Automotive Technology

Department of Mechanical Engineering,
Eindhoven University of Technology

Quality Assurance Netherlands Universities (QANU)
Catharijnesingel 56
PO Box 8035
3503 RA Utrecht
The Netherlands

Phone: +31 (0) 30 230 3100
Telefax: +31 (0) 30 230 3129
E-mail: info@qanu.nl
Internet: www.qanu.nl

Project number: Q0452

CONTENTS

This report was finalised on 27-11-2013

Report on the master's programme Automotive Technology of Eindhoven University of Technology

This report considers the NVAO's Assessment Framework for Limited Programme Assessments as a point of departure.

Administrative data regarding the programme

Master's programme Automotive Technology

Name of the programme:	Automotive Technology
CROHO number:	60428
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specialisations or tracks:	-
Location(s):	Eindhoven
Mode(s) of study:	full time
Expiration of accreditation:	27-10-2014

The visit of the assessment committee Automotive Technology to the Department of Mechanical Engineering of Eindhoven University of Technology took place on 25th and 26th of September 2013.

Administrative data regarding the institution

Name of the institution:	Eindhoven University of Technology
Status of the institution:	publicly funded institution
Result institutional quality assurance assessment:	applied (pending)

Quantitative data regarding the programme

The required quantitative data regarding the programme are included in Appendix 5.

Composition of the assessment committee

The committee that assessed the master's programme Automotive Technology consisted of:

- Ir. L. J. J. (Leo) Kusters MSc. (chair), Managing Director TNO Transport and Mobility;
- Ir. L. (Loek) van Seeters, Assistant Chief Engineer DAF Trucks/PACCAR;
- Drs. M. J. H. (Kalinka) Grijpink–van den Biggelaar, Senior Educationalist, Faculty of Electrical Engineering, Mathematics and Computer Science, Delft University of Technology;

- Prof. Dr. L. (Lars) Nielsen, Full Professor in the chair Sten Gustafsson Professor of Vehicular Systems, Electrical Engineering, Linköping University, Head of Department of Electrical Engineering, Linköping University;
- W.R. (Roel) Brouwer BSc. (student member), master student of Mechanical Engineering, University of Twente.

The committee was supported by Mrs. J.J. (Jasne) Krooneman, MSc., who acted as secretary.

Appendix 1 contains the curricula vitae of the members of the committee.

Working method of the assessment committee

Preparation
During the preparation process, the programme provided a critical reflection. Subsequently, the project manager (from QANU) checked the quality and completeness of the information. Once it was approved, it was forwarded to the members of the committee, who formulated questions based on its content. In addition, each committee member had to review three theses and the corresponding assessment forms prior to the site visit. The theses were carefully selected by the project manager, in consultation with the chair of the committee (see Appendix 7 for a list of theses and documents studied by the committee).

The project manager designed a visiting timetable, which was discussed with the coordinator of the programme (from Eindhoven University of Technology) and the chair of the committee. Preparations for the site visit continued only after an agreement on the visiting timetable was reached.

Site visit
During the preparatory meeting held at the start of the site visit, the committee was officially installed. The committee discussed the working method, its findings based on the critical reflection and theses, and its perception of the domain-specific framework of reference. It also studied additional information on the content of several courses, such as reference books and other learning material, and read reports on consultations in relevant committees/bodies. It analysed important management information and documentation regarding teacher and student satisfaction. Its members did not find it necessary to request any additional theses or interviews.

Immediately after the preparatory meeting, interviews were held with representatives of the management, students, teachers, alumni, Programme Committee, Examination Committee and study advisor/coordinator. Nobody made use of the open office hour, when people involved in the programme had the opportunity to speak freely to the committee.

The site visit concluded with an oral presentation of the preliminary findings by the chair of the committee, consisting of a general assessment and several specific observations and impressions of the programme.

Report
After the site visit, the secretary wrote a draft report based on the committee's findings. This draft was sent to the committee members. After processing their comments, the report was delivered to the programme management to check for factual irregularities. Any suggestions

made by the programme were discussed with the chair of the committee, and a general notice was circulated to the other committee members. After that, the report was finalised.

Decision rules
In accordance with NVAO's Assessment Framework for Limited Programme Assessments (as of 22 November 2011), the committee used the following definitions for the assessment of both the standards and the programme as a whole.

Generic quality
The quality that can reasonably be expected in an international perspective from a higher education bachelor's or master's programme.

Unsatisfactory
The programme does not meet the current generic quality standards and shows serious shortcomings in several areas.

Satisfactory
The programme meets the current generic quality standards and shows an acceptable level across its entire spectrum.

Good
The programme systematically surpasses the current generic quality standards across its entire spectrum.

Excellent
The programme systematically well surpasses the current generic quality standards across its entire spectrum and is regarded as an (inter)national example.

Summary judgement

This report provides an overview of the findings and considerations of the committee regarding the master's programme Automotive Technology at Eindhoven University of Technology. The committee based its judgement on information acquired from the critical reflection, a selected number of theses, the interviews during the site visit, additional reading material which was available during the site visit, and the digital learning environment. The committee found both positive aspects as well as points for improvement. After a careful consideration, it concluded that the master's programme Automotive Technology satisfies the requirements for accreditation.

Standard 1
The committee studied the domain-specific framework of reference and is very positive about its clear link to the automotive industry. However, since this reference framework was initially designed in close collaboration with key automotive industry players united in the Hightech Automotive Sytems (HTAS) Innovation Programme, which is now part of AutomotiveNL, it tends to limit the programme to searching for innovative processes beyond Dutch national borders. The committee therefore recommends that the programme links up its reference framework more explicitly to international developments. It thinks that this is a well-chosen vision for the programme, which matches the reference framework, and it would welcome an elaboration of this central vision. Nevertheless, it stresses that the domain-specific framework of reference is well formulated and clearly defined. It believes that the systems approach, which is identified as the central vision, could be further formalised and implemented throughout the programme. Further implementation of the systems approach would contribute to the programme's profile and orientation, as well as to its intended learning outcomes. The committee is convinced that the profile of the programme matches an academic master's level and argues that the balance between being research-driven as well as connected to the industry should be advertised more explicitly. The construction of an interdisciplinary programme in automotive technology, which has such a fine balance between research and industry, and derives from a systems approach, is a brave attempt to train engineers who are prepared for the future needs in the industry, according to the committee. It is very enthusiastic about this new, challenging programme and would like to support the management in continuing to develop and refine the programme's goals and vision. It believes that the intended learning outcomes are formulated adequately and fit the programme well.

Standard 2
The committee noticed that the curriculum has undergone continuous development over the past few years and believes that the curriculum is now nicely structured and that the intended learning outcomes are sufficiently embedded within the programme. With regard to the internship, however, it recommends implementing clear objectives and requirements to improve the procedure and assessment.

The teaching concepts and formats, which are based on the underlying notion that the bachelor student's perspective upon intake should develop into a professional attitude, are formulated adequately and contribute to the academic environment of the master's programme, according to the committee. In addition, it is impressed by the great laboratories that the students of Automotive Technology have access to.

The committee believes that the rather low intake numbers of the past few years can be related to several factors, such as the existence of an automotive track within the master's

programme of Mechanical Engineering, the absence of a bachelor's programme in Automotive Technology, the master's programme is considered as a tough programme, it has a rather difficult bridging programme for students from higher vocational studies, it has frequently been counteracted regarding campaign issues, and it has witnessed an increase of international student fees and decrease of available scholarships. Nevertheless, the committee has faith in the expected growth of intake numbers in the near future. From next year onwards, there will be an influx of students from the new bachelor's programme Automotive Technology, the master's programme will advertise itself more actively within the university, and the new, personal approach of the Director of Education towards new applicants will stimulate international students especially to join the programme.

Despite the fact that the programme seems to house very motivated and enthusiastic students, the committee would like to stress that the course load should not increase any further; students already spend an average of 45-50 hours per week on their studies. Particularly the first semester with its mandatory courses is considered pretty tough, but the committee still thinks that the programme is feasible in general.

The committee is very positive about the relatively large number of international students in the master's programme. However, it would like to point out some deficiencies concerning international students that the programme must pay attention to: the possible difficulties of finding an internship in industry and struggling with extra costs in case of a delay in the graduation date. It is convinced that the programme has excellent teaching staff and praises their open attitude towards their students. Although it understands that teachers in the programme come from different departments and that the University Teaching Qualification (UTQ) demands a large time investment, it nevertheless recommends raising the UTQ target. The student-staff ratio is adequate, and the committee is positive about the supervision of the quality assessment by the active Programme Committee. It appreciates the 'automotive lunches' as they seem to be fruitful sessions where new ideas are picked up.

