Aerospace Engineering
Master of Science

FACULTY 06
AEROSPACE ENGINEERING

FH AACHEN
UNIVERSITY OF APPLIED SCIENCES

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

Introducing
the degree programme

We are pleased to know about your interest in our our Master‘s courses in Aerospace Engineering.

The technical expertise of Aerospace is in many ways part of the modern life and the Aerospace Industry has reported significant growth in recent years. This industry is shaped by world-open thinking and international cooperation. Shaped by high technology, these branches offer a multiplicity of interesting jobs. As in the last years, in the next years many more qualified engineers will be required than available. Environmental aspects becoming more and more important, introduction of new materials, the envisaged shortage of natural resources together with an increase of the demand, require creative solutions - leading to a strong necessity of well-qualified engineers.

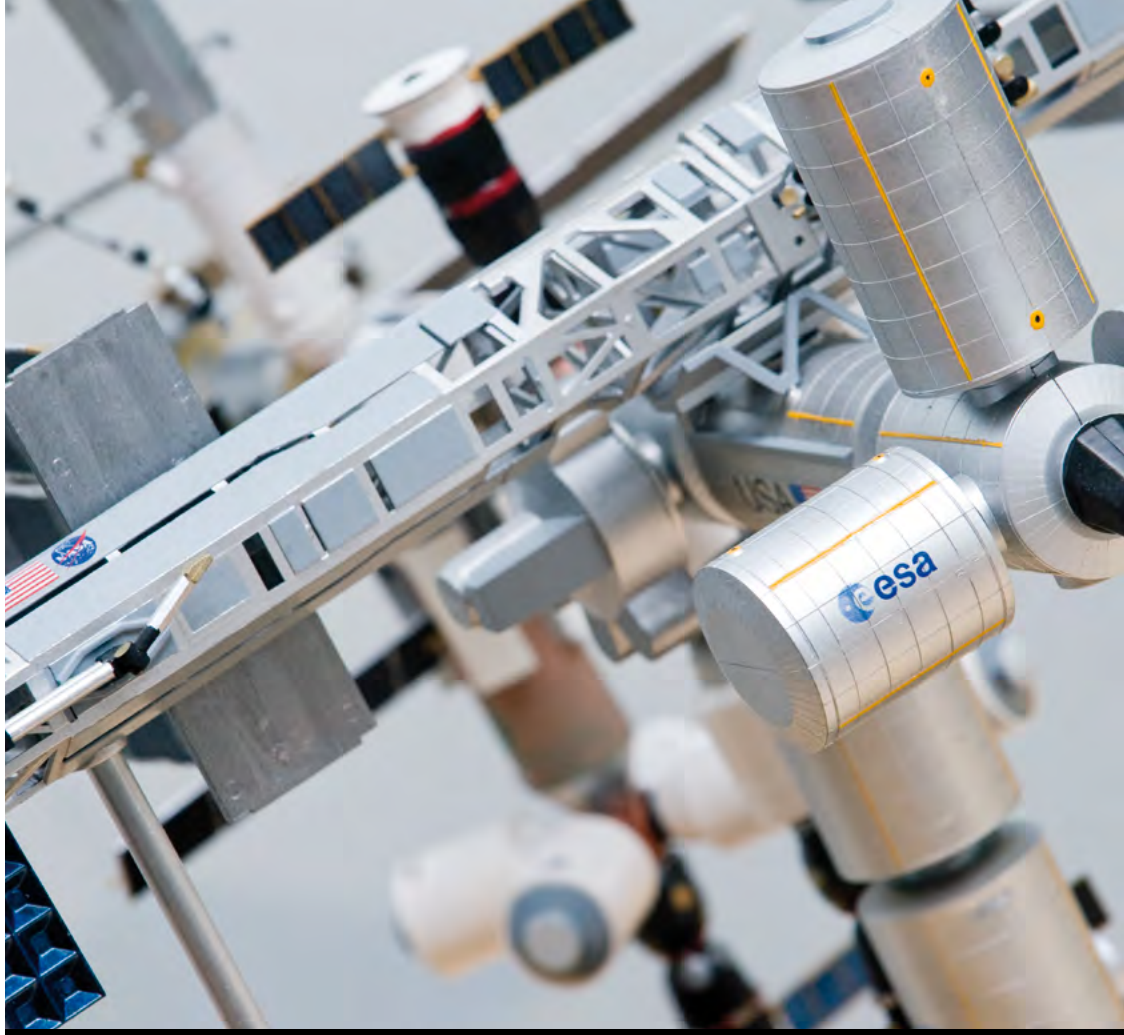
Aerospace manufacturers no longer develop and produce all the product components “in house”, but increasingly assign these tasks to suitable suppliers or risk sharing partners (Outsourcing). Assigning essential tasks to the suppliers leads to a change of the engineering requirements at both suppliers and manufacturers. The tasks of today’s engineers cover not only construction and computation, but beyond that: the supply of new technologies, pre-development, project lead, data management, management of test facilities, quality assurance and the development and use of software for the virtual product development.

