

MASTER'S PROGRAMME

AUTOMOTIVE ENGINEERING



Automotive Engineering Master at Chalmers A Natural Choice!

The ever-increasing requirements of high quality mobility and safe transportation of people and goods make the automotive industry a necessity in our society. Global warming, environmental challenges and the vision of zero accidents push for innovations from an holistic view, therefore the need for skilled Automotive Engineers is immense. The Automotive Engineering Master's Programme at Chalmers has the potential to provide you with the possibilities and knowledge to develop future technologies for a sustainable mobile society.



Wheel Suspension

AIMS

Automotive Engineering provides a solid and holistic knowledge about the automotive industry and a system perspective of automotive vehicles together with an understanding of common tools used in vehicle design, simulation and testing. The programme focuses on Powertrain, Vehicle Dynamics and Safety and since all automotive development is carried out in a team-based project environment; the programme addresses the importance of communication, teamwork and project management.

CAREER OPPORTUNITIES

Automotive Engineering prepares for professional roles within research and development and design and testing of processes, systems and parts of vehicles or other mechanical systems. Some possibilities are development of engine processes, design of suspension systems or human body models for virtual crash testing, testing and evaluation of powertrains, safety systems or stability of heavy vehicles. The provided system view is also suitable when aiming for a career/role within technical support, sales, manufacturing or management at different levels.

PROGRAMME IDEA

The Automotive Engineering programme is designed to provide a system perspective of automotive vehicles with depth within the three focus areas; Powertrain, Vehicle Dynamics, and Safety. To accomplish this, the programme is based on lectures, assignments, simulations and experiments

and these are carried out as real-case studies, or similar, with aid of industrial tools.

The experience of the team-based project environment is provided through the automotive project courses. The aim is to offer a work environment close to the one in industry; multi-cultural teams composed of many different competences. The task would come from industry or academia and consider technical aspects as well as project work skills.

The Powertrain courses are focused on the internal combustion engine, engine processes, fuel consumption and emissions, after treatment and management and control of powertrains including hybrids.

The Vehicle Dynamics courses are focused on topics related to the dynamic operation and control of the vehicle. Environmental effects and active safety (e.g. side-wind disturbances and different road surfaces) are central issues.

The Safety courses are focused on safety systems and countermeasures to prevent and reduce traffic accidents and injuries. This includes design and evaluation of systems for active and passive safety and covers impact biomechanics, human factors and accident investigations and reconstructions.

LINK TO RESEARCH

Automotive Engineering has links to competence centres in Powertrain, Combustion Engines Research Center,

CERC, and Safety, SAFER, VTI and SHC, the Swedish Hybrid Centre. In conjunction to these centres, links exist to high quality research in solid and fluid mechanics.

LINK TO INDUSTRY

Automotive Engineering has an established extensive network of contacts with industry in courses and student projects to increase the work integrated learning. Companies involved are AB Volvo, VCC and SAAB but also suppliers; Johnson Controls, SKF, Autoliv and consultants; AVL, Semcon, Epsilon, Lotus Engineering and FKG (Scandinavian Automotive Suppliers) among others.

MANDATORY BLOCK OF COURSES

Chalmers Automotive Projects (CAP)

In Automotive Engineering, teamwork and communication skills are much appreciated. At Chalmers, there is a good opportunity to practise these skills within our projects.

In **Chalmers Formula Student**, a business concept of a light competitive vehicle is presented and a prototype is designed, built and tested.



In **Chalmers EcoMarathon**, the aim is to further develop the Chalmers Eco vehicles to travel as far as possible for a given amount of energy.



In the **Automotive Engineering Projects**, industrially oriented projects are offered in cooperation with automotive industry.

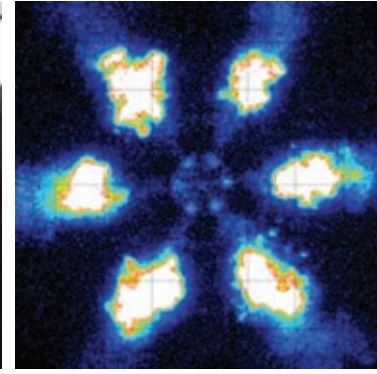


Traffic Safety Research

Volvo City Safety — low-speed auto brake



Aerodynamic Design at Saab



Gasoline Direct Injection Spray.

Engineering of Automotive Systems describes the vehicle as a set of systems and components and presents an overview of the automotive industry, including drivers and trends for manufacturers and suppliers.

Internal Combustion Engines presents fundamental knowledge of engines that are used in ground vehicles and the overall characteristics of energy conversion and transmission is considered.

Vehicle Dynamics considers the dynamics of a vehicle during braking, accelerating and cornering is explained and handling, stability and ride comfort aspects.

Vehicle and Traffic Safety introduces the role of passive and active safety in the context of traffic safety. Prepares for participation in system testing and provides an understanding of the complexity of the design and evaluation of safety systems.

SEMI MANDATORY COURSES

4 courses or 2 courses and 1 project

Hybrid Vehicles and Control goes deeper into different powertrains, hybrid solutions, components and powertrain control.