Standard 3
With regard to the assessment system, the committee believes that the Examination Committee should further implement a clear, explicit assessment monitoring system to improve the transparency while also reflecting on and developing its duties. For instance, the Examination Committee should compare the theses, examinations and internships with the outside world and not just accept that the teachers involved in the programme are carefully selected and therefore able to guarantee the quality of these 'products'.
It is pleased to note that changes are already being planned, and a new Assessment Quality Assurance Committee will be formed. It also argues that all documents stating anything about rules and regulations should be translated into English and communicate them in a more pro-active way. It suggests establishing an Industrial Advisory Board.

The committee studied a great variety of exams of a more than satisfactory academic level. Considering the thesis procedure, however, it has several recommendations to make: there should be detailed formal rules and regulations regarding the grading of the thesis, the process should depend less on peer reviews, the systems approach is worthwhile to be included in the process, and students should be provided with explicit criteria before they begin their final project. Nevertheless, the committee thinks that the rather informal but intensively coached thesis procedure of the past few years was of sufficient quality to guarantee a satisfactory final outcome.

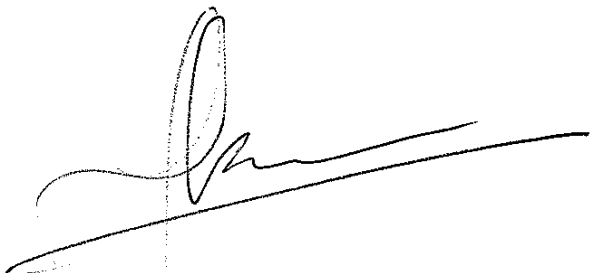
The committee is satisfied with the overall level of the theses, and is very positive about the transition of the graduate students into their new careers; the entrance to the labour market in particular seems to work out rather well. The satisfaction expressed by the graduate students and the general level of the theses show that the learning outcomes are achieved. According to the committee, graduate students do match the requirements of an engineer who is able to work with a systems approach, integrating the different disciplines as necessary in a high-tech environment.

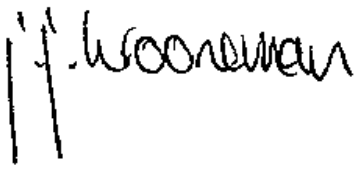
The committee assesses the standards from the Assessment framework for limited programme assessments in the following way:

Standard 1: Intended learning outcomes	satisfactory
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment and achieved learning outcomes	satisfactory
General conclusion	satisfactory

The chair and the secretary of the committee hereby declare that all members of the committee have studied this report and that they agree with the judgements laid down in it. They confirm that the assessment has been conducted in accordance with the demands relating to independence.

Date: 27-11-2013





Ir. L. J. J. (Leo) Kusters MSc.

Mrs. J.J. (Jasne) Krooneman MSc.

Description of the standards from the Assessment framework for limited programme assessments

Standard 1: Intended learning outcomes

The intended learning outcomes of the programme have been concretised with regard to content, level and orientation; they meet international requirements.

Explanation:
As for level and orientation (bachelor's or master's; professional or academic), the intended learning outcomes fit into the Dutch qualifications framework. In addition, they tie in with the international perspective of the requirements currently set by the professional field and the discipline with regard to the contents of the programme.

Findings

This standard first provides an insight into the committee's findings regarding the domain-specific framework of reference (1.1). Subsequently, attention is paid to the profile and orientation (1.2) and the intended learning outcomes and their level (1.3).

1.1 Domain-specific framework of reference

According to the critical reflection, the master's programme Automotive Technology aims to educate future automotive engineers who are science-oriented designers and design-oriented researchers in one of the automotive disciplines. This engineer should be able to work with a systems approach, integrating the different disciplines as necessary in a high-tech environment. As is stated in the domain-specific framework of reference (see Appendix 2), the systems engineering approach is central to the programme. This approach focuses on analysing and eliciting customer needs and required functionality early in the development cycle, first documenting requirements and then proceeding with design synthesis and system validation while considering the problem as a whole. This approach is an outcome of the close contact with the key automotive industry players united in the Hightech Automotive Sytems (HTAS) Innovation Programme, which is now part of AutomotiveNL, who were involved in the design of the master's programme Automotive Technology.

The committee studied the domain-specific framework of reference and approves the clear link with the industry. However, it believes that one of the limitations of this domain-specific framework of reference is the fact that it was designed in close contact with the national automotive industry, namely the key automotive industry players united in the HTAS Innovation Programme, which was the result of an industry-wide cooperation between Dutch automotive industry partners and knowledge institutes. It therefore recommends that the programme expands its perception further to an international level. According to the committee, this can be achieved relatively easily: since one of the spearheads, 'smart mobility', is considered of great importance nationally, this can be linked with intelligent transport systems internationally. It would like to see the programme proceeding towards a European level, so that the management can take the programme even further in the near future. Nevertheless, it thinks that in the current situation, the domain-specific framework of reference is well formulated and clearly defined.

The committee thinks that the systems approach, which is the central vision of the programme, should be embedded throughout the entire curriculum and the thesis procedure and has to be carried out by all students and staff members, including the members of the

Examination Committee and Programme Committe. Although further and explicit implementation of this central vision is advisable and a great opportunity, the committee believes that the systems approach is a well-chosen vision for the master's programme and nicely matches the domain-specific framework of reference.

1.2 Profile and orientation

The master's programme Automotive Technology is influenced by the general mission statement of Eindhoven University of Technology. As quoted in the critical reflection: 'Eindhoven University of Technology (TU/e) intends to be a research-driven, design-oriented university of technology at an international level, with the primary objective of providing young people with an academic education within the engineering science & technology domain'.

According to the critical reflection, one of the three strategic areas of TU/e is smart mobility. This area is characterised by an immense transition from classical (mono-disciplinary) engineering towards ICT-driven, high-tech mobility solutions, including 'cars-as-iPads'. The systems aspects of cars are closely related to the industrial area of high-tech systems, which is the core of the regional focus around Eindhoven. It is the mission of the master's programme Automotive Technology to provide society with engineers who are equipped to work in this high-tech industry of tomorrow and the far future. As the critical reflection states, the programme strives to deliver more engineers and a wider variety of engineers who can match the demands of this new era of smart mobility. As stated above, the programme believes that the future automotive engineer is a science-oriented designer and design-oriented researcher in one of the automotive disciplines, and hence it is the aim of the programme to produce engineers who able to work with a systems approach, integrating the different disciplines as necessary in a high-tech environment. In order to achieve this, the profile and orientation of the master's programme are shaped accordingly. According to the mission of the programme, the main pillars of the strategy are implemented in the following manner:

- The quality of teaching must meet high international standards;
- The students and staff are offered an intellectually stimulating, international and academic study and working environment that promotes and sustains broad-based personal development;
- The focus of the programme is on long-term, generic, internationally competitive research on analysis, engineering and design for high-tech automotive systems. It offers a fully multidisciplinary, systems-oriented approach to automotive technology, with input from mechanical and electrical engineering, computer science, chemistry and social science;
- The educational and research programme is balanced between fundamental and utilitarian aspects and aimed at producing scientifically educated and application-driven engineers;
- There is a profound link with the national and international high-tech automotive industry.

The committee studied the profile of the master's programme and feels that it definitely matches an academic master's level. In particular, the multidisciplinary, systems-oriented approach lives up to the expectations of an educational programme on this level. Nevertheless, the committee noted that there is still some discussion going on within the programme regarding the application of the systems approach. It believes that everybody in the programme knows about the systems approach, and that this approach is widely appreciated, but that it could be defined in a more explicit manner. The committee would like to see the approach formalised in definitions, guidelines, rules and regulations, etc. so that it

can be implemented throughout the master's programme. This would not only contribute to the programme, but also to academic knowledge as such. It believes that this systems approach is very closely connected to the identity of an automotive technology graduate: someone who is able to see the bigger picture.

In addition, the committee is of the opinion that the profile of the master's programme includes a fine balance between research and industry. Students combine research with design, which is a relatively rare combination according to the committee. Therefore, it recommends that the programme makes it more explicit that it is research-driven as well as connected to the industry. It thinks that this balance is something to be proud of, and the programme should emphasise this in recruitment material.

1.3 Intended learning outcomes and academic level

As stated in a more extensive manner in Appendix 3, the master's programme Automotive Technology has formulated the following learning outcomes:

1 Knowledgeable in automotive science and engineering;
2 Competent in doing research;
3 Competent in designing;
4 Scientific approach;
5 Basic intellectual skills;
6 Competent in cooperating and communicating;
7 Taking account of the temporal and societal context.

According to the critical reflection, the learning outcomes are formulated in a framework designed by Eindhoven University of Technology that specifies the Dublin Descriptors in a way that meets the demands of technical research universities.

The committee studied the learning outcomes and appreciates the general balance the programme is striving for. It is also of the opinion that the intended learning outcomes are formulated adequately and realise the target academic level. However, it feels that the systems approach should be part of the intended learning outcomes. It suggests that since the systems approach is central to the programme, the intended learning outcomes should cover the systems approach explicitly, so that the programme can use this for benchmarking.

