Master Automotive Technology

Dr. Ir. Igo Besselink
Prateek Tiwari (2nd year student)
Practical information

Today’s program:
• Presentation Master’s & pre-Master’s program (30 min)
• Time for questions (30 min)

Department tour (30 min): 17:00 – 17:30
CONTENT
MASTER AUTOMOTIVE TECHNOLOGY (AT)

• Brainport region
• AT: why?
• AT: what?
• After graduation
• Application / More information
• AT Pre-Master program: what?
Eindhoven University of Technology

Top-ranking Dutch university

At the heart of the high tech region Brainport

Strong technology heritage in Eindhoven

The Netherlands → Brainport → Eindhoven

- 10,766 Total number of students (+38% compared to 2012)
- More than 80 nationalities
- Programs
  - 15 BSc
  - 11 PDEng
  - 22 MSc
  - 15 PHD
- 92% Of the graduated students finds a job within 6 months
Brainport: the beating technological heart of Europe
TU/e Graduate School – shape your own future!

Bachelor College

- BSc Bachelor of Science (3 years)

Graduate School

- MSc Master of Science (2 years)
- PDEng Professional Doctorate in Engineering (2 years)

PhD
- Doctor of Philosophy (4 years)
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Future in mobility

- No pollution
- No congestion
- Zero accidents
- Ease of use
Focus on smart & sustainable mobility

Automotive technology is more than just one car:

- Cooperative vehicle control
- Autonomous and cooperative driving vehicles
- Human-technology interaction
- Driver assistance systems
- Powertrain design & control
- Vehicle dynamics control
- Smart grids
- Sensing & mapping
- Functional architecture and safety

...from a systems engineering perspective
Systems engineering perspective

- Understanding of the relations between disciplines
- The car from a system perspective

15000 parts, 4.5 km and 80 kg of copper wires, 70 processors, 60 actuators; all weather, power cogeneration unit, comfort, entertainment and communication features, cockpit, multi-purpose display, safety and security systems.

All moving on 4 wheels.
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MSc Automotive Technology

• Duration: 2 years (120 ECTS)
• Time of entry international students: September
• Degree: Master of Science (MSc)
• Language: English
SPECIALIST FROM MANY FIELDS INVOLVED

Cooperation between 5 departments:

- Electrical Engineering
- Mathematics and Computer Science
- Industrial Engineering and Innovation Sciences
- Industrial Design
- Mechanical Engineering
# PROGRAM OVERVIEW

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

- Vehicle dynamics (W)
- Automotive human factors (IE&IS / ID)
- Automotive systems engineering project
- Real-time software system engineering (W&I)
- Powertrains (W / EE)
AUTOMOTIVE SYSTEMS ENGINEERING PROJECT

‘18-’19: Autonomous Driving and Parking of Trucks in Distribution Centers and integrating Functional Safety

Multidisciplinary project team (+/- 6 members) in collaboration with industry
PROGRAM OVERVIEW

1st year

• Core program (30 EC)

• **Specialization courses (15 EC)**

• Free electives (incl. homologation, 15 EC)

2nd year

- Internship
  15 EC

- Graduation project
  45 EC
Specialization themes: Smart Mobility

- Autonomous Driving
- Embedded Software
- Vehicle Dynamics Control
- Automotive Human Factors
## Smart Mobility: specialization themes & sections

<table>
<thead>
<tr>
<th>Autonomous Driving &amp; Embedded Software</th>
<th>Vehicle Dynamics Control</th>
<th>Automotive Human Factors</th>
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</thead>
<tbody>
<tr>
<td>Model Driven Software Engineering (W&amp;I)</td>
<td>Dynamics &amp; Control (W)</td>
<td>Human Technology Interaction (IE&amp;IS)</td>
</tr>
<tr>
<td>System Architecture and Networking (W&amp;I)</td>
<td></td>
<td>Future Everyday (ID)</td>
</tr>
<tr>
<td>Signal Processing Systems (EE)</td>
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<td></td>
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<tr>
<td>Electronic and Embedded Systems (EE)</td>
<td></td>
<td></td>
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<tr>
<td>Control Systems Technology (W)</td>
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<td></td>
</tr>
<tr>
<td>Dynamics &amp; Control (W)</td>
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</tr>
</tbody>
</table>
Specialization themes: Sustainable Mobility

- Future Fuels
  - $E_{\text{fuel}}$
  - $\dot{m}_{\text{fuel}}$

- Internal Combustion Engines
  - Engine
  - $P_{\text{engine}}$

- Electric Machine
  - Electric Machine
  - $P_{\text{electric}}$
  - $P_{\text{EM}}$

- Electric and Hybrid Vehicles and Transmission
  - $E_{\text{battery}}$

- Automotive Materials
  - $P_{\text{request}}$

- Engine
  - $P_{\text{engine}}$

TU/e
## Sustainable Mobility: specialization themes & sections

<table>
<thead>
<tr>
<th>Internal Combustion Engines &amp; Future Fuels</th>
<th>Electric &amp; Hybrid Vehicles and Transmissions</th>
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</thead>
<tbody>
<tr>
<td>Power &amp; Flow (W)</td>
<td>Electromechanics and Power Electronics (EE)</td>
</tr>
<tr>
<td>Control Systems Technology (W)</td>
<td>Control Systems (EE)</td>
</tr>
<tr>
<td></td>
<td>Control Systems Technology (W)</td>
</tr>
<tr>
<td></td>
<td>Dynamics &amp; Control (W)</td>
</tr>
</tbody>
</table>
Year 2: Internship & Graduation Project