The FH Aachen with its 3 semester Master Course Aerospace Engineering realizes these demands in their education.

Starting from summerterm 2014 students of Aerospace Engineering are offered the opportunity to acquire a dual 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.

The faculty with its focused spectrum of competences and the highly motivated professors is awaiting you for an ambitious and application-oriented course.

Yours sincerely,
Prof. Dipl.-Ing. J.-Michael Bauschat
Study Course Director



Aerospace Engineering

Fields of Activity
From scratch to an airborne object

Graduates of the master course on Aerospace Engineering will find employments at:

- aerospace manufacturers
- suppliers of components and subsystems
- aerospace research establishments
- authorities and agencies
- airlines and airports
- automotive and transport
- high technology sections of mechanical engineering

They will generate into new solutions for the future requirements and transform them to reality.

The substantial fields of working are:

- application orientated research and maturing of technology
- design and development
- construction (CAD) and simulation (FEM, MBS, CFD)
- production planning and optimization
- experimental proofs
- assurance of product safety and quality control
- management of complex facilities
- technical customer contact
- technical management

Career Opportunities
Prepared for starting up on your way

According to current inquiries most German and European enterprises look for engineers. A majority of today's aerospace engineers will retire in the next years.

The need of air transport grows strongly requesting additional new, more economical and environmentally friendly airplanes; the airplanes still in use are to be replaced. Space-based services, missions and exploratation possibilities are constantly growing (GPS, communication, weather and environmental monitoring, satellite TV).

Therefore, today the prospects for a qualified new generation of engineers is excellent.

Based on the high scientific level of the courses, the graduates will be able to solve specific problems for product development in the industry as well as tasks in scientific research; and so they are well prepared to grow into leading management positions.

The Masters of Science can likewise find their place in the application orientated research or continue their studies with a PhD at an university. The FH Aachen Master courses also qualify for the higher public service level in Germany.

Competences
All you need for a system-oriented professional

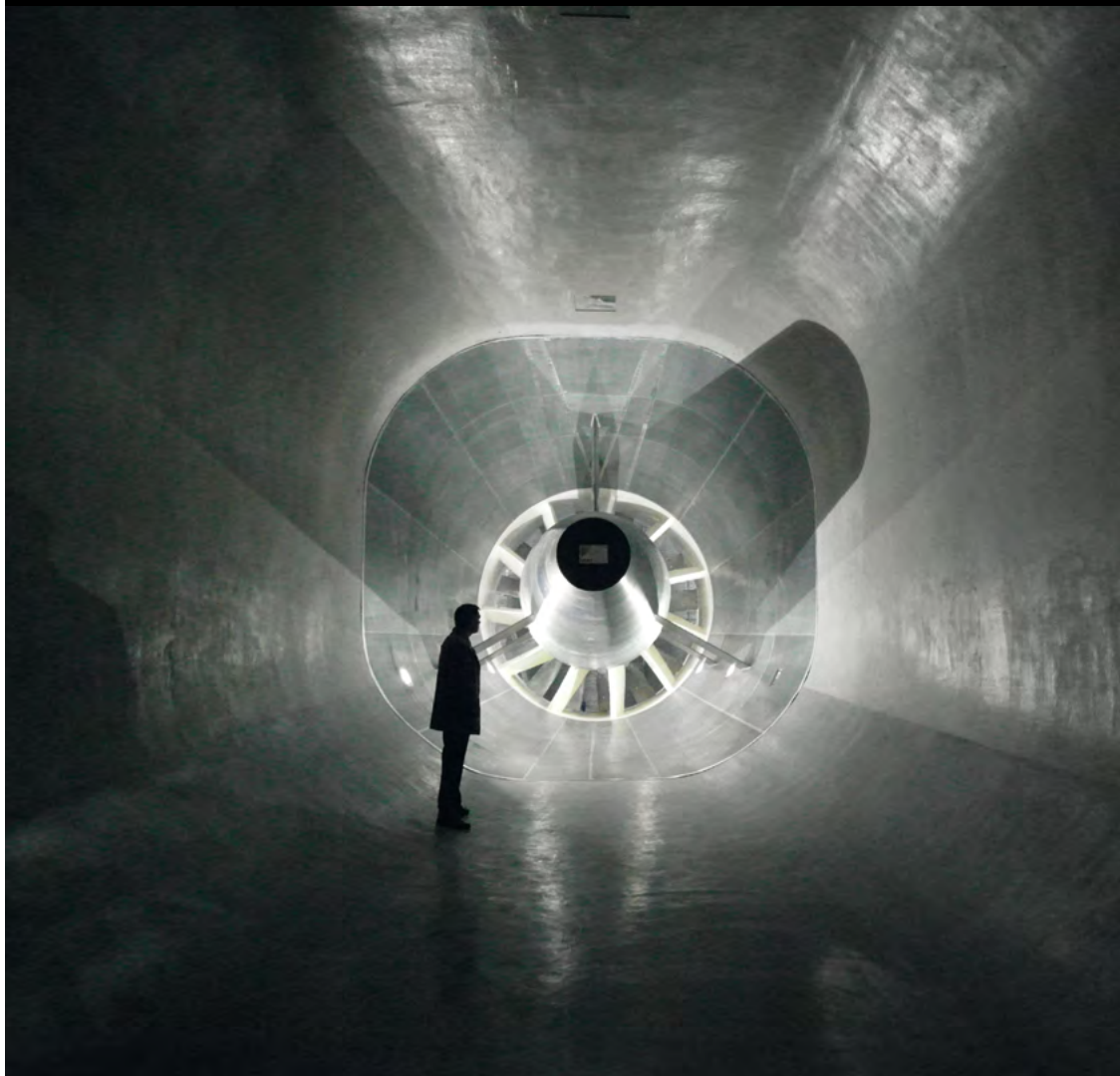
The course „Master of Aerospace Engineering" provides the students with the ability to solve complex problems. Thus, they improve their mathematical and technical base, study modern analytical and computer-based methods and apply them to selected tasks. Special attention will be given to teamworking and multidisciplinary thinking.