Considerations

The committee studied the domain-specific framework of reference, the profile and orientation, and the intended learning outcomes of the master's programme Automotive Technology. It is convinced that all elements are formulated adequately and targeted at the correct academic level. However, it would like to see the management go beyond the current state of affairs and bring the programme one step further. Therefore, it has several recommendations to make. To begin with, it encourages the programme to implement the central systems approach explicitly in the intended learning outcomes and formalise it in all documents. In this way, the vision of the programme is carried out in a consistent manner throughout. Secondly, the committee argues that the profile's fine balance between research and industry should be exploited for advertising purposes. It is of the opinion that the balance between research and industry is a wonderful characteristic of the programme, and is worth highlighting. Last but not least, it believes that the domain-specific framework of reference should have an explicit international link, so that apart from a certain positioning

within the national automotive field, the programme can also be explicitly framed within an international context.

Conclusion

Master's programme Automotive Technology : the committee assesses Standard 1 as 'satisfactory'.

Standard 2: Teaching-learning environment

The curriculum, staff and programme-specific services and facilities enable the incoming students to achieve the intended learning outcomes.

Explanation:
The contents and structure of the curriculum enable the students admitted to achieve the intended learning outcomes. The quality of the staff and of the programme-specific services and facilities is essential to that end. Curriculum, staff, services and facilities constitute a coherent teaching-learning environment for the students.

Findings

This standard provides an insight into the curriculum (2.1) of the master's programme Automotive Technology. Special attention is paid to the relation between the learning outcomes and the curriculum in section 2.2. Then, the teaching concept, formats and programme-specific services (2.3) and the feasibility (2.4) of the master's programme are analysed. In section 2.5 the quality and quantity of the teaching staff are discussed. This standard concludes with an analysis of the programme-specific quality control (2.6).

2.1 Curriculum

The committee studied the curriculum of the master's programme Automotive Technology. The curriculum of the two-year master's programme (see Appendix 4) is divided into core courses, electives, an internship and a graduation project. Altogether, these elements are worth 120 EC (European Credit). The core courses broaden the student's knowledge, while the electives deepen it. The electives are frequently selected within specialisation tracks. The specialisation tracks are: Powertrain Components (PTC), Vehicle dynamics (VD), Electrical systems for driveline and communication (Ele), Embedded software (EmS), Chemistry in automotive (Che), Systems engineering (SE), High-tech automotive materials (Ma) and Human factors (HF).

Year 1
In the first year of the programme, students spend their academic time on core courses (33 EC) and electives (27 EC). The core courses are split into Driving Guidance courses and Efficient Vehicle courses. As stated on the programme's website, students follow four Driving Guidance courses, which all focus on improving the safety, comfort and handling of vehicles like dynamics, human-car interaction and software. These courses are: *Vehicle Dynamics*, *Automotive Human Factors*, *Real-Time Architectures*, and *Software System Engineering*. During the course *Vehicle Dynamics*, different vehicle models are presented and analysed, and attention is paid to tire modelling and behaviour. At the end of the course, students develop a vehicle model. *Automotive Human Factors* is a course which addresses the relation between a car or truck, its human driver, and the dynamic environment that is navigated. The course is concerned with the goals of productivity (getting from A to B in a reasonable time), safety, and driver comfort. The course *Real-Time Architectures* deals with the issue of real-time requirements and their impact on the hardware-software architecture of a system. During this course, the focus is on systems in hardware and the hardware-software interface. *Software System Engineering* is a course about the notions of software engineering. The objective of this course is to learn how to model communication between software components and how to perform basic behavioural analysis on those models.

The four Efficient Vehicle courses focus on reducing fuel consumption and the use of cleaner fuels. They are: *Powertrain Components*, *Electric Components*, *Energy Management in*

Automotive Applications, *Secondary Batteries and Hydrogen Storage*. As described on the programme's website, *Powertrain Components* is a course about the basic principles of the automotive drive train and its components. Some elements of the internal combustion engine are discussed, and the course concludes with basic power train modelling techniques. *Electric Components* provides insight into electrochemical and power electronic converters and their application in electric drives. With the use of hand and computer simulations, mechanical systems coupled to electric drives are modelled and analysed. The course *Energy Management in Automotive Applications* deals with the physics and mathematical models of components used by energy management: internal combustion engines, generators/motors, batteries and super capacitors. Attention is paid to optimisation strategies, dynamic programming, quadratic programming and causal programming. *Secondary Batteries and Hydrogen Storage* outlines the main principles of electrochemical energy storage. In this course, state-of-the-art battery technology related to automotive applications is presented. Li-ion and NiMH batteries are discussed in detail.

Along with the Driving Guidance and Efficient Vehicle courses, students follow two extra core courses: *Cars in Context: Emergence of an automobile system in a mobile world* and *Cars in Context Project*. As is clearly outlined on the programme's website, *Cars in Context: Emergence of an automobile system in a mobile world* allows students to put their specialist knowledge into a broader societal context, and should lead to a reflection on the role of the automotive engineer, allowing well-founded career planning. *The Cars in Context Project*, however, provides selected case studies from the industries participating in the HTAS programme, in order to come to an initial orientation on vehicle-system design and research. The *Cars in Context Project* is worth 6 EC, all other core courses are worth 3 EC.

The electives are provided to improve the theoretical basis and deepen specific knowledge prior to the graduation project. Students can choose from a wide range of courses. However, they tend to select electives within their specialisation. The most popular specialisation tracks are Powertrain components (PTC) and Vehicle dynamics (VD). The number of EC per elective varies, but students should take up to 27 EC of electives.

Year 2
In the second year of the programme, students choose an internship (15 EC) and work on their graduation project (45 EC).

The internship, as stated in the critical reflection, prepares students for their graduation project and allows them to experience a working environment. During the internship, a student works individually on a research-related topic. The internships take place in a company, at Eindhoven University of Technology, or at an international institute/university. To give an example, traineeships or internships are offered at companies such as Daimler AG, Bosch, DAF trucks N.V., and TNO.

The programme is concluded with a graduation project. This research assignment is executed by the student individually and to a large extent independently. The graduation project takes place at Eindhoven University of Technology, in a company, or at a research institute/university. According to the critical reflection, the graduation project is always carried out under direct supervision from Eindhoven University of Technology.

The committee is convinced that the structure of the curriculum is properly organised, and from the interview with students it became clear that the option for specialisation in the second year is appreciated. It concludes that the programme offers a great variety of very

interesting internships. In general, it would like to see some explicit objectives for the internship, and also some clear requirements to assess this. Despite the fact that the internship takes up 12.5% of the entire programme, there do not seem to be any clear guidelines for it.

The committee confirms that the curriculum has improved significantly over the past few years, and especially the Cars in Context courses have been appropriately fine-tuned. It praises the programme for continuously and very actively developing the curriculum.

2.2 Relation between learning outcomes and the curriculum

The committee analysed the relation between the learning outcomes and the curriculum. It also focussed on the cohesion and composition within the curriculum.

As discussed in chapter 1.3, the programme has identified the following learning outcomes:

1. Knowledgeable in automotive science and engineering (kn);
2. Competent in doing research (re);
3. Competent in designing (ds);
4. Scientific approach (sc);
5. Basic intellectual skills (in);
6. Competent in cooperating and communicating (co);
7. Taking account of the temporal and societal context (so).

The master's programme Automotive Technology designed a table (see below) to visualise the relation between the learning outcomes and the curriculum.

Curriculum vs Learning outcomes

	code	EC	kn	re	ds	sc	in	co	so
Cars in Context	0E011	3	▪▪▪	▪▪▪	▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪
Cars in Context Project	4AT01	6	▪▪▪		▪	▪▪▪	▪▪	▪▪▪	▪▪▪
Vehicle Dynamics	4L150	3	▪▪▪		▪▪	▪▪▪	▪		
Automotive Human	0P900	3	▪▪		▪▪	▪▪▪	▪	▪	▪▪
Real-Time Architectures	2IN60	3	▪▪▪		▪▪	▪▪▪	▪▪	▪	
Software System	2IW60	3	▪▪▪		▪	▪▪▪	▪	▪	
Powertrain	4AT00	3	▪▪▪		▪	▪▪	▪		▪
Electric Components	5EE90	3	▪▪▪		▪	▪▪▪	▪		
Energy Management	5MB50	3	▪▪▪	▪	▪▪	▪▪▪	▪		
Batteries and Hydrogen	5AT01	3	▪▪▪		▪	▪▪▪	▪		
Electives		27	▪▪▪		▪	▪▪▪	▪		▪
Internship		15		▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪
Graduation project		45		▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪

As can be seen in the table above, and also as stated in the critical reflection, the core courses are primarily used for knowledge transfer (kn) and the development of a scientific approach (sc), although intellectual (in) and design skills (ds) are also practised. The core course *Cars in Context* and *Cars in Context Project* both focus on the societal context (so) within which automotive engineering and design takes place, and on the required communication skills (co). The acquisition of research (re) and design (ds) skills is addressed primarily during the internship and graduation project. The electives can cover a diversity of specialist topics.

