# Welcome at the TU/e Graduate School Event

## Presentation Mechanical Engineering - Hans Kuerten and Daniël Lelivelt

# Top-ranking Dutch university

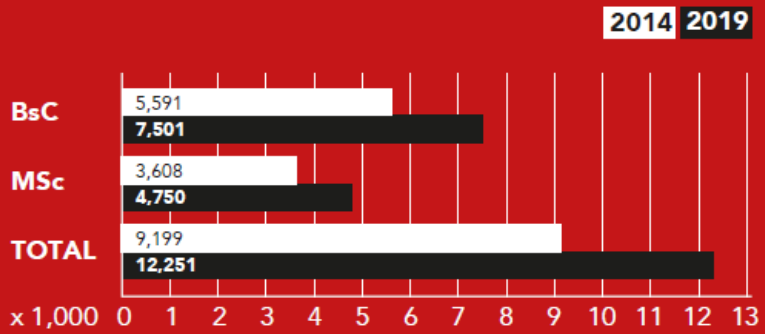
At the heart of the Brainport region

Strong technology heritage in Eindhoven

The Netherlands → Brainport → Eindhoven

Accounts for 23,1% of total Dutch private R&D expenditure*

## Student growth




## Engineers for the future

More than **93** nationalities

86% Dutch
14% International

73% Male
27% Female

**12,251** total number of students

**92%** of the graduated students finds a job within 6 months. Nationwide this is 89%

**3,298** total degrees awarded
1.441 BSc / 1.455 MSc
120 PDEng / 282 PhD

**59,341** total number Alumni
83% Male, 17% Female

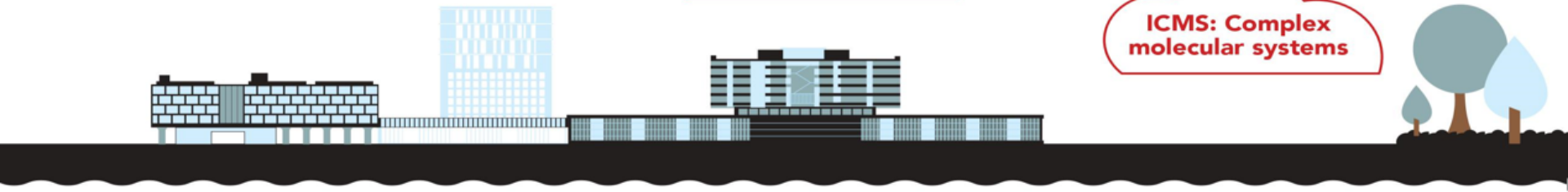
**The TU/e campus covers an area of 75 hectares**

**EIRES: Energy transition**

**3 Interdisciplinary research institutes**

**EAISI: Artificial intelligence**

**ICMS: Complex molecular systems**



## 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
- **54** New start-ups and spin-offs
- **15** Large research labs
- **50** Smaller research facilities

## International working environment

**3,301.3** Total staff (fte)

**2,122** Research staff (fte)

- 64.3% Dutch
- 35.7% International
- 61.5% Male
- 38.5% Female

- 154 Full professors
- 138 Part time professors
- 144 Associate professors
- 300 Assistant professors
- 1,572 PhD fellows

## Rankings:

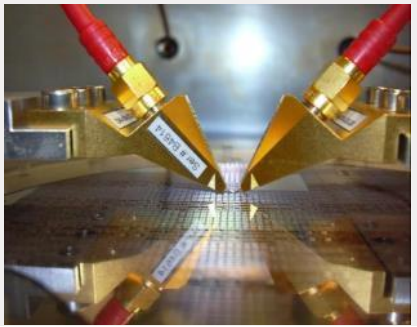
- CWTS Leiden Ranking 2020: **TU/e no. 4 in industry cooperation**
- Times Higher Education: 2021 **no. 187 of 1000**
- QS-Ranking 2021: **no. 120 of 1003**

## Why TU/e?

- High Tech Campus
  - Signify (Philips Lighting) and Healthcare
  - Solliance PV solar energy
  - SEAC Solar Energy
  - ECN Energy research Center NL
  - NXP semiconductors
- ASML wafersteppers (Veldhoven)
- Océ  a Canon company (Venlo)
- VDL Groep
- DAF trucks
- TNO Applied Scientific Research
- TU/e
- Automotive Campus (Helmond)
- FEI High-performance microscopy

