Students acquire the theoretical knowledge, numerical and experimental skills, and practical hands-on experience they need to develop the next generation of energy and process technologies.

Diploma | Master of Science Mechanical Engineering Track: Energy and Process Technology
---|---
Credits | 120 ECTS, 24 months
Starts in | September
Language of instruction | English
% international students | 40%

All Energy and Process Technology (EPT) students complete courses on fluid dynamics, equipment for heat and mass transfer, and applied thermodynamics. The elective portion of the EPT course load allows students to tailor their degree to emphasize energy engineering, process engineering, or fluid mechanics, which provides a fundamental bridge between the first two topics.

**Energy Technology**

Energy is the vital force powering business, manufacturing and the transportation of goods and services to serve the world economies. Demand for energy is growing, while the related environmental impact of pollutants from energy conversion processes is one of the major problems facing humanity. One of the fundamental challenges for the future is the sustainable production of energy, with gradual emancipation from fossil fuels due to their increasing scarcity and associated political danger. This can only be achieved by technological improvement and innovation.

EPT students who focus on energy technologies develop a thorough understanding of energy conversion and utilization. Students learn about state-of-the-art analysis tools and apply them to study highly efficient, environmentally friendly and integrated processes for the production and utilization of heat, power and secondary fuels like hydrogen. Starting at a systems analysis level, students gain skills to apply their knowledge in sustainable next-generation processes.

The research activities focus on both systems and components. The system-related studies aim at optimizing the complete chain of energy production and utilization, the thermodynamic design of processes and their integration into larger systems and online optimization using modern diagnostic tools. Examples include advanced biomass utilization concepts such as gasification in combination with fuel cells, gas or ORC turbines and hydrogen production. Component-level research is related to combustion, co-combustion and gasification in fluidized bed and/or pulverized fuel systems and the combustion of LCV gases in gas turbines.
EPT students who focus on process technology learn to define, design and optimize the processes and equipment that transform raw goods into consumer products.

Nowadays Process Technology faces tremendous challenges related to the shrinking availability of non-renewable resources, rising energy prices, and a broad spectrum of environmental and safety issues. These challenges affect numerous industries, including oil and gas, food, pharmaceutical and bulk industries.

The Process Technology of the future must get more while using less. That requires the re-invention of industrial processes to develop sustainable processes that use energy and resources more efficiently while drastically reducing waste streams – or even reuse waste as new primary material resources.

Students within EPT specializing in Process Technology receive the knowledge and skills they need to systematically define, design and optimize a variety of sustainable processes and equipment. Students learn the state-of-the-art in process intensification, thermodynamics, fluid dynamics and process control. They get hands-on experience in sustainable process technology within their graduation project at one of the sections of the Process & Energy Department.

Program Structure

Students in the Energy and Process Technology (EPT) track follow a combination of compulsory and elective courses in their first year. The second year consists of an internship and thesis project.

First Year

Course requirements for the first year of the EPT track are divided into several categories. The first is a core group of four courses (16 ECTS total) common to all Mechanical Engineering Master tracks at TU Delft, along with a "social course" of 3-8 ECTS.

- Physics and Measurement (6 ECTS)
- Control Theory for Mechanical Engineering (3 ECTS)
- Advanced Heat Transfer (3 ECTS)
- Advanced Nonlinear Mechanics (4 ECTS)

The second category (16 ECTS total) comprises compulsory courses for all students in the EPT track. These courses train the student in key basic disciplines such as fluid dynamics, thermodynamics, process modeling and simulation, and process equipment design. All EPT students also attend a colloquium series (1 ECTS) that exposes them to the very latest academic and industrial research in mechanical engineering.

- Advanced Applied Thermodynamics (5 ECTS)
- Equipment for Heat and Mass Transfer (5 ECTS)
- Advanced Fluid Dynamics (5 ECTS)

In the third category, students begin to tailor their degree program by selecting two courses from a list of four:

- Process Plant Design (5 ECTS)
- Modeling of Thermodynamic and Hydrodynamic Systems (5 ECTS)
- Advanced Reaction and Separation Systems (5 ECTS)
- Turbulence (5 ECTS)

Finally, there is a fourth category (15 ECTS total) containing a long list of electives, examples of which are given below. Other choices from the full TU Delft course catalog are also possible, in consultation with the EPT Master’s Coordinator.

- Energy from Biomass
- Indoor Climate Control Fundamentals
- Process Dynamics & Control
- Multiphase Reactor Engineering
- Fluid-Structure Interaction
- Gas Dynamics
- Molecular Thermodynamics
- Computational Materials Science
- Product & Process Design
- Nonlinear Differential Equations
- Numerical Analysis
- Gas Turbine Simulation/Application

Second Year

Second year students in the EPT track complete and industrial internship (15 ECTS) and a research project (30 ECTS) under the supervision of a TU Delft researcher. Internships can be completed in the Netherlands and abroad.