The committee agrees with the programme that there is a clear relation between the learning outcomes and the curriculum. The Cars in Context courses are, according to the committee, a great example of how the learning outcomes are entwined and embedded in the curriculum, and also a perfect model to show how the rest of the curriculum is nicely connected to those courses. The mandatory courses adapt their content to the *Cars in Context Project* and teachers from those courses come to the *Cars in Context* course to present their domain. In fact, the systems approach is already very clearly present here: a problem is looked at from many different angles. Subsequently, several skills, such as research and design skills, are stimulated and used in order to solve a problem or answer a pressing question within the *Cars in Context Project* course. The committee appreciates the integration of diverse types of knowledge and skills, and from the interviews with students and alumni it became clear that the Cars in Context courses were among the most popular items in the curriculum.

2.3 Teaching concept, formats and programme-specific services

The committee examined which teaching concept and formats form the basis of the offered education, and which programme-specific services enable this.

The Department of Mechanical Engineering formulated the teaching concept and formats based on the underlying notion that the bachelor student's perspective upon intake should develop into a professional attitude. Therefore, the department selected three core principles. The teaching should include a gradual transition from guided learning to independent learning, there has to be a balanced combination of lectures and project assignments, and in the graduation project the master/apprenticeship model is key. According to the critical reflection, those principles contribute to the realisation of a professional attitude. In other words, the programme provides a balance between lectures and practical work, between problem-oriented projects and research assignments.

The programme is part of the Department of Mechanical Engineering, which is housed in two connected buildings. The participating departments all have lab facilities available for the education of Automotive Technology master students:

- The Automotive Engineering Science Lab and the Engine Lab, with engine test beds and dedicated high-pressure facilities at the Department of Mechanical Engineering.
- The labs of the Electro-mechanics and Power Electronics group at the EE Department.
- The labs of the Model-Driven Software Engineering (MDSE) and Security and Embedded Networked Systems (SENS) sections of the Department of Mathematics and Computer Science.
- The Department for Industrial Design has a fixed-base driving simulator that is used as part of the core course (0P900; Automotive Human Factors) and in graduation projects for investigating the effect of ITS (intelligent transport systems) on driver's performance and appreciation.
- The Energy Materials and Devices group at the Department of Chemical Engineering has extensive facilities for experiments with rechargeable automotive batteries.

The committee is of the opinion that the teaching concepts and formats are adequately formulated and contribute to the academic environment of the master's programme. It agrees with the students, who all were enthusiastic about the programme-specific services, that they indeed have access to great laboratories.

2.4 Feasibility

The quantitative data regarding intake numbers, transfers and graduates, the achieved teacher-student ratio and the average amount of face-to-face instruction per stage of the study programme can be found in Appendix 5.

Intake numbers
According to the critical reflection, there are several ways to be admitted to the master's programme Automotive Technology. Usually, the programme is a continuation of an academic bachelor's programme in Mechanical Engineering or Electrical Engineering. For applicants with a bachelor's degree from an institute of higher vocational education, a master's bridging programme is a prerequisite.

As can be seen in Appendix 5, the intake numbers have dropped slightly over the past few years. While the total intake of students was 27 in the 2009/2010 cohort, it was only 19 in the 2012/2013 cohort. In the critical reflection, two arguments are provided by the programme management for this decrease and not achieving the proposed intake target of 40 students per year, of whom 25% should be from abroad. First of all, the non-EU fee has increased from €8000 to €12.500, and the number of scholarships has been drastically reduced. Nevertheless, the target for 2015 remains an intake of 25% international students. Second, the profiling of the master's programme within the university needs to be improved. According to the critical reflection, there was deliberately less focus on profiling within the university as it was feared it would lower the intake to other Eindhoven Technical University master programmes.

The committee raised the issue of the decrease and rather low numbers of intake in several interviews and is convinced that the arguments provided above can indeed be perceived as a valid explanation for the problems. From the interviews with alumni and students, it became clear that many of them had been warned by fellow students that Automotive Technology is a tough programme. In addition, the interviews also showed that those with a background in higher vocational education often have difficulty completing the bridging programme, and only a few are eventually able to enter the master's programme. The teachers emphasised that there is an automotive track within the master programme of Mechanical Engineering, in which students have more freedom in choosing their subjects. While there are many mandatory courses in the master's programme Automotive Technology, these are electives within the Mechanical Engineering automotive track. Therefore, many students tend to stay with the Mechanical Engineering programme. The master's programme Automotive Technology is much more challenging and generally attracts the more motivated students who wish to pursue a more modern approach to the automotive field. According to the alumni the difference between the Mechanical Engineering automotive track and the master's programme Automotive Technology is that the mechanical automotive track is traditionally focussed on mechanics, while Automotive Technology has a more modern systems approach: it incorporates electronics and software, which are needed in the modern car industry. Members of the Examination Committee pointed out that for the past few years, there has been no bachelor's programme in Automotive Technology that could boost the intake of the master's programme. However, starting in the next academic year, there will be an inflow of students from the new bachelor's programme Automotive Technology. From the interviews with the management, the committee found out that the master's programme is finally being given more scope to advertise itself within the university. It applauds the tactic of the Director of Education to address foreign applicants personally. Last year, the programme received 100 foreign applications, of which 90 were eligible, but only 4 eventually showed up. This year, there were again 90 applicants admitted, and the programme director sent all of

them a personal e-mail, resulting in a total of 25 students. Those students are all from outside the EU, and all have to finance their own education.

The committee hopes that the master's programme will finally start to advertise itself within the university. In addition, it has faith in the effect of the new bachelor's programme Automotive Technology on the intake numbers of the master's programme.

Course load
As can be read in the critical reflection, students consider the study load to be relatively heavy, according to the National Student Enquiry (NSE). This perception was confirmed in the interviews with students and alumni. Generally, students study 45-50 hours per week, and especially the first semester with its mandatory courses is considered pretty tough. Although students did not seem to mind the heavy course load and were highly motivated, the committee would like to stress that the master's programme has to be alert not to increase the course load any further.

Feasibility
According to the table provided in Appendix 5, the total number of dropouts has remained rather low over the past few years. In the 2010/2011 cohort as well as the 2011/2012 cohort, only one student left without a degree. As can be read in the critical reflection, students can choose specialisation electives in each quartile, and it is therefore possible to compose a well-balanced individual programme in terms of coherence and study load that fits the student's specialisation profile.

According to the committee, the master's programme is feasible, although the first semester with mandatory courses is considered pretty tough. In addition, it became clear from the interviews that a slight delay in completion is rather problematic for international students as they have to pay a lot of extra money for every additional month they stay. The committee advises providing tailored guidance for such students.

Internationalisation
Since the programme attracts a lot of international students, it is worthwile paying extra attention to their care. The committee praises the international recruitment and stimulates the programme to continue its international outlook. However, there are a few issues that seem to require attention. First of all, the committee advises the programme to keep in mind that if international students would like to find an internship in industry, instead of completing their internship at the university itself, they will need help coping with several related practical difficulties. Secondly, international students might need some extra guidance in avoiding, or at least reducing, a delay in their graduation. As mentioned above, postponed graduation results in additional international student fees.

2.5 Teaching staff

The committee focussed on the quality and quantity of the teaching staff at the master's programme Automotive Technology.

Quality
According to the critical reflection, all academic staff members involved in the master's programme Automotive Technology have a PhD. In 2010, Eindhoven Technical University began working according to the rules and regulations of the new University Teaching Qualification (UTQ). As of June 2010, the following department members are obliged to acquire the UTQ:

- All newly appointed teaching staff (assistant professors, associate professors, professors) must acquire the UTQ within three years of their appointment;
- All faculty members contending for promotion must acquire the UTQ before promotion can be granted;
- Faculty members who perform below expectations (for example, by repeatedly receiving low scores on course evaluations).

All other department members are free to acquire the UTQ on a voluntary basis. In 2011, 12.5% of the staff at Eindhoven Technical University had a UTQ. The target for 2015 is set at 25%. To strengthen staff development within the automotive field itself, 'automotive lunches' are organised every six weeks to improve the quality of the staff as a team and address specific issues concerning automotive technology as a field of expertise in its own right.

The committee is positive about the 'automotive lunches' and is convinced that the master's programme indeed houses excellent teaching staff. From the interviews it became clear that students are enthusiastic about the dedicated attitude of teachers, and that they are always willing to help out.