This provides the ability to gain further needed knowledge independent and/or in teams.

The 3 semester Master course is based on the Bachelor course „Luft- und Raumfahrttechnik" (Aerospace Technology). It is scheduled starting directly after this 7 semester BA course of our Faculty. The Master courses technically continue the Bachelor courses and deepen and widen their technical knowledge.

The Master courses of „Aerospace Engineering" are consecutive application oriented courses. Consecutive study is also possible after job phases between Bachelor graduation and Master course. Training, lessons, scientific qualification of the professors, equipment and the connections of the university with industry support the uniqueness of the course wirh strong links to applied research. Graduating from FH Aachen will grant the title "Master of Science" (M. Sc.).

Before you start



Admission Requirements

3 semster programme
Only applicants with the following qualifications can be considered to the application procedure:
an excellent Bachelor degree in Aerospace Engineering or Mechanical Engineering with correspondingly major study courses, at least 210 ECTS

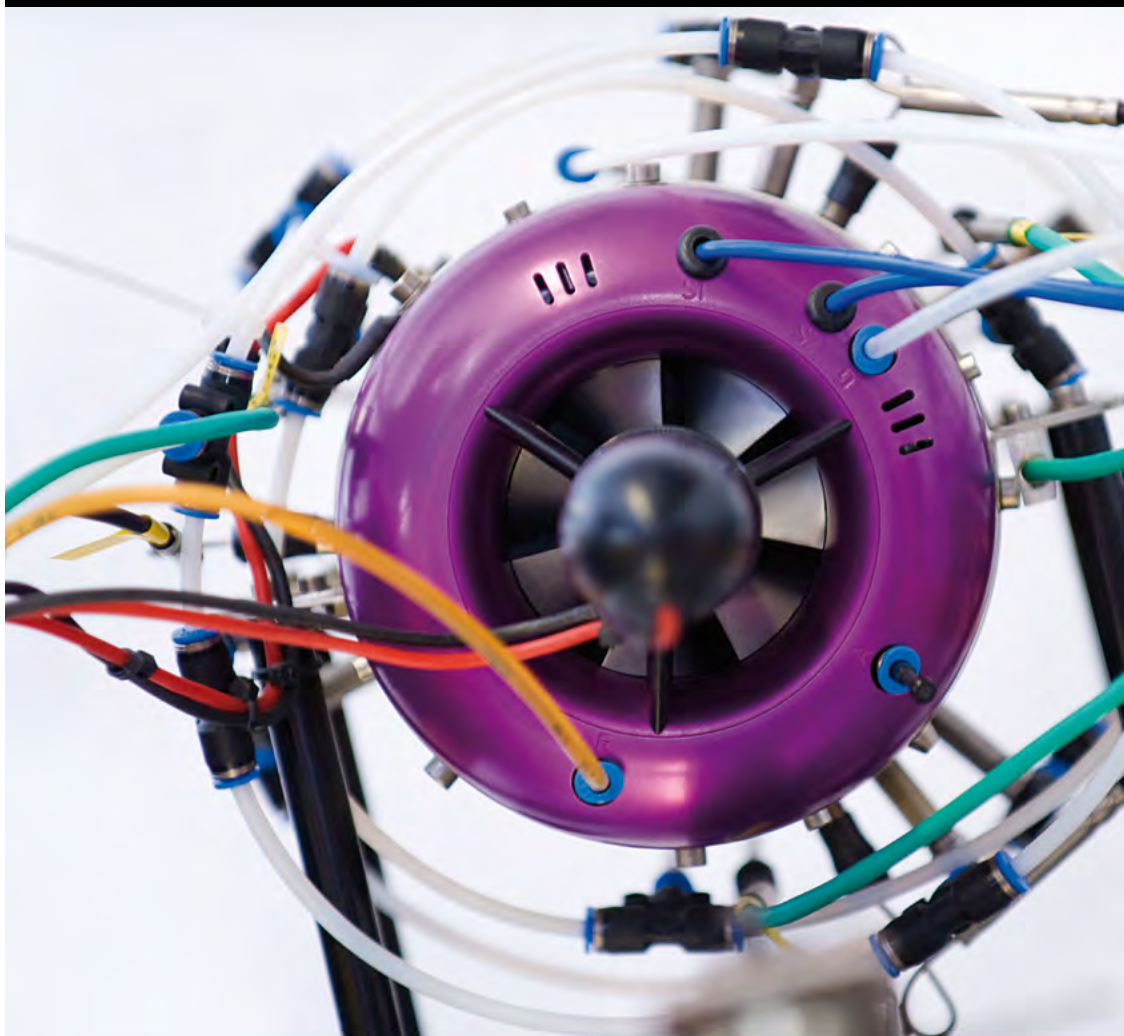
- an excellent University degree in another equivalent engineering study
- Applicants, whose study qualification was not achieved at a German speaking University have to send a proof of German language skill as “Zertifikat Deutsch (B1)”-certificate
- Applicants, whose study qualification was not achieved 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 skill (TOEFL/IELTS)

