

## MSc Programme Electrical Engineering



Track

# Electrical Sustainable Energy

Electrical power conversion is essential for improving energy efficiency and harvesting renewable energy.

Diploma	Master of Science Electrical Engineering Track: Electrical Sustainable Energy
Credits	120 ECTS, 24 months
Starts in	September
Language of instruction	English
% International students	65%

Electricity is the most flexible and efficient source of energy to power mankind. If we improve the exploitation of sustainable energy sources, electricity is sure to play a leading role throughout the foreseeable future.

In the decades to come, a revolution will unfold in the generation and delivery of electrical power, driven by the largescale introduction of renewable and distributed power generation, the need for environmentally-friendly and sustainable components and the liberalisation of the energy markets. Electrical sustainable energy engineers are needed in order to design new components with an eye towards sustainable materials and efficient conversion processes, as well as to integrate them into a smart and adaptable electricity infrastructure.

### Programme

The Master of Science programme in Electrical Engineering at TU Delft offers the track: Electrical Sustainable Energy.

If you are interested in getting an in-depth understanding of the challenges that electrical engineers must overcome, you must join this track. The programme covers a wide range of issues, including renewable energy, smart grids, environmentally friendly material technologies, the decentralisation of power generation, power-systems operations, power electronics and electrical machines. The Department of Electrical Sustainable Energy will provide you with a number of outstanding research facilities, including the High-Voltage Laboratory, the Sustainable Energy Laboratory; DENlab, a Real-Time Digital Simulator and the Power Processing (Electrical Machines and Electronic Conversion) Laboratory. The programme starts with several compulsory courses that provide you with the basics of Electrical Sustainable Energy. During the second semester of the first year, you can choose an in-depth specialisation based on the profiles suggested below.

First Year (60 EC)			
1st quarter	2nd quarter	3rd quarter	4th quarter
Profile Orientation & Academic Skills		Systems Engineering	
Core courses	Core courses	Core courses	Core courses
Specialisation courses	Specialisation courses	Specialisation courses	Specialisation courses
		Free Elective courses	Free Elective courses
Second Year (60 EC)			
1st quarter	2nd quarter	3rd quarter	4th quarter
Specialisation	Graduation project (45 EC)		
Free elective courses			

For more information on all courses, please visit: [www.studyguide.tudelft.nl](http://www.studyguide.tudelft.nl)

### Programme specialisations

The track offers the following specialisations:

**High Voltage** focuses on High Voltage Transmission Networks for large scale implementation of Renewable Energy Sources (solar, wind, wave), development of intelligent materials, monitoring of HV systems, and the optimization and controllability of HV transmission grids.

**Smart AC and DC grids** focuses on the generation, transmission and distribution of electrical energy, and it explores technological options for the design and operation of future intelligent power grids, which will be subject to sustainability and reliability constraints. The topics of microgrids, e-mobility and smart cities are also covered within this profile.

### Power Electronics & Electrical Machines

covers electrical power processing and conversion, with an emphasis on improving efficiency in industrial processes, offices, homes and E-mobility. It also covers the operation and design of electrical machines.

**Solar Energy** addresses all aspects of photovoltaic technology, from the design of a PV cell to the implementation of PV systems in the electricity grid. Students are free to compose their own specialisations by choosing from a list of courses, in consultation with their thesis supervisors.

### Example of graduation projects

- Optimisation of on-site partial discharge measurements and evaluation of diagnostic parameters for assessing the condition of distribution cable systems
- Control of a multi-terminal voltagesource converter HVDC for offshore wind power
- Sustainable off-grid power for rural areas
- Wireless power transfer for e-mobility
- Directional relay coordination in ungrounded radial distribution networks using a real-time digital simulator
- Design of fault-tolerant energy conversion systems for increasing wind turbine reliability



Nikoleta Kandalepa (Greece)

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200 years ago the main energy source was wood while today plenty of alternative energy sources are available. But the challenges never end. Electrical engineers have the unique power to visualise the future and to change the way people live in the most efficient way. The future lies in the largescale integration of sustainable energy, the increasing flexibility of intelligent power grids and the emission-free sources. The MSc track in Electrical Sustainable Energy at TU Delft gives you the opportunity to acquire solid theoretical knowledge, to gain valuable practical experience and to take advantage of a

strong network with companies. What you have to do is: be proactive, use your creativity and keep your eyes open to make the most out of the ESE programme. TU Delft provides all the qualifications for a promising career in the ever-changing power world! My decision to do a master in Electrical Sustainable Energy was a big step in my personal learning curve and both TU Delft and the programme exceeded my high expectations. Join this challenging unique experience and grab the opportunity of a lifetime, now!