Although the committee understands that teachers in the programme come from different departments and that the UTQ demands a lot of time, it nevertheless recommends raising the UTQ target. It supports the programme's aim for a 100% target. There was positive feedback from teachers who already acquired the UTQ.

Quantity
For an interdepartmental programme, it is impossible to give an unambiguous definition of the student-staff ratio, as the critical reflection argues. With six departments contributing to the courses, project work and student supervision, the various ratios for all these departments should be taken into consideration. Since the majority of the students graduate within the Departments of Mechanical Engineering and Electrical Engineering, the student-staff ratios of those departments are provided in Appendix 5. The ratio at the Department of Mechanical Engineering rose from approximately 1:19 in 2009/2010 to 1:21 in 2011/2012. At the Department of Electrical Engineering, it decreased from approximately 1:9 in 2009/2010 to 1:7 in 2011/2012.

The committee studied the student-staff ratios and argues that they are currently on the safe side. However, if the programme rapidly grows in future, new staff members will have to be employed.

2.6 Programme-specific quality control

At the highest level, the Department Board is responsible for the quality of the master's programme Automotive Technology. As stated in the critical reflection, the departmental Director of Education has the final responsibility for the programme and all processes necessary to keep the programme on track (including quality assurance). The quality control (QC) officer conducts and monitors the main aspects of the quality assurance cycles. The main tasks are preparing and conducting course evaluations, including analysing the results and discussing those results with the lecturers concerned. The QC officer provides the Programme Committee with the reports on course evaluations and also conducts other evaluation activities.

The master's programme Automotive Technology has a Programme Committee comprising four staff members from different faculties and four student members. The Director of Education, programme coordinator(s), the student counselor and the quality control officer are involved as advisors to the Programme Committee. The Programme Committee meets every two months and discusses the Teaching and Examination Regulations (TER) annually.

In 2011, a survey of teacher satisfaction at the Department of Mechanical Engineering was introduced. All students are asked to participate regularly in course evaluations. On average, 30% of the student population contributes to the evaluations.

After interviewing staff and student members, the committee has gained a positive view of the Programme Committee. It functions very well, and its members are actively involved. The 'automotive lunches' mentioned earlier seem to be fruitful sessions where new ideas can be picked up. They work well because they are arranged in an informal manner. The Programme Committee reviews the programme in terms of feasibility, and makes recommendations as a result of the student evaluations. The committee advises the programme management to encourage a higher percentage of the student population to fill in the evaluation forms.

Considerations

The committee studied the teaching-learning environment to analyse whether the curriculum, teaching concepts, formats, programme-specific services, feasibility, staff, and programme-specific quality control enable the student to eventually achieve the learning outcomes.

The committee is satisfied with the developments within the curriculum since the previous accreditation. It is convinced that the curriculum is now well organised and has a coherent structure in which the learning outcomes are embedded. However, it would like to see some clear objectives and assessment requirements for the internship.

The committee believes that the teaching concepts and formats are formulated adequately, and is impressed by the great labaratories that are available for students.

There was a discussion about the low numbers of intake, from which the committee derived several explanations. For example, it noted that Automotive Technology is considered as a tough programme, that many students with a higher vocational background do not succeed in completing the bridging programme, and that there is an automotive track within Mechanical Engineering which is considered to be more feasible. Nevertheless, the committee is convinced that given the new Automotive Technology bachelor's programme, the new approach to recruiting foreign applicants, and the increased scope for campaigning within the university, the intake numbers will rise in the near future.

The committee is of the opinion that the study load is pretty high and advises the programme not to let it increase any further. Despite the high study load and the tough first semester consisting solely of mandatory courses, it thinks that the programme is still feasible. Regarding the intake of international students, it encourages the international recruitment but would like to point out that those students might need extra assistance in some specific cases, such as course planning, the internship and thesis project.

The committee is satisfied with the quality and quantity of the staff, and would like to encourage the programme to strive for a 100% UTQ target in the future.

According to the committee, the Programme Committee functions perfectly well, although there should be a continuous drive to increase the participation of students in evaluations.

Conclusion

Master's programme Automotive Technology : the committee assesses Standard 2 as 'satisfactory'.

Standard 3: Assessment and achieved learning outcomes

The programme has an adequate assessment system in place and demonstrates that the intended learning outcomes are achieved.

Explanation:
The level achieved is demonstrated by interim and final tests, final projects and the performance of graduates in actual practice or in post-graduate programmes. The tests and assessments are valid, reliable and transparent to the students.

Findings

This standard considers the findings regarding the assessment system (3.1) and subsequently deals with the question whether the graduate students are able to achieve the learning outcomes (3.2).

3.1 Assessment system

The committee analysed the assessment system of the master's programme Automotive Technology and focussed on the assessment policy, including the functioning of the Examination Committee, the examinations and the thesis procedure.

Assessment policy
According to the critical reflection, the Examination Committee supervises and ensures the correct implementation of the examination philosophy and rules. In addition, the committee is implementing a monitoring system conform institutional guidelines and boundaries. The Examination Committee also receives individual requests from students or teachers and makes decisions on a case-by-case basis. It schedules eleven virtual meetings a year, and at least six meetings are confirmed but only when there are sufficient points to discuss. It is responsible for monitoring the quality and accuracy of the programme assessment as a whole. To this end, it is currently reconsidering its role in monitoring the quality of exams. According to the critical reflection, the quality of the theses is ensured by the active participation of a member of the scientific staff from another department on the Graduation Committee. The quality of exams is monitored by the student course evaluation questionnaires as performed in the standard quality cycle. The evaluations are discussed by the Programme Committee. In addition to these measures, from September 2013 onwards the Examination Committee will investigate examinations that have a high or low pass rate.

From several interviews during the site visit, the committee gained the impression that the role of the Examination Committee in quality control needs further development. The programme management also recognises that there is room for improvement. The committee has judged several graduation reports and concludes that a significant number of the projects is performed in contact with the outside world (industry). This also results in advisory members from industry in the Graduation Committee, which the committee appreciates. The Examination Committee, however, currently relies on the system of peer review. In the thesis procedure, for instance, it argues that the teachers involved in the programme are carefully selected and therefore able to guarantee the quality of the final theses. The committee accepts this as a valid approach, yet it nevertheless advises the Examination Committee to look at the outside world, such as other universities and the industry, to compare their own decisions. The committee regrets the absence of more guidance by the Examination Committee in particular during the start of this lengthy graduation process. It argues that it is the task of the Examination Committee to guarantee that the thesis has the identity of an

Automotive Technology thesis. It advises the Examination Committee to explicitly implement a clear assessment quality assurance system and improve the transparency of grading, especially now that the master's programme is likely to grow in the coming years.

The committee is satisfied with the programme's plans to install an Assessment Quality Assurance Committee, and encourages the Examination Committee to further develop and reflect on its duties. In addition, it strongly advises the programme management translating all rules and regulations into English and communicate them in a more pro-active way. It is crucial for all students to know all the ins and outs of their programme and to be aware of what is expected from them.

With regard to the comment that the Examination Committee should adopt a broader perspective, the committee suggests the programme to install an Industrial Advisory Board. From the interviews with alumni, it became clear that the cooperation between the university and the industry is highly appreciated. The committee sees an opportunity for the programme to involve the industry in the procedure of the final theses, for example. People from the industry can observe the process and eventually provide feedback to the programme. In this way, the outside world is efficiently used to reflect on the developments within the programme and also to assess the final outcome of the programme and further strengthen the transition of graduates from the academic world into industry. It can also contribute to the construction and consolidation of international linkages.

Examinations
According to the critical reflection, courses are assessed by means of a written or oral exam, an assignment, or a combination of an assignment and an oral exam. Some courses require an oral exam after an individual or groups assignment is completed. The assignment and evaluation of the internship are in the hands of an internship coach. The coach is always a member of the academic staff and authorised as an examiner. The final evaluation of the internship is typically based on the external assessment, the written report and the final presentation.

According to the committee, the examinations are typical for a master's programme Automotive Technology. It observed many types of exams, oral and written, assignments and papers and believes that there is enough diversity and that the exams are at a satisfactory academic level. It believes the content of the exams is adequate and argues that the examination is consistent. The students experience the examinations as manageable, and the committee appreciates the fact that students know beforehand what type of exams they can expect from each course. However, it is not entirely convinced of the internship assessment. As mentioned earlier (in 2.1), it would like to see clear objectives and requirements for the internship.

Thesis procedure
The assessment of a graduation project is based on demonstrated analytical engineering skills, theoretical, practical and technical skills, creativity, independence, a written report, an oral presentation and the final defence before the Graduation Committee. The committee concludes that the assessment of all competences and the final grade together with the composition of the Graduation Committee is laid down in an assessment form which is reviewed by the Examination Committee.

