MASTER’S PROGRAMME
SCIENCE AND TECHNOLOGY OF NUCLEAR FUSION

DEPARTMENT OF APPLIED PHYSICS
DEPARTMENT OF MECHANICAL ENGINEERING
DEPARTMENT OF ELECTRICAL ENGINEERING
EINDHOVEN UNIVERSITY OF TECHNOLOGY
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This report was finalized on 23 September 2019
REPORT ON THE MASTER’S PROGRAMME SCIENCE AND TECHNOLOGY OF NUCLEAR FUSION OF EINDHOVEN UNIVERSITY OF TECHNOLOGY

This report takes the NVAO’s Assessment Framework for Limited Programme Assessments as a starting point (September 2018).

ADMINISTRATIVE DATA REGARDING THE PROGRAMME

Master’s programme Science and Technology of Nuclear Fusion
Name of the programme: Science and Technology of Nuclear Fusion
CROHO number: 66904
Level of the programme: master’s
Orientation of the programme: academic
Number of credits: 120 EC
Location(s): Eindhoven
Mode(s) of study: full time
Language of instruction: English
Accreditation deadline: 1 November 2019

The visit of the assessment panel Nuclear Fusion to the Graduate School of Eindhoven University of Technology took place on 20 June 2019.

ADMINISTRATIVE DATA REGARDING THE INSTITUTION

Name of the institution: Eindhoven University of Technology
Status of the institution: publicly funded institution
Result institutional quality assurance assessment: positive

COMPOSITION OF THE ASSESSMENT PANEL

The NVAO has approved the composition of the panel on 15 April 2019. The panel that assessed the master's programme Science and Technology of Nuclear Fusion consisted of:

- Em. Prof. G. (Guido) Van Oost, professor at the National Research Nuclear University "MEPHI" (Moscow, Russia) and the National Research University "Moscow Power Engineering Institute", (Moscow, Russia), and emeritus professor Nuclear Fusion at Ghent University [chair];
- Dr. A. (Alberto) Loarte, Head of Science Division, Science and Operations Department, ITER Organization (France);
- Dr. ir. G.C. (Cornelise) Vreman-De Olde, educational advisor, trainer and researcher at the Centre for Expertise in Learning & Teaching at Twente University;
- F. (Floris) Heeres BSc., master's student Aerospace Engineering at Delft University of Technology [student member].

The panel was supported by P.A. (Peter) Hildering, MSc., who acted as secretary.
WORKING METHOD OF THE ASSESSMENT PANEL

The master’s programme Science and Technology of Nuclear Fusion jointly offered by the departments of Applied Physics, Mechanical Engineering and Electrical Engineering of Eindhoven University of Technology was assessed as a stand-alone programme.

The QANU project manager for the assessment was P.A. (Peter) Hildering, MSc. He also acted as secretary during the site visit at Eindhoven University of Technology.

Preparation
On April 5, 2019, the panel chair was briefed by the project manager on the tasks and working method of the assessment panel and more specifically his role, as well as use of the assessment framework. A schedule for the site visit was composed. Prior to the site visit, representative partners for the various interviews were selected. See Appendix 4 for the final schedule.

Before the site visit, the programme wrote a self-evaluation report and sent this to the project manager. He checked these on quality and completeness, and sent it to the panel members. The panel members studied the self-evaluation report and formulated initial questions and remarks, as well as positive aspects of the programmes.

The panel also studied a selection of theses. The selection existed of 15 theses and their assessment forms for the programmes, based on a provided list of graduates between 2017 and 2018. A variety of topics and a diversity of examiners were included in the selection. The project manager and panel chair assured that the distribution of grades in the selection matched the distribution of grades of all available theses.

Site visit
The panel held a preparatory panel meeting on June 19, 2019. During this meeting, the panel members received instructions on the tasks and working method and the use of the assessment framework(s). The panel also discussed its initial findings on the self-evaluation report and the theses, as well as the division of tasks during the site visit.

The site visit to Eindhoven University of Technology took place on 20 June 2019. During the site visit, the panel studied additional materials about the programmes and exams, as well as reports of the Board of Examiners. An overview of these materials can be found in Appendix 5. The panel conducted interviews with representatives of the programmes: students and staff members, the programme’s management, alumni and representatives of the Board of Examiners and the Programme Committee. It also offered students and staff members an opportunity for confidential discussion during a consultation hour. No requests for private consultation were received.

The panel used the final part of the site visit to discuss its findings in an internal meeting. Afterwards, the panel chair publicly presented the panel's preliminary findings and general observations.

Report
After the site visit, the secretary wrote a draft report based on the panel’s findings and had it checked by a colleague for peer assessment. Subsequently, the secretary sent the report to the panel. After processing the panel members’ feedback, the project manager sent the draft report(s) to the faculty in order to have it/these checked for factual irregularities. The project manager discussed the ensuing comments with the panel’s chair and changes were implemented accordingly. The report was then finalised and sent to the department of Applied Physics and University Board.

Definition of judgements standards
In accordance with the NVAO’s Assessment framework for limited programme assessments, the panel used the following definitions for the assessment of both the standards and the programme as a whole.
Generic quality
The quality that, from an international perspective, may reasonably be expected from a higher education Associate Degree, Bachelor’s or Master’s programme.

Meets the standard
The programme meets the generic quality standard.

Partially meets the standard
The programme meets the generic quality standard to a significant extent, but improvements are required in order to fully meet the standard.

Does not meet the standard
The programme does not meet the generic quality standard.

The panel used the following definitions for the assessment of the programme as a whole:

Positive
The programme meets all the standards.

Conditionally positive
The programme meets standard 1 and partially meets a maximum of two standards, with the imposition of conditions being recommended by the panel.

Negative
In the following situations:
- The programme fails to meet one or more standards;
- The programme partially meets standard 1;
- The programme partially meets one or two standards, without the imposition of conditions being recommended by the panel;
- The programme partially meets three or more standards.
SUMMARY JUDGEMENT

Intended learning outcomes
The master’s programme Science and Technology of Nuclear Fusion is a unique, goal-oriented programme with the aim of educating scientists and engineers for the development of a working nuclear fusion reactor. It is one of the few fusion-specific programmes in Europe and fulfils a crucial role in educating the nuclear fusion experts of the future. The panel praises the programme and the TU/e for taking up and supporting this goal.