# TU/e in a nutshell

- High quality research and education
- International network with prominent universities and institutes
- Modern facilities and lab spaces
- TU/e alumni in high demand among employers
- International community with over 80 nationalities
- Friendly, open culture



# TU/e in a nutshell

- One campus in city center
- Compact, green
- Modern student facilities

# TU/e in a nutshell

- Student associations
- Excellent sport facilities
- Student teams
- Eindhoven – city of design and technology

# Mechanical Engineering

- Why Mechanical Engineering (ME) and why TU/e?
- Content of the Master program at ME
- Specializations in the Master
- Experience Daniel Lelivelt
- Pre-Master's program (schakelprogramma)
- Why study at a university?

# Why Mechanical Engineering at TU/e?


- Excellent chance of good job
- Combination of depth and broad range of topics
- Participation in all research themes of TU/e
- Very good contacts with Brainport industries

Did you know that we are in the global top-50 of Engineering & Technology universities? One of the highest ranked areas is Mechanical Engineering! (rank 37)

# Mechanical Engineering

- Why Mechanical Engineering (ME) and why TU/e?
- Content of the Master program at ME
- Specializations in the Master
- Experience Daniel Lelivelt
- Pre-Master's program (schakelprogramma)
- Why study at a university?

# Master program MW: overview

2 years, 120 Ecs, English, Master of Science (MSc)

| | | | |
|---|---|---|---|
| **Core** | 20 | 4 core courses out of 12 core courses offered | Y1 |
| **Specialization** | 20 | 20 EC out of a total of ~150 EC offered | |
| **Electives** | 15 | Free choice out of all TU/e Master courses offered | |
| **Professional skills** | 5 | 2 compulsory modules | |
| **Internship** | 15 | | Y2 |
| **Graduation project / Thesis** | 45 | | |

**One quartile = 15 EC ≈ 10 weeks**
**Most courses are 5 EC = 3 courses per quartile**
**8 weeks courses, 2 weeks exams**
**Resits in next quartile, only 2 exam possibilities per year**

# Degree program: professional skills

**Each student has to pass two courses:**

- 4WM00 – Coaching and tutoring (2.5EC)
  (group dynamics, leadership, project planning, …)
- 4WM10 – Career Development (2.5EC)
  (orientation of future career, assessment, networking, …)

* HBO and international students take the course 4WM50 Group work and academic writing.

# Mechanical Engineering

- Why Mechanical Engineering (ME) and why TU/e?
- Content of the Master program at ME
- Specializations in the Master
- Experience Daniel Lelivelt
- Pre-Master's program (schakelprogramma)
- Why study at a university?

# Research divisions

| Dynamical Systems Design (DSD) | Thermo Fluids Engineering (TFE) | Computational and Experimental Mechanics (CEM) |
|---|---|---|

- Each research division contains different sections
- Specializations for MW are the sections

# Sections

| Section | Chair | Research division |
|---|---|---|
| CST: Control Systems Technology | Prof. Steinbuch | DSD |
| D&C: Dynamics and Control | Prof. van de Wouw | DSD |
| P&F: Power and Flow | Prof. Deen | TFE |
| ET: Energy Technology | Prof. Smeulders | TFE |
| MoM: Mechanics of Materials | Prof. Geers | CEM |
| PT: Polymer Technology | Prof. Anderson | CEM |
| MS: Microsystems | Prof. Den Toonder | CEM |

A section is the basis for your choice for core and specialization courses, internship, thesis project and possibly your electives.

# Dynamical Systems Design

*Sections:*

- Control Systems Technology, Prof. M. Steinbuch
- Dynamics and Control, Prof. N. van de Wouw

