

Master of Automotive Systems

HAN Automotive facilities

The Master programme of Automotive Systems is offered in the building of the HAN Education of Automotive Engineering, located in Arnhem, Ruitenberglaan 29. This building is part of the campus facilities of the HAN University of Applied Sciences, see figure 1.

Both the bachelor education and the research teams on Mobility Technology and Vehicle Mechatronics are located in this same building, leading to extensive cooperation, both by

involvement of teaching staff in research and by joint activities in the laboratory ARLA (Applied Research Laboratory Automotive).

The Automotive building is well equipped with laboratory and software facilities, where we refer to the next chapter for a detailed description of facilities. The frequent use of these facilities in research activities guarantees the up-to-date quality and performance, both regarding the facilities themselves and the skills to operate them. Many of the adjustments, investments and test/research vehicles have been motivated by research.

The laboratory ARLA operates as an independent organisation with their own financial budget responsibility as a partner for the bachelor education and the research teams.

The building of HAN Automotive offers lecture rooms, rooms for group work and special facilities for student internships. The direct availability of the research staff is an advantage to the master students.

The total HAN campus facilities include free entrance to open shop computer centres, a general library, meeting-rooms for project-based study, a restaurant, an auditorium and other rooms needed for the educational programme. HAN promotes 'virtual action learning' in an electronic learning environment. As an example 'Scholar' is used in the Bachelor as well as in the Master programmes of the HAN. As a result HAN students and staff can communicate easily with one another and with their colleagues in other institutes.

A number of books is made available to the master students. Information from journals and conferences (like AVEC: Advanced Vehicle Control, IFAC in Vehicle Control) are also made available to the students. The students have access to the wireless internet. There are arrangements with universities like Radboud University in Nijmegen, the Technical Universities in Delft and Eindhoven to share research sources.



**Figure 1 HAN Automotive building
(HTS Autotechniek)**

The documentation centre of the HAN is able to retrieve relevant documents rather quickly. And most important is the personal contacts and network of the Programme director and the Module Coordinators with research teams all over the world, for example through their conference scientific board and journal editorial committee activities.

Description of facilities

The HAN Institute of Engineering is well equipped with laboratory (ARLA: Applied Research Lab Automotive) and software facilities:

- Dynamometer (SCHENK) for high speeds and high performance capacity.
- Road simulator (four-post rig, MTS) for vibration, road-vehicle interaction research
- Instrumented vehicles, equipped with all systems (GPS, Correvit optical system) to monitor detailed handling performance (Mercedes, BMW) and ABS/driveline performance (IVECO Van).
- Instrumented vehicle (BMW), specially equipped for vehicle-driver research
- Software to analyse and control the test environment (Labview)
- Testbed for tests on the hydraulic and pneumatic components of the drive line
- Development, assessment and adaptation of motor management systems. Testing of LPG and natural gas injection systems
- Measurement and analyses of emissions
 - (automated) testbeds (CVS, Scania, DAF-Paccar,...)
 - Dynamometers (CLAYTON for low speeds and low level performance; SCHENK for performance capacities of up to 200kW and speeds of up to approximately 250 km/hour)
 - Equipment for the analysis of exhaust emissions, which is fully operated by a microprocessor
- Hydrogen test facility for research on fuelcell systems from 1 to 25 kW and hybrid drive trains.
- Various research vehicles, using hydrogen-natural gas blends as a fuel (Yamaha scooter, Honda Civic), or using fuelcell technology (fork lifter, peplemover)
- Facilities for research in electrical engineering (feedback control systems, the influence of electrical malfunctions and magnetic fields, investigation of micro-processors and micro-processor controls,...)
- Simulation and CAD software (Matlab-Simulink, Simmechanics, ADAMS, AutoCAD, solidworks,...)



Figure A.4. : MTS Road simulator



Figure A.5.: Instrumented vehicle



Figure A.6.: Engine testbed