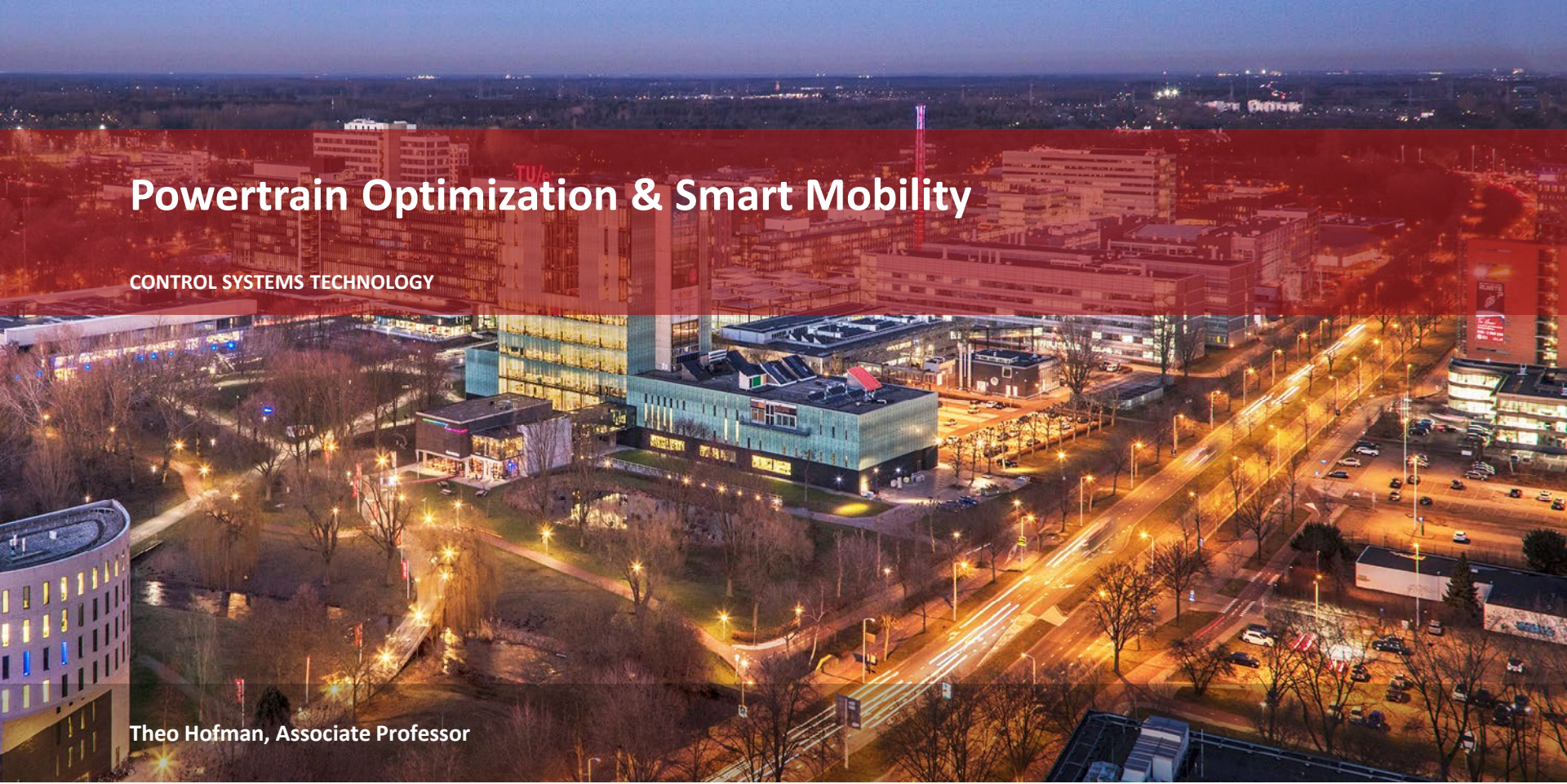
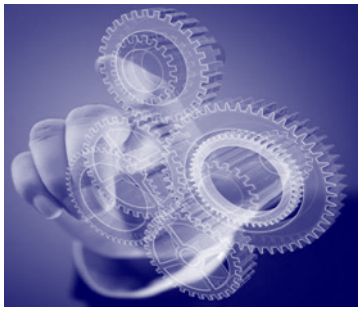


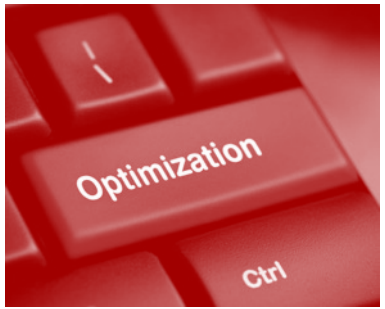
Powertrain Optimization & Smart Mobility