After interviewing many people involved in the master's programme Automotive Technology, the committee believes that there is an acceptable manner of working when it

comes to the thesis procedure, but that it could be more explicit. The committee understood that in half of the Graduation Committees there is a member from industry involved. Hence, the committee advises to explicitly formalise this practice. According to the committee, there is not enough transparency with regard to the thesis procedure for the outside world. Therefore, it has several recommendations. Since the committee considers the systems approach as the central vision of the programme, it would like to see this vision reflected in the thesis procedure and the graduation assessment. This will clarify the definition of the Automotive Technology student. The programme needs to clearly define a typical Automotive Technology student, and consequently the thesis has to be an obvious Automotive Technology thesis. What exactly does the field of Automotive Technology consider the final outcome of the systems approach of the programme? That is a question which requires more reflection and discussion. Once this question has a clear answer, and the vision of the programme is formalised adequately, there will be more consistency in the end product: the theses.

Second, the committee advises providing detailed formal rules and regulations regarding the weighing and calculation of the different elements of the thesis procedure and the final grade. Finally, the committee thinks it is crucial that students have access to a clear set of criteria before they start their thesis project. Students need that foundation and should be aware of what is required to obtain a good final grade for their thesis.

3.2 Achieved learning outcomes

By reading fifteen theses, the committee analysed the achieved learning outcomes of graduate students. The theses were carefully selected, taking into account a proportional distribution of low, average and high grades.

Although there was some discussion regarding the uniformity of the identity and formats of the theses, the committee was generally satisfied with the overall level achieved. Most students formulate a clear objective and show a logical and consistent line of reasoning in their thesis, the conclusion follows logically from the presented material, and the research methods are described and applied in a thoroughly considered way.

The committee believes that graduates are well prepared for the labour market. The programme offers some very interesting internships and is well connected to the labour market. In addition, the domain-specific framework of reference, the programme's profile and orientation are all defined in such a way that the graduates indeed match the requirements of an engineer. From the interview with alumni, it became clear that graduates are satisfied with their academic background. They all think that the master's programme Automotive Technology provided an adequate foundation to enter the labour market as well as to continue in the academic world. They rated the programme as 7.7 out of 10 regarding the transition into their new careers. The alumni who entered the labour market even rated the programme as 8. Considering the fact that the vast majority of the students (more than 90%) ends up in the industry, the master's programme can be perceived as having a very solid basis.

The satisfaction of the graduates, the good connection with the labour market and the general level of the theses prove that the learning outcomes are indeed achieved at the end of the master's programme Automotive Technology, according to the committee.

Considerations

The committee studied whether the master's programme Automotive Technology has an adequate assessment system in place, and analysed whether the learning outcomes are actually achieved.

The committee initially had some doubts about the assessment system but is now convinced that the programme is already taking action to develop the quality assessment further. It believes that if several steps are taken, the assessment system will be further formalised and hence be transparent for the outside world. The explicit implementation of a clear assessment system is also crucial for the expected growth of the programme in coming years. The committee would like to advise the Examination Committee to take a broader approach and no longer rely solely on a peer review system. In addition, the committee strongly advises translating all rules and regulations into English and communicate them in a more pro-active way.

Regarding examinations, the committee has observed a great variety of types and argues that the assessment is consistent and the content of the exams adequate. For the internship, however, the committee would like to see clear objectives and requirements formulated.

Just as with the current assessment policy, the committee would like to see some transformations for the thesis procedure as well. It wishes more recognition of the systems approach in this procedure, advises providing detailed formal rules and regulations regarding the grading of the thesis, believes that it should depend less on peer reviews, and states that objectives, requirements and a clear set of grading criteria, explicitly related to the intended learning outcomes, must be provided before students begin their thesis project.

Nevertheless, the committee concludes that the overall level of the theses is satisfactory, showing clear objectives, logical and consistent reasoning, good conclusions and well considered and applied research methods. In addition, it is very positive about the transition of the graduates into their new careers; in particular, the entrance into the labour market seems to work out rather well. The committee appreciates the good connection of the programme to the labour market. The satisfaction of the graduates and the general level of the theses show that the learning outcomes are achieved. According to the committee, the graduates indeed match the requirements of an engineer.

Conclusion

Master's programme Automotive Technology : the committee assesses Standard 3 as 'satisfactory'.

General conclusion

The committee enjoyed studying the master's programme Automotive Technology at Eindhoven University of Technology. It is impressed by the drive of the programme management, in particular the energy and compassion of the Director of Education. It believes that the Director of Education and his team are trying to do something new, something difficult, and something unique in the Netherlands at least. The construction of an interdisciplinary programme in automotive technology which has a fine balance between research and industry, and derives from a systems approach is a brave attempt to train engineers who are prepared for the future needs in the industry, according to the committee. It is enthusiastic about this new, challenging programme and would like to support the management in continuing to develop it. With the anticipated influx of new bachelor graduates in Automotive Technology, this master's programme is likely to get a more stable basis in coming years. However, the committee also thinks that the master's programme is not yet complete, and several additional steps have to be made. An important issue that has to be implemented further is the systems approach. The committee would like to see this approach included in the learning outcomes, so that the strive to deliver engineers with a holistic perspective to the industry is already rooted in the core goals of the programme. It also believes that the leadership of the programme has to become more distributed or shared, which is now mainly dependent on the Director of Education. It realises that bringing staff members from different faculties together in one new programme and motivating them at the same time is a very difficult task. It would therefore be ideal if a central body of teachers from different faculties could be formed so that the programme is approached with a great interdisciplinary enthusiasm. Additionally, the committee is of the opinion that the assessment system, although of adequate quality, requires further improvements and that the criteria, rules and regulations need to be implemented in an explicit manner. Nevertheless, it thinks that the master's programme Automotive Technology is already on its way towards becoming a mature master's programme, that the achieved learning outcomes are already of an adequate level, and that the programme has the potential to even grow beyond.

Conclusion

The committee assesses the *master's programme Automotive Technology* as 'satisfactory'.

Appendices

Appendix 1: Curricula Vitae of the members of the assessment committee

Ir. L. J. J. (Leo) Kusters MSc. (1961) holds a master degree (with honors) in Agricultural Engineering, which he obtained at Wageningen University. Kusters worked at DAF Trucks in several management positions in the R&D department. Since 1994, he works at TNO, primarily in the automotive domain. He is the initiator of the unique VEHIL-laboratory (Vehicle Hardware in the Loop) and the EEMC (European Electric Mobility Centre). In addition, Kusters is Executive boardmember of EARPA (European Association of Automotive R&D organisations) and AutomotiveNL. He is chairman of the board of public private partnership TNO/TAI, member of the board DITCM (Dutch Integrated Testsite Cooperative Mobility), and member of the board of the TKI Logistics (Top Consortium on Logistics).

Ir. L. (Loek) van Seeters (1961) studied Mechanical Engineering at the Eindhoven Technical University and specialised in Automotive Driveline Technology by finishing his final thesis at Audi in Ingolstadt/Germany. He started his career at DAF Trucks in Eindhoven as an engineer of driveline components. Mid nineties he left DAF to continue his former interest in automotive drivelines at nowadays BOSCH transmissions in Tilburg. Since early 2001, he recaptured his career at DAF trucks on several managerial positions. He represents DAF in external contacts where automotive technology roadmaps, future product related strategies and directions or legislative aspects are point of discussion. Also in the network of automotive bachelor educations in the Netherlands he represents DAF in advisory groups.

Drs. M. J. H. (Kalinka) Grijpink – van den Biggelaar (1953) graduated as teacher in Tilburg and in Leiden in pedagogical sciences and specialised in educational theory, management and administration. As she has many years of teaching experience, she easily relates practice and educational theories in her current function as educationalist at the Delft University of Technology. Professionalisation is a key topic in her work. Earlier, she was active at Erasmus University, high schools and in high vocational- and medical programmes, not only for professionalisation, but also for quality assurance and accreditation. Grijpink – van den Biggelaar is experienced in building integral quality systems for education, in guidance of writing self-assessments and in the execution of visitations. She is a member of the Dutch university expertise network.

Prof. Dr. L. (Lars) Nielsen (1955) completed his PhD in Automatic Control at Lund University in 1985. From 1992 onwards he is full Professor in the chair Sten Gustafsson Professor of Vehicular Systems, Electrical Engineering, Linköping University, and since 2003 he is the Head of Department Electrical Engineering at Linköping University. He has numerous contacts and networks in the automotive industry and in the automotive research community. The latter is manifested in the fact that during 2002-2005 he was chairman of Automotive Control within the International Federation of Automatic Control, and 2005-2011 he was Chairman for all Transportation and Vehicle Systems.