Recent graduation research project topics include:

- Research Design and analysis of a heat pump applied to apartment buildings
- Numerical modeling of heat transfer in flameless and conventional combustion
- Power systems combining Solid Oxide Fuel Cells and gas turbines
- Ultrasonic irradiation and its mixing and crystal nucleation consequences
- Experimental Validation of a New Ammonia/Water Absorption Model
- Eco-efficiency of biomass co-firing with coal
- Cooling crystallization under influence of a strong DC electric field for controlling polymorphism
Irene de Sera (The Netherlands)

After my bachelor in Mechanical Engineering I chose for the master track EPT. This is a decision with which I am still very pleased. The first thing I noticed was the great ambiance within EPT. The ‘Dispuut Process & Energy’ has a huge share in this, with monthly activities and traditions that go way back in time. They make sure that the EPT students get to know each other, the professors and PhD’s within the Process & Energy Department, but also the companies in the process & energy field.

From the beginning I have always worked together with my fellow master students. The courses are challenging, but since everybody within the department knows each other and works in the same building, it is easy to find the right people when you have a problem.

For me, the great international reputation of the Process & Energy Department and its staff was also a plus; thanks to this I had the chance to do my internship at a highly innovative project in Italy. My task focused on the development of an air-conditioning system driven by the heat of the sun. This system has the potential to provide the world with sustainable air conditioning, how “cool” is that?

Fluid Mechanics

EPT students who focus on fluid mechanics receive training in the fundamentals of fluid flow. Particular attention is paid to turbulence and multiphase flow, since these are relevant to many industrial and environmental applications. Much emphasis is placed on computational fluid dynamics (CFD) and its use in solving various practical problems.

Associated research activities at the Fluid Mechanics Group at TU Delft concern the application of numerical tools to fluid mechanics, particularly with respect to the simulation of turbulence. In fluid mechanics we cannot do without experiments. For this reason, most of the numerical work is combined with experimental research emphasizing the use of new measurement techniques. Consequently, the student is trained in all aspects of modern fluid mechanics in both classroom and research environments.
Admission requirements and application procedure

Dutch BSc degree
In most cases, if you hold a BSc degree and the Master’s programme is closely related to your Bachelor’s programme, you will be admitted directly into the programme. However, if the Master’s programme does not follow directly from your undergraduate 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 Dutch university, go to www.doorstroommatrix.nl.

Application goes through Studielink: tudelft.studielink.nl

Dutch HBO degree
An HBO Bachelor’s degree does not qualify you for direct admission to a TU Delft Master’s degree programme. To start a Master’s degree 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 securing 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 for detailed information.

Application goes through Studielink: tudelft.studielink.nl

International applicants
To be considered for admission to a MSc Programme you’ll need to meet TU Delft’s general admission requirements.

1. A BSc degree (or a proof that you have nearly completed a BSc programme) in a field closely related to the MSc programme.
2. A BSc Cumulative Grade Point Average (CGPA) of at least 75% of the scale maximum.
3. Proof of English language proficiency:
   - TOEFL with a minimum score of 21 for each section and an overall band score of at least 90 (internet-based test). Please note that we only accept the TOEFL internet-based test.
   - or IELTS (academic version) with a minimum score 6.0 for each section and an overall Band score of at least 6.5.
   - or proof that you have passed the University of Cambridge ‘Certificate in Advanced English’ with a minimum grade B or the University of Cambridge ‘Certificate of Proficiency in English’.

For international students, the application period starts in October and closes on 1 April. To start an MSc application, fill in the online application and pay the refundable application fee of €100. Then send hard copies of the application documents to TU Delft’s International Office. Please note that you should apply early when you want to be considered for a scholarship as well!

For more information about the application procedure and studying at TU Delft in general, go to: www.admissions.tudelft.nl.

Further information
Please visit the webpage for all details, complete requirements, deadlines and contact information: www.me.msc.tudelft.nl.

Dutch BSc degree
Dr.ir. B.P. Tighe
Master’s Track Coordinator
T: +31 (0)15 27 81103
E: B.P.Tighe@tudelft.nl

Further information for international applicants
International Office 3mE
T: See website
E: internationaloffice-3me@tudelft.nl
W: www.studyabroad.3me.tudelft.nl

3mE Faculty
Mekelweg 2
2628 CD Delft
The Netherlands
www.3me.tudelft.nl

www.facebook.com/TUDelft
@DelftUniversity
instagram.com/TUDelft
www.campus.tudelft.nl

February 2017