Road Vehicle Aerodynamics considers the aerodynamic influence on the vehicle and its handling and stability.

Advanced Active Safety covers design and evaluation of active safety systems from an engineering and human-factor perspective. Applied exercises address key safety problems from the automotive industry.

Internal Combustion Engines Advanced provides a deeper understanding of gas exchange, charge motion, combustion, fuel sprays, engine control, emissions and exhaust after treatment. Numerical and experimental tools are introduced.

Powertrain Mechanics includes design, analyses and simulation of components and systems in automotive powertrains including IC engines, traditional gearboxes/transmissions and hybrids solutions/layouts.

Vehicle Dynamics advanced offers an understanding of the coupled dynamics of the vehicle including non-linear effects and introduces some vehicle-specific signal processing and automatic control.

Impact Biomechanics goes deeper into biomechanics and human anatomy and how injury tolerance levels and injury criteria are established. Also includes biological, mechanical and mathematical simulation modelling.

In the Automotive Engineering Projects, industrially oriented projects are offered in cooperation with automotive industry, e.g. development of an electric vehicle, an independent suspension for a truck rear axle or design of a hybrid moped car.

Course Plan

Year 1				Year 2	
Engineering of Automotive Systems 7,5c	Vehicle Dynamics 7,5c	Road Vehicle Aerodynamics 7,5c	Vehicle Dynamics, advanced 7,5c	Automotive Engineering Project 15c	
Internal Combustion Engines 7,5c	Vehicle and Traffic Safety 7,5c	Advanced Active Safety 7,5c	Impact Biomechanics 7,5c	Elective 7,5c	Master Thesis Work 30c
		Hybrid Vehicles and Control 7,5c	Internal Combustion Engines, advanced 7,5c	Powertrain Mechanics 7,5c	
Chalmers Formula Student 15c Either in 1st or 2nd year					





“Chalmers – for a sustainable future is a vision which exudes the long-term approach, the acceptance of responsibility and the trust I feel is worthy of Chalmers. At the same time, it is obvious that this vision has to be shared by many and that Chalmers has to co-operate across disciplines in order to promote the whole of society's commitment to our future.”

Karin Markides, president

CHALMERS UNIVERSITY OF TECHNOLOGY

Chalmers conducts research and education in engineering and natural sciences, architecture, technology-related mathematical sciences and nautical sciences – in close collaboration with industry and society. Chalmers is one of Sweden's largest universities of technology with about 12 000 students and 2 200 employees.

Approximately 40 percent of Sweden's graduate engineers and architects are educated here. Chalmers has formed partnerships with major industries mostly in the Gothenburg region such as Ericsson, Volvo and SKF.

The Master's Programmes at Chalmers are strongly linked to advanced research in areas of particular strength. Upon completion of studies, candidates will be granted a Master's degree. The programmes are taught in English and open to applicants from the whole world.

Chalmers has eight areas of advance where the aim is to bring together research, education and innovation across departmental boundaries and to co-operate with bodies and organisations outside Chalmers: Materials Science, Production, Information & Communication Technology, Transport, Built Environment, Nanoscience & Nanotechnology, Life Science and Energy. The eight key areas also have a firm foundation in the basic sciences. The pursuit of new knowledge and improved technology has characterized Chalmers ever since its foundation in 1829.

More info at: chalmers.se/en

THE SMALL METROPOLIS – GOTHENBURG

More than 60 000 are currently studying in Gothenburg. In many ways, their decision to choose Gothenburg when the time came to take the next step into the future isn't surprising. Gothenburg is an attractive major city with a maritime atmosphere and within easy reach of outdoor activities in the rest of West Sweden.

Gothenburg is an uncommonly inviting city for students, with a great deal to offer: You'll find an exciting cultural and entertainment scene worthy of any major city, as well as a friendly atmosphere that will help you to quickly feel at home.

Founded in 1621, Gothenburg is a young city by European standards. Since formative years it has been an important port of international trade and today it is the largest in Scandinavia. With a population of about half a million, it is both friendly and cosmopolitan. More info at: goteborg.com

SWEDEN – A CULTURE OF INNOVATION

One of the world's most modern countries, Sweden is the birthplace of many successful international corporations. Innovative research at Swedish universities and companies has resulted in a number of successful inventions. Some examples are: the computer mouse, Bluetooth for internet mobility, the pacemaker, the ball bearing, the Tetra Pak beverage packaging system, the dialysis machine and internet applications such as the online music streaming service Spotify and the free internet calling service Skype. These fairly recent inventions build on a long history of excellence in academia and research. Sweden is the home of the prestigious Nobel Prize, awarded in Stockholm every year.

Sweden has a number of large multinational corporations, such as telecom supplier Ericsson, automotive companies Volvo and Scania, household appliances corporation Electrolux, bearing manufacturer SKF, and high-tech engineering groups Sandvik and Atlas Copco. The deep-rooted creative environment has made Sweden a strong nation in the areas of design, fashion and music, with well-