**Internship:** 15 EC | **Graduation project:** 45 EC

- Independent work
- Model, analyse, design new automotive (sub)systems
- Explore new research questions
- Within university or in cooperation with industry
Examples of graduation projects

• “Development of a generic hybrid energy management strategy for CO2-declarations”
• “Object tracking for autonomous and cooperative driving”
• “Maximization of Brake Energy Recuperation with Minimal Impact on other Drive Train Components”
• “Development and validation of a multibody model of a Renault Twizy”
Examples of graduation projects

• “Research and Development of Human Machine Interface (HMI) for future long-haul trucks”
• “Guidelines for transition of control in autonomous vehicles”
• “Vehicle stability analysis of a solar car: Stella Lux”
Examples of graduation projects

• “Alcohol containing fuels in partially premixed combustion”

• “Modelling of a commercial vehicle steering system”
Facilities

• Automotive Technology lab

• Other labs:
  - engine test cells
  - fixed base driving simulator
  - ...

• Automotive Campus Helmond
Selection of TU/e student teams

- Solar Team Eindhoven
- University Racing Eindhoven
- ATeam
- TU/ecomotive
- Storm
- InMotion
- FAST
Master Automotive Technology in a nutshell

• Focused discipline with a system engineering perspective
• Interdepartmental
• Broad basis and a specialization within a section in one of the involved departments
• Fixed core program
• Integration project
• Professional skills: academic writing, presentation, project management
• International environment (>30% int. students)
• Automotive laboratory
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After graduation

• PDEng Automotive systems design
• PhD project
• Job in industry
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Application master degree programs

Dutch students:
• More info about admissions: www.tue.nl/admission
• Application via www.studielink.nl
• Questions: studeren@tue.nl

Deadline
1 May 2020
Application master degree programs

International students:
• Check [www.tue.nl/admission](http://www.tue.nl/admission) for the requirements
• Apply via online application form
• Application fee of €100 per application (non refundable)
• Application procedure takes +/- 8 weeks
• You will be informed by email about the outcome of your application
• Questions: [io@tue.nl](mailto:io@tue.nl)

Deadline
1 May 2020
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- **AT Pre-Master program: what?**
Pre-Master Automotive Technology

• Duration: 1 years (30 EC)
• Time of entry: September
• Language: English
Pre-Master Automotive Technology

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

What?
• Program of 30 EC, to be achieved within one year
• Focus on mathematics (10 EC)
AT pre-Master program 2020-2021 (30 EC)

<table>
<thead>
<tr>
<th>Compulsory courses</th>
<th>25 EC</th>
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<tbody>
<tr>
<td>Elective course*</td>
<td>5 EC</td>
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<table>
<thead>
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<tbody>
<tr>
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<td>2DL60</td>
<td>Linear Algebra</td>
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<td></td>
<td>2WBB0</td>
<td>Calculus variant 2</td>
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<tr>
<td></td>
<td>4CB00</td>
<td>Signals and Systems</td>
<td>5</td>
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</table>

<table>
<thead>
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<tr>
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<td>2DL40</td>
<td>Advanced Calculus I</td>
<td>2.5</td>
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<tr>
<td></td>
<td>4DB00</td>
<td>Dynamics and control of mechanical systems</td>
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</tbody>
</table>

<table>
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<td>4GB10</td>
<td>Combustion Engine</td>
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<td></td>
<td>5APA0</td>
<td>Power Electronics*</td>
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</table>

<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td>4PB00</td>
<td>Heat and flow*</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>2ISS0</td>
<td>Software Development for Engineers*</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>5AI80</td>
<td>Sensing computing &amp; actuating*</td>
<td>5</td>
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</tbody>
</table>

Mandatory trainings
- RSI (healthy use of laptop)
- Safety & environment

Recommended
- MATLAB training

* Elective course: students have to choose one of these 4 courses
Difference WO & HBO (in general)

University of technology:
• **Developing** new technology and design methods to solve technological problems
• Education focusses on concepts and their implications
• Guaranteeing performance of controlled and engineered systems
• **Internship is a research project**

University of applied science:
• **Applying** existing technology and design methods to solve technological problems
• Education focusses on practical application
• Internship in 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 the industry

• Check the additional entry requirements regarding mathematics and English

• Subscription for a pre-master via Studielink before May 1st
Admission HBO bachelors to pre-Master

Depending on HBO degree:

→ Direct admission:
  • Mechanical engineering
  • Automotive
  • Applied physics
  • Electrical engineering
  • Aerospace technology / aviation
  • Mechatronics

→ Individual admission by admission committee
  • Send grades and course information HBO bachelor to Admission.Mech@tue.nl
More information

Go to the stand in Auditorium!

Or contact:

• Master AT: https://www.tue.nl/en/education/graduate-school (info on Master’s program, curriculum, interviews with students and alumni)
• https://www.tue.nl/en/education/mystarttue/webinars/ (inloggen via MyStart@TU/e)
• Check www.tue.nl/education for more information
• Receive updates about our events? Go to http://start.tue.nl and create a mystart@tue account
• Questions right after the webinar? WhatsApp +316 416 83 406