The intended learning outcomes are aligned with the expectations of the field through compliance with the FuseNet criteria and regular interaction with the programme’s External Advisory Panel, and are fitting for an academic master’s programme in terms of level and orientation. To further improve the usefulness of the ILOs in designing the curriculum, the panel recommends expanding upon the content-specific knowledge and skills that it expects of its graduates, and making the link with the Meijers criteria more explicit.

Teaching-learning environment
The programme’s intended learning outcomes have been well translated into a coherent curriculum, which covers the fundamentals of nuclear fusion and a balanced mix of academic competences, has a multidisciplinary and goal-oriented approach, and connects students to the international endeavour of fusion development. It is offered in English in order to tie in to the international field, which the panel deems appropriate. The students have many opportunities to shape the programme to their own preferences and are individually coached to achieve a coherent curriculum. To improve coherence on the level of the programme, the panel recommends developing learning trajectories specifying where and how the core knowledge and skills are taught in the programme.

Education is provided in a small-scale, interactive setting by teachers who are valued by the students and are experts in their field. The panel particularly appreciates the fusion master classes and science lunches. As the expertise of the core staff members is mainly in plasma physics, it recommends future development in the direction of fusion engineering, both in the composition of the core staff and in the content of the core curriculum. The programme is feasible: it accommodates the various backgrounds of the students and takes care to achieve a timely completion of the internship and the graduation project. The students are well supported and facilitated during the programme: they are individually coached and mentored by staff members, receive organizational and financial support for external internships, and can use their own study centre and plasma lab.

Assessment
The programme has a valid, transparent and reliable system of assessment in place. The panel was particularly impressed by the thorough and careful procedures for the grading of the final graduation projects by a four-person assessment committee, and the elaborate, insightful and well-implemented assessment forms in use. It recommends a further improvement of the programme’s assessment plan, including a connection to learning trajectories detailing the core knowledge and skills of the programme. The Examination Committee of the programme fulfils its formal tasks but could improve its procedures on a number of issues. The panel recommends that the Committee documents the mandate given to the programme coordinator to approve the individual curriculum of each student at the start of the programme, and increase its efforts in the quality assurance of exams and projects through sampling. It encourages the discontinuation of the double role of programme coordinator and chair of the Examination Committee, but at the same time recommends ensuring the connection of the Examination Committee to the programme without a core staff member on the Committee.

Realized learning outcomes
The panel concludes that the final graduation projects of the master’s programme Science and Technology of Nuclear Fusion are of good quality and convincingly show that the intended learning outcomes of the programme are achieved by the students. This is further demonstrated by the high
number of alumni who start a PhD and the excellent job prospects of all students in nuclear fusion and elsewhere.

The panel assesses the standards from the *Assessment framework for limited programme assessments* in the following way:

*Master’s programme Science and Technology of Nuclear Fusion*

<table>
<thead>
<tr>
<th>Standard</th>
<th>Meets the standard</th>
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<tbody>
<tr>
<td>Standard 1: Intended learning outcomes</td>
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<tr>
<td>Standard 2: Teaching-learning environment</td>
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<td>Standard 3: Student assessment</td>
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<td>Standard 4: Achieved learning outcomes</td>
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**General conclusion**  
positive

The chair and the secretary of the panel hereby declare that all panel members have studied this report and that they agree with the judgements laid down in the report. They confirm that the assessment has been conducted in accordance with the demands relating to independence.

Date: 23 September 2019
DESCRIPTION OF THE STANDARDS FROM THE ASSESSMENT FRAMEWORK FOR LIMITED FRAMEWORK ASSESSMENTS

Standard 1: Intended learning outcomes
The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.

Findings

Mission and vision
The master’s programme Science and Technology of Nuclear Fusion is an interdepartmental programme offered by the departments of Applied Physics, Mechanical Engineering and Electrical Engineering of Eindhoven University of Technology (TU/e) since 2012. It is coordinated by the Applied Physics department, which provides all administrative and educational support, including quality assurance and assessment policy. It has an intake of approximately 25 students per year.

The programme is unique in its goal-oriented approach, as it specifically aims to educate a new generation of highly trained engineers and scientists for the development of a nuclear fusion reactor. The development of nuclear fusion as a safe, clean and inexhaustible energy source is currently culminating in the construction of the International Thermonuclear Experimental Reactor (ITER) in southern France. The goals and content of the programme are designed to reflect the competence and expertise needed to contribute to this project. This includes the ability to work in international, multidisciplinary teams, a flexible attitude and socio-economic awareness. The programme recognizes that these interdisciplinary skills are also well-aligned with the requirements for other jobs in research and high-tech industry, which it views as a viable career path for its graduates.

The panel is very positive about the mission and vision of the programme. Well-educated scientists and engineers in nuclear fusion are essential for the success of the fusion project, which in itself has the potential to contribute greatly towards resolving the global energy challenge. It recognizes the programme as one of the few dedicated fusion programmes within Europe and praises the commitment of the TU/e towards supporting education in this field. The goal-oriented approach provides the programme with a strong mission and focus for designing a coherent curriculum. The panel also feels that having a secondary focus on a career in high-tech industry provides graduates with multiple career options upon leaving the programme.

Intended learning outcomes
The programme translates its goals into a set of intended learning outcomes (ILOs) presented in Appendix 1. They are based on the profile of the ‘engineer of tomorrow’ described in the ACQA framework for master’s programmes. The ACQA framework (also known as the Meijers criteria) has been developed by the technical universities as a translation of the Dublin descriptors for higher education in engineering.

The panel studied the ILOs of the master’s programme Science and Technology of Nuclear Fusion and concluded that they form a compact and coherent overview of the main goals of the programme translated into knowledge and skills to be acquired by students. The use of the Meijers criteria in designing the ILOs guarantees that they meet the master’s level and academic orientation. This is for instance visible in learning outcomes related to conducting research and design work independently, and to the scientific approach to complex problems and ideas.

The panel notes that the ILOs are formulated at a high level of abstraction. As a result, the core knowledge and skills relevant to fusion are not specified other than in the composition of the core curriculum. It recommends making the ILOs more specific, including a broad description of the content-specific knowledge and skills it expects its students to acquire throughout the programme. This could be helpful in constructing learning lines within the programme (see Standard 2) and in
giving both students (current and prospective) and stakeholders a better idea of what knowledge and skills to expect from graduates of the programme. To this end, the programme could also profit from a more explicit link between the Meijers criteria and the ILOs. In designing the curriculum, the programme uses the Meijers criteria and the ILOs interchangeably without specifying their precise relation. More specific ILOs as recommended above could further obscure this relation, which can be remedied by making an explicit mapping of the ILOs to the Meijers criteria.