4 semester programme (dual degree Programme)
Requirement of English language proficiency for RMIT immatriculation:

- If you have studied for at least 2 years and your qualification is taught and assessed in English, you may be deemed to have met the English requirement (an official letter from the institution stating the program is entirely taught and assessed in English must be submitted).
- Fachhochschulreife with at least grade 3 in English, or, Abitur with at least 7 points in English, or, DAAD language test with minimum of B in all sections (completion within 5 years of RMIT program commencement).

Detailed information can be found at *www.fh-aachen.de* entering the following webcode: **11111129**

The practical degree programme Aerospace Engineering



Industry Contacts

The rapid progress in aerospace technology requires highly trained engineers, who directly fit in the modern working environment.

The Faculty of Aerospace Technology maintains very good contacts to the relevant industry, research establishments and other universities. Thus there are regular consultations with the (industrially occupied) faculty advisory board, which accompanies the development and „need-oriented“ adjustment of the courses offered and releases recommendations.

Students can write their Master Thesis within the international industry, research institutes or at partner universities. Block lessons or seminars are held by industry representatives. Excursion go to selected companies in Germany or abroad.

The Master courses in the qualification group with selected partners from industry and research secure study contents highly related to the professional practice; they are constantly oriented towards industry needs.

Course Profile

The three as well as four semester Aerospace Engineering courses teach methods and techniques for aeronautical and astronautical engineering. They have been established supported by consultations of the industry's advisory board. Our professors are well-experienced in aerospace industry or research establishments. Aerospace Engineering takes place in international cooperation. Therefore an essential part of the courses will be offered and discussed with the students in English language. Presentations held in English by the students are part of the exercises and practicals.

The course of studies deepens the most important scientific engineering bases where required for demanding applications. This is complemented by modern methods for optimized solving complex interdisciplinary problems.

By choice of Selective Modules the students have the opportunity to deepen their knowledge in a specific focus area as well as to acquire soft skills which are very important for the career. The Programme offers free choice of subjects in „General Aerospace Engineering“ and „Advanced Aerospace Engineering“ areas. Beside this the faculty suggests degree programmes with focus on „Aeronautical Engineering“, „Astronautical Engineering“, „Propulsion Engineering“ and „Simulation Engineering“ where the related subjects can be studied without collisions with parallel courses. The courses award the title „Master of Science“. The three-semester Master Programmes is accredited. *http://www.aqas.de/.*

The study is concluded with a project oriented Master Thesis and a colloquium.

Curriculum

Focus Aeronautic, Astronautic, Propulsion

3 semester programme
Example for summer semester entry|

No.	Name of Module	C/E	Cr	SWS L	T	Lab	SU	∑
1st Semester								
6190x	Elective General Aerospace Engineering (GAE Programme)	E	10	-	-	-	-	-
6191x	Elective Advanced Aerospace Engineering (AAE Programme)	E	15	-	-	-	-	-
6194x	Elective GAE Programme or General Competencies Programme	E	5	-	-	-	-	-
Total			**30**	-	-	-	-	-
2nd Semester								
6290x	Elective General Aerospace Engineering (GAE Programme)	E	10	-	-	-	-	-
6291x	Elective Advanced Aerospace Engineering (AAE Programme)	E	15	-	-	-	-	-
6294x	Elective GAE Programme or General Competencies Programme	E	5	-	-	-	-	-
Total			**30**	-	-	-	-	-
3rd Semester								
69000	Masters Thesis	E	29	-	-	-	-	-
69001	Colloquium	E	1	-	-	-	-	-
Total			**30**	-	-	-	-	-