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## Career prospects

Career opportunities for Electrical Sustainable Engineers are exceptionally good, both in the Netherlands and abroad. Graduates can choose from a number of career paths, with attractive positions open to starting engineers in the areas of product design, consultancy and research. At higher levels, electrical sustainable energy engineers often move into management positions. Electrical sustainable energy engineers are found in larger companies (including distribution and transmission system operators), as well as in such prominent firms as Siemens, ALSTOM, ABB, Shell and Philips. They also find employment in research institutes (e.g. TNO and ECN), hightech companies and consultancy firms (e.g. KEMA). Some graduates choose to continue their education and pursue doctoral studies.



**Dr Pavol Bauer, DC Systems & Storage**

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I'm Pavol Bauer head of the DC systems and Storage group (DC&S). We investigate system integration of renewable energy sources and energy storage in DC networks and systems and future DC transmission grid. Examples include exciting applications such as smart cities with DC micro-grids and renewable energy sources such as solar and wind energy and energy storage in the form of electric vehicles. The integration of renewable energy via Dr Pavol Bauer, DC Systems & Storage DC networks offers lower cost and higher efficiency as most of the sources and loads are having DC character. Charging electric vehicles directly from photovoltaic energy, the impact of E-mobility on the grid and solutions for contactless charging (stationary and on road) of electric vehicles are solutions for smart cities of the future. Storage plays an important role in future smart cities in the form of electric vehicles but also beyond. Understanding different storage options and their behaviour is essential for the system integration of renewable sources. Future DC transmission HVDC grids are also investigated. The DC&S laboratory has a scaled setup of a HVDC grid controlled by a real time simulator (Opal RT). HVDC power conversion technology and control of systems e.g. with wind energy are here experimentally tested and verified. High Voltage diagnostics & monitoring and High Voltage DC Materials & Components are also investigated and experimentally tested in HV the laboratory. The DC&S group is well connected to the industry with a large number of national and international research projects, which offer students possibility to join the research team and contribute to a future sustainable development.

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## Admission requirements and application procedures

### Dutch BSc degree

If you hold a Dutch BSc degree closely related to the Master's programme, you will be admitted directly. However, if your undergraduate programme is not closely related to the Master's programme you will be required to take additional courses in what is called a bridging programme. This may be a standard programme or it may be tailored to your specific situation.

To see which master's programmes are open to you on completion of your bachelor's degree from a non-technical Dutch university go to [www.studychoice.nl](http://www.studychoice.nl) If you completed your bachelor's at a technical university, go to [www.doorstroommatrix.nl](http://www.doorstroommatrix.nl)

### Dutch HBO degree

An HBO Bachelor's degree does not qualify you for direct admission to a TU Delft Master's programme. You will first need to complete a supplementary programme in order to bring your knowledge to the required level. You can do this during your HBO programme by completing a bridging minor, or by means of a bridging programme after completing your HBO diploma. Entrance requirements for mathematics and English (some exceptions) apply for both the bridging minor and the bridging programme.

See [www.hbodoorstroom.tudelft.nl](http://www.hbodoorstroom.tudelft.nl) for detailed information. Applications through Studielink: [www.tudelft.studielink.nl](http://www.tudelft.studielink.nl)

### International applicants

To be considered for admission to an MSc programme you will need to meet TU Delft's general admission requirements.

1. A University Bachelor's degree (or proof that you have nearly completed a Bachelor's programme) in a main subject closely related to the MSc programme to which you are applying, with good grades on the key courses.
2. A BSc Cumulative Grade Point Average (CGPA) of at least 75% of the scale maximum.
3. Proof of English language proficiency. A TOEFL (Test of English as a Foreign Language) with an overall Band score of at least 90 and a minimum score of 21 for each section. Please note that we only accept the TOEFL internet-based test.  
*An IELTS (academic version) with an overall Band score of at least 6.5 and a minimum of 6.0 for each section.*  
Or proof that you have passed the **University of Cambridge 'Certificate of Proficiency in English'** with a minimum grade B or the **University of Cambridge 'Certificate in Advanced English'**

For international students, the application period starts October 1 and closes at April 1. To start an MSc application, please complete the online application and pay the refundable application fee of € 100. Next, you will receive an email with the link to upload the required documents.

For more information about the application procedure and studying at TU Delft in general, go to [www.admissions.tudelft.nl](http://www.admissions.tudelft.nl)

### Introduction week

All international students will be welcomed with the award-winning introduction programme. The introduction consists of a variety of workshops and projects, during which you will get to know other international students, visit the highlights of Delft and learn the ins and outs of the TU Delft campus.

After this very interesting and fun week, you will be introduced to the EEMCS faculty. During the Master Kick Off, you will receive helpful information about the Dutch education system and meet the fellow students from your programme in a variety of social and educational activities.

### For further information

Please visit the webpage for all details, complete requirements, deadlines and contact information, please visit: [www.ewi.tudelft.nl](http://www.ewi.tudelft.nl)

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### Further information for international applicants

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