W. R. (Roel) Brouwer BSc. (1990) began his academic career in 2008 by studying Mechanical Engineering at the University of Twente. He was on the board of his study association, as well as on the interim board. In both cases he was the commissioner of educational affairs. In addition, he has been a representative of the faculty council for two years and he has been member of the 'benoemingsadviescommissie' for the chair of Elastomer Technology Engineering. Brouwer completed his bachelor degree in 2012, and continued for his master's degree in Mechanical Engineering at the same university. Brouwer

is currently following the track Engineering Fluid Dynamics, under supervision of prof. dr. ir. Harry Hoeijmakers. He plans to finish his studies early 2015.

Appendix 2: Domain-specific framework of reference

The Automotive Technology MSc programme was designed in close contact with key automotive industry players united in the HTAS Innovation Programme, which is now part of AutomotiveNL. The HTAS Innovation Programme was the result of industry-wide cooperation between Dutch automotive industry partners and knowledge institutes. This challenging programme proposed, among other things, a dedicated Automotive MSc programme at TU/e (as of September 2008), in order to address a major bottleneck faced by the automotive sector, that is, a lack of sufficiently highly trained staff. Professional standards were thus designed into the Automotive Technology Master's programme from the start.

According to HTAS[1] (later updated by AutomotiveNL[2]) in today's automotive innovation arena suppliers are on the ball. "Original equipment manufacturers (OEMs) expect suppliers to provide them with future technology and ideas for new features. The OEM chooses from this menu to compose the car. Keys to success are: (1) understanding the forward and backward relations in the complete value chain, and keen scanning of market and technology developments; (2) creating synergy between the suppliers of automotive functions and systems, and the micro-electronics and embedded systems industry; and (3) international cooperation at all levels of research, development and marketing rapidly adopting new business models to take advantage of new markets."

According to HTAS, the most important trends and influencing factors are related to CO_2 reduction, mobility and congestion, and safety. Taking into account the position of the Dutch automotive industry, the two most promising focus areas to address are:

"Driving guidance (with the connected car and human–machine interaction and vehicle dynamics control as priority subjects).
Vehicle efficiency (focusing on powertrain efficiency and light construction)."

HTAS identifies education, business and knowledge as enablers within these focus areas. The two areas identified by the HTAS analysis (driving guidance and vehicle efficiency) guided the programme design.

The systems engineering approach is central to the programme. Systems engineering focuses on analysing and eliciting customer needs and required functionality early in the development cycle, first documenting requirements and then proceeding with design synthesis and system validation while considering the problem as a whole. This approach to engineering is a key element in the programme's philosophy and an added value. It is a major concern of the high-tech industry in general and of the automotive industry in particular, that many engineering studies have a restricted, mono-disciplinary scope and focus too little on integration. The AT MSc programme is the first TU/e programme to specifically address this systems engineering/architectural need. Because of the new aspects involved, our future goal is clear, and the current curriculum already represents the major building blocks for this. However, it also requires the teachers involved to have a certain mind-set, and this is clearly a process with a longer time constant. We recently launched the Bachelor programme in Automotive and the PDEng programme in Automotive Systems Design, both of which include the same mission.

1. HTAS Innovatie Programma (2007)
2. AutomotiveNL Innovation Programme (2012), http://www.automotivenl.com/organisatie/innovatie

The learning outcomes and content of the programme were defined by an international perspective on the automotive engineering discipline. A benchmark[3] looked into several automotive programmes of a number of prominent European universities. In this way, TU/e positioned the programme within the European context, and assured international standards of both the academic and the professional community. The systems approach perspective offered by the programme is unique: in Europe, there are no programmes comparable to the MSc in Automotive Technology at Eindhoven.

3. Benchmark research for Master of Automotive Technology. T. Hofman, TU/e (2007)

Appendix 3: Intended learning outcomes

The intended learning outcomes of the Automotive Technology (AT) Master's programme were first described in the 2007 Automotive Technology accreditation proposal.[4] They were subsequently incorporated into the Teaching and Examination Regulations (OER).[5] They are listed here for ease of reference:

1. *Knowledgeable in automotive science and engineering.* Profound knowledge in one of the basic engineering sciences (electrical engineering, mechanical engineering, chemical engineering, applied mathematics and control), a systems overview of the entire automotive field, and the capability to apply both knowledge and overview at an academic level in the automotive engineering discipline. Also broad and profound technical knowledge of automotive engineering and the skills to use this knowledge effectively. The field is mastered at various levels of abstraction, including a reflective understanding of its structure and relation to other fields, [and reaching in part the forefront of scientific or industrial research.
2. *Competence in doing research.* Capability to independently conduct scientific research and to investigate, rethink and solve technological problems in automotive technology in a systematic way, involving problem formulation, problem analysis, formulating sub-problems and providing innovative technical solutions.
3. *Competence in designing.* Thorough knowledge of paradigms, methods and tools as well as the skills to actively apply this knowledge in analysing, modelling, simulating and designing innovative technological systems, with an appreciation of different application areas.
4. *Scientific approach.* A systematic approach characterized by the development and use of theories, models and coherent interpretations, a critical attitude, and insight into the nature of science and technology in general. This includes a professional attitude towards identifying and acquiring expertise, monitoring and evaluating existing or developing new knowledge, planning and executing research, adapting to changing circumstances, and integrating new knowledge with an appreciation of its ambiguity and limitations.
5. *Basic intellectual skills.* Competence in reasoning, reflecting and forming a judgment. These are skills that are learned and sharpened within the context of automotive technology, but are generically applicable. Attitude to maintain professional competence through life-long learning.
6. *Competence in cooperating and communicating.* Capability to work both independently and in multidisciplinary teams, interacting effectively with specialists and taking initiatives where necessary. Capability to effectively communicate (including presenting and reporting) about one's work to both professionals and a non-specialized public in English.
7. *Taking account of the temporal and societal context.* Ability to evaluate and assess the technological, ethical and societal impact of one's work, and to take responsibility with regard to sustainability, economy and social welfare.

4. Master of Science Automotive Technology Accreditation Proposal, TU/e (2007)
5. Automotive Technology master Exam Regulations, TU/e (2012/13)

Appendix 4: Overview of the curriculum

The programme has the following parts:

Year 1	1) 33 EC: core courses	2) 27 EC: electives
Year 2	3) 15 EC: internship	4) 45 EC: graduation project

1. A generic core (33 EC), with a strong multidisciplinary character; students learn the core elements of the disciplines that are essential in automotive engineering: driving guidance and efficient vehicles. In the Cars in Context project, students become familiar with the systems approach to solving real-life problems in the automotive field, while working with students from various backgrounds.

Course name	**EC**
Vehicle Dynamics	3
Automotive Human Factors	3
Real-Time Architectures	3
Software System Engineering	3
Powertrain Components	3
Electric Components	3
Energy Management in Automotive Applications	3
Secondary Batteries and Hydrogen Storage	3
Cars in Context: Emergence of an automobile system in a mobile world	3
Cars in Context Project	6

2. Elective courses (27 EC), to improve the theoretical basis and deepen specific knowledge prior to the graduation project.
3. Internship (15 EC), where students work individually on a research related topic. The internships prepare students for their graduation project and allow them to experience a working environment for the first time. The internships take place in a company or at the university in Eindhoven, or at an international institute/university, depending on the students' individual learning objective, interest and background.
4. The graduation project (45 EC), which concludes the programme. This is a research assignment of considerable size executed by the student individually and to a large extent independently. The graduation project takes place at TU/e, in a company or at a research institute/university. The graduation project is always carried out under direct TU/e supervision.

Appendix 5: Quantitative data regarding the programme

Data on intake, transfers and graduates

Intake numbers

Cohort	Total	BSc TU/e	Pre-MSc	BSc national, non TU/e	BSc international	Other
2012/13	19	6	9	0	4	0
2011/12	24	9	6	2	7	0
2010/11	26	4	7	1	14	0
2009/10	27	8	6	1	8	4

Numbers are based on the Annual Report Education. The reports for 2011/12 and 2012/13 were not available at the time of writing and so the university student database (OWAppl) has been used. Reference date: occurs between 1 September and 31 August of the study year. The Automotive Technology programme started in 2009.