CONTROL SYSTEMS TECHNOLOGY

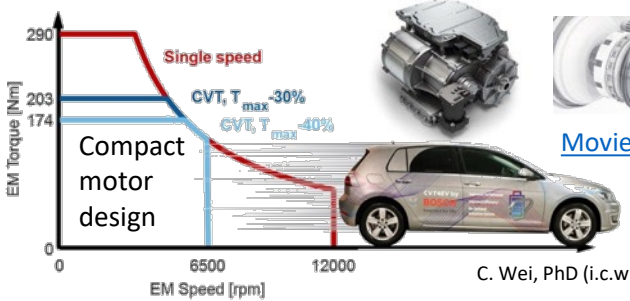
Theo Hofman, Associate Professor

Developing integrated design methods that produce system-wide optimal solutions for complex dynamic engineering systems





CVT design for Electric Vehicle: battery, E-drive, CVT

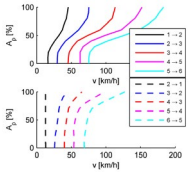


Movie CVT4EV

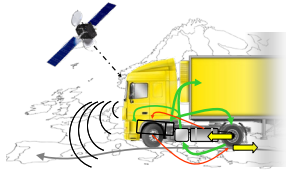
C. Wei, PhD (i.c.w. Bosch)

…cars, ships, machinery equipment, trucks, buses, …

K. Van Berkel, PhD

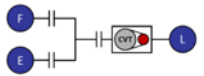


N. Dac Viet, PhD

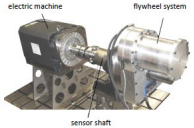


V. Van Reeven, PhD

Component specification
Storage (kWh), conversion (kW) and transmission technology (%)



Control design
Low/high level



Validation and verification
System performances

…low cost (€), energy (kWh/km), CO_2 (g)…

…new system engineering methods & tools…

TU/e

Powertrain systems research

Energy management

Component design
Topology design

Virtual sensing
Sensor fusion

Data-driven models
Physics-based models

Predictive control
Adaptive control

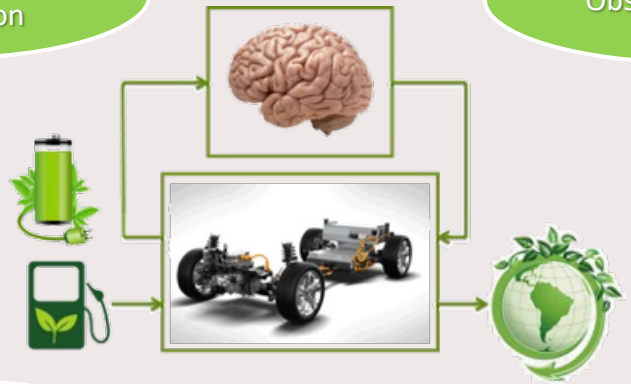
Optimal control

System optimization

Observer design

Control-oriented modelling

Self-learning control



Sustainable E-fuels

Human-centric design solutions

Internal Combustion Engines

Waste Heat Recovery

Electric & Hybrid, Fuel-Cell Vehicles

TU/e

Research group

Group leader

Dr. Theo Hofman

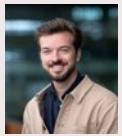
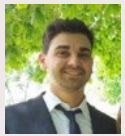
Dr. Mauro Salazar

Dr. Emilia Silvas (TNO)

Prof. Frank Willems (TNO)

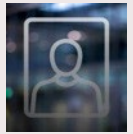
Student contact

Dr. Asia van de Mortel

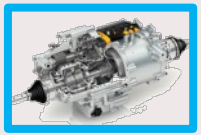







E-powertrain system, E-charging infrastructure design, E-Racing (F1)

Self-learning powertrain control







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Courses CST section

Specialization (*key*, Master)

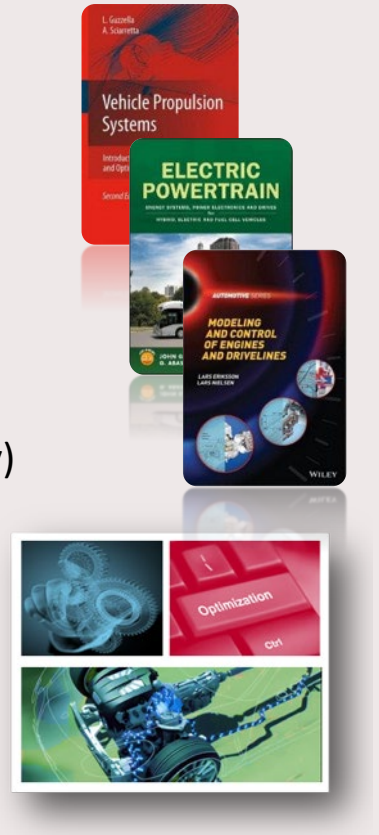
- 4AT030 Advanced Electric & Hybrid Powertrain Design (Hofman, Salazar)
- 4AT070 Advanced Control of Future Heavy-Duty Powertrains (Willems, Van Keulen)

Elective courses (*recommended*, Master)