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

Curriculum

Focus Simulation

3 semester programme
Example for General Competencies Programme selected in 1st semester replacing one General Aerospace subject|

No.	Name of Module	C/E	Cr	SWS L	T	Lab	SU	∑
1st Semester								
6190x	Elective General Aerospace Engineering (GAE Programme)	E	10	-	-	-	-	-
6191x	Elective Advanced Aerospace Engineering (AAE Programme)	E	15	-	-	-	-	-
6194x	Elective GAE Programme or General Competencies Programme	E	5	-	-	-	-	-
Total			**30**	-	-	-	-	-
2nd Semester								
6290x	Elective General Aerospace Engineering (GAE Programme)	E	20	-	-	-	-	-
6291x	Elective Advanced Aerospace Engineering (AAE Programme)	E	10	-	-	-	-	-
Total			**30**	-	-	-	-	-
3rd Semester								
69000	Masters Thesis	E	29	-	-	-	-	-
69001	Colloquium	E	1	-	-	-	-	-
Total			**30**	-	-	-	-	-

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SWS: Contact hours per week
SU: Seminar

Curriculum

Focus Propulsion Technology

4 semester programme
Example for winter semester entry and for General Competencies Programme selected in 2nd semester replacing one General Aerospace subject |

No.	Name of Module	C/E	Cr	SWS L	T	Lab	SU	∑
1st Semester (Winter Semester, FH Aachen)								
62901	Strukturdynamik	C	5	2	1	1	0	**4**
62911	Transonic Aerodynamics	C	5	2	2	0	0	**4**
62914	Propulsion System Integration	C	5	3	1	0	0	**4**
6191x	Advanced Aerospace Engineering Programme	E	5	-	-	-	-	**-**
6290x	General Aerospace Engineering Programme	E	10	-	-	-	-	**-**
Total			**30**	**-**	**-**	**-**	**-**	**-**
2nd Semester (Summer Semester, FH Aachen)								
61901	Advanced Control Technology	C	5	2	1	1	0	**4**
61911	Environmental Effects of Aircraft Propulsion	C	5	2	1	1	0	**4**
61912	Dynamics of Flight and Flight Control	C	5	2	2	0	0	**4**
6290x	General Aerospace Engineering Programme	E	5	-	-	-	-	**-**
6191x	Advanced Aerospace Engineering Programme	E	5	-	-	-	-	**-**
6294x	Elective General Competencies Programme	E	5	-	-	-	-	**-**
Total			**30**	**-**	**-**	**-**	**-**	**-**
3rd Semester (Second Term, RMIT University)								
AERO2566	Aerospace Materials	C	12 ACTS	-	-	-	-	**-**
AERO2515	Avionics and ATM Systems	C	12 ACTS	-	-	-	-	**-**
OENG1088	Master Research Project Part 1	C	24 ACTS	-	-	-	-	**-**
Total			**48 ACTS**	**-**	**-**	**-**	**-**	**-**
4th Semester (First Term, RMIT University)								
OENG1120	Research Methods in Engineering	C	12 ACTS	-	-	-	-	**-**
AERO2321	Aviation Safety Systems	C	12 ACTS	-	-	-	-	**-**
OENG1089	Master Research Project Part 2	C	24 ACTS	-	-	-	-	**-**
Total			**48 ACTS**	**-**	**-**	**-**	**-**	**-**

Curriculum

Focus Aircraft and Flight Operation Technology

4 semester programme
Example for winter semester entry and for General Competencies Programme selected in 1st semester replacing one General Aerospace subject |

No.	Name of Module	C/E	Cr	SWS L	T	Lab	SU	∑
1st Semester (Winter Semester, FH Aachen)								
62901	Strukturdynamik	C	5	2	1	1	0	**4**
62913	Aircraft Design 2	C	5	2	2	0	0	**4**
62914	Propulsion System Integration	C	5	3	1	0	0	**4**
6290x	General Aerospace Engineering Programme	E	5	-	-	-	-	**-**
6191x	Advanced Aerospace Engineering Programme	E	5	-	-	-	-	**-**
6294x	Elective General Competencies Programme	E	5	-	-	-	-	**-**
Total			**30**	**-**	**-**	**-**	**-**	**-**
2nd Semester (Summer Semester, FH Aachen)								
61901	Advanced Control Technology	C	5	2	1	1	0	**4**
61911	Environmental Effects of Aircraft Propulsion	C	5	2	1	1	0	**4**
61912	Dynamics of Flight and Flight Control	C	5	2	2	0	0	**4**
62913	Aircraft Design 1	E	5	-	-	-	-	**-**
6191x	General Aerospace Engineering Programme	E	10	-	-	-	-	**-**
Total			**30**	**-**	**-**	**-**	**-**	**-**
3rd Semester (Second Term, RMIT University)								
AERO2566	Aerospace Materials	C	12 ACTS	-	-	-	-	**-**
AERO2515	Avionics and ATM Systems	C	12 ACTS	-	-	-	-	**-**
OENG1088	Master Research Project Part 1	C	24 ACTS	-	-	-	-	**-**
Total			**48 ACTS**	**-**	**-**	**-**	**-**	**-**
4th Semester (First Term, RMIT University)								
OENG1120	Research Methods in Engineering	C	12 ACTS	-	-	-	-	**-**
AERO2321	Aviation Safety Systems	C	12 ACTS	-	-	-	-	**-**
OENG1089	Master Research Project Part 2	C	24 ACTS	-	-	-	-	**-**
Total			**48 ACTS**	**-**	**-**	**-**	**-**	**-**