Relation to the professional field
The programme Science and Technology of Nuclear Fusion is compliant with the joint criteria for master’s education described by FuseNet, the European Fusion Education Network. To keep the programme’s goals aligned with the expectations of the field, the programme has an External Advisory Panel consisting of international stakeholders in fusion research, education, and the high-tech and nuclear industry. This external committee advises the programme on its objectives and curriculum. According to the panel, the compliance with the FuseNet criteria guarantees that the programme’s goals are well-connected to the requirements of the field. Moreover, being a dedicated two-year master’s programme on fusion, it is able to offer significantly more depth and breadth in fusion-specific knowledge as well as hands-on research experience than required by FuseNet. The panel also values the External Advisory Panel and thinks it is a very good way to obtain input from the professional field.

Considerations
The master’s programme Science and Technology of Nuclear Fusion is a unique, goal-oriented programme with the aim of educating scientists and engineers for the development of a working nuclear fusion reactor. It is one of the few fusion-specific programmes in Europe and fulfils a crucial role in educating the nuclear fusion experts of the future. The panel praises the programme and the TU/e for taking up and supporting this goal.

The intended learning outcomes are aligned with the expectations of the field through compliance with the FuseNet criteria and regular interaction with the programme’s External Advisory Panel, and are fitting for an academic master’s programme in terms of level and orientation. To further improve the usefulness of the ILOs in designing the curriculum, the panel recommends expanding upon the content-specific knowledge and skills that it expects of its graduates, and making the link with the Meijers criteria more explicit.

Conclusion
Master’s programme Science and Technology of Nuclear Fusion: the panel assesses Standard 1 as ‘meets the standard’.

Standard 2: Teaching-learning environment
The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.

Findings

Curriculum
The curriculum of the 120 EC master’s programme Science and Technology of Nuclear Fusion has been designed around the ultimate goal of contributing to the construction of a working fusion reactor. To this end, students should be able to learn the fundamentals of nuclear fusion, acquire a balanced mix of academic competences, be able to integrate the three main disciplines of applied physics, mechanical engineering and electrical engineering, and become connected to the international endeavour of fusion development.

The programme’s curriculum consists of a compulsory 30 EC core, 15 EC of fusion-relevant electives, 15 EC of free electives, an external internship of 15 EC, and is completed by a 45 EC graduation
In the compulsory core, students follow courses on the fundamentals of nuclear fusion and related methodologies such as control engineering, power electronics and modelling. Also included are fusion master classes: problem-based learning items in which students tackle a multidisciplinary real-world problem in project groups. The fusion-relevant electives allow students to obtain in-depth knowledge within nuclear fusion and/or applied physics, mechanical engineering and electrical engineering in order to prepare for their graduation project. These courses are offered by the three departments associated with the programme and can be shared with other master’s programmes. The free electives can consist of any university’s master’s courses and allow students to broaden their view outside fusion and engineering. The external internship is meant to give students an introduction to the professional environment, developing skills and applying knowledge in another setting. In the final graduation project, the students conduct independent research in the field of nuclear fusion. Due to the international nature of the field, the majority of students execute their graduation project at a research institute or university abroad.

In line with the policy of TU Eindhoven, the programme facilitates the pursuit of a double degree, in which students follow two master’s programmes at the university simultaneously in a combined programme that meets the requirements of both single degrees. The graduation project should cover a topic that is relevant for both disciplines and is assessed separately by both programmes. The Fusion programme offers a standard programme with the Applied Physics master’s programme, in which the programme is extended by 30 EC (at least). A double degree with Electrical Engineering or Mechanical Engineering can be obtained upon approval of an individual curriculum by both responsible Examination Committees. More than half of the students of the programme follow a double degree, usually with Applied Physics.

The panel studied the structure and content of the curriculum as well as the content of a selection of courses within the programme, and spoke to the programme management, teaching staff and students. It concluded that the programme's intended learning outcomes are well incorporated into the curriculum. The students are offered a thorough core of the fundamentals of nuclear fusion that exceeds the requirements of FuseNet. During the internship and graduation projects but also through the courses and excursions and the teaching staff, the students become well connected to the field of nuclear fusion. The integrated, multidisciplinary character of the programme is clearly present in the compulsory courses and the fusion master classes, which cover topics from nuclear fusion using multiple approaches. The panel was also pleased to note that the courses include elements focusing on the ethics and social acceptance of nuclear fusion, which it considers important in developing new ground-breaking technology. It considers the curriculum to be very student-centred, as it offers them many opportunities to pursue their own interests through electives, the internship and the graduation project. Facilitating a double degree is an extra opportunity for talented students with a broader interest.

While the programme covers both the science and engineering components of fusion technology, the panel thinks that the focus of the programme is particularly well developed towards the scientific, (plasma) physics approach to fusion, which is also the area of expertise for the majority of the core lecturers in the programme. This was also recognized by the students interviewed by the panel, with some of them with an engineering bachelor's degree expressing the wish for more engineering content in the curriculum. In the future development of the programme, fusion engineering could be expanded within the programme. According to the panel, the ITER project and other fusion projects have a high demand for engineers specialized in nuclear fusion to tackle the many engineering challenges. More opportunities for students to specialize in this direction within the programme would be welcomed by the field. The panel also points out that there are other opportunities for students to learn about engineering for nuclear fusion, such as the summer school on fusion technology offered by the Karlsruhe Institute of Technology. The programme could consider offering this option to students who want to study engineering topics outside the expertise of the Eindhoven staff.
**Structure and coherence**

The programme has a great amount of freedom to connect the curriculum to the student’s individual preferences. To ensure that the students develop all the necessary academic, research and engineering competences, each student has a mentor with whom s/he has quarterly competence development interviews. The mentor helps them explore their future goals and compose a coherent education and development plan and the associated curriculum choices. S/he also coaches them in the development of the seven ACQA competences related to the programme's intended learning outcomes.

The panel finds that the coaching sessions are a good way to provide a coherent programme for individual students. On the level of the programme as a whole, it thinks the structure and coherence could be made more insightful. It recommends developing learning trajectories which show in more detail where the core knowledge and skills defined in the intended learning outcomes (as recommended in Standard 1) are taught within the programme, and what the associated educational objective is (knowing, understanding, applying). These learning lines could make the programme more insightful to students, give the mentors a tool to help them ensure that all their students have a coherent curriculum, and could be the basis for a more detailed assessment plan (see Standard 3).

