International Automotive Engineering Master of Science

FACULTY 06
AEROSPACE ENGINEERING

FH AACHEN
UNIVERSITY OF APPLIED SCIENCES

International Automotive Engineering

Before you start

The practical degree programme

General Information

You will find all relevant information with respect to the course of studies International Automotive Engineering in the internet. For that purpose, just photograph the QR code and use the adequate reader of your mobile phone*.

* Please note: Costs may arise upon initiating the web page.

Introducing
the degree programmes

Dear prospective students, dear students, dear future automobile experts,

thank you for your interest in our International Master Course Automotive Engineering.

The positive rapid development within the automotive field, can be observed both by the implementation of high technologies and by the job market aspects.

Automobile manufacturers do not develop and produce all the products' components (modules) in-house anymore; they rather assign these tasks to suitable outsourcing-partners. The shifting of system competence to suppliers changes also the qualification profile of the future engineers employed by both the manufacturers and the suppliers. The tasks of an engineer extend successively beyond the construction problems into project management, test-bench operation or software design of virtual product development and above all system integration capabilities.

The FH Aachen with its 3 semester Master course International Automotive Engineering realizes these demands in their education.

Starting from summerterm 2014 students of International Automotive Engineering are offered the opportunity to acquire a double degree as part of a 4 semester course. Credits gained at the respective partner university are mutually recognized, which leads to the Master`s degree from two universities. A cooperation with the Royal Melbourne Institute of Technology (RMIT) in Melbourne / Australia has been established.

We are looking forward to welcome you as students of the FH Aachen.

Yours sincerely,
Thomas Esch (Prof. Dr.-Ing)
Programme Manager

International Automotive Engineering

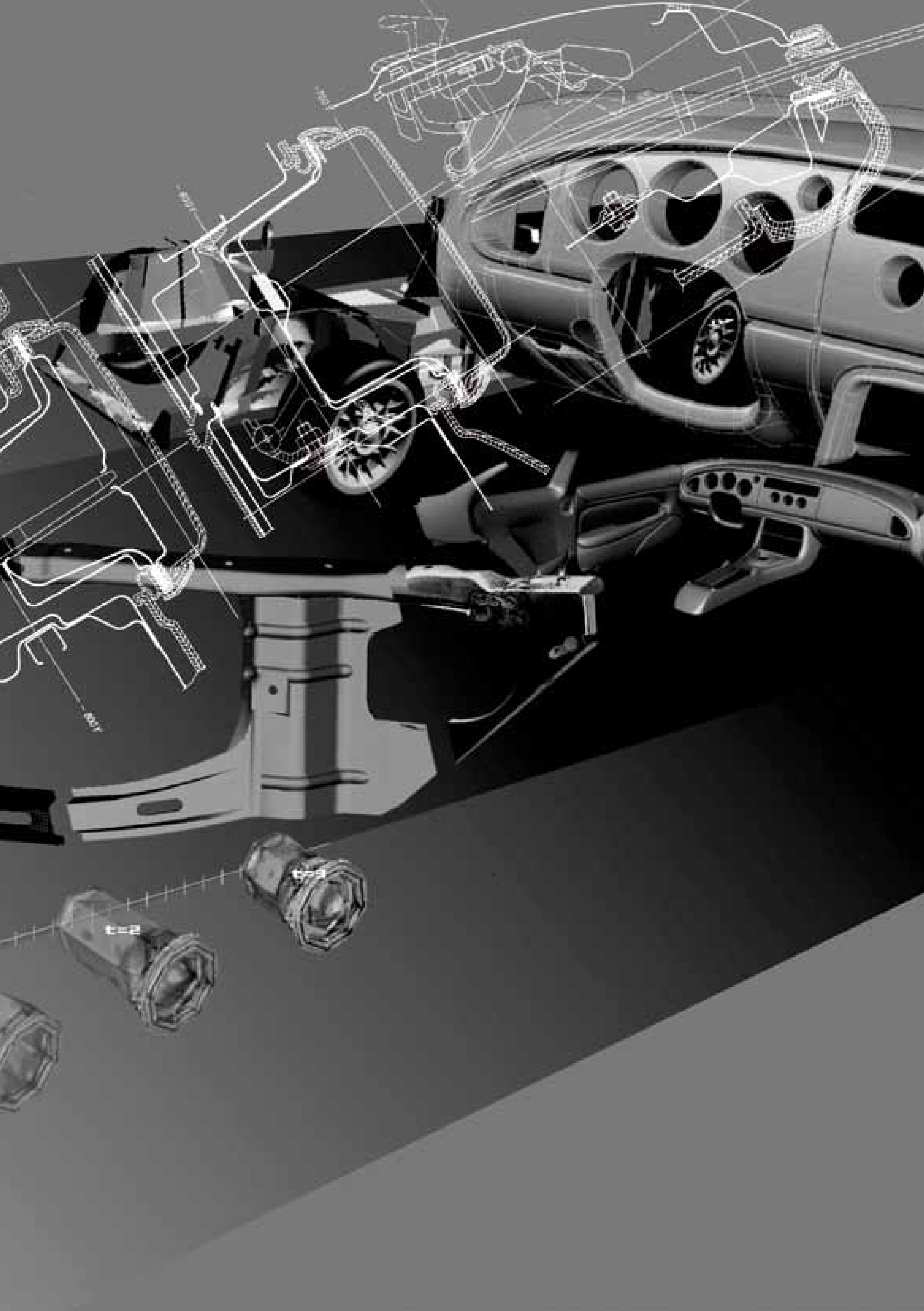
Vehicle Integration
From individual modules to a functioning whole vehicle

Vehicle Integration Teams keep an eye on the entire development process. Organizing projects in an economical manner is just as important as fulfilling all technical requirements.

The Vehicle Integration Team controls and monitors the defined requirements for vehicle safety, fuel consumption, emissions, acoustics and aerodynamics throughout the entire development process: from design, simulation, testing and validation to certification across all modules. It ensures the mechanical integration, the wedding of the powertrain/chassis system and the body while integrating electronic/electric systems and taking care of the homologation activities.

In order to plan for validation of developments, it is important to establish project plans controlling the entire course of the project and covering all modules and functions. How many prototypes are needed? Which tests can be performed using which prototypes? Together with the experts from all disciplines, the Vehicle Integration Team taps into synergy effects in order to reduce the prototype cost. The goal is to apply a development plan that is both time and cost effective.

In order to comply with legal requirements, the Vehicle Integration Team ensures access to all applicable laws worldwide concerning vehicle development and supports the individual departments in their development efforts.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CAE

From the first planning idea to a functional, virtual prototype

Technical Calculation Teams ensure that functional requirements for individual vehicle modules are fulfilled all the way through the whole vehicle, prior even to construction of the first prototype. Based on the DMU synchronization products, all relevant functions, such as vehicle safety, acoustics, aerodynamics, fuel consumption, exhaust emissions, operational stability, and rigidity of vehicle parts are tested virtually. Results from the technical calculation enable to define ideal solution suggestions for the construction and the subsequent practical application to the prototype. Installation space analysis and packaging studies are also virtual part of a full vehicle integration process.

Today‘s hardware infrastructure consisting of several computer clusters allows providing calculation and optimization results within a very limited amount of time. Furthermore, the Technical Calculation Teams constantly work on optimizing the internal process times by programming their software tools accordingly. By working closely with the Testing Division Teams, intensive validations are performed to optimize simulation methods and explore new subject areas.

Technical calculations are a vital success factor in validating all functional requirements within a limited amount of time.

Testing and Validation

Anything that is meant to go into production has to pass laboratory tests

In Testing Laboratories, virtual simulation results are tested and validated under real conditions. Whether single assemblies or the whole vehicle are tested, testing equipment enables to simulate any possible impact on the vehicle later on in real life situations (mechanical tests and environmental simulations, functional and life span tests of e.g. engine and transmission, vibroacoustic appraisals, passive vehicle safety, vehicle trials, ...).

Testing and Validation Teams are a vital part of the integrated development process. It is integrated with the Technical Calculation Teams and focuses on validating and confirming virtual simulation results. Testing results are immediately fed back to development and contribute to constant quality enhancement. There are no compromises for companies when it comes to quality.

From creating specifications and continuous development controlling, defining methods to documenting testing results in detail, the Vehicle Integration Teams ensure that tests are conducted with the required intent. Test results are used to benchmark the whole vehicle.

Electrics/Electronics
Integrated solutions for tomorrow's demands

Working on the basis of a requirement analysis, Electrics/Electronic Integration Teams work out concepts ranging from the definition of the electric/electronic architecture, or the development of hard and software, through to vehicle integration. By carrying out checks and tests on both software and hardware components throughout the development and production phases, the team guarantees ready-for-production solutions.

The electric design and development of the vehicle's electrical system are further elements in the service spectrum. They cover all relevant process stages, from the development of the concept for the electrical system, cable routing and component design through to the management of the suppliers concerned.

Besides designing space requirements (package) and parts (e.g. electric/electronic components, cable harnesses, actuator/sensor technology, etc.) the **Electronic Development Teams** develop complete control units and guarantee their integration within the network of all the systems in the vehicle. Daily work is characterised by the frequent use of bus systems such as CAN, LIN, Most or Bluetooth and their corresponding tools.

The focus of Electronic Development Team is on the development of safe, embedded systems in accordance with the IEC and ISO standard.

The functional safety in the vehicle is greatly enhanced not only by the growing number of driver assistance systems, but also due to ever-increasing demands on passenger and pedestrian protection.

Project Management – the Nerve Center

The challenge is bringing together customers, system developers and partners to work as an integrated team. To this end, minimizing and supporting the interface is one of the key factors. Development projects need to be well-structured and effectively organized so that their complexity remains at a controllable level, and deadlines, budgets and pre-defined quality goals can be met. For successful project management, this is the guiding principle.

Planning, continued testing, recognizing optimization potential and regulation make up the control system **Project Management Teams** have mastered. At the same time, standardized management methods have to be utilized that enable to adjust to individual client processes.

Project Management Teams ensure a project is handled optimally by establishing a clear analysis of customer requirements, defining product oriented responsibilities and by matching expectations with industry-specific application of each individual task.

Career Fields

The qualifications required in development departments of automobile industry are not to be interpreted as pure technical CAE tasks. The range of the performance extends recently far beyond that into project management, testing operation, development of software tools, etc. The development processes in the automobile engineering segment can be divided in 5 main phases:

- Design/Construction
- CAE Verification (simulation, computation, prototyping, development)
- Testing and Validation
- Homologation
- Project Management

The course of Automotive-Master focuses on the integration of powertrain systems– consisting of engine and transmission – as well as the integration of chassis systems into the complete vehicle concept.

The graduates of the Master Course practically undertake a variety of application orientated tasks in module integration, development, construction and manufacturing of automobile systems. They plan, calculate and produce intelligent co-operating mechanical, electronic and technical information components and integrate them spatially- and functionally with methods from the mechanical, electrical and information engineering in the automobiles. Recently these belong to the most physically and technically complex machines.

The graduates will therefore find their jobs at manufacturers and suppliers of the automobile industry and predominantly in vehicle integration teams to aim low fuel consumption, low emissions, low engine and vehicle noise, as well as high comfort and performance.

Career Opportunities

Due to current inquires all Automotive Companies around the world are looking for engineers with rising tendency! In Germany about one of seven jobs depends on the automobile industry: This industry is still considered as one of the strongest job machines. Especially the need for experts with know-how in vehicle integration was covered insufficiently in the past years.

As result of the high scientific requirement of the study courses the graduates are able to independently solve field specific problems in product development, as well as in scientific research in industry and are thereby suitable for leading positions.

The master degree of the FH Aachen in the 3 semester programme and FH Aachen/RMIT Melbourne in the 4 semester programme grants an access to a higher public service level to provide the graduates with optimal conditions to begin a career as a German government employee.

Alternatively the Masters of Science and Masters of Engineering can find their place in the application orientated research or continue to study a doctorate programme (PhD) at a technical university (e.g. Partnered PhD Programme with RMIT).

In addition also the capabilities of entrepreneurial ways of thinking will be trained during the study. With appropriate field specific knowledge, personal qualifications and motivation can self-employment also be a career opportunity.

Competences

The study to the „Master of International Automotive Engineering“ is based on two unique-characteristics:

- The integration of powertrain, body and chassis systems into the complete automobile is deemed to be the principal guidelines by the lectures, exercises and practical sessions of the courses. This content-wise focussing considers the changed requirements of the manufacturers and suppliers in system integration and interface definition in the automobile manufacturing industry.
- The study in the qualification network group with selected partners from industry and research (i.e. FEV Group – Aachen, ETAS Group - Stuttgart, GIF - Alsdorf, SCHAEFFLER Engineering - Werdohl , ALTAIR - Böblingen, BMW Group-München) secures a high practical relation to the study contents, which constantly orients itself at the need of the industry.

In accordance with study and examination regulations the three-semester master course - with regard to the study contents and programme duration - builds on the seven-semester bachelor course „Automotive Vehicle and Powertrain Engineering“. The master course deepens and extends the modules-coherences from the bachelor‘s course. The study programme can still be also studied with a professional working experience between the bachelor and master course.

The master course in „International Automotive Engineering“ is a consecutive application orientated programme. The programme contents, the scientific qualification of the instructors, the equipment and the connections of the university with the industries support the uniqueness of the course with strong links to applied research. Graduating in the 4 semester programme from FH Aachen grant the title “Master of Science” (M. Sc.) and graduates from RMIT Melbourne grant the title „Master of Engineering“ (M.Eng.).

Before you start

Admission Requirements

3 semester programme
Applicants with the following qualifications can be considered to the application procedure:

- Bachelor degree (B.Sc. or B.Eng.) in Automotive Engineering or Mechanical Engineering with correspondingly major study
- Diplom-Ingenieur-degree (Dipl.-Ing. FH or TU/TH) in Automotive Engineering or Mechanical-Engineering with correspondingly major study
- University degree in another equivalent engineering study
- Applicants, whose study qualification was not achieved at German speaking university have to send a proof of German language skills “Zertifikat Deutsch (B1)”-certificate
- Applicants, whose study qualification was not achieved at a University in a country that participates in the Bologna process have to send a certified copy of the „Graduate Record Examination (GRE) – General Test“ –result.
- Proof of English language skills (e.g. TOEFL/IELTS) with specifique scores.

4 semester programme (Double Degree Programme)
Admission requirements are identical to the 3 semester programme.

Detailed information can be found at *www.fh-aachen.de* entering the following webcode: **11111131**.

The scientific degree programme International Automotive Engineering

Course Profile

The Faculty of Aerospace Engineering of the Aachen University of Applied Sciences (AcUAS) offers a 3/4-semester Master Programme, both with a free choice of subjects in „General Automotive Engineering“ and „Advanced Automotive Engineering“ areas. Beside this the faculty suggests two degree programmes with focus on „Powertrain Application“ or „Vehicle Simulation“ where the related subjects can be studied without collissions. The courses award the title „Master of Science“. The 4 semester programme is in the process of accreditation“. The 3 semester long Master Programme is accredited. *http://www.aqas.de/*

Vehicle Integration 2 | powertrain types and positioning, engine compartment packaging, process development (VPP), Portfolio planning, engine life cycles, definition and development of powertrain attributes, interface management

Advanced Automotive Electronic | base knowledge of up-to-date sensors and actuators, microprocessor-based control systems, cross-linking methods using modern bus-systems, wiring, safety requirements

Environmental Effects of Vehicle Powertrain | exhaust emissions regulations of the European Union and the USA, operating conditions and the exhaust gas of petrol and diesel engines, exhaust gases after treatment, alternative vehicle powertrain, fuels for future driving systems

Powertrain Calibration - Engine | engine management (petrol and Diesel), optimization strategies for cold-starting, warm up, idle operation and driveability, highly developed combustion technologies, OBD calibration, transmission calibration, vehicle calibration methods and tools

Powertrain Calibration - Transmission | emission legislation worldwide, Technical trends in automotive technology, Engine control, Types of transmissions, Transmission control, Transmission base data determination, Transmission test bench calibration, In vehicle transmission calibration, Calibration tools and methods (model based approach, standards, tools and processes).

Vehicle Acoustics | environmental impact by motor vehicle noise, physical and audiological bases, acoustic measuring techniques, regulations, noise reduction measures, psychoacoustic

Global Automotive Homologation and Mass Production Release | regulations, guidelines, whole-vehicle approval - Powertrain, measuring regulations, measuring expirations, test algorithm/systems, documentation, knowledge management, certifying.

Curriculum
3 semester programme

Example for summer semester entry |

No.	Name of Module	C/E	Cr	SWS L	SWS T	SWS Lab	SWS SU	SWS ∑
1st Semester (Summer Semester)								
6192x	Elective General Automotive Engineering (GAE Programme)	C	15	-	-	-	-	-
6193x	Elective Advanced Automotive Engineering (AAE Programme)	C	15	-	-	-	-	-
Total			**30**	**-**	**-**	**-**	**-**	**-**
2nd Semester (Winter Semester)								
6292x	Elective General Automotive Engineering (GAE Programme)	C	10	-	-	-	-	-
6293x	Elective Advanced Automotive Engineering (AAE Programme)	C	15	-	-	-	-	-
6294x	Elective General Competencies Programme	C	5	-	-	-	-	-
Total			**30**	**-**	**-**	**-**	**-**	**-**
3rd Semester (Summer Semester)								
69000	Masters Thesis	C	29	-	-	-	-	-
69001	Colloquium	C	1	-	-	-	-	-
Total			**30**	**-**	**-**	**-**	**-**	**-**

Cr: Credits
L: Lecture
C: Compulsory
T: Tutorial
E: Elective
Lab: Laboratory
SWS: Contact hours per week
SU: Seminar

Curriculum
4 semester programme

Example for winter semester entry |

No.	Name of Module	C/E	Cr	SWS L	T	Lab	SU	∑
1st Semester (Winter Semester, Aachen University of Applied Sciences)								
6192x	Elective General Automotive Engineering (GAE Programme)	C	15	-	-	-	-	-
6193x	Elective Advanced Automotive Engineering (AAE Programme)	C	15	-	-	-	-	-
Total			**30**	**-**	**-**	**-**	**-**	**-**
2nd Semester (Summer Semester, Aachen University of Applied Sciences)								
6292x	Elective General Automotive Engineering (GAE Programme)	C	10	-	-	-	-	-
6293x	Elective Advanced Automotive Engineering (AAE Programme)	C	15	-	-	-	-	-
6294x	Elective General Competencies Programme	C	5	-	-	-	-	-
Total			**30**	**-**	**-**	**-**	**-**	**-**
3rd Semester (Second Term, RMIT University)								
AUTO 1025	Management of Automotive Manufacturing Process	C	12 ACTS	-	-	-	-	
AUTO 1028	Automotive Materials	C	12 ACTS	-	-	-	-	
AUTO xxxx	Elective	C	12 ACTS	-	-	-	-	
OENG 1087	Master‘s Research Methods	C	12 ACTS	-	-	-	-	
Total			**48 ACTS**	**-**	**-**	**-**	**-**	
4th Semester (First Term, RMIT University)								
OENG 1088	Master‘s Research Project	C	48 ACTS	-	-	-	-	
Total			**48 ACTS**	**-**	**-**	**-**	**-**	

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SU: Seminar

Elective Modules Aachen University of Applied Sciences

No.	Name of Module	C/E	Cr	SWS L	SWS T	SWS Lab	SWS SU	SWS ∑
Summer Semester Electives General Automotive Engineering								
61903	Höhere Ingenieur-Mathematik	E	5	2	2	0	1	**5**
61902	Advanced CAD Methods	E	5	0	0	4	0	**4**
61901	Advanced Control Technology	E	5	2	1	1	0	**4**
61935	Environmental Effects of Vehicle Powertrain	E	5	2	2	1	0	**5**
Summer Semester Electives Advanced Automotive Engineering								
61921	Vehicle Acoutstics	E	5	2	1	1	0	**4**
61933	Advanced Automtive Electronics	E	5	2	1	1	0	**4**
61934	Design of Electronic Powertrain Management Systems	E	5	2	1	1	0	**4**
61932	Vehicle Engineering - FEM-Simulation & Application	E	5	1	0	3	1	**4**

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E: Elective
Lab: Laboratory
SWS: Contact hours per week
SU: Seminar

No.	Name of Module	C/E	Cr	SWS L	SWS T	SWS Lab	SWS SU	SWS ∑
Winter Semester Electives General Automotive Engineering								
61922	Vehicle Integration 2	E	5	3	1	0	0	**4**
83304	Dynamik der Mehrkörpersysteme	E	5	2	1	1	0	**4**
62601	Strukturdynamik	E	5	2	1	1	0	**4**
62905	Advanced Measurement and Control Systems	E	5	1	2	1	0	**4**
62907	Mathematical Optimisation	E	5	2	1	1	0	**4**
Winter Semester Electives Advanced Automotive Engineering								
62902	Advanced Finite Element Methods	E	5	2	1	1	0	**4**
62921	Global Automotive Homologation and Mass Production Release	E	5	3	0	0	2	**5**
62912	Applied Computational Fluid Dynamics	E	5	2	0	2	0	**4**
62932	Powertrain Calibration - Engine	E	5	2	1	1	0	**4**
62933	Powertrain Calibration - Transmission	E	5	2	1	1	0	**4**
Elective General Competencies								
62942	Advanced Project Management (MS Office)	E	5	0	0	0	4	**4**
62941	Negotiation Strategies & Scientific Reasoning	E	5	0	0	0	4	**4**
61941	Entrepreneurship	E	5	0	0	0	4	**4**
61942	Engineering meets Design	E	5	0	0	0	4	**4**
62944	Critical Thinking and the Scientific Method	E	5	0	0	0	4	**4**
62943	Other Faculty Electives	E	5	0	0	0	4	**4**

Cr: Credits C: Compulsory E: Elective SWS: Contact hours per week
L: Lecture T: Tutorial Lab: Laboratory SU: Seminar

Modules Aachen University of Applied Sciences

61901 **5 Credits**

Advanced Control Technology | *Prof. Dipl.-Ing. J.-Michael Bauschat*

The lecture deepens the knowledge which was gained in a basic lecture Control Technology. The students are capable to calculate the dynamic and the feedback gains of a sophisticated control loop. Students get a good overview of well-known but also actual scientific approaches in the area of Advanced Control Technology. The ability to apply state of the art software tolls will be given after this course.

61902 **5 Credits**

Advanced CAD Methods | *Prof. Dr.-Ing. Bruno Burbaum*

The participants of this lecture will learn how to create simple as well as advanced surfaces and shapes using the surface modeling features of CATIA V5. Besides creating single surfaces there will be shown different ways how to combine these surfaces to full-parameterized parts. There will be shown useful methods how to create 3D models from scratch. The lecture will show its participants how to create parts with complex surfaces which are input for a large number of interdisciplinary application. 3D models are often processed by CAE- (stress analysis, crash simulation, etc.) and CAM- (computer aided manufacturing; Rapid Prototyping, etc.) related software tools.

61903 **5 Credits**

Höhere Ingenieur-Mathematik | *N.N.*

Die Studierenden können mit mathematischen Methoden der Vektoranalysis umgehen. Sie kennen Grundbegriffe aus der Theorie partieller Differentialgleichungen.

61922 **5 Credits**

Vehicle Integration 2 | *Prof. Dr.-Ing. Thilo Röth*

The students will be challenged with the complexity of the drive-train integration into the vehicle as well as the interaction of the drive-train, in special the engine peripherals with the entire vehicle. Strategic and global contexts (eg, „Portfolio Planning," „World Engine") and the intense scrutiny of the development and configuration of „attributes" as well as with modern development processes and methods to qualify the students to apply knowledge gained in abstract contexts. So that the student is proficient in a particular way, to analyse new problems in the integration of mechanical systems into a entire vehicle and to develop new approaches. This subject requires basic

knowledge to students from different engineering disciplines (e.g. thermodynamics - cooling or structural mechanics - motor mount) to apply to this integration tasks with high transfer performance. Strategic thinking will be focused and methodological skills will be trained. The learned is reinforced with concrete examples and through internships.

61935 **5 Credits**

Environmental Effects of Vehicle Powertrain | *Prof. Dr.-Ing. Thomas Esch*

Mobility is a piece of life quality, which modern humans do not want to lose. To this decisively belong the automobile. Traffic is indispensable; it is the engine of our economics and the pulse, which determine our life. Since long it became a criterion of our prosperity. The advantages of individual mobility are bought however by disadvantages for the environment. This lecture describes the up-to-date regulations, which are undertaken by the legislator of automobile and aircraft industry, in order to limit the effects of the increasing auto and air traffic with piston motors.

61921 **5 Credits**

Vehicle Acoustics | *Prof. Dr.-Ing Jan-Welm Biermann*

The study module describes beside the fundamental physics and acoustics, at first place the relevant valid regulations, limits, measurement standards and procedures. In a follow, specific vehicle noise sources i.e. powertrain, brakes or tyres according to their noise origin and realistic solutions of noise reduction will be handled.
Basics on today's traffic conditions is to be discussed, in how far vehicle manufactures, users as well as governments are able to effect the reduction of traffics noise. Demonstrations of applied techniques of noise reduction using examples of performed research projects will complete the study module.

61932 **5 Credits**

Vehicle Engineering - FEM Simulation and Application | *Prof. Dr.-Ing. Thilo Röth*

The aim of this practical course is to convey skills in the conflict of accompanying development of experimental procedure and virtual methods of vehicle development to the students. The emphasis is on the structural dynamic vehicle systems. The different practical courses aim to educate professionals in the FEM simulation with increased application background. The curses are in accordance with typical laboratory CAx „tools" and performed at several laboratories of the FH Aachen. In addition to the „practical" implementation, methodical expertises are required skills. Specific experience reports are required.

61933 **5 Credits**

Advanced Automotive Electronics | *Prof. Dr.-Ing. Günter Schmitz*

Interdisciplinary understanding of complex interrelations
Capability for transferring electrotechnical and mechanical knowledge to interoperating components in the complete system of the automobile as well as the analysis of the overall behavior.
Competence for the solution of new tasks in the topic of automobile electronics. Moreover the social competence and teamwork abilities shall be increased in the course of the laboratory exercises.

61934 **5 Credits**

Design of Electronic Powertrain Management Systems | *Prof. Dr.-Ing. Günter Feyerl*

Well-funded knowledge of the technical background of the Software Structure of Power Train Control and the interaction of the different control Units within the

powertrain bus system as well as. Abilities in design of new or redesign of existing functionalities and the testing of control functions in the control units. Ability to work in interdisciplinary teams.

62901 **5 Credits**

Strukturdynamik | *Prof. Dr.-Ing. Michael Wahle*

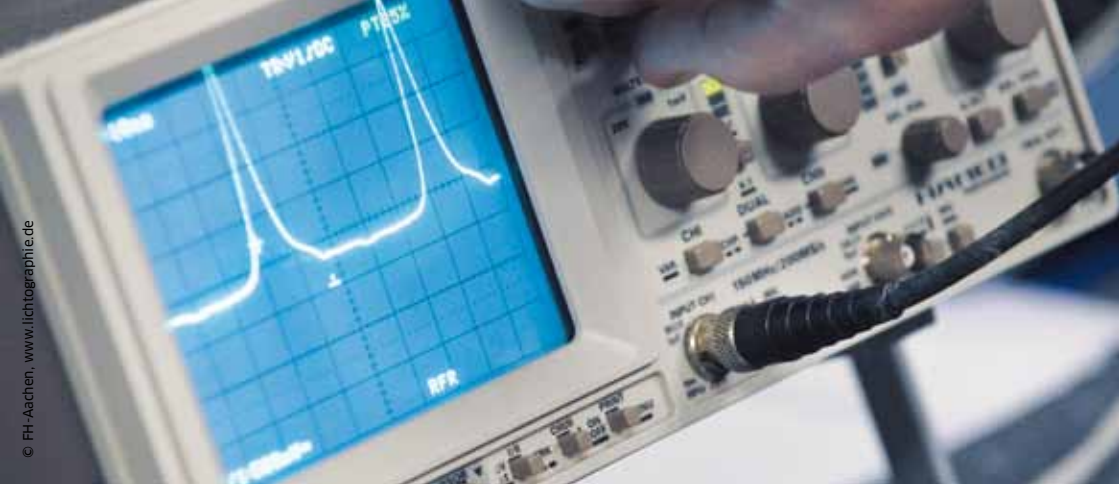
Es soll eine Kompetenz in den Grundbegriffen, Prinzipien und Vorgehensweisen im Bereich der Strukturdynamik mit Hilfe der Finite-Elemente-Methode erreicht werden. Ein wichtiges Ziel ist der selbständige Aufbau von geeigneten linearen und nichtlinearen Simulationsmodellen mit dem Werkzeug ANSYS, um damit die unterschiedlichen Berechnungsmöglichkeiten zu behandeln. Es sollen auch die verschiedenen Möglichkeiten zur Verbesserung des strukturdynamischen Verhaltens durch Simulationseinsatz erkannt werden, wobei die gezielte Auslegung von Zusatzsystemen zur Strukturkontrolle ein wichtiges Ausbildungsziel darstellt. Auch die Kompetenz zur Berücksichtigung von Messergebnissen beim Aufbau und der Kontrolle komplexer Rechenmodelle soll erlangt werden.

62902 **5 Credits**

Advanced Finite Element Methods | *Prof. Dr.-Ing. Jörn Harder*

The aim of the course is (based on the knowledge of typical bachelor courses for the Finite Element (FE) treatment of linear problems) that the students acquire the basic knowledge to solve more demanding structural mechanics tasks (basic non-linear problems, basic stability problems) with the help of the FE method. Moreover the students gain a deeper understanding of the universality of the FE method by the treatment of another class of field problems, namely heat conduction problems. Accordingly the students reach the competence to treat basic heat transfer problems and to determine the corresponding thermal stresses.

In the Practical Exercises the students deepen the acquired theoretical knowledge by exemplarily performing FE-analyses. Oral presentations are practised. At the same time the capacity for teamwork and social competence is practised by preparing and giving the presentations in small groups.



62905 **5 Credits**

Advanced Measurement and Control Systems | *Prof. Dr.-Ing. Thomas Franke*

Practical competence, to

- dimension, program and to use computer based measurement chains
- use the graphical language LabVIEW
- organize experiments and to calculate the achievable accuracy of the hardware and the sensors

83304 **5 Credits**

Dynamik der Mehrköpersysteme | *Prof. Dr.-Ing. Hans-Jürgen Raatschen*

Die Studierenden lernen die systematische Aufstellung der Bewegungsgleichungen von Mehrkörpersystemen mit n Freiheitsgraden. Lösungsverfahren im Zeit- und Frequenzbereich werden für lineare gedämpfte und ungedämpfte Systeme besprochen. Für nicht-lineare Systeme werden geeignete Integrationsalgorithmen bereitgestellt. Darüber hinaus kommen MKS Programme zur Lösung des Schwingungsproblems zum Einsatz. An speziellen Anwendungsproblemen werden die Möglichkeiten und Grenzen der Verfahren diskutiert.

62907 **5 Credits**

Mathematical Optimisation | *Prof. Dr. rer. nat. Klaus-Gerd Bullerschen*

Acquisition of the basic mathematical and information technological knowledge of the subjects mentioned below and the qualification for the independent application of this knowledge to engineering and business management problems. The naturally versatile mathematical and information technological methods support the subject spreading comprehension of the graduates and their possible employment in interdisciplinary teams. In the practical training the students are to mutually assist each other for the development of their team ability.

62912 **5 Credits**

Applied Computational Fluid Dynamics | *Prof. Dr.-Ing. Marc Havermann*

Governing equations, fundamentals of numerical solution possibilities, application of CFD-software for the numerical calculation of different aerodynamic flows, grid generation, turbulence modeling, unsteady flows, presentation of results, validation of calculations.

62921 **5 Credits**

Global Automotive Homologation and Mass Production Release | *Prof. Dr.-Ing. Thomas Esch*

The lecture details fundamental relationships of gobal automotive homologation processes and mass production release contents to the students of automotive engineering. The students are capable to evaluate and describe the global processes of homologating a vehicle The students learn the worldwide legal prescriptions, directives, regulations and rulemaking authorities. Students can understand and communicate the subject-specific knowledge of mass production activities to release a vehicle by measurement-procedures and -processes. The course offers the foundation for self-dependent access to the relevant literature and the independent scientific work.

62932 **5 Credits**

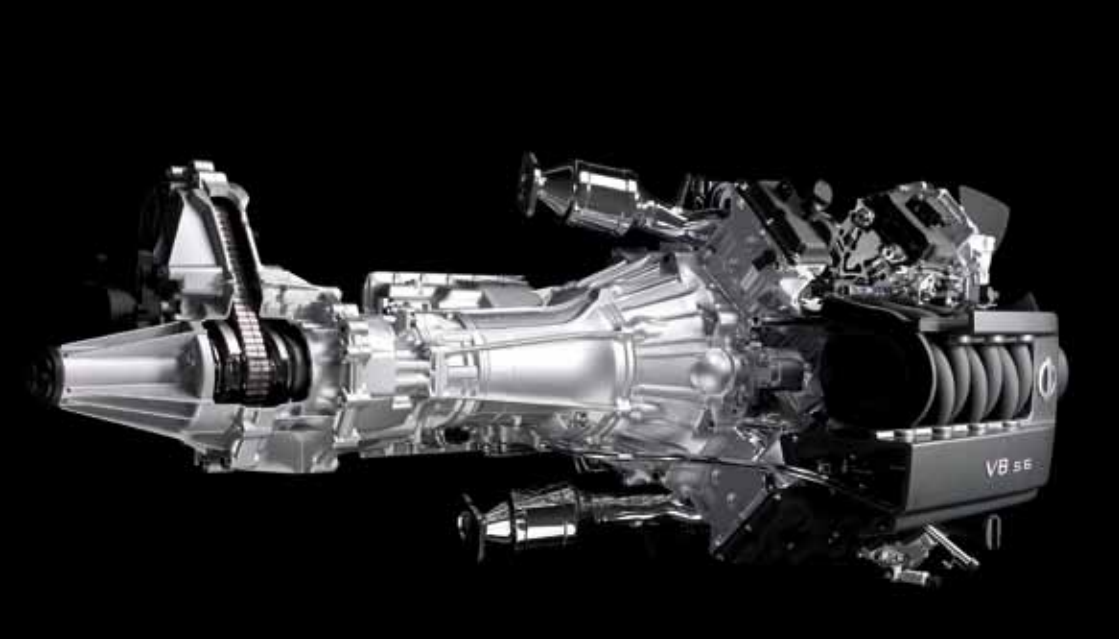
Powertrain Calibration – Engine | *Prof. Dr.-Ing. Günter Feyerl*

Well-funded knowledge of the technical background of the vehicle application as well as competence in the application of Rapid SW- Prototyping Tools. Abilities to reprocess change and amend the programming of an engine electronic control unit (ECU). Competence in design of new functionality and the testing of control functions in the ECU. Theoretical and practical abilities in vehicle application and experience with Rapid Software Prototyping. Ability to work in interdisciplinary teams.

62933 **5 Credits**

Powertrain Calibration - Transmission | *Prof. Dipl.-Ing. Hans Kemper*

Well-funded knowledge of the technical background of general vehicle application and general transmission application as



well as competence in the utilization of Rapid Control Prototyping Tools. Abilities to reprocess, change and amend the programming of a transmission control unit (TCU). Competence in design of new functionality and testing of transmission control functions in the TCU. Theoretical and practical abilities in transmission calibration and experience with Rapid Software Prototyping. Ability to work in interdisciplinary teams.

General Competencies | To strengthen also the soft-skill qualification of the students the study is supplemented by multidisciplinary modules.

Modules Royal Melbourne Institute of Technology

AUTO 1025 **12 ACTS**

Management of Automotive Manufacturing Processes | *Prof. John Mo*

This course aims to enable you to gain a deep understanding of the manufacturing technologies and overlapping logistics in the automotive industry in the global marketplace. More specifically, the course will introduce you to the advanced methods and tools for design, analysis, optimization and management of automotive manufacturing systems and processes.

AUTO 1028 **12 ACTS**

Automotive Materials | *Dr. Fugen Daver*

The course aims to enable you to develop an understanding of materials requirements for the automotive industry with particular emphasis on the light-weighting, safety and energy absorption, recycling and whole life cost and globalization effects. Primary focus of the course is to provide a link between design, materials and manufacturing through a sound understanding of structure-processing-property relationship of automotive materials.

OENG 1087 **24 ACTS**

Master's Research Methods | *Prof. Mark Easton*

This course introduces you to the general principles, methodologies and practices of data collection and analysis in qualitative research, analytic techniques such as thematic analysis, content analysis design aspects such as quality indicators and research ethics, human subject experimental design constraints, parametric and non-parametric analysis, modelling, hypothesis testing, correlation, simple linear regression, validity and reliability, simulation and discipline specific case studies using different research methods (quantitative and qualitative).

General Information

Organisational Matters

Course Duration and Course Begin | The regular study duration of the Master Course is 3 semesters and 4 semesters for the Double Degree Option. Admission to the Master Course is possible every summer semester and every winter semester.

Course Fee | Every semester all students have to pay the contribution fee to the students' union executive committee (AstA) at FH Aachen. Included in the contribution fee is the so called „Semester Ticket", which entitles you to use the local public transportation as well as some train connections freely. The cost for the contribution may change every semester. More information can be found at *www.studierendensekretariat.fh-aachen.de* Every semester all students in the Double Degree programme have to pay the normal international student tution fees at RMIT Melbourne. A number fee waivers are available granted in a selection process. More information can be found at *www.international.rmit.edu.au/info/programfees.asp*.

Application Documents | For further information please refer to *www.fh-aachen.de* using the following webcode **11111131**.

Application Deadline | Application deadlines for the admission restricted (öNC) course are as follows:

For the Summer Semester | Citizens of Germany, other EU-member states or EEA states, als well as foreign applicants holding a German Bachelors Degree: 15.01., for applicants from abroad: 30.11.

For the Winter Semester | Citizens of Germany, other EU-member states or EEA states, als well as foreign applicants holding a German Bachelors Degree: 15.07., for applicants from abroad: 31.05.

Detailed information regarding the affiliation to these groups can be found at *www.recht.nrw.de.* Any change of this date will be published in the website *www.studierendensekretariat.fh-aachen.de.*

Modules Descriptions and List of Lectures | As well as details about application deadline are available at *www.luftraum.fh-aachen.de.*

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