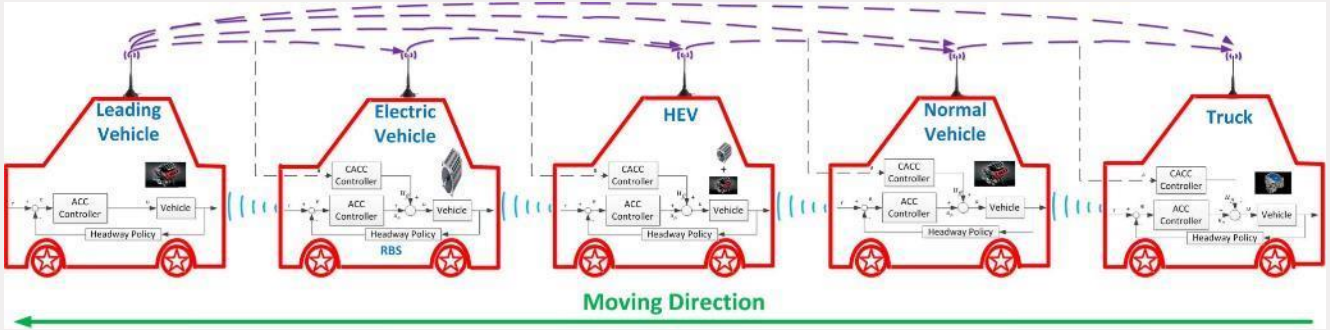
*Example research areas:*

- Automotive Powertrains
- Advanced Motion Systems (Hybrid and Networked Control Systems)
- Robotics for Care and Cure
- Energy Systems

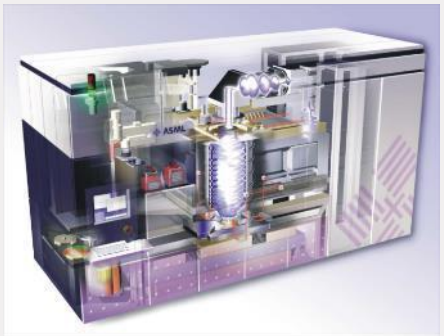
- Acoustics and Noise Control
- Manufacturing Networks
- Cooperative Adaptive Cruise Control
- Vehicle dynamics, tire dynamics and control

# Dynamical Systems Design

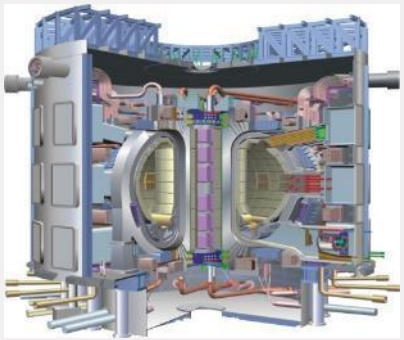
*Cooperative Adaptive Cruise Control*




*Master-slave, haptic feedback*



*Wafer stepper*



*Fusion reactor*

# Thermo Fluids Engineering

*Sections:*

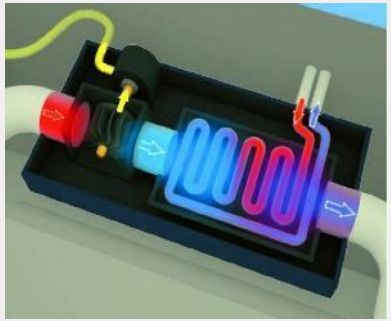
- Power and Flow, Prof. N. Deen
- Energy Technology, Prof. D. Smeulders

*Example research areas:*

- Efficient Engines
- Multiphase Flows
- Metal Fuels

- Micro-scale Heat Transfer
- Small-scale Renewable Energy Systems
- Heat Storage

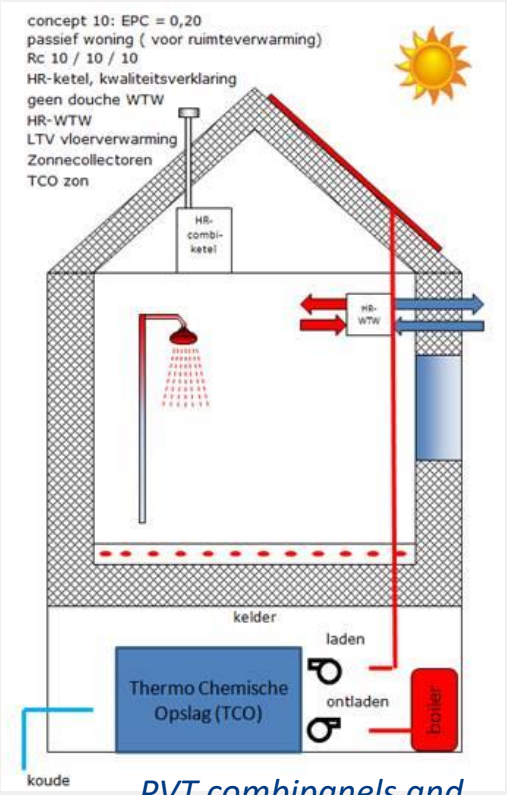
# Thermo Fluids Engineering



*WEDACS*

*Solar simulator*

*Master Mechanical Engineering*




*PVT combipanels and heat storage*

# Computational and Experimental Mechanics

*Sections:*

- Mechanics of Materials, Prof. M. Geers
- Polymer Technology, Prof. P. Anderson
- Microsystems, Prof. J. den Toonder

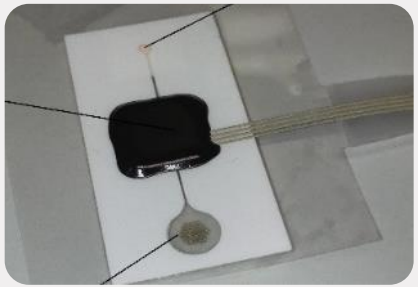
*Example research areas:*

- Mechanics of Micro-Electronics
- Advanced High-Tech Materials
- Materials for Energy

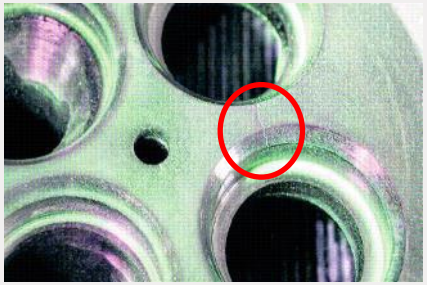
- Applied Rheology and Process Modelling
- Chaotic Mixing and Multiphase Flows

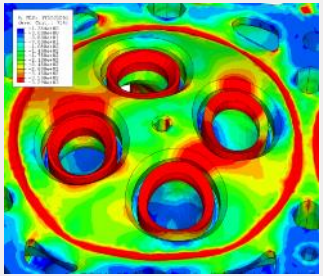
- Micro-Manufacturing Technologies
- Cells and Organs on a Chip

# Computational and Experimental Mechanics



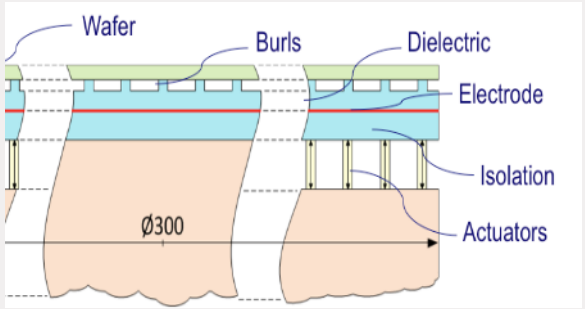
Wearable sweat sensor





DAF cylinder heads: micro-crack formation

micro structure → processing history → macroscopic performance



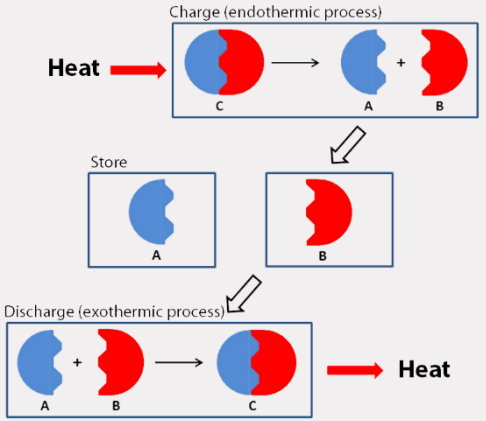

Novel microactuators for ASML

# Mechanical Engineering

- Why Mechanical Engineering (ME) and why TU/e?
- Content of the Master program at ME
- Specializations in the Master
- Experience Daniel Lelivelt
- Pre-Master's program (schakelprogramma)
- Why study at a university?