Elective Modules

No.	Name of Module	C/E	Cr	SWS L	T	Lab	SU	∑
Summer Semester Electives General Aerospace Engineering								
61901	Advanced Control Technology	E	5	2	1	1	0	**4**
61902	Advanced CAD Methods	E	5	0	0	4	0	**4**
61903	Advanced Mathematics	E	5	2	2	0	1	**5**
61904	Actuator Systems	E	5	2	2	0	0	**4**
61905	Hypersonic Aerodynamics and Atmospheric Entry	E	5	2	2	0	0	**4**
Summer Semester Electives Advanced Aerospce Engineering								
61911	Environment Effects of Aircraft Propulsion	E	5	2	1	1	0	**4**
61912	Dynamics of Flight and Flight Control	E	5	2	2	0	0	**4**
61913	Aircraft Design	E	5	3	1	0	0	**4**
61915	Space Environment	E	5	1	1	0	1	**4**
61916	Space Mission Analysis and Design	E	5	2	1	0	0	**4**
61917	Advanced Space Dynamics	E	5	2	1	0	1	**4**
62918	Einführung in die Aeroelastik	E	5	2	1	0	1	**4**

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No.	Name of Module	C/E	Cr	SWS L	T	Lab	SU	∑
Winter Semester Electives General Aerospace Engineering								
62901	Strukturdynamik	E	5	2	1	1	0	**4**
62902	Advanced Finite Element Methods	E	5	2	1	1	0	**4**
62904	Flight Simulation Technology	E	5	2	1	1	0	**4**
62905	Advanced Measurement and Control Systems	E	5	1	2	1	0	**4**
83304	Dynamik der Mehrkörpersysteme	E	5	2	1	1	0	**4**
62907	Mathematical Optimisation	E	5	2	1	1	0	**4**
Winter Semester Electives Advanced Aerospace Engineering								
62911	Transsonic Aerodynamics	E	5	2	2	0	0	**4**
62912	Applied Computional Fluid Dynamics	E	5	2	0	2	0	**4**
62913	Analysis and Sizing of Aircraft Structures	E	5	2	2	0	0	**4**
62914	Propulsion System Integration	E	5	3	1	0	0	**4**
62915	Advanced Space Propulsion	E	5	2	2	0	0	**4**
62916	Space Mission Engineering	E	5	3	1	0	0	**4**
62917	Space Utilization and Exploration Project	E	5	0	0	0	4	**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**
61943	Technisches Deutsch	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**

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Modules

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 tools 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**

Advanced Mathematics | *Prof. Dr. rer. nat. Klaus Bullerschen*

The topics of the module are the Fourier series, curves and surfaces in parametric representation, scalar- and vector funtions and fields, the analysis of the fields using the gradient, divergence and curl, the integral theorems of Gauss, Green and Stokes, the solution of differential equation systems by Laplace transform, and the algebra and characteristic properties of tensors. For all topics, which are a basis of the design and construction of systems such as airplanes, satellites and robots, examples and applications are given und discussed.

61904 **5 Credits**

Actuator Systems | *Prof. Dr.-Ing. Peter Dahmann*

The module qualifies for the description and calculation of linear and rotary actuators acting on the basis of hydraulic, pneumatic and electro-mechanical principles. It enables them to analyze these actuators both conservative as well as by means of digital simulation. Thus one can gain the qualification, the problems which arise in the use of actuators in systems to solve independently. Actuators are usually part of an overall system. Therefore the power to think in interdisciplinary and cross-disciplinary understanding is obtained. By the independent design of a hydrostatic drive cylinder with the digital simulation, the competence is achieved, not only to

use acquired knowledge, but also to solve unknown problems in productive use.

