instance at the big fusion devices JET, ASDEX Upgrade and W7-X, all offer the students many exciting opportunities. The educational approach is novel in the sense that it has been designed from the beginning to develop a well-balanced set of competences, making optimal use of the specific possibilities the international fusion program offers. Individual coaching, the multidisciplinary methodology, the problem-based learning methods, and hands-on educational tools of the TU/e should put you in an excellent position to start a rewarding career.

Graduated... and then?
Engineers with the degree MSc in Science and Technology of Nuclear Fusion are expected to continue their career either in research (about 40%, of which the majority is absorbed in the fusion research program, but other big science projects are also a possible career path), or in industry (about 60%). With the decision to build ITER, a worldwide political commitment to develop fusion exists, for at least the next 35 years, providing a long term career perspective. The construction and subsequent operation of ITER calls for the education of a new generation of fusion scientists and engineers. You could be one of those. At the same time, the Master’s Program is also excellently equipped for a career outside fusion, in particular in the high tech, innovative industry.

Eindhoven University of Technology (TU/e) offers a wide range of Graduate Programs. The Graduate Program Applied Physics zooms in on four areas: FLOW, NANO, PLASMA and FUSION (the Master’s Program Science and Technology of Nuclear Fusion, or FUSION for short). This leaflet of the interdisciplinary Master’s Program FUSION informs you about the contents of the program, the career perspective it offers, the educational approach and the admission requirements. The information is intended to help you decide whether FUSION is the right study for you.

Fusion energy: science of extreme conditions
Nuclear fusion: the promise of clean and safe energy, for all, for ever. Presently a coalition of countries around the world are constructing the first net power producing fusion reactor, ITER, in the south of France. At ITER, the science of extreme conditions – extreme temperatures of hundreds of millions degrees, extreme heat fluxes, extremely large magnetic fields, extreme complexity – has to be translated into technological solutions. This provides both a challenge and a career perspective to master students, and calls for the training of a new generation of fusion researchers. The FUSION Master’s Program is the perfect preparation for a career in fusion research.

Photography: Bart van Overbeeke

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Engines with a broad range of competences

The objective of the program is to deliver engineers at the MSc level, who have been trained in the various competences and expertise relevant to the field of Science and Technology of Nuclear Fusion. This is not a narrow specialization!

To summarize, the field is:

- interdisciplinary: it encompasses physics, mechanical engineering and electrical engineering, as well as knowledge about the socio-economic aspects of a new energy source.
- international: more than any other scientific field, fusion is characterized by international collaborative networks spanning the globe, with the ITER project as the ultimate example.
- goal-oriented: although ranging from the very fundamental aspects of nuclear fusion to any TU/e Master’s degree Program:
  - you must have a relevant Bachelor’s degree (or equivalent), based on a program of sufficient academic level and quality to enable you to complete the TU/e Master’s degree Program to which you wish to be admitted.
  - you must be able to demonstrate sufficient command of the language in which the program is taught (English).

Internship opportunities

Your first year will include a 3-months internship to introduce you to the professional environment and to acquaint you with the state-of-the-art research and technology in fusion. Most of the second year is devoted to the graduation project. This will allow you to gain experience in fusion research, in an international environment. The graduation work can entail experimenting, modelling, analysis, theory, or the design of new systems for the control of fusion reactors, or for the diagnosis of the processes in the reactor. The TU/e has very good contacts with practically all fusion laboratories in Europe and many others worldwide, and normally one or both of these internships will take place abroad. Possible locations include the big fusion experiments JET, W7X (Germany) and MAGNUM-PSI (NL), but in the recent past, students of the group have also ventured to e.g. W7-X (Germany) and MAGNUM-PSI (NL), but in the recent past, students of the group have also ventured to 

The policy of the group is to stimulate international student projects provided there is sufficient link to the research and education program at the TU/e, and that the quality of the local supervision is assured.

Research profile

An important characteristic of the field ‘nuclear fusion’ is its broad interdisciplinary. Not only do Applied Physics, Mechanical Engineering, Control Systems Technology and Electrical Engineering come together here, also socio-economic aspects and societal relevance are important. Depending on your background and interests, you may want to put together a program which has a stronger ‘physics’ or ‘mechanical engineering’ or ‘electrical engineering’ flavour. The structure of the Master’s Program allows that: there is a generic fusion core that all students take, but this is complemented with electives that allow you to tailor the program to your interests. Further, the choice of topic in the final research project gives a great deal of flexibility.

