

Mechanical Engineering

Vehicle Engineering

MSc Programme



The automotive field is rapidly transforming with cheap sensors, computers, smart algorithms and big data facilitating support and automation of the driving task. In traditional vehicles, where the driver is under control, the automation level is gradually increased; witness the ever more sophisticated autopilots. At the same time, the next generation is emerging: that of self driving vehicles as part of a mobility service, where the human driver is no longer necessary and where any supervision is exerted remotely by an operator.

Degree	Master of Science in Mechanical Engineering
Starts	September
Credits	120 ECTS, 24 months
Language	English
Application deadline	April 1st: international students July 1st: Dutch degree
Tuition fee	€ 18.750 (non EU) € 2.083 (EU)
Scholarships	scholarships.tudelft.nl

The Vehicle Engineering track focuses on automated driving of cars, trucks and public transport vehicles driving on public roads. Education in automated driving focusses on perception to detect other road users, path planning and control to navigate through traffic, and human factors providing safe interaction with drivers/users and other road users. An integrated approach is offered to design vehicle automation proving performance and safety in complex real world driving conditions. The track is hosted by the department of cognitive robotics providing a strong basis in research and education in artificial intelligence and human robot interaction.

The Vehicle Engineering track offers four specialisations;

- **Perception and Modelling (PM)** Sensor processing (video, radar, lidar) to obtain a 3D spatial representation of the vehicle environment, to recognize other road users and road objects, and to predict how the traffic situation will evolve. Deep learning and other methods are used to develop reliable perception even in adverse weather. Students develop extensive programming capabilities, including ROS and C++.

Mechanical Engineering Vehicle Engineering

First Year

A solid basis in mechanical engineering with courses in Non-linear Mechanics, Physics and Measurement, Control System Design, Advanced Heat Transfer, complemented with a social course.

Compulsory Vehicle Engineering courses include: Intelligent Vehicles, Vehicle Dynamics and Automotive Human Factors.

A range of elective courses is provided on computer vision, control theory, human factors, haptics, and materials. As good programming skills are increasingly important for the Intelligent Vehicles domain, a course on robot software basics is also offered.

Students can furthermore select elective courses from other Master programmes at TU Delft and elsewhere.

Courses and projects in Vehicle Engineering are open to students from other tracks and masters (e.g. Computer Science, Computer Engineering, Material Science) provided that they have the required entry level.

Second Year

Literature Research (10 EC)

Internship (15 EC optional)

Master thesis project (50 EC or 35 EC if an internship is performed)

For more information on all courses please visit: www.studyguide.tudelft.nl

• **Dynamics and Control (DC)** Vehicle path planning and control, safely interacting with other road users while optimising traffic flow and driving comfort. Active suspension to enhance motion comfort. Education focuses on vehicle dynamics, vehicle state estimation, and path planning and control methods.

• **Human Factors (HF)** Human Perception and performance, driver modelling, human fallback capability in cases which cannot be handled by the automation, perception of motion and comfort. Education focuses on human factors experimental methods including virtual reality and driving simulators to investigate and enhance human interaction. Perception and biomechanical models are used to investigate motion comfort and motion sickness.

• **Materials (MAT)** Lightweight materials including composites, multi material design, performance in durability, sustainability and energy absorption in crash conditions.

Courses provide in depth multidisciplinary knowledge of current and future vehicle technology, complemented with top level courses in mechanical engineering, human factors and

robotics. TU Delft develops its own automated vehicles and closely cooperates with the automotive industry.

Toyota Prius vehicles are equipped for automated driving. Two automated shuttle buses are developed for low speed operation in the province of Gelderland (<http://wepods.nl>). A BMW 5 series vehicle is equipped with individual wheel braking, wheel load sensing sensors and active suspension for high performance driving. Steer by wire systems for single track vehicles (bicycles and motorcycles) are developed. Several fixed base and moving base driving simulators are equipped for normal and automated driving of passenger cars, trucks and bicycles. Driver behaviour monitoring includes eye tracking, muscle and heart activity.

Career prospects and international possibilities

All supervisors actively cooperate with the automotive industry, research institutes and other universities in international and national projects. This offers an excellent scope for internships and jobs in the automotive industry and research community

 Track started in september
2015

 **50**
students

 **50%**
international students

Career perspective

 **75%**
find jobs within 2 months