61905 **5 Credits**

Hypersonic Aerodynamics and Atmospheric Entry | *Prof. Dr.-Ing. Marc Havermann*
Fluid and entry path dynamics around atmospheric entry vehicles including: gas dynamics in the hypersonic range, high-temperature gas effects, kinetic theory of gases, estimation of lift and drag using Newtonian theory, numerical and experimental simulation of hypersonic flows, calculation and analysis of ballistic and lifting entry trajectories.

61911 **5 Credits**

Environmental Effects of Aircraft Propulsion | *Prof. Dr.-Ing. Harald Funke*
Knowledge of the environmental aspects of aircraft propulsion and the regulations of aviation authorities. Understanding of the interaction and environmental effects of exhaust gas and acoustic emissions and their influence towards people and environment. Ability to identify technical solutions for the protection of our environment. Knowledge about latest techniques and research in reduction of emission and alternative fuels for aviation.

61912 **5 Credits**

Dynamics of Flight and Flight Control | *Prof. Dipl.-Ing. J.-Michael Bauschat*
The lecture deepens the knowledge which was gained in basic lectures Flight Mechanics, Dynamic of Systems and Flight Control. The students are capable to understand and to describe mathematically the dynamic behavior of an aircraft. Students will be able to describe fundamental flight control systems but also the idea of Fly by Wire. Students will be able to describe fundamental flight control systems and get a deeper understanding concerning Fly by Wire.

61913 **5 Credits**

Aircraft Design | *Prof. Dr.-Ing. Carsten Braun*
Understanding of the interrelationships of the various disciplines and the most important design parameters in aircraft design. Overview of the different phases of aircraft design and development of the associated tasks.

61915 **5 Credits**

Space Environment | *Prof. Dr.-Ing. Bernd Dachwald*
The lecture details the space environment of the Solar System, which is the arena for all human spaceflight activities and influences the design of spacecraft. The astronautical engineer also needs knowledge of the space environment to be able to communicate with the space scientists to understand the mission requirements. As a prerequisite to understand this environment, the students acquire an understanding of plasma physics. Then they acquire the relevant knowledge about the Solar System and the physical methods of solar system research. Using current scientific research papers, they are introduced to the scientific work in this field. In the end, the students can understand and communicate the subject-specific knowledge. The course offers the foundation for self-dependent access to the relevant literature and the independent scientific work.

61916 **5 Credits**

Space Mission Analysis and Design | *Prof.-Dr.-Ing. Markus Czupalla*
The lecture details the subjects of the analysis and design of space missions. The contents are detailed below. The students learn how to perform the analysis and design of a space mission. The students can understand and communicate the subject-specific knowledge. The course offers the foundation for self-dependent access to the relevant literature and the independent scientific work.

61917 **5 Credits**

Advanced Space Dynamics | *Prof. Dr.-Ing. Bernd Dachwald*
The lecture details fundamental relationships of advanced celestial mechanics / space dynamics. The main goal is to develop the competence to solve realistic problems in near-earth and interplanetary spaceflight as in use today and to get a deeper understanding of non-Keplerian spaceflight dynamics. Understanding of analytical methods on which numerical methods of spaceflight rely. Further to acquire the ability for discussions with practioners and to understand current scientific and technological publications on spaceflight mechanics. The course offers the foundation for self-dependent access to the relevant literature and the independent scientific work. Students can understand and communicate the subject-specific knowledge.

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.

62904 **5 Credits**

Flight Simulation Technology | *Prof. Dipl.-Ing. J.-Michael Bauschat*
The lecture deepens the knowledge which was gained in basic lectures Flight Mechanics, Dynamic of Systems and Flight Control. The students are capable to understand and to describe mathematically the dynamic behavior of aircraft. Students will be able to build flight simulation sys-

tems using state of the art digital simulations tools in real-time but also as offline simulation.

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 Mehrkörpersysteme | *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.

62911 **5 Credits**

Transonic Aerodynamics | *Prof. Dr.-Ing. Marc Havermann*

Importance and understanding of transonic flows in aerodynamics, theory of transonic flows, lift and drag of airfoils in transonic flows, calculation of the critical Mach number for airfoils, aerodynamic improvements in transonic flows, aeroelastic effects, transonic wind tunnels.

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.

62914 **5 Credits**

Propulsion System Integration | *Prof. Dr.-Ing. Harald Funke*

Understanding for the complex and comprehensive requirements for the system “aircraft-engine” and its integration into an aircraft. Knowledge of the interdisciplinary interactions of design processes and fundamentals in project management in aero-engine development.

62915 **5 Credits**

Advanced Space Propulsion | *Prof. Dr.-Ing. Bernd Dachwald*

The lecture details fundamental relationships of advanced in-space propulsion systems and of ramjet engines with subsonic and supersonic combustion to the students of aerospace engineering.

The students are capable to evaluate and describe the components of the investigated propulsion systems (solar sails, electric engines, ramjet and scramjet engines). The students learn the systemic aspects of the selection and design of the system components. Students can understand and communicate the subject-specific knowledge. The course offers the foundation for self-dependent access to the relevant literature and the independent scientific work.