Requirements for admission

There are a number of general requirements for admission to any TU/e Master’s degree Program:

- Engineers with a broad range of competences

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- international: more than any other scientific field, fusion is characterized by international collaborative networks spanning the globe, with the ITER project as the ultimate example.
- goal-oriented: although ranging from the very fundamental to the very applied, the approach of fusion research and development is always directed to a very concrete goal, i.e. the construction of a working fusion reactor.

Everything in the program derives from that.

Scientists and engineers who are active in this field are:
- used to work in large international, interdisciplinary teams.
- flexible; the field of fusion is so broad that the fusion engineer often has to acquire new skills. Therefore, the ability to learn new skills and technologies is strongly developed in the fusion engineer alongside the ability to identify the relevant experts and communicate with them.
- well aware of the societal value of their work; fusion students are often (partly) motivated by a wish to contribute to a clean and sustainable energy supply. This aspect of societal value – which translates into a keen awareness of the role of fusion R&D in society – is also an important aspect of the field.

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To prove sufficient command of the English language you should submit an Academic IELTS or TOEFL test. For the scores or exemptions, you can contact the International Relations Office (io@tue.nl) or visit www.tue.nl/masterprograms.

Specific requirements for this Master's Program are in principle a Bachelor's degree in one of the three founding disciplines: applied physics, mechanical or electrical engineering. But the definitions of those fields are not the same in different countries, so if you are applying from abroad the decision will be based on the actual list of subjects you have taken. When in doubt, there is more information on www.tue.nl/masterprograms. And most importantly, don’t hesitate to contact us at fusion@tue.nl.

Why study Fusion in Eindhoven?
The full 2-year TU/e Master's Program Science and Technology of Nuclear Fusion is unique worldwide in its breadth and depth, but is not isolated. Parallel developments exist in Europe: for example, France has a 1-year fusion master’s track in physics, the universities of York (UK) and Prague (CR) offer a fusion specialization program and there is an Erasmus Mundus program on Fusion Science and Engineering, Fusion education in Europe is being stimulated and coordinated by the European Fusion Education Network, which has its seat in Eindhoven. The close link of our group with the Dutch fusion research center DIFFER (which will be relocated to the Eindhoven University campus), our participation in the ITER-NL consortium (with TNO, FOM and NRG), our collaboration within the European fusion research community (for

Degree: Master of Science (MSc)
Language: English
Admission:
Bachelor Applied Physics, Mechanical Engineering, Electrical Engineering
Admission from other studies can be possible after an admission interview.

Study possibilities: Full-time

Times of entry: At the beginning of each semester

Duration: 2 years (120 ECTS)

Program: 1st year, lecture courses:
- generic core: 15 ECTS
- compulsory fusion courses: 15 ECTS
- elective fusion courses: 10 ECTS
- free electives: 5 ECTS
- internship: 15 ECTS

Program: 2nd year, lecture courses:
- generic courses: 5 ECTS
- elective courses: 5 ECTS
- Graduation Project: 50 ECTS

In the student-built TU/e FUSOR fusion reactions are produced for research, not energy production!
Focal area / Master's Program

The ultimate challenge in sustainable energy

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More information about Science and Technology of Nuclear Fusion
Applied Physics Information officer
tel. +31 (0)40 247 4415
e-mail: fusion@tue.nl
www.tue.nl/fusion
Skype us at fusiontue

Introduction to Science and Technology of Nuclear Fusion by the Master's Program coordinator:

instance at the big fusion devices JET, ASDEX Upgrade and W7X, all offer the students many exciting opportunities. The educational approach is novel in the sense that it has been designed from the beginning to develop a well-balanced set of competences, making optimal use of the specific possibilities the international fusion program offers. Individual coaching, the multidisciplinary methodology, the problem-based learning methods, and hands-on educational tools of the TU/e should put you in an excellent position to start a rewarding career.

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More information about TU/e
Education and Student Service Center
tel. +31 (0)40 247 4747
e-mail: io@tue.nl
www.tue.nl/masterprograms

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At the same time this high-level, interdisciplinary and goal-oriented program prepares students equally well for a career in high-tech, innovative industry.