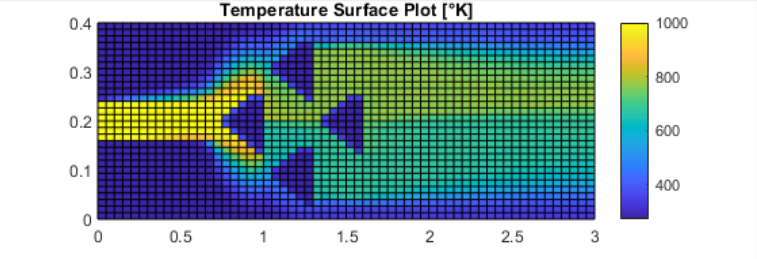
# Experience Daniël Lelivelt

- Bachelor Mechanical Engineering
  - BEP: Energy storage
- Master ME
  - Power & Flow



# Experience Daniël Lelivelt

- Before Master:
  - Visit master-presentations
  - Talk with master-students
  - Look on websites of research groups
  - Check interesting courses
    - Free space




Introduction to CFD

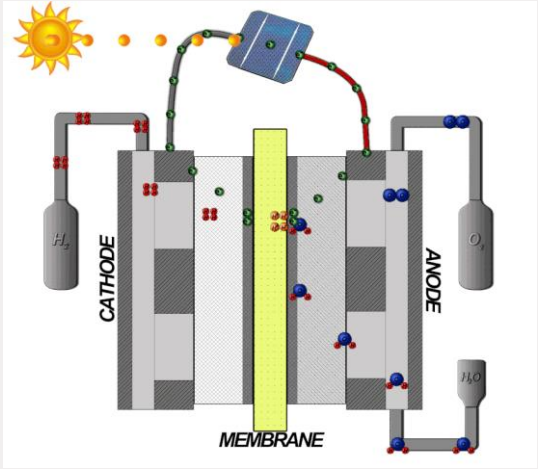
Experimentation for ME – Scanning Electron Microscopy

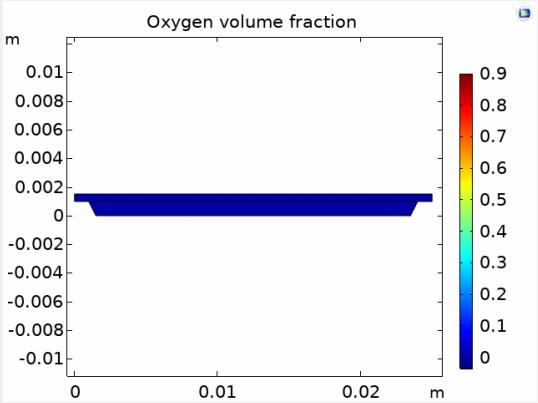
# Experience Daniël Lelivelt

- During Master:
  - Develop yourself
    - Soft-skills
    - Self-reflection
  - Internship: Bosch, Tilburg
  - Look into job options
  - Plan your future

BOSCH
Invented for life

MyFuture.tue.nl



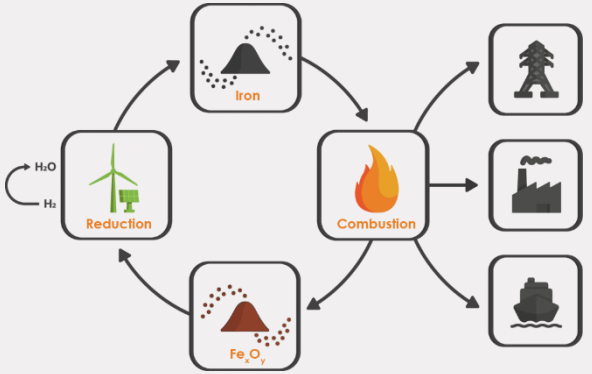





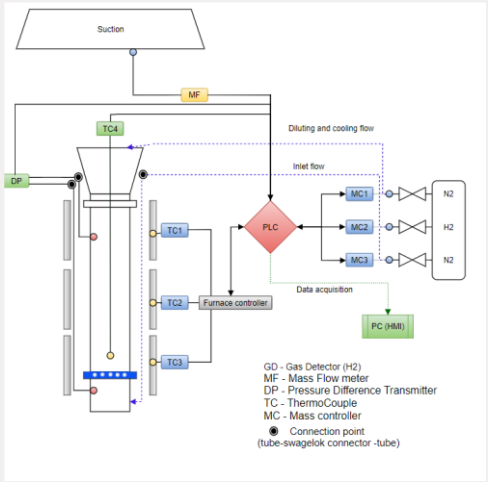

TU/e

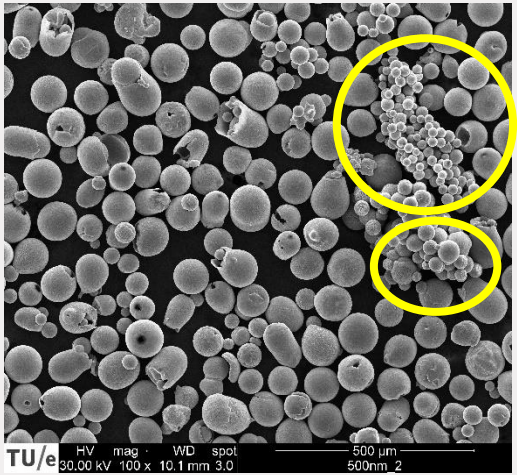
# Graduation Project

- Characterization of the fluidization and reduction behavior of combusted iron(-oxide)
- Practical




Iron fuel cycle, adapted from SOLID[1]




[1]https://teamsolid.org/our-solution/

# Extracurricular activities

- SSCE (Student Sport Centre Eindhoven)
  - ± 70 sports
- Part-time job: Teaching Assistant
  - Education team
  - Guided selfstudies of master course
- STEHVEN
- W.S.V. Simon Stevin
- Student team
  - Organizing events for energy enthusiasts

# Student teams









# Mechanical Engineering

- Why Mechanical Engineering (ME) and why TU/e?
- Content of the Master program at ME
- Specializations in the Master
- Experience Daniel Lelivelt
- Pre-Master's program (schakelprogramma)
- Why study at a university?

# Pre-Master’s program for HBO-students

- Program of 30 EC’s
- Starts in September
- Aim of the program
  - Knowledge deficiency, especially mathematics
  - Does academic education suit you?

# Pre-Master's program 2022-2023

| Quartile 1 | Quartile 2 | Quartile 3 | Quartile 4 |
|---|---|---|---|
| Calculus (5 EC) | Advanced Calculus (2.5 EC) | Solid Mechanics (CEM) | Electives |
| Linear algebra (2.5 EC) | Dynamics & control of mechanical systems (DSD) | Electives | |
| Trainings | Thermodynamics (TFE) | | |
| **7.5 EC** | **12.5 EC** | **10 or 5 EC** | **0 or 5 EC** |

- Trainings: Matlab, RSI, safety and environment
- Compulsory courses of 25 EC, one elective of 5 EC
- 10 EC for mathematics
- If interested in new master's program AIES: choose specific elective

# Regulations in the pre-master's program

- **Binding Study Advice** of 100 % - so 30 EC's in 1 year
- With good study progress the student can start attending master courses up to a maximum of 15 EC's
  - Yields exemptions in the master

# Be prepared

- 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

# Admission

- **Direct admission with:**
- Mechanical Engineering, Applied Physics, Marine Technology and Aerospace Engineering at university level (WO Werktuigbouwkunde, Technische Natuurkunde, Maritieme Techniek en Lucht- en ruimtevaarttechniek)

- **Admission via pre-master's program with:**
- Mechanical Engineering, Electrical Engineering, Automotive, Applied Physics, Mechatronics, Aerospace Engineering at HBO level
  (HBO Werktuigbouwkunde, Elektrotechniek, Autotechniek, Technische Natuurkunde, Mechatronica, Luchtvaarttechniek)
- Tailor-made pre-master's programs for other (university + HBO) diplomas via admission committee

# Mechanical Engineering

- Why Mechanical Engineering (ME) and why TU/e?
- Content of the Master program at ME
- Specializations in the Master
- Experience Daniel Lelivelt
- Pre-Master's program (schakelprogramma)
- Why study at a university?

# Difference WO and HBO

**University of Technology:**

- **Developing** new technology and design methods to solve technological problems
- In depth education
- Lecturers are also researchers
- **Internship is a research project**

But also: research in close connection with industry!

**University of Applied Science:**

- **Applying** existing technology and design methods to solve technological problems
- Education focusses on practical application
- Internship in industry

Or contact:

- Academic advisor: me.academic.advisor.msc@tue.nl
- Program director: J.G.M.Kuerten@tue.nl
- TU/e-website: https://www.tue.nl/en/education/studying-at-tue
- ME-website: www.tue.nl/me (info on our department, Master's program, etc.)

# 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