**Didactics**

Science and Technology of Nuclear Fusion is a small-scale programme that is centred around interactive teaching methods. The lectures are usually offered for small groups of students, allowing frequent interaction between teachers and students. Teachers often apply the flipped classroom approach, in which the students prepare a topic, and the lecture is used to discuss it. The fusion master classes are problem-based group projects in which the students learn to apply the goal-oriented approach towards nuclear fusion and use insights from multiple disciplines to solve the problem. The programme also organizes science lunches once or twice per week, at which staff members and fellow students present their ongoing research. Each student is expected to give a presentation at these science lunches at least twice during their graduation project. Other teaching methods include excursions to nuclear fusion facilities and high-tech companies, guest lectures on specific topics, and practical work in the programme’s own PlasmaLab.

The panel is positive about the variety of teaching methods within the programme, which it thinks are very well connected to the programme’s aims in terms of a goal-oriented approach, multidisciplinarity and skills development. The students interviewed by the panel were particularly enthusiastic about the fusion master classes and science lunches, which they felt really helped them to develop their skills. They felt challenged to engage in the academic discussions at the science lunches and valued the goal-oriented approach of the fusion master classes. The panel agrees with this view.

**Language and internationalization**

The programme is offered fully in English in line with the international character of the field. As the ITER project is a global endeavour, the field of nuclear fusion is by nature very international. The panel fully supports this decision, as the English language is essential for the work in that field. The staff members are all international researchers experienced in teaching in English. In terms of internationalization within the programme, the panel notes that the percentage of international students is relatively low (15-20%). With regard to its international ambitions, the programme could benefit from a higher inflow of international students. The programme management agrees with this and is searching for ways to better promote the programme in an international context. The panel suggests that the programme try to uncover a number of universities abroad with bachelor’s programmes that are a good fit to this master’s programme, and focus their promotional efforts there. This could also have the added benefit of increasing gender diversity within the programme if the target universities have a better gender balance than the Eindhoven programme (which is around 90% male).
Feasibility

Being a multidisciplinary programme, the master’s programme Science and Technology of Nuclear Fusion accommodates the different backgrounds of students participating in the programme. Bachelor’s students from either applied physics, mechanical engineering or electrical engineering are automatically admitted to the programme but are required to follow two 2.5 EC homologation courses in the other two disciplines as part of the compulsory core of the programme to bring them up to the starting level in each discipline. Students with an applied university degree in one of these three disciplines can be admitted to the programme after completion of a 30 EC pre-master’s programme, which consists of mathematics courses and a number of discipline-specific topics on the academic level. Students with another background and/or an international bachelor’s degree can be accepted if their curriculum meets a number of criteria for the engineering, mathematics and physics content. The students indicated to the panel that they felt well-supported by the programme to get to the starting level of the curriculum. After some settling in, they feel the programme is feasible from each of the various backgrounds. The panel is positive about the programme’s efforts to get the students on the same level, in particular the homologation courses with which they can remedy their gaps in knowledge without study delay.

The previous assessment panel recommended measures to prevent the internship and graduation project from overrunning. The programme responded to these recommendations by restructuring the curriculum to have the second year focus only on the internship and graduation project. It also introduced a more structured approach in which students have deadlines for the submission of proposals and reports, and timely completion is an element considered in the grading of the projects. After introduction of these measures for the 2017 cohort and onwards, the average programme duration has dropped from 3 years to 2.5 years. The panel is satisfied with this improvement in feasibility, and noted from the interview with students that the more structured approach is recognized and valued by them. With regard to the internships, it praises the high level of support the programme offers students in finding a suitable project through their network in the nuclear fusion and high-tech industry, and the financial support offered by FuseNet to facilitate internships abroad.

Teaching staff

The master’s programme has a small core of permanent academic staff (6 staff members, 3.3 fte) dedicated to the programme. They are responsible for teaching the core components of the programme, mentoring the students, and supervising the internship and graduation projects. They are supported by a team of PhD students who are involved in the daily supervision of research projects and teaching tutorials and practicals. The fusion electives are provided by the participating departments of Applied Physics, Mechanical Engineering and Electrical Engineering, and in some cases by fusion experts from the Dutch Institute for Fundamental Energy Research (DIFFER), which is located on the Eindhoven campus. All teachers in the programme are active researchers in their field, and the majority has obtained the University Teaching Qualification (UTQ). External daily supervisors of research projects are preferred partners, based on previous experiences. New partners usually first supervise an internship and, if this cooperation is successful, can then provide daily supervision for graduation projects.

The students of the programme are very enthusiastic about their teachers. They praise the involvement and approachability of the staff members and their interactive teaching methods. The offices of the core staff are located directly opposite the student study centre within the building, which guarantees frequent interaction between the students and staff. The panel also judges the quality of the teaching staff positively. They are top researchers within their field and well connected within the world of nuclear fusion. External experts are carefully selected and bring added value to the quality of the teaching.

In terms of expertise, the panel noted that the core staff mainly consists of plasma physics experts, while the engineering aspects of the programme are covered by lecturers from within the three departments. It recommends that, if the opportunity arises to increase the core staff, a staff member...
with an engineering profile would be welcome to add to the diversity and interdisciplinarity. In the current set-up, the small core staff is just enough to ensure a feasible mode of operation, but the panel notes that there is no room for back-up. It recommends making sure that the main ideas, overviews and plans surrounding the programme are shared and well documented to ensure continuity in case of unforeseen circumstances.

Programme-specific facilities
The master’s programme is located in the Flux building on the TU/e campus, and mainly uses the facilities of the Applied Physics department. The programme has a number of facilities specifically for its students. This includes the Fusion Study Centre, an open room in which all first-year students have a desk and work together on their course work and projects, and the PlasmaLab, where ten plasma physics experiments are set up for use by students in practicals and as preparation for their graduation project. These experiments include a table-top fusion experiment in which charged particles are confined with electrostatic fields. For other experimental facilities, the programme collaborates with DIFFER, which is located opposite the Flux building on the Eindhoven campus.

During the site visit, the panel had the opportunity to visit both the Fusion Study Centre and the PlasmaLab. It was very impressed by the collaborative and welcoming atmosphere the programme offers its students through the Fusion Study Centre, and the opportunities to develop experimental skills in the PlasmaLab. It also thinks that the close collaboration with the world-class DIFFER institute is very beneficial for the programme, by providing not only facilities but also expert guest lecturers and opportunities for graduation projects.

Considerations
The programme’s intended learning outcomes have been well translated into a coherent curriculum, which covers the fundamentals of nuclear fusion and a balanced mix of academic competences, has a multidisciplinary and goal-oriented approach, and connects students to the international endeavour of fusion development. It is offered in English in order to tie in to the international field, which the panel deems appropriate. The students have many opportunities to shape the programme to their own preferences and are individually coached to achieve a coherent curriculum. To improve coherence on the level of the programme, the panel recommends developing learning trajectories specifying where and how the core knowledge and skills are taught in the programme.

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Conclusion
Master’s programme Science and Technology of Nuclear Fusion: the panel assesses Standard 2 as ‘meets the standard’.
**Standard 3: Student assessment**
The programme has an adequate system of student assessment in place.

**Findings**

**System of assessment**
In accordance with the assessment policy of TU Eindhoven, the master's programme Science and Technology of Nuclear Fusion uses a mix of formative (assistance, delivered during the course) and summative (judgement, delivered at the end of the course) assessment methods suited to the course goals. They include written exams, group projects, experimental work, poster presentations, essays and reports. In order to improve the validity and transparency of the tests, all learning outcomes, the associated assessment and their contribution to the final grade within a course are communicated beforehand, and all tests are reviewed by at least one peer before the exam. When grading assignments, lecturers can use plagiarism detection tools. Each course has a lecturer appointed as examiner, who is responsible for the entire assessment within the course, including components offered by external lecturers. The panel is satisfied with these procedures and is of the opinion that they contribute to a valid, transparent and reliable assessment.

To guarantee that all intended learning outcomes are assessed, the programme has composed a map detailing where all core competences are assessed within the educational units. The panel studied this overview and concluded that all competences are assessed within the courses, regardless of the electives and projects chosen by the student. It notes, however, that the overview is composed at a high level of abstraction and uses the Meijers criteria rather than the intended learning outcomes of the programme. The Examination Committee informed the panel that the programme plans to construct a more detailed assessment plan, including the intended learning outcomes of the programme and each individual course and the associated assessment methods. The panel encourages the programme to go ahead with this. It recommends connecting this new assessment plan to the learning trajectories that specify the core knowledge and skills that students obtain within the programme (see Standards 1 and 2), in order to complete a coherent and insightful overview of the education within the programme.

**Assessment of research projects**
The final graduation project is the culmination of the master's programme and aims to show the student's level of proficiency in the programme's intended learning outcomes. It takes the form of an independent research project in the field of nuclear fusion, carried out at either TU Eindhoven or another research institute or university in the Netherlands or abroad. For an external research project, which is the case for the majority of students, the daily supervisor will not be from TU Eindhoven. These students will have an academic supervisor from within the programme. She informs the external supervisor about the goals and procedures of the project. Upon completion, the graduation project is assessed by an assessment committee consisting of at least four members: the academic supervisor (chair) and three examiners from within the university. At least one of these assessors should be either full or associate professor at TU Eindhoven, and at least two of the three departments contributing to the programme should be represented. External experts who are not appointed as examiner, such as the daily supervisor, act as consultant to the committee. The student presents his or her work to the assessment committee, which grades him/her on the quality of the report, the quality of the defence and the execution of the project. The committee members first determine their assessment individually and then compare their results. The final consensus of the committee is laid down and elaborated on an assessment form, which contains explicit explanations of all criteria in order to guide the assessors. The internship has a similar, but lighter procedure of assessment, as this project is mainly aimed towards getting students acquainted with the professional practice. The internship is assessed on the same criteria as the final graduation project, and graded by the academic supervisor with advice from the daily supervisor.
The panel is very positive about the careful and thorough procedures surrounding the assessment of research projects. Using the consensus of multiple examiners contributes to a valid and reliable assessment of the students’ exit level. The panel studied a number of assessment forms that accompanied the theses it read to determine the realized learning outcomes of the programme. It was impressed by the fair and complete description of the strengths and weaknesses of each project, and the constructive feedback provided to students in order to further develop their skills later in their career. The rubric was insightful and, together with the elaborative feedback, provided a very transparent grading process.

Examination Committee
The master’s programme Science and Technology of Nuclear Fusion has its own Examination Committee consisting of a chair from within the core teaching staff, and three external members, one from each of the three departments contributing to the programme. The Examination Committee ensures the quality of assessment within the programme by determining whether each individual student has met the criteria for graduation in the programme, studying the analysis of examinations, sampling exams and research projects to check the quality of the test and its grading, and deciding upon individual requests and issues concerning fraud and plagiarism.

The panel interviewed the Examination Committee and studied a number of its annual reports, and concluded that it fulfils its formal tasks in safeguarding the quality of assessment within the programme. It noted that the check for compliance with the programme requirements of the student’s individual curriculum has been mandated to the programme coordinator, who bases this decision on the advice given by the student’s mentor. This mandate is not formally described in the Regulations of the Examinations Committee, which initially led the panel to the incorrect conclusion that the Board was not involved in this decision. The panel recommends to better document this mandate. It also concluded from the Committee’s annual reports that it has not performed any sampling of course assessment or research projects in the past two years. It encourages the Committee to increase its efforts in this important aspect of quality assurance of assessment within the programme.

At the time of the site visit, the chair of the Examination Committee also served as programme coordinator of the master’s programme. Due to the small size of the core teaching staff, this person was the only staff member available for this task. Although the chair has no financial responsibility with regard to the programme, the programme management felt uncomfortable with this double role. Therefore, it was decided to replace the committee chair per 2019-2020 with an external chair from within the Applied Physics department that is closely associated with the programme. The panel supports this decision and deems it appropriate in order to prevent any conflicts of interest (perceived or actual). At the same time, it recommends keeping the Examination Committee connected to the fusion programme through frequent interaction, as now all of its members are not part of the core staff.

Considerations
The programme has a valid, transparent and reliable system of assessment in place. The panel was particularly impressed by the thorough and careful procedures for the grading of the final graduation projects by a four-person assessment committee, and the elaborate, insightful and well-implemented assessment forms in use. It recommends a further improvement of the programme’s assessment plan, including a connection to learning trajectories detailing the core knowledge and skills of the programme. The Examination Committee of the programme fulfils its formal tasks but could improve its procedures on a number of issues. The panel recommends that the Committee documents the mandate given to the programme coordinator to approve the individual curriculum of each student at the start of the programme, and increase its efforts in the quality assurance of exams and projects through sampling. It encourages the discontinuation of the double role of programme coordinator and chair of the Examination Committee, but at the same time recommends ensuring the connection of the Examination Committee to the programme without a core staff member on the Committee.
**Conclusion**

*Master’s programme Science and Technology of Nuclear Fusion:* the panel assesses Standard 3 as ‘meets the standard’.

**Standard 4: Achieved learning outcomes**
The programme demonstrates that the intended learning outcomes are achieved.

**Findings**

*Final graduation projects*
Before the site visit, the panel studied 15 final graduation projects of the programme. It was very positive about the quality of the work and agreed with the grades provided to the students. The students clearly showed their research and academic skills and demonstrated a multidisciplinary, goal-oriented approach towards nuclear fusion. In general, the panel considers the quality of the theses to be very high. From the feedback provided on the assessment forms, it noted that some supervisors were of the opinion that the knowledge of specific fusion concepts was in some cases not as deep as could be expected. It thinks that this is not related to the exit level of the students, which it considers high, but is rather a case of expectation management for external supervisors that could be remedied by a better articulation of the skills and knowledge obtained by students in the programme, as discussed under Standard 1.

*Performance of graduates*
Almost all graduates of the programme find a suitable job shortly after graduation. Some 45% continues with a PhD programme, of which approximately two-thirds are in nuclear fusion and one-third in related fields. Another 40% has started a career as an engineer in the high-tech industry, in consultancy or as an entrepreneur. The total number of graduates ending up in the field of nuclear fusion (PhD students and other jobs) is 35%. During the site visit, the panel discussed with the programme whether this number is not too low considering the aims of the programme to educate the next generation of scientists and engineers in nuclear fusion. The programme indicated that it is satisfied with this percentage, and that this is in fact in line with the original targets it formulated at the launch of the programme. Moreover, a significant percentage of students (40-50%) follows the programme as a double-degree programme with Applied Physics. According to the programme, these students are often attracted by the multidisciplinary nature of the programme but choose a career in physics after graduation. The same multidisciplinary (and international) nature is very attractive for the high-tech industry, which manages to attract a significant portion of the programme's graduates. This was confirmed by the alumni of the programme interviewed by the panel. They indicated that the programme offers a broad collection of skills and competences in a multidisciplinary, international environment, which makes it a good choice for students who want to pursue other careers. The panel was convinced by these explanations. Also, the high number of alumni continuing in a PhD programme reflects the high level of graduates. It congratulates the programme on its successes in this aspect, as well as on the excellent job prospects of its alumni.

**Considerations**
The panel concludes that the final graduation projects of the master’s programme Science and Technology of Nuclear Fusion are of good quality and convincingly show that the intended learning outcomes of the programme are achieved by the students. This is further demonstrated by the high number of alumni who start a PhD and the excellent job prospects of all students in nuclear fusion and elsewhere.

**Conclusion**

*Master’s programme Science and Technology of Nuclear Fusion:* the panel assesses Standard 4 as ‘meets the standard’.
GENERAL CONCLUSION

The panel judged that the master’s programme Science and Engineering of Nuclear Fusion offered by Eindhoven University of Technology meets all the standards of the NVAO assessment framework for limited programme assessment. The panel therefore advises positively about the accreditation of the programme.

Conclusion
The panel assesses the master’s programme Science and Technology of Nuclear Fusion as ‘positive.'
APPENDIX 1: DOMAIN-SPECIFIC FRAMEWORK OF REFERENCE

A European master certificate for 'Science and technology of Nuclear Fusion'. Common Educational goals.

Background

The development of nuclear fusion as a safe, clean and inexhaustible source of power, has been a worldwide collaborative effort since the 1950-­ties. In particular in Europe, the research and development program on fusion has been coordinated by Euratom, which has led to a very well developed European Fusion program, in which researchers from nearly all European countries collaborate.

With the decision to build the large fusion reactor ITER, a project with worldwide collaboration, the world has committed itself to a research and development program that will last decades. Europe is the host and leading party of this project. ITER calls for the education of a new generation of fusion scientists and engineers, while at the same time it provides a career perspective for students who are interested in this field.

Against this background, Europe is now establishing a European Network on Fusion Education: FUSENET. As part of the activities of this network, joint criteria have been established for the award of a European Master certificate for 'Science and Technology of Nuclear Fusion'.

Motivation and objectives

The objectives of the establishment of this certificate are multifold.

First, by creating this certificate and agreeing on the award criteria, we define the canon of fusion education. As fusion research is a broad and interdisciplinary field, in which besides physics, mechanical and electrical engineering are important, the emphasis of a fusion master will be different from the standard physics or applied physics master. The certificate and associated guidelines for the contents of the curriculum will lead to a common ground for master students who have specialized in fusion.

Second, the criteria set a high standard, which will be maintained throughout Europe. This will create more homogeneity in the educational programs on fusion, while still allowing sufficient flexibility for universities to have their own profile concerning specializations or teaching methods.

Third, we aim to establish the fusion master as a 'brand'. The fusion master is a flexible researcher, trained to work in an interdisciplinary, international research environment, typically in multicultural teams. A researcher who has been trained to absorb the newest technological advances, and to work in a goal-oriented way. Finally, a researcher who has a keen eye for the societal relevance and the socio-economic aspects of his/her research and is capable to place his/her research in a wider context.

Fourth, with the European Fusion Master certificate, the specialization in the field of fusion will become a much more visible and attractive option for the student. Already, we see that fusion research has a particular attraction to good students, because of the combination of frontier science and technology with a clear societal value.
The fusion master: career perspective

Obviously, the fusion master will be very well prepared for a career in fusion research. However, this is by no means the only career perspective of the fusion master student. In fact, the particular set of competences and scientific training that are guaranteed by the fusion master certificate, render the fusion master extremely well prepared for a variety of functions outside fusion research. In particular, in the innovative, high-tech industry the skills set of the fusion master, in combination with the experience of working in interdisciplinary teams with a strongly goal-oriented approach, are highly valued.

The fusion master certificate

For these reasons it is felt to be important that a Europe-wide acknowledged fusion master certificate is established. It will strongly stimulate universities to offer a curriculum that is well adapted to the requirements of the certificate; and it will stimulate students to put together a package of courses, practica and assignments that will make them eligible to the certificate.

We have therefore structured the requirements for the Master certificate in such a way that every student will have a firm basis in what is commonly seen to be the ‘canon’ of fusion science, while this knowledge is complemented by a selection of relevant courses chosen from a program of elective courses. The requirements leave room for significant variation between universities, which will have their own specialties and teaching culture, but the requirements with respect to topics, quality and volume in terms of ECTs will guarantee a high level of the fusion master, independent of where the education was received.

