Welcome at the TU/e Graduate School Event
Master Sustainable Energy Technology (SET)

< Name + function staff member + department >
< name student + 1\text{st} \text{ year} / 2\text{nd} \text{ year} >
Welcome to Sustainable Energy Technology!

Today’s program

• Presentation (30 min)
  • Master program SET
  • Pre-Master program SET
  • Master program SELECT

• Time for questions (15 min)
CONTENT
MASTER SUSTAINABLE ENERGY TECHNOLOGY (SET)

• Brainport region
  • SET: why?
  • SET: what?
  • SET: specializations
• After graduation
• SET Pre-Master program
• Application / More information
• MSc program SELECT
Top-ranking Dutch university

At the heart of the Brainport region

Strong technology heritage in Eindhoven

Accounts for 23.1% of total Dutch private R&D expenditure*

Student growth

<table>
<thead>
<tr>
<th>Year</th>
<th>BSc</th>
<th>MSc</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>5,591</td>
<td>3,608</td>
<td>9,199</td>
</tr>
<tr>
<td>2019</td>
<td>7,501</td>
<td>4,750</td>
<td>12,251</td>
</tr>
</tbody>
</table>

Engineers for the future

- More than 93 nationalities
- 12,251 total number of students
- 86% Dutch, 14% International
- 92% of the graduated students finds a job within 6 months. Nationally this is 89%
- 3,298 total degrees awarded
  - 1,441 BSc / 1,455 MSc
  - 120 PhD / 282 PhD
- 59,341 total number of Alumni
  - 83% Male, 17% Female
The TU/e campus covers an area of 75 hectares

Ecosystem and characteristics
- 47 new patent applications
- 7 patents filed by third parties
- 29 provisionals converted
- 35 transferred via a transfer or license
- 2747* Scientific publications

International working environment
- 3,301.3 Total staff (fte)
- 2,122 Research staff (fte)
- 54 New start-ups and spin-offs
- 15 Large research labs
- 50 Smaller research facilities

Rankings:
- CWTS Leiden Ranking 2020: TU/e no. 4 in industry cooperation
- Times Higher Education: 2021 no. 187 of 1000
- QS-Ranking 2021: no. 120 of 1003

Eires: Energy transition
EAISI: Artificial intelligence
ICMS: Complex molecular systems
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The need for an energy transition
Future power system?
Example of SET

https://www.tue.nl/en/research/research-areas/energy/
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The energy system

Bradford ‘The energy system’ fig 1.9; adapted from ‘Energy efficiency indicators: Fundamentals on Statistics’ (Paris: OECD/IEA, 2014)
Master Sustainable Energy Technology

MISSION: Educate academic engineers who possess scientific knowledge on and insight into the design, behaviour and performance of energy technologies, and the integration of these technologies in grids, buildings, and into society at large.

- Focus on technological aspects of sustainable energy
- Broad basis and system integration approach
- Program is characterized by 4 themes reflecting the whole energy system
Master Sustainable Energy Technology

Specialists from many fields are involved

Cooperation between 6 departments:

- Applied Physics (AP)
- Built Environment (BE)
- Chemical Engineering and Chemistry (CEC)
- Electrical Engineering (EE)
- Industrial Engineering and Innovation Sciences (IE&IS)
- Mechanical Engineering (ME)
Master Sustainable Energy Technology

• Duration: 2 years (120 EC)
• Entry for international students: September
• Entry for TU/e students: every month
• Language: English
• Degree: Master of Science (MSc)
# Program overview

<table>
<thead>
<tr>
<th>1st year</th>
<th>2nd year</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Core program (30 EC)</td>
<td>Internship (15 EC)</td>
</tr>
<tr>
<td>• Specialization courses (15 EC)</td>
<td>Graduation project (45 EC)</td>
</tr>
<tr>
<td>• Free electives (incl. homologation, 15 EC)</td>
<td></td>
</tr>
</tbody>
</table>
SET - core program

- Sustainable Energy Sources (ME, AP)
- Electrical power engineering and system integration (EE)
- Building performance and energy systems simulation (BE)
- Energy, Economy & Society (IE&IS)

System integration project
Positioning of core courses in the energy system

Bradford 'The energy system' fig 1.9; adapted from 'Energy efficiency indicators: Fundamentals on Statistics' (Paris: OECD/IEA, 2014)
System integration project (10 EC)

“Group assignment, in which sustainable energy has to be applied to a concrete, real-world problem”

“Multidisciplinary project team (+/- 5 members) in collaboration with stakeholders (e.g. industry, municipality)”
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# Program Overview – specialization

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<th>1st year</th>
<th>2nd year</th>
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<tr>
<td>• Core program (30 EC)</td>
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<td>• <strong>Specialization courses</strong> (15 EC)</td>
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</tr>
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<td>• Free electives (incl. homologation, 15 EC)</td>
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**TU/e Graduate School Event 2022 – MSc Sustainable Energy Technology**
Specialization themes

- Sources, fuels & storage (ME, AP, CEC)
- Electrical power systems (EE)
- Application in built environment (BE, W)
- Energy & society (IE&IS)
Positioning of specialization themes in the energy system

Bradford 'The energy system' fig 1.9; adapted from 'Energy efficiency indicators: Fundamentals on Statistics' (Paris: OECD/IEA, 2014)
Sources, fuels & storage

Mechanical Engineering

- Thermochemical Heat storage
- Geothermic
- PhotoVoltaic Thermal panels
- Metal fuels
Sources, fuels & storage

Applied Physics and Chemical Engineering & Chemistry

- Crystalline silicon and thin film solar cells
- Polymer solar cells
Electrical power systems
Electrical Engineering

vertical power flow

The TU/e Power Quality Laboratory

horizontal power flow
Application in built environment

Mechanical Engineering & Built Environment

- Sustainable energy-positive built environment
- Climate adaptive building shells
Energy & society
Industrial Engineering and Innovation Sciences

How technology works in the real world: development, application and diffusion of technology.
## Specializations SET – sections

<table>
<thead>
<tr>
<th>Sources, fuels &amp; storage</th>
<th>Electrical power systems</th>
<th>Application in built environment</th>
<th>Energy &amp; society</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport in Permeable Media (AP)</td>
<td>Electro mechanics and Power Electronics (EE)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Technology (ME)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power &amp; Flow (ME)</td>
<td></td>
<td></td>
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<tr>
<td>Functional Organic Materials and Devices (CEC)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Macro-Organic Chemistry (CEC)*</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Moleculair Catalysis (CEC)*</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

*Only for students with bachelor's degree Chemical Engineering or comparable
Examples of internship projects

- ‘Promoters and inhibitors for the potential of upscaling social enterprises for rural electrification of India’ (IE&IS)
- ‘Assessment and improvement of scale model household level TCM storage for direct hot water supply’ (ME)
- ‘Self-adjusting Interleaving of Boost Type DC-DC Converters’ (EE)
- ‘Aggregated Economic Value to households: A starting point Plan’ (IE&IS)
- ‘Flame Performance for Different 3-D Burner Deck Models’ (ME)
- ‘Vapour-Assisted Solution Processing of Methylammonium Lead Triiodide Perovskite Photovoltaic Devices’ (CEC)
Examples of graduation projects

- ‘Optimal Energy Trading using Reinforcement Learning for an Energy Storage System’
- ‘Integrated local energy systems in Dutch residential areas’
- ‘Thermal Modelling and experimenting on Solarus Power Collector’
- ‘Electric drive system design toward integration of variable flux reluctance machines and transmission systems’
- ‘Development and application of a reactive forcefield for Ca-doped MgCl2 hydrates for thermochemical heat storage’
- ‘Atomic layer deposited nickel oxide for perovskite solar cells’
Graduation project – Silvia Nieddu

Performances analysis of the software Modelica in modelling and simulating thermal dynamic behaviour with focus on heat transmission and consumption in a district heating system.
Coaching

• Mentor program: Full, associate or assistant professor

• Student mentor

• Academic advisor
Exchange program: DTU SE - TU/e SET

https://www.dtu.dk/english/Education/Incoming-students/Exchange
Exchange program: DTU SE – TU/e SET

What

• For TU/e-SET students: yr 1 at TU/e, yr 2 at DTU
  For DTU-SE students: yr 1 at DTU, yr 2 at TU/e

• 5 students per year, max 2 students per section

• Involved sections:
  • Energy Technology (Mechanical Engineering)
  • Electrical Energy Systems (Electrical Engineering)
  • Power & Flow (Mechanical Engineering)
  • Plasma & Materials Processing (Applied Physics)
Exchange program: DTU SE - TU/e SET

Why is this an opportunity?

• International experience

• More possibilities to construct an optimal course portfolio making use of courses offered at DTU

• Opportunity to study at two world-leading universities

• Get a supplement in your MSc diploma
Student teams

**STUDENT TEAM**
**Solar Team Eindhoven**
Solar Team Eindhoven is working on the sustainable mobility of the future and will participate in the 2019 World Solar Challenge in Australia with their solar car Stella Era. This family car can also share energy and park itself autonomously in the sun to charge.

**STUDENT TEAM**
**Team Energy**
Team Energy realizes events to accelerate the transition towards sustainable energy. We aim to inform, inspire and connect students.

**STUDENT TEAM**
**SOLID**
Team SOLID is working on a new concept called “metal fuels”, in which metals are used to sustainably store energy.

**STUDENT TEAM**
**Core**
They want to use e-waste as raw material in the future by retrieving elements in their and reusing them!
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  • MSc program Select
After graduation:

- PDEng program Smart Buildings and Cities (2 years)
- PhD program (4 years)
- Job in consultancy, government, research or industry
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Pre-Master Sustainable Energy Technology

• Duration: 1 year (30 EC)
• Time of entry: September
• Language: English

Why?
• Can you handle the level?
• Eliminate deficiencies

What?
• Program of 30 EC, to be achieved within one year
• Focus on mathematics (10 EC)
# Pre-Master program 2022-2023

<table>
<thead>
<tr>
<th>Quarter 1</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>2DL60</td>
<td>Linear Algebra</td>
<td>2.5</td>
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<tr>
<td></td>
<td>2WBB0</td>
<td>Calculus variant 2</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quarter 2</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2DL40</td>
<td>Advanced Calculus I</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>4PB00ONL</td>
<td>Heat and Flow (online)</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>4EB00</td>
<td>Thermodynamics</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quarter 3</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4GB10</td>
<td>Combustion Engine</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>4EC10</td>
<td>Dynamics of energy systems</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>5APA0</td>
<td>Power Electronics*</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>7XSUC0</td>
<td>Design for a Sustainable Future: specializing enterprise</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quarter 4</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7S9X0</td>
<td>Introduction building performance</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>5XWA0</td>
<td>Power system analysis and optimization*</td>
<td>5</td>
</tr>
</tbody>
</table>

### Compulsory courses
25 EC

### Elective course
5 EC

### Additional training (no EC's):
- RSI-training (mandatory)
- Arbo en milieu (mandatory)
- Matlab (strongly recommended)

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* Option for students with a HBO bachelor in EE or comparable.

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Difference Bachelor WO & HBO (in general)

University of technology:
• Developing new technology and design methods to solve technological problems
• Education focusses on (mathematical and physical) concepts and their implications
• Students do also internal research projects
• All lecturers are involved in scientific research
• Internship is a research project

University of applied science:
• Applying existing technology and design methods to solve technological problems
• Education focusses on practical applications
• Multiple internships in companies/industry
How to prepare during your bachelor’s program?

• A pre-master’s program is more work than one might think. You must be willing to work hard.

• It is not advised to do the pre-master in combination with a part-time job in industry.

• Subscription for a pre-master via Studielink before May 1st.

• required minimum level of mathematics: pre-university (VWO) mathematics B or TU/e mathematics B test completed before September 1st

• required minimum level of English proficiency: pre-university (VWO) level English or English language proficiency test completed before September 1st
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Admission with a BSc degree in:

- Advanced Technology (pre-mechanical engineering track)
- Aerospace Engineering
- Applied Physics
- Chemical Engineering
- Electrical engineering (Automotive included)
- Marine Technology
- Mechanical engineering
- Molecular Science and Technology
Admission via pre-master’s program

Depending on HBO degree:

➢ direct admission:
  • Automotive
  • Aviation / Aeronautical Engineering
  • Chemical Engineering / Technische scheikunde
  • Electrical and Electronic Engineering
  • Engineering Physics
  • Mechanical Engineering
  • Mechatronics

➢ Individual admission by admission committee

Tailor-made pre-master’s programs for other (university + HBO) diplomas via admission committee Admission.Mech@tue.nl
APPLICATION MASTER PROGRAMS

For Dutch students:
• More information about admission: www.tue.nl/admission
• Application via http://www.studielink.nl/
• Questions: studeren@tue.nl

For international students:
• Check the requirements for admission via www.tue.nl/admission
• Apply at the online application form (available from 1 Oct – 1 May)
• Application fee of €100 for each application (non refundable)
• Application procedure takes +/- 8 weeks
• You will be informed by email about the outcome of your application
• Questions: io@tue.nl
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MSc SELECT

Environmental Pathways for Sustainable Energy Systems

Study two years in two different countries

Energy Technology with strong focus on innovation & entrepreneurship


Real-world energy challenges.
Collaborative solutions.
A sustainable tomorrow
MSc SELECT

Environomical Pathways for Sustainable Energy Systems

Second year specializations

- Polygeneration (KTH)
- Offshore energy systems (IST)
- Solar Systems (UPC)
- Innovation in Energy systems (TU/e)
- Sustainable Fuels Economy (AGH)
- Solar systems (UPC)
More information & Questions

Information:

• Master SET: https://www.tue.nl/en/education/graduate-school (info on Master’s program, curriculum, interviews with students and alumni)

Questions:

• Content program: me.studyinformation@tue.nl