62916 **5 Credits**

Space Mission Engineering | *Prof. Dr.-Ing. Markus Czupalla*

The lecture details the subjects of the analysis and design of space missions. The contents are detailed below. The students learn how to perform the analysis and design of a space mission. The students can understand and communicate the subject-specific knowledge. The course offers the foundation for self-dependent access to the relevant literature and the independent scientific work.

62917 **5 Credits**

Space Utilization and Exploration Project | *Prof. Dr. rer. nat. Rainer Willnecker*

The utilization and exploration of space are amongst the most important applications of astronautical engineering. This seminar details these subjects and exposes the students to a practical seminar project in this field. In this seminar project, the students fuse their technical knowledge and their knowledge about space mission analysis and design into a self-contained piece of work that is relevant to the field of space utilization and exploration. This could involve an actual problem / project at the German Aerospace Center (DLR), at FH Aachen, or at a space company or a scientific partner. The students have to work together as a team similar as in a project management structure. The students learn to present their work in the form of a report and a presentation. In the end, the students can work in a team and present their work to team-members and others.

62918 **5 Credits**

Einführung in die Aeroelastik | *Dr.-Ing. Athanasios Dafnis*

The students are able to classify static and dynamic aeroelastic processes and to describe their physical phenomena such as divergence, control reversal, as well as classical flutter. They can distinguish between typical structural response problems and aeroelastic instability problems. They know different types of how to describe the equations of motion, taking into consideration variable aerodynamic and structural boundary conditions and assumptions. They know analytical methods in order to solve 2D and 3D structural problems implying 2D steady and quasi-steady subsonic aerodynamic conditions and they know how to apply these methods. They also know fundamental methods being able to solve the unsteady aeroelastic problem applied to wing structures and they can describe their advantages and disadvantages. The students are able to assess theoretical scientific discussions of complex aeroelastic occurrences, based on the imparted background. The exercise classes enable the students to identify problems, to develop approaches and to assess and to defend the obtained results. The course will be complemented by an additional revision course before examination.

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

AERO2566 **12 ACTS**

Aerospace Materials | *Everson Kandare*

This course provides you with the skills required to assist the design process of aerospace structures and components considering the broad range of engineering materials available. You will learn both qualitative and quantitative methods of materials selection. You will also study the main properties, domain of application and fabrication processes of aerospace materials, with a particular emphasis on lightweight alloys and composite materials. You will investigate the impact of different materials in critical areas pertaining to the operation of aircraft, such as structural integrity (including prevention methods), airworthiness requirements (including testing and maintenance), sustainability/recyclability issues and cost effectiveness. Furthermore, you will be exposed to state-of-the-art materials topics (e.g., nanomaterials and smart materials), and assess pathways for the development of aerospace structures and components with optimised features.

AERO2321 **12 ACTS**

Aviation Safety Systems | *Dr. Kyriakos Kourousis*

The course aims to provide participants with a practical appreciation of safety and risk management systems, the elements of support, and the way in which such systems are implemented within aviation operations.

AERO2512 **12 ACTS**

Avionics and ATM Systems | *Prof. Roberto Sabatini*

This course aims to address fundamental and advanced issues in aviation electronics (avionics) which are used in civil and military aircraft, as well as unmanned aero-vehicles (UAVs). You will become familiar with the fundamental theoretical aspects of the underlying technology, as well as receive an overview of the principles of the associated electronic devices and equipment incorporated in avionics systems. The course further explores the architecture, functions and operation of the various avionics systems (e.g. telecommunication system, flight control system, etc).

OENG1120 **12 ACTS**

Research Methods in Engineering | *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 engineering (discipline) specific case studies using different research methods (quantitative and qualitative).

OENG1088/1089 **48 ACTS**

Master Research Project Part 1 and 2 | *Prof. Pavel Trivailo*

You will undertake this course in the first semester of final two semesters of your Master program. The course constitutes the major experimental and/or analytical research project for the program and engages you in achieving the objectives of a research project investigated and formulated in Research Methods. You will work on research projects individually or in small groups; however, you will submit individual minor thesis.

This course requires you to demonstrate in depth technical and research skills, and professional and personal attributes at a level that is commensurate with professional engineering and research practices. In this course you will plan and manage your research project, conduct a critical review of relevant literature, undertake research work to a high level standard of professional engineers and researchers, evaluate and report your research findings.

As appropriate to the level of professionalism that is required in this course, you are expected to conduct the research with a high degree of independence and with limited guidance from your research project supervisor.

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 dual 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). 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 dual degree programme have to pay the normal international student tution fees at RMIT Melbourne. A number of 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 webcode: **11111129**

Application Deadline | Application deadlines for the admission restrictet (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.

Modules Description and List of Lectures | As well as details about application deadline available at *www.fh-aachen.de* with webcode **11111129**.

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