Academic criteria

Below we define the knowledge, in terms of physics and technology fundamental notions and of experimental and theoretical or numerical methods, which should be acquired by students for the EU master in fusion science and engineering. The basic idea of the certificate is to establish a minimum set of criteria, without at the same time lowering the level at each individual programme down to a possible lowest common denominator, or to remove specificities that can be associated with locally developed schools and centres of excellence.

The multi-disciplinary character of plasma physics and fusion should lead to a large spectrum of knowledge and applications, but it should not prevent a clear-cut affiliation to a departmental structure within the local academic systems. Graduates of such programs should naturally be prepared to a holistic approach, which in turn would encourage a strong awareness of societal needs and boundary conditions.

Below we specify guidelines for this common knowledge, providing an estimate for the equivalent ECTS credits for different blocks. These blocks do not necessarily correspond to courses, but rather to areas of knowledge that should have similar relative weights. In addition, for the advanced topics, a large degree of flexibility should be applied, as part of this knowledge can be acquired though laboratory (internship) projects, without necessarily formal ex-cathedra teaching. The list of elective subjects should be considered by no means exhaustive or exclusive.

ECTS accounting

We consider that the fusion Master certificate would require a total of 60 credits, of which 24-36 corresponding to academic work, and 24-36 to the Master thesis projects. Of the former, a possible scenario would be that 12 credits can come from the core curriculum topics (see below), 12 from the more advanced list of topics (Section 4), and 12 from more practical laboratory/internship work. Note, however, that part or, in some cases, all of the 12 credits for the more advanced topics could be obtained through laboratory/internship work.
Criteria

To be eligible for the certificate 'European Master of Fusion Science and Engineering', a student should have completed a curriculum with the following content.

1. Topics of which a EU Master student should have a solid knowledge (total of about 12 ECTS)

Block 1 (typically 3 ECTS) – the fundamentals
- Basics of thermonuclear fusion
- Specificities of magnetic vs. inertial fusion
- The plasma state and its collective effects
- Charged particle motion in electric and magnetic fields
- Collisions, plasma resistivity and relaxation phenomena

Block 2 (typically 3 ECTS) – macroscopic description of plasmas in fusion devices
- Two-fluid and single-fluid MHD models
- Macroscopic plasma equilibrium and stability
- Magnetic confinement
- Basic properties of tokamaks and stellarators

Block 3 (typically 3 ECTS) – plasma dynamics and waves for heating and diagnostics
- Basic aspects of waves in magnetized plasmas
- Fundamentals of wave-particle interactions
- Exchange of energy between waves and particles
- Basic micro-instabilities

Block 4 (typically 3 ECTS) – from plasma physics to fusion technology
- Basic design aspects of a fusion reactor
- Confinement and transport
- Plasma heating and current drive
- Elements of material science for fusion
- The basic problems of plasma-wall interaction

2. Topics of which a EU Master student should have some knowledge (total of about 12 ECTS)

2.1 Physics oriented curriculum
- Advanced treatment of Vlasov equation
- Fokker–Planck collisional terms
- Kinetic description of plasma waves
- Waves in a hot magnetized plasma
- Non-linear effects in plasmas
- The tokamak (construction and operation, present-day experiments, experimental and theoretical limits on confinement, plasma current, density and kinetic pressure)
- Plasma diagnostic techniques
- Plasma heating by neutral beams
- Plasma heating by EC, IC and LH waves
- Alfvén waves
- The burning plasma regime
- The Stellarator and other confinement schemes of potential for a fusion reactor
- Elements of plasma-wall interactions (including plasma fuelling and particle control)
- ITER and DEMO
Elements of the application of plasma physics to space and astrophysics problems

2.2 Engineering oriented curriculum
The construction, maintenance and operation of fusion devices require mastering of many branches of engineering. The proposed curriculum should train students to understand and develop related technologies. It should offer a general education in the fields of materials, cryogenic and vacuum engineering, superconductors, high-power microwaves for plasma heating, and thermal science. Below we list topics that could typically be covered.

- Materials in extreme environments
- Cryogenics and superconductivity, vacuum techniques
- High Power Microwaves: Generation and Transmission
- The magnet system of a fusion device
- Vacuum vessel and in-vessel components (Limiter, Divertor design)
- Engineering aspects of Neutral Beam Injection
- Fusion plasma diagnostics
- Fuel cycle and breeding blanket
- Robotics: Manipulators and Remote handling systems
- Nuclear safety
- Plasma control theory and technology
- Computational engineering

3. Required work in Master thesis (total of about 24--6 ECTS)
Although the formal requirements and the procedure for the Master thesis will follow local rules and regulations, some guidelines can be provided in the frame of FUSENET.

The Master thesis should represent an original piece of research work in plasma physics and/or fusion engineering. The originality can reside in the experimental or theoretical/numerical methods adopted to solve a particular problem, if not in the final physics results. The student should be exposed to the work of a professional research group, and should be able to situate his/her own specific activity within a global framework, in terms of overall motivation as well as in reference to the research that is done elsewhere in the fusion community.

4. Required know-how, achieved directly in laboratories (internships), or ad hoc seminars
Through the academic classes and the Master thesis work, the student should have developed a qualitative overall view of the fusion science and technology and plasma physics field, with a specific, more quantitative expertise in a sub-field. He/she should be familiar with at least one set of experimental techniques (such as plasma diagnostics, plasma control, data acquisition and management), and/or one set of theoretical techniques (such as an analytical expansion method). He/she should also have a solid knowledge of the fundamentals of numerical methods for the solution of physics and/or engineering problems. The student should also be ready to be integrated for his/her PhD into a research team, with which to communicate and exchange ideas and know-how. The student should be at ease with writing a scientific manuscript in English, and communicate orally the results of a project work in an effective way. Finally, the student should be sensitive to the societal value of his/her research, and be ready to undertake problem driven, solution-oriented research and development.
APPENDIX 2: INTENDED LEARNING OUTCOMES

Master’s programme Science and Technology of Nuclear Fusion

After graduating, students of TU/e’s Fusion MSc:

- are qualified to a degree level within the domain of Science, Engineering and Technology;
- are competent in the relevant domain-specific discipline(s), specifically the Science and Technology of Nuclear Fusion;
- are able to conduct research and design independently;
- have the ability and attitude to include other disciplines in their research where necessary;
- have a scientific approach to complex problems and ideas;
- possess intellectual skills that enable them to reflect critically, reason and form opinions;
- have the ability to communicate the results of their learning, thinking and decision-making processes at an international level;
- are aware of the temporal and social context of science and technology (comprehension and analysis) and can integrate this context into their scientific work;
- possess, in addition to a recognizable, domain-specific profile, a sufficiently broad basis to be able to work in an interdisciplinary and multidisciplinary context; in this context, multidisciplinary means focusing on the other relevant disciplines needed to solve the design or research problem in question;
- have the ability and attitude to seek new potential applications while taking the social context into consideration.
APPENDIX 3: OVERVIEW OF THE CURRICULUM

Master’s programme Science and Technology of Nuclear Fusion

In line with the core elements of TU/e’s educational vision and the implementation of these elements into the Fusion MSc, the Fusion MSc curriculum has been designed with the following aims:
- to fulfill the FuseNet requirements (Appendix 4) while offering much more depth and more interdisciplinarity;
- to ensure that students acquire a balanced mix of all of the academic competences;
- to have an integrated approach to the three main disciplines of AP, EE and ME;
- to use intentionality as the guiding principle of the educational approach;
- to connect students to the international endeavor of fusion development.

These considerations, in combination with the core values of the TU/e Graduate School, have led to the general structure of the Fusion MSc. This structure complies with the uniform structure of all master’s programs at TU/e. The Fusion MSc offers the following components, as depicted in Figure 1:

1. A general compulsory core of 30 ECTS, including two fusion masterclasses
   a) This compulsory core consists of three sets of activities in parallel. Firstly, specific knowledge is provided through courses aimed at deepening and diversifying students’ prior knowledge. Secondly, several essential methodologies are dealt with through a general course. These are methods and knowledge that are broadly applicable and indispensable for a successful career in research in a scientific or technological setting. Thirdly, in the fusion masterclasses, the integration of the (systems) character of the program is assured by the project work and by the ‘problem-based learning item’, in which students tackle a multidisciplinary problem from the real world of fusion research in a group. Here, the integration of the various disciplines and the intentionality (which is the key learning philosophy for the Fusion MSc) are the dominant aspects of the learning program.
   b) It is clear that the master’s program, being essentially multidisciplinary, will need to make sure that students from different bachelor’s programs can successfully enroll. In order to accommodate the different backgrounds of the students participating in the program, a ‘homologation’ phase has been introduced as part of the core. A course has been set up as a capita selecta of Electrical Engineering / Physics / Mechanical Engineering for Fusion students. This course takes the students to the required starting level in the complementary disciplines.

2. A fusion-relevant elective part of 15 ECTS
   In addition to the general Fusion program, electives exist to provide the necessary depth in the program. Within their elective courses, students are given ample opportunities to prepare themselves for their graduation project. Whereas the core of the Fusion program is multidisciplinary in nature, these electives offer the possibility to opt for a more physics- or (electrical/mechanical) engineering-oriented profile.

3. A free elective portion of 15 ECTS
   A portion of the curriculum can be spent on free electives, i.e. any university master’s course. This offers students the possibility to broaden their views outside of the fusion and engineering worlds and gives them the possibility to deepen their knowledge.

4. An (external) internship of 15 ECTS
   The internship is primarily meant as an introduction to the professional environment and a means to become acquainted with the state-of-the-art research or technology in fusion. Its purpose is to motivate the students, give them an insight into a potential career path, apply the knowledge gained in the courses in an integral and multidisciplinary way and improve their skills in teamwork, project management, goal orientation, etc. Furthermore, another important aspect of the internship is that students gain experience working in different environments and with other cultures.
5. A final graduation project of 45 ECTS
The master’s graduation project is primarily intended to give students experience in the international fusion field through experimenting, modeling, analyzing and/or designing new diagnostic systems or by exploring new research questions. In the graduation project, students conduct independent academic research, which includes a study of the literature and of the discussions in the field at an academic level. Since the graduation project plays such an important part in the Fusion MSc curriculum and the educational approach, it is elaborated on in Appendix 9a.

All theoretical courses take place in the first year. In the second year, students undertake their graduation project and internship. The program’s coherence is achieved by ensuring the connection between the core program, the specialization elective program and the choice of graduation project. To safeguard this, a mentor (a member of one of the departments; an assistant, associate or full professor) advises students on the composition of their study program. Before students are permitted to begin their graduation project, they must submit their program to the Examination Committee for approval.
APPENDIX 4: PROGRAMME OF THE SITE VISIT

WEDNESDAY 19 JUNE 2019

16.00  17.30  Panel instruction
17.30  19.00  Preparing site visit interviews

THURSDAY 20 JUNE 2019

08.30  09.00  Arrival, welcome and settling in
09.00  09.45  Interview programme management
09.45  10.00  Break
10.00  10.45  Interview students and alumni
10.45  11.00  Break
11.00  11.45  Interview teaching staff
11.45  12.15  Tour of the facilities
12.15  13.15  Lunch / internal meeting
13.15  13.45  Interview Board of Examiners
13.45  14.15  Internal meeting
14.15  14.45  Final interview programme management
14.45  15.30  Development dialogue
15.30  17.00  Composing panel findings
17.00  17.15  Oral feedback panel findings
17.15  17.30  Wrap-up
APPENDIX 5: THESES AND DOCUMENTS STUDIED BY THE PANEL

Prior to the site visit, the panel studied 15 theses of the master’s programme Science and Technology of Nuclear Fusion. Information on the selected theses is available from QANU upon request.

During the site visit, the panel studied, among other things, the following documents (partly as hard copies, partly via the institute’s electronic learning environment):

- Intended learning outcomes
- FuseNet Reference Framework for Fusion master’s students
- Curriculum overview, study guide
- Education and Exam Regulations
- Overview of teaching staff
- Course information, materials and exams:
  - 3MF100 Fusion on the back of an envelope
  - 3MF120 Fusion reactors: extreme materials, intense plasma wall interaction
- Course information, materials, exams, assessment matrix, evaluation plan and improvement plan:
  - 3MF110 Magnetic confinement and MHD of fusion plasmas
- Survey results
  - End of Year Survey results 2017-2018
  - End of Year Survey results 2016-2017
  - Transfer to TU/e Master’s Program survey results 2015-2016
- Annual Reports Examination Committee
  - Annual Report 2017-2018
  - Annual Report 2016-2017
  - Annual Report 2015-2016