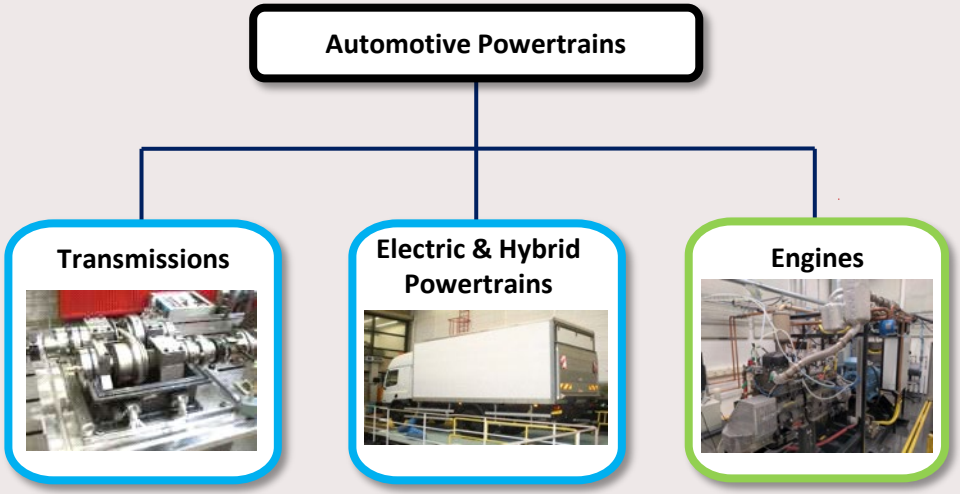
- 4DM20 Engineering Optimization (Etman, Salazar, Krishnamoorthy)
- 4SC000 Optimal Control & Reinforced Learning (Antunes)
- 4CM60 Advanced Motion Control (Oomen)

Related courses (*core*, Bachelor AT)

- 4AUB10 Electric & Hybrid Powertrain Design (Hofman)
- 5ATA0 Spectrum of Automotive (Hofman)



Test facilities

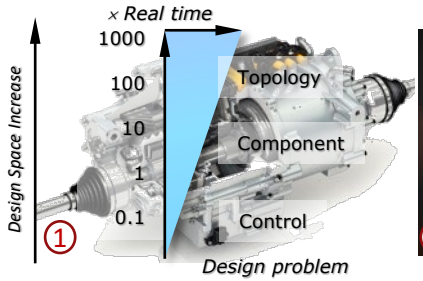


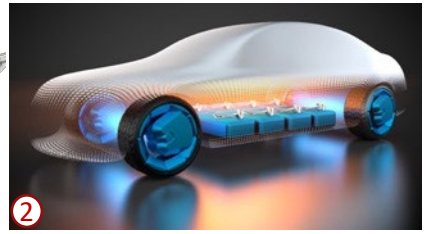
4AT030: Adv. Electric & Hybrid Powertrain Desig

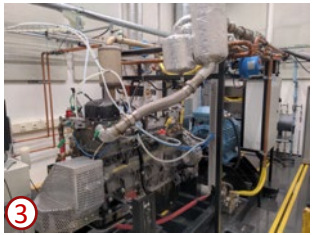
4AT070 Advanced control of future heavy-duty powertrains

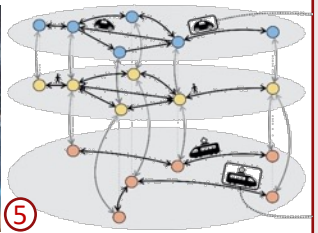
Thematic student research subjects (examples)

1. Integrated topology, component & control system design (**Hofman**)
2. Integrated thermal & battery management (**Hofman, Willems, Salazar**)
3. Self-learning control for future powertrains (**Willems**)
4. Intelligent control for cooperative & autonomous driving (**Silvas**)
5. Optimal design & control of autonomous, connected & intermodal E-mobility systems (**Salazar**)









- **Industry**: DAF, VDL, Punch, Bosch, Lightyear, TNO, Ford, Diverto, Damen, Porsche, Daimler, Tesla, Audi, Denso, Shell, Honeywell, Delphi, Sensata, etc.
- **Academia**: Chalmers, Linkoping, Aalto, Darmstadt, JKU Linz, ETH, McMaster, Doshisha, Melbourne, UC Davis, Michigan, Stanford, Boston University, etc.

Towards a smart and sustainable future!

Ongoing research projects (posters):

① **Multi-fidelity modeling for E-powertrains** - O. Borsboom

① **Product-family design for E-vehicles** - M. Clemente

① **System Topology Design for E-powertrains** - J. Van Kampen

① **1-MW E-charging infrastructure design (truck, plane)** - J. Bertucci

⑤ **E-fleet design, autonomous mobility-on-demand concepts** - F. Paparella

③ **Self-learning powertrain control** - M. Vlaswinkel, P. Garg

Meet & Greet Event Date: 22-9 (next week Thursday), Time: 12:30 - 13:30, **Location:** GEM-Z 0.05.
There will be "Worstenbrood" ☺! **PLEASE SIGN** cst_sa@tue.nl