Deregistered MSc students per cohort AT

Cohort	N	Still registered		Deregistered without degree		Deregistered with degree	
2011/12	24	23	96%	1	4%	n/a	
2010/11	26	14	54%	1	4%	11	42%
2009/10	29	2	7%	6	21%	21	72%

Diploma's MSc AT

Study year	Total	Cum laude		With Great Appreciation	
2011/12	10	1	10%	1	10%
2010/11	9	0	0%	2	22%
2009/10	1	0	0%	0	0%

Teacher-student ratio achieved

Student-staff ratios at the Faculty of Mechanical Engineering

Year	Teaching effort	Students (1 Dec.)						Student–staff ratio
	Staff (FTE)	Number of registered BSc and MSc students						Total
		BSc Mech. Eng.	MSc Mech. Eng.	MSc SET	MSc S&C	MSC-AT	Total	
2011/12	60.7	713	332	130	39	48	1262	20.7
2010/11	61.1	702	313	93	46	36	1190	19.5
2009/10	57.7	703	273	67	31	21	1095	18.9

Student-staff ratios at the Faculty of Electrical Engineering

Year	Teaching effort	Students (1 Dec.)			Student–staff ratio
	Staff (FTE)	Number of registered BSc and MSc students			Total
		BSc EE + AU	MSc EE	Total	
2011/12	67	355	140	495	7.4
2010/11	61.2	354	127	481	7.9
2009/10	58.1	350	143	493	8.5

Average amount of face-to-face instruction per stage of the study programme

Average number of contact hours per study phase

	Attendance lecturer						Non-attendance lecturer		
Programme	Lectures	Tutorial	Individual study under supervision	Practical training (laboratory course)	Project etc.	Total	Individual study	Project	Total
1 year	324	-	60	36	24	444	1008	228	1236
2 year	-	-	-	-	15	15	-	405	405
Thesis	-	-	-	-	45	45	-	1215	1215

Appendix 6: Programme of the site visit

Wednesday September 25th		
11.30	14.30	Preparation meeting (self-assessment + theses), reading additional documentation + lunch
14.30	15.15	Interview with management Prof. dr. ir. M. Steinbuch (Director of Education AT) Dr. ir. H.C. de Lange (Director of Education ME) Ir. ing. D.A.A. van Noort (Programme coordinator)
15.15	16.00	Interview with students J.G.S. van Uden J.W. v.d. Vleuten J. van Dijk V. Pandian Muthuramalingam
16.00	16.15	Break
16.15	17.00	Interview with teachers Dr. ir. W.J.A.E.M. Post (Department of Mechanical Engineering) Dr. ir. R.J. Bril (Department of Mathematics & Computer Science) Dr. ir. I.J.M. Besselink (Department of Mechanical Engineering) Dr. ir. T. Hofman (Department of Mechanical Engineering) Dr. ir. R.H. Cuijpers (Department of Industrial Engineering & Innovation Sciences) Dr. Mphil. J.J.H. Paulides (Department of Electrical Engineering) Dr. ir. J.M.v.d. Mortel-Fronczak (Department of Mechanical Engineering)
17.00	17.45	Interview with alumni MSc. L. Pan MSc. M. Meijer MSc. J.D. Okutman

Thursday September 26th		
9.00	9.15	Interview with student members of the Programme Committee (OLC) S.T.M. Bus (student Automotive Technology) A.J.M. de Visser (student Automotive Technology) J.E. Maldonado Reyes (student Automotive Technology) A. Mahendru (student Automotive Technology)
9.15	10.00	Interview with teachers and students of the Programme Committee (OLC) Prof. dr. J.J. Lukkien (Department of Mathematics & Computer Science) (Chair) Dr. J.M.B. Terken (Department of Industrial Design) Dr. ir. L.M.T. Somers (Department of Mechanical Engineering) S.T.M. Bus (student Automotive Technology) A.J.M. de Visser (student Automotive Technology) J.E. Maldonado Reyes (student Automotive Technology) A. Mahendru (student Automotive Technology)
10.00	10.30	Open office 'hour' + internal meeting of the committee
10.30	11.30	Interview with Examination Committee + study advisor Prof. dr. M.G.J. van den Brand (Department of Mathematics & Computer Science) (Chair) Prof. dr. H. Nijmeijer (Department of Mechanical Engineering) Prof. dr. ir. P.M.J. van den Hof (Department of Electrical Engineering)

		Dr. J.R.C. Ham (Department of Industrial Engineering & Innovation Sciences) Drs. P.M.M. Verbeek (Study advisor & Quality Control Officer)
11.30	13.00	Lunch and internal meeting of the committee + guided tour (30min)
13.00	13.45	Final interview with management (including the dean) Prof. dr. L.P.H. de Goey (Dean) Prof. dr. ir. M. Steinbuch (Director of Education AT) Dr. ir. H.C. de Lange (Director of Education ME) Ir. ing. D.A.A. van Noort (Programme coordinator)
13.45	15.00	Internal meeting committee
15.00	15.30	Presentation of preliminary findings

Appendix 7: Theses and documents studied by the committee

Prior to the site visit, the committee studied the theses of the students with the following student numbers:

757392	729655	755748	591905	754588
666453	728531	666282	728402	662608
665218	597118	636311	639665	589297

During the site visit, the committee studied, among other things, the following documents (partly as hard copies, partly via the institute's electronic learning environment):

- Subject-specific reference framework and the learning outcomes of the programme;
- Overview of the curriculum;
- Outline description of the curriculum components;
- Teaching and examination regulations;
- Overview of allocated staff;
- List of the last 25 final projects or the final projects of the past two years;
- Overview of the contacts maintained with the professional field;
- Report on the institutional quality assurance assessment;
- Reports on consultations in relevant committees/bodies;
- Test questions with corresponding assessment criteria and requirements and a selection of actual administered tests and assessments;
- Selection of final projects with corresponding assessment criteria and requirements;
- Reference books and other learning materials;
- Summary and analysis of recent evaluation results and relevant management information;
- Documentation regarding teacher and student satisfaction.

Appendix 8: Declarations of independence

nvao
nederlands-vlaamse accreditatieorganisatie

DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: Lusters R.J.

HOME ADDRESS:

Vinklaan 26
Rietheven.

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

Automotive Technology.

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

University Eindhoven.

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

1

nvao
nederlands-vlaamse accreditatieorganisatie

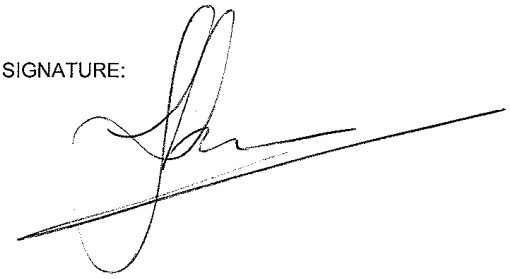
HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Eindhoven. DATE: 25/9/2013

SIGNATURE:



nvao
nederlands - vlaamse accreditatieorganisatie

DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: Loek van Seetens

HOME ADDRESS:

Gildelaan 21
5081 PJ Hilvarenbeek

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

MSc Automotive Technology
TU/e Eindhoven.

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

~~QANU~~. TU/e Eindhoven

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

nvao
nederlands - vlaamse accreditatieorganisatie

HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Hilversum DATE: 25-09-13

SIGNATURE:

nvao
nederlands - vlaamse accreditatieorganisatie

DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: MJH. Grijpink - van den Biggelaar

HOME ADDRESS: Munnikenland 13
2716 BV Zoetermeer

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

Master Automotive Technology

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

TU Eindhoven

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

1

nvao
nederlands - vlaamse accreditatieorganisatie

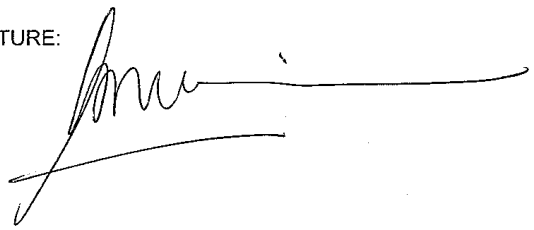
HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Eindhoven DATE: 25-9-'13

SIGNATURE:



nvao
nederlands - vlaamse accreditatieorganisatie

DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: Lars Nielsen

HOME ADDRESS: Krokgatan 5A
SE- 587 31 Linköping
SWEDEN

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

MSc Automotive Technology

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

TU/e

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

1

nvao
nederlands - vlaamse accreditatieorganisatie

HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Eindhoven DATE: 2013-09-24

SIGNATURE: Kan Niel

nvao
nederlands - vlaamse accreditatieorganisatie

DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: Rael Brouwer

HOME ADDRESS: Hoogstraat 113 a
7512 GW Enschede

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

Automotive Technology

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

Eindhoven University of Technology

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

1

nvao
nederlands-vlaamse accreditatieorganisatie

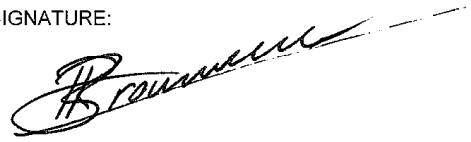
HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Eindhoven DATE: 25-09-2013

SIGNATURE:



nvao
nederlands-vlaamse accreditatieorganisatie

DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: J. J. Krooneman

HOME ADDRESS:

Kazernestraat 8N
Amsterdam

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN ~~EXPERT~~ / SECRETARY:

Automotive Technology

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

Eindhoven University of Technology

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

1

nvao
nederlands-vlaamse accreditatieorganisatie

HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Eindhoven DATE: 25-09-2013

SIGNATURE: