective.

In the panel's view, the programme management has ensured the intended learning outcomes to conform to the Flemish Master of Science in Engineering Sciences discipline-specific learning outcomes. Therefore, the programme meets the official requirements for these programmes in Flanders. The panel feels that the specificities of the Fire Safety

Engineering are an important feature of this programme and have been addressed in an appropriate way.

As a next step, these intended learning outcomes have adequately been converted into a wide range of competencies the graduates are to master. The panel has studied these competencies and has verified that these on the one hand conform to the intended learning outcomes and on the other hand specify the competencies for relevant domains like in-depth knowledge about fire safety engineering, scientific skills, skills with regard to communication and cooperation, awareness of social and ethical aspects and specific capabilities in the engineering field.

The panel is convinced the programme meets the master's level. This has appropriately been demonstrated by the comparison of the programme's intended learning outcomes with the official requirements of the Master of Science in Engineering programmes in Flanders and with the dominant features of the Master of Science in Engineering-programmes of Ghent University.

The panel welcomes the programme's focus on the performance-based design approach in the fire safety engineering field. The panel regards this focus to contribute to the profile of the programme and to be proof of its innovative nature. As the programme management has shown, this programme will be very much comparable to other important programmes in the world in this domain.

In the panel's opinion, this programme definitely is an academic programme, emphasizing the scientific approach to subjects and problems in the fire safety engineering field. The support for the programme on the part of the professional field is very strong, so the panel observed. The panel welcomes this support, as it is an important sign of the relevance of the programme for the professional practice.

#### *Conclusion*

The panel assesses the generic quality standard 1 *Intended exit level* as satisfactory.

### **3.2 Teaching and learning process (generic quality standard 2)**

*The teaching and learning process makes it possible for the students to realize the intended learning outcomes.*

#### *Outline of findings*

The programme steering committee is the most important body within the programme, advising the programme director and being primarily responsible for the contents and the delivery of the programme. This committee is composed of core lecturers, visiting professors, assistant lecturers, students and a representative of the administrative and technical staff. The steering committee monitors on a regular basis the curriculum and the delivery of the programme and decides on revisions of and innovations in the programme. The committee convenes two to three times per year.

In the programme's application file, a number of bachelor degrees have been listed, which give direct access to this programme. These bachelor degrees are Bachelor of Science in Engineering programmes with specific specializations. In his meeting with the panel, the

dean of the Faculty of Engineering and Architecture indicated about four or five bachelor's programmes giving direct admission to the programme. Students with other bachelor diplomas may either obtain admission after the programme management has studied their dossier or may be admitted, after having completed pre-master's programmes to remediate any deficiencies they may have. Students from abroad may only enter the programme, if the programme steering committee has approved the level and quality of their prior education.

The incoming students will come from a variety of backgrounds, having bachelor diplomas in different domains. So, their knowledge and skills may differ as well. In the first modules of the first semester of the programme, the lecturers endeavour to bring all of the students, regardless of the domain of their prior bachelor education, to the same level. The lecturers of modules like Thermodynamics, Heat and Mass Transfer and Basics of Structural Engineering have informed the panel they are bringing these students to the same level by advising them to study additional literature, by clarifying specific topics and by offering extra lectures on subjects. The learning goals of these modules are the same for every student.

The courses of the curriculum have been compared with the intended learning outcomes and the relations between these two elements have been made visible in a table. From this table, may be derived that all of the intended learning outcomes are covered in the courses.

The curriculum is composed of three basic courses at the beginning of the programme (24 EC), acquainting the students with the fundamentals of fire safety engineering and, as has been indicated above, bringing them to the same level. In the remainder of the programme, students take advanced courses in this domain (54 EC). In addition, two broadening courses Turbomachines and Fluid Mechanics (12 EC) are offered. Students are allowed to choose one or two electives, mainly addressing social aspects (6 EC). At the end of the curriculum, they complete their study with the Master's thesis (24 EC). All of the courses in the programme are taught in English.

The curriculum has a definite structure. After the students have taken the basic courses, they proceed with the advanced courses, addressing various aspects of fire safety engineering. A number of these are to be regarded as supporting courses, going into specific topics like risk management, legislation and human behaviour. These courses allow the students to integrate these subjects in the main specialist fire safety engineering courses. At the end of their study, the students test their knowledge and skills in the final course Performance-Based Design and in the Master's thesis.

In the curriculum, much attention is devoted to topics regarding fire containment and damage control. Having discussed this item with the programme's representatives, the panel concludes fire prevention issues are addressed as well in a number of courses.

The programme management estimates about 85 % of the courses to be predominantly academic, whereas the remaining 15 % are of a primarily professional nature. An example of the latter category is the course Basics of Structural Engineering.

The programme steering committee has listed a number of courses the students may choose from for their electives. Students are allowed to take courses not on this list, but approval by the programme steering committee is then required. Not all of these courses are given in English, so the panel noted.

The curriculum does not include a mandatory internship. Students may take the internship as one of their electives, but it is not compulsory. The programme management recognizes the added value of an internship, but is reluctant to make it obligatory because of practical considerations.

Course descriptions have been drafted for all of the courses. In these course descriptions, the learning goals, the course contents, the teaching methods, the literature to be studied and the examination methods have been specified. In the first lecture of the courses, the students are informed about the set-up and the characteristics of the course.

The Ghent University policy regarding course contents and teaching methods has been summarized under the name of *creative knowledge development*. The programme management has adopted this policy, which at the same time stresses the importance of knowledge acquisition and the relevance of applying this knowledge in a creative way. The teaching methods in the programme constitute lectures, aimed at knowledge transfer, seminars and guided exercises, meant to allow students to apply their knowledge in cases, models, exercises and experiments and project work, with the objective of learning students to solving problems in groups, addressing their cooperation and communication skills. As part of their group work, the students have to write reports and present their findings. In the basic courses the lectures dominate, while in the advanced courses the study methods tend to be more diverse.

The lecturers discuss their courses and the relations between these in the programme steering committee meetings and in separate sessions. They do so to avoid gaps between the courses and to prevent overlap of the courses. The lecturers told the panel they deliberately introduce some overlap between courses to highlight topics and approach these from different angles, in order to enhance the understanding on the part of the students. As a consequence, some topics may feature in more than one course.

The programme steering committee is responsible for selecting the lecturers for the programme. Most lecturers are researchers in their discipline, being members of a research group. The programme steering committee asks these for lecturers with specific expertise and appoints these lecturers, after having established they have the expertise required. Some of the lecturers are members of international organisations in this field.

A considerable number of lecturers are visiting professors. They may be researchers, but they may also come from the professional field. Some of them, so the panel noted, do not have a PhD. An ad hoc committee, representing the programme steering committee, checks these professors' qualifications, including their educational capabilities before they are allowed to lecture in the programme. The programme management continues to monitor their performance, by considering the students' evaluation results, among others.

The students of the joint-degree programme informed the panel that the lecturers tend to refer to their research in the lectures.

The representatives of the professional field informed the panel they met with the programme steering committee and were given the opportunity to bring forward topics which they felt are important. The steering committee was receptive to their suggestions and introduced a number of subjects in the curriculum. To maintain contact with the professional field, the programme management installed an advisory board, which meets on a regular

basis with the programme management and discusses the programme from the perspective of the needs of the professional practice.

The study progress of every student is being monitored by the programme management. If a student does not have satisfactory results after the first semester, one of the staff will meet with the student and discuss the reasons for this in order to remedy any problems. The students from abroad will be welcomed by the programme management and will be informed about the programme. These students are entitled to specific facilities, like housing and library opening hours in the evening and in the weekend. Every student may turn to one of the lecturers if he or she feels having been treated wrongly. If the complaint is not resolved, the student has the right to go to one of the Faculty's ombudspersons.

In the programme, students' opinions are requested regularly in the form of evaluations. The students of the joint-degree programme informed the panel suggestions by the students are acted upon by the programme management.

In the application file, the programme management made clear practically no investments may be required for this programme, since nearly all of the courses have already been designed and developed for other engineering programmes at the Faculty or for the joint-degree programme.

#### *Considerations*

The panel regards the organization of the programme to be solid and is particularly positive about the role the programme steering committee intends to fulfil in advising the programme director and in monitoring the contents and the delivery of the programme.

The panel is of the opinion the entry requirements and the admission procedure the programme management has put in place, tend to be appropriate. The panel advises, however, to be more precise and transparent about those requirements, since the information in the application file seems to differ somewhat from the statements by the programme's representatives.

The programme management has taken appropriate measures to bring students, having different bachelor diplomas, to the same level after the first basic courses. The lecturers of these courses were convincing about the various methods they planned to introduce to this effect.

The panel observed the curriculum meets the intended learning outcomes completely and appropriately. All the intended learning outcomes are being met in the courses and this is done in a clear and straightforward manner. The panel considers the curriculum contents not only to meet the intended learning outcomes, but also to be very relevant for the study of the field of fire safety engineering. In the curriculum, no nice-to-know courses feature which may distract students from the core of this discipline. The programme management has succeeded in constructing a predominantly academic programme, leaving ample space for professional aspects. The panel would, however, like to add a few recommendations in this respect. The list of electives the students may choose from, is rather long, not all of these electives seem to be equally relevant for this programme and some of these are taught in Dutch. So, the panel recommends limiting the list of electives to those, most relevant and to increase the number of English-spoken electives. Another advice concerns the internship.

Since taking an internship is very useful for the students, the panel recommends to emphasize more strongly the importance of internships among the students.

The panel assesses the structure of the curriculum to be adequate, leading the students from basic courses to advanced courses in fire safety engineering and culminating in the course Performance-Based Design and the Master's thesis. As the lecturers regularly meet to discuss the gaps between and the overlap of their courses, the panel regards the coherence of the curriculum to be satisfactorily ensured.

Although the course descriptions generally provide accurate information about the courses, some of these seem to be less precise and partly even seem to be duplicates. Therefore, the panel suggests completing and scrutinizing the course descriptions and eliminating parts which may be misplaced.

The panel regards the teaching methods the programme management wants to adopt to be appropriate, being in line with the University's policy. On the other hand, the panel noted the formal ex cathedra lectures teaching method to be very dominant, especially in the first year. The panel would like to suggest to introduce alternative teaching methods in this first year to promote the active participation in the classroom on the part of the students.

The panel studied the curricula vitae of the lecturers. In the panel's opinion, the qualifications of the lecturers are very appropriate for the programme. Not only are the lecturers experts in the disciplines they will be teaching but most of them also have ample experience in doing research, having published widely in their discipline. The lecturers are experienced lecturers and have adequate teaching competencies. All in all, the panel is very positive about these lecturers. Although the programme management has taken appropriate measures to select and monitor the large number of visiting professors in the programme, the panel recommends to remain attentive in this respect.

The panel visited the laboratories which some lecturers and the students in the programme have access to. The panel considers these facilities to be of a high level, allowing the students to gain practical experience. The students tend to visit these laboratories only a few times during their study and the panel, therefore, hopes the frequency may increase. The number of computers, including specialized software, available for the students, is satisfactory.

The panel observed that the professional organisations having a seat on the advisory board, constitute a wide and rich variety of profit and not-for-profit organisations, active in the field of fire safety engineering and are, therefore, a fair representation of the professional field.

The panel regards the internal quality assurance system, as exemplified by the programme steering committee, the advisory board and the system of students' evaluations to be up to standard. The panel feels, however, the outcomes of the evaluations by the students could be communicated more effectively among the lecturers.

#### *Conclusion*

The panel assesses the generic quality standard 2 *Teaching and learning process* as satisfactory.

### 3.3 Evaluation (generic quality standard 3)

*The programme has an assessment policy that sets up a sufficient evaluation system to ascertain whether the intended learning outcomes are being achieved.*

#### *Outline of findings*

Ghent University is in the process of implementing a new examination policy, being called the *institutional evaluation concept*. This policy specifies, among other, that every intended learning outcome of a programme has to be covered by at least two courses. In addition, the policy stipulates that the examinations in the programme have to meet criteria regarding their validity, reliability and transparency. Obviously, the University's policy in this respect will apply to this programme as well.

The programme management listed a number of examination methods which will be adopted in the courses. These methods have been selected in accordance with the competencies derived from the programme's intended learning outcomes. The examination methods are, among others, written multiple-choice or open questions examinations (meant to test knowledge c.q. understanding of students), written open book examinations (meant to test students' understanding), oral examinations (meant to probe students' knowledge in a specific domain), behavioural evaluation on the work floor (meant to verify whether students are able to perform complex tasks over a prolonged period of time), assignment results (test by means of the end result of an assignment in the form of a report, scale-model, design or paper and, in some cases, a presentation) and participation (meant to test the degree of active participation on the part of the students in class). From a frequency distribution, presented by the programme management may be derived that oral examinations and written open book examinations are the dominant examination methods. By using various examination methods specific aspects of the students' performance and capabilities may be tested. As has been mentioned under standard 2, the examination methods for each of the courses have been indicated in the course descriptions. The lecturers are the examiners of their course, having the authority to grade the examinations, as long as they may be able to justify their grading if asked to do so. Upon request, the students will be given an explanation of their grade.

Regarding the Master's thesis, the students are to look for a suitable subject in the second semester. Almost always, the theses' subjects are part of ongoing research in the Faculty. The students conduct their research and write the thesis in the third and fourth semester. The students are entitled to a thesis supervisor who guides them through the process, acting on behalf of the thesis promotor. The meetings between the supervisors and students are weekly. The supervisors meet regularly to discuss their findings. The promotors will give feedback to the students during the process. This is not an assessment but more of a check on the students' progress.

The thesis supervisors and promotors are to check theses with regard to plagiarism. The programme management does not intend to use plagiarism detection software, because the theses often will contain formulas and drawings which may not be detected by this software.

For the assessment of the Master's thesis, the programme management drafted an assessment form. The student's performance is evaluated on the basis of the work done, the quality of the written thesis and the oral defence of the thesis on the part of the student. For each of these categories, a number of criteria have been specified, giving the examiners

a means to substantiate their assessment. Assessment forms will only be accepted, if all of the criteria have been assessed and all of the concluding items have been filled out.

The assessment of the Master's thesis is in the hands of an examination committee, consisting of four to five examiners among whom the promotor, the co-promotor and an external expert.

#### *Considerations*

The panel considers the University's newly adopted examination policy to be sound and a positive step towards improving the examination practice in the University's programmes, including this programme. At the same time, the panel notes the programme's examination practice does not yet conform to the University's new policy and recommends the programme management to take additional measures to implement this policy.

The panel regards the examination methods to be well chosen, as these have been selected to reflect the competencies to be tested. This ensures the correspondence between the programme's intended learning outcomes and the examination methods. The panel noted that the examination methods include reporting and presentation skills and welcomes these as being very useful for students to master. The panel would like to recommend the programme management to describe the examination methods more explicitly and clearly in the course descriptions.

The guidance by the supervisors and the promotors during the Master's thesis process is very appropriate, allowing the students to meet regularly with their supervisors and guiding them in the right direction. The panel considers the assessment of the Master's thesis by the examination committee to be very solid and reliable, as this examination committee is composed of no less than four or five expert examiners. On the other hand, the panel finds the Master's thesis assessment form to be of a somewhat general nature. Therefore, the panel advises the programme management to review this form in order to more explicitly describe the evaluation criteria and level.

#### *Conclusion*

The panel assesses the generic quality standard 3 *Evaluation* as satisfactory.



#### **4 Discipline-specific learning outcomes (domeinspecifieke leerresultaten)**

The programme management drafted the discipline-specific learning outcomes for this programme. These learning outcomes have been drawn up especially for this programme, since no discipline-specific learning outcomes for programmes like this one were available in Flanders. The learning outcomes do, however, conform to the discipline-specific learning outcomes of the Master of Science in Engineering Sciences programmes (in Dutch: Master of Science in de Ingenieurswetenschappen), which have been approved by Flemish Council of Institutions of Higher Education (VLUHR) in 2012.

As the panel has established, the discipline-specific learning outcomes of the intended Master of Science in Fire Safety Engineering programme are in line with the Flanders qualifications structure (Vlaamse Kwalificatiestructuur; VKS). The discipline-specific learning outcomes conform to the level 7 descriptors of this qualifications structure (VKS) and, therefore, meet the requirements of master's programmes.

The panel accepts the discipline-specific learning outcomes of this programme and regards these as being a sound representation of the programme's objectives. The programme management has submitted the learning outcomes to VLUHR. The panel advises NVAO to validate the programme's discipline-specific learning outcomes.

## 5 Assessment procedure

### 5.1 The procedure

NVAO received a request for an initial accreditation procedure regarding the proposed Master of Science in Fire Safety Engineering programme. The request was submitted by the Rector of Ghent University on 4 June 2014.

NVAO has convened a panel of experts. The panel consisted of:

- prof. em. ir. R. Van den Braembussche, Honorary professor in Turbomachinery and Propulsion, Von Karman Institute, panel chair;
- ir. J. Bens, Director General, Federal Agency for Nuclear Control, panel member;
- prof. dr. P. Van Petegem, full professor Education Science, Antwerp University, panel member;
- D. Van Isterdael, alumnus master's programme in Electromechanical Engineering, Vrije Universiteit Brussel, student member.

On behalf of the NVAO, drs. L. Meijer, NVAO policy advisor, was responsible for the process-coordination. Drs. W. Vercouteren RC, secretary, drafted the experts' report.

The panel's composition reflects the expertise deemed necessary by NVAO (please refer to Annex 1: Composition of the panel). All the panel members as well as the secretary have signed a statement of independence and confidentiality.

The panel based their assessment on the standards and criteria described in the NVAO Assessment framework for the initial accreditation of higher education programmes in Flanders, 2<sup>nd</sup> round, dated 25 January 2013.

The following procedure has been undertaken. The panel members studied the documents (please refer to Annex 3: Documents reviewed) with regard to the proposed programme. Their first impressions were sent to the secretary of NVAO, who listed these remarks and questions, to be clarified during the site visit.

Based on their preliminary findings, the panel held a preparatory meeting on 26 November 2014. During this meeting, the panel discussed their findings and listed a number of questions to be put to the programme's representatives during the site visit. The site visit took place on 27 November 2014 at the Ghent University campus (please refer to Annex 2: Schedule of the site visit). The discussions during the site visit were, in the panel's opinion, more informative than the application file, presented before the site visit. These discussions allowed the panel to obtain an in-depth view of the programme's main characteristics and the programme's dominant features.

Immediately after the site visit, the panel shared their assessments for the standards of the NVAO Assessment framework. These assessments were based on the findings during the site visit, building upon the review of the programme documents.

Thereupon, the secretary drew up a draft report, sending this to the panel members. The panel members forwarded their comments and amendments. These comments having been included in the text by the secretary, the report was approved by the Ghent University and finalised on 27 January 2015.

## 5.2 Panel report

The first chapter of this report is the executive summary of the report.

The second chapter gives a brief description of the programme including its position within Ghent University and within the Flanders higher education system.

The panel presented its assessments in the third chapter. The programme has been assessed using the standards in the NVAO Assessment framework for the initial accreditation of higher education programmes in Flanders. For each of the standards the panel presented an outline of their findings, considerations and a conclusion.

The *outline of the findings* are the objective facts as found by the panel in the programme documents, in the additional documents and during the site visit. The panel's *considerations* are the panel's evaluations with regards to these findings. The *considerations* presented by the panel logically lead to a concluding assessment.

The panel concludes the report with a table containing an overview of their assessments per standard.

## 6 Overview of the assessments

The panel presents their assessments per generic quality standard, as outlined in chapter 3, in the following table.

Generic quality standard	Assessment
1 Intended exit level	Satisfactory
2 Teaching and learning process	Satisfactory
3 Evaluation	Satisfactory
Programme as a whole	Satisfactory

## Annex 1: General information institution and programme

Naam, adres, telefoon, e-mailadres, website instelling	Universiteit Gent Sint-Pietersnieuwstraat 25 9000 GENT
Status instelling	ambtshalve geregistreerd
Naam associatie	Associatie Universiteit Gent
Naam, functie, telefoon, e-mail contactpersoon	Kristiaan Versluys hoofd Directie Onderwijsaangelegenheden 09 331 00 21 kristiaan.versluys@ugent.be
Naam opleiding (graad, kwalificatie, specificatie)	Master of Science in Fire Safety Engineering
Niveau en oriëntatie	Master of Science
Bijkomende titel	Burgerlijk ingenieur
(Delen van) studiegebied(en)	Toegepaste wetenschappen
Opleidingsvarianten: – Afstudeerrichtingen – Studietraject voor werkstudenten	Niet van toepassing
Onderwijstaal	Engels
Vestiging(en) opleiding	Gent
Studieomvang (in studiepunten)	120
Nieuwe opleiding voor Vlaanderen	Ja
Aansluitingsmogelijkheden en mogelijke vervolgopleidingen	Bachelor of Science in de ingenieurswetenschappen: bouwkunde; Bachelor of Science in de ingenieurswetenschappen, afstudeerrichting: bouwkunde; Bachelor of Science in de ingenieurswetenschappen: chemische technologie en materiaalkunde; Bachelor of Science in de ingenieurswetenschappen, afstudeerrichting: chemische technologie; Bachelor of Science in de ingenieurswetenschappen, afstudeerrichting: materiaalkunde; Bachelor of Science in de ingenieurswetenschappen, afstudeerrichting: chemie en materialen; Bachelor of Science in de ingenieurswetenschappen: werktuigkunde-elektrotechniek; Bachelor of Science in de ingenieurswetenschappen, afstudeerrichting:

	werktuigkunde, nevenrichting elektrotechniek; Bachelor of Science in de ingenieurswetenschappen, afstudeerrichting: werktuigkunde-elektrotechniek; Bachelor of Science in de ingenieurswetenschappen: architectuur.
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## **Annex 2: Discipline-specific learning outcomes (domeinspecifieke leerresultaten)**

The programme management drafted the programme's discipline-specific learning outcomes. According to these learning outcomes, the graduates should be able to:

- Demonstrate knowledge of and understanding in fire safety engineering, including both broad scientific knowledge of the field and substantially deeper knowledge of at least one subfield.
- Possess deeper insight into current research and development work in fire safety engineering.
- Demonstrate advanced knowledge of and understanding in thermodynamics and fluid mechanics.
- Demonstrate basic knowledge of and understanding in structural engineering.
- Critically and systematically integrate knowledge and analyze, assess and deal with complex fire safety engineering related phenomena, issues and situations within specified time limits, even when limited information is available.
- Present and discuss conclusions on the basis of scientifically founded knowledge and arguments, in dialogue with different groups, orally and in writing, in national and international contexts.
- Demonstrate skills required to participate in research and development or to work in other specialized professional contexts.
- Assess performance-based design in the context of fire safety engineering, taking into account relevant human behavior, scientific, social, economic and ethical aspects, and demonstrate awareness regarding ethical aspects in research and development.
- Demonstrate insight in the potential and limitations of fire safety engineering, taking into account user responsibility.
- Demonstrate the ability to identify the need to expand and develop knowledge.

## Annex 3: Composition of the panel

The composition of the panel that assessed the quality of the Master of Science in Fire Safety Engineering programme of Ghent University was as follows:

- prof. em. ir. R. Van den Braembussche, Honorary professor in Turbomachinery and Propulsion, Von Karman Institute, panel chair
- ir. J. Bens, Director General of Federal Agency for Nuclear Control, panel member
- prof. dr. P. Van Petegem, full professor Education Science, Antwerp University, panel member
- D. Van Isterdael, alumnus master's programme in Electromechanical Engineering, Vrije Universiteit Brussel, student member.

prof. em. ir. R. Van den Braembussche, panel chair

Mr Van den Braembussche is Honorary professor in Turbomachinery and Propulsion at Von Karman Institute, since 2009. Previously, he was a professor at Vrije Universiteit Brussel, University of Genova and Von Karman Institute. In his career, he has won a number of awards, among which the Association of European Research Establishments in Aeronautics Best Paper Award in 2011. Mr Van den Braembussche served on a number of committees in his area of expertise.

ir. J. Bens, panel member

Since January 2013, Mr Bens is Director General of Belgian Federal Agency for Nuclear Control. Previously, he held a number of positions in the energy sector, among which the position of Deputy Director at WANO and the position of advisor and of Station Director at Electrabel. Mr Bens studied at Vrije Universiteit Brussel and took his master's in Computer, Information and Control Engineering at University of Michigan.

prof. dr. P. Van Petegem, panel member

Mr Van Petegem is a full professor in Educational Science at Institute of Educational and Information Sciences of Antwerp University. In 1997, he obtained his PhD on a subject regarding self-assessment by schools. He is the head of the Edubron research group of Antwerp University. Mr Van Petegem served on numerous accreditation panels and has published widely in his field of expertise.

D. Van Isterdael

Mr Van Isterdael recently graduated from the master's in Electromechanical Engineering programme of Vrije Universiteit Brussel. From 2010 till 2013, he served as a student member on the governing board of Faculty of Engineering of Vrije Universiteit Brussel. Also, Mr Van Isterdael was the chair of the polytechnische kring vzw. Mr Van Isterdael promotes student participation in higher education.



## Annex 4: Schedule of the site visit

The site visit by the panel to the programme was conducted on 27 November 2014 as part of the external assessment procedure regarding the Master of Science in Fire Safety Engineering programme of Ghent University.

09.00 h. – 10.00 h.	Panel arrival, deliberations and document study (closed session)
10.00 h. – 11.00 h.	Programme management prof. B. Merci, prof. L. Taerwe, prof. J. De Saedeleer
11.00 h. – 12.00 h.	Lecturers prof. E. Annerel, prof. T. De Mulder, prof. I. Stankovic, prof. J. Degroote, prof. K. Van Tittelboom
12.00 h. – 12.10 h.	prof. K. Versluys (director of Education)
12.10 h. – 13.00 h.	Lunch and document study panel (closed session)
13.00 h. – 13.45 h.	Students J. Vandekerckhove, D. Van Haverbeke, H. Hiemstra
14.00 h. – 14.30 h.	Faculty's representatives prof. R. Van de Walle (dean Faculty of Engineering and Architecture), prof. J. Vierendeels (department chair)
14.45 h. – 15.30 h.	Representatives of the professional field F. Bonte (BelV), C. Gryspeerd (Flanders Fire Association), B. Sette (WFR Ghent), D. Du Tré (Agoria)
15.30 h. – 16.45 h.	Visit to programme's facilities
16.45 h. – 17.30 h.	Deliberations panel (closed session)

## **Annex 5: Documents reviewed**

The programme management presented the following documents prior to the site visit:

- Application file Master of Science in Fire Safety Engineering programme accreditation
- Positive results of macro-efficiency check for this programme
- Positive advice by Ghent University Association regarding this application
- Statements of approval regarding the need for this programme by companies and institutions, operating in this field
- Study programme 2015/2016
- Framework of discipline-specific intended learning outcomes
- Table with relationships between intended learning outcomes and courses
- Course specifications
- Curricula vitae of lecturers
- Glossary of evaluation methods
- Master's thesis evaluation form

During the site visit the programme management presented the following documents:

- Teaching and examination regulations
- Course descriptions
- Course material
- Examinations
- Literature to be studied
- Internship reports
- Assessment form internship
- Programme committee minutes
- Results of students' evaluations

## **Annex 6: List of abbreviations**

EC	credits according to the European Credit Transfer System
NVAO	Dutch-Flemish Accreditation Organization (Nederlands-Vlaamse Accreditatie Organisatie)

The panel report has been ordered by NVAO for the initial accreditation of the Master of Science in Fire Safety Engineering programme of Ghent University.

Accreditation Organisation of the Netherlands and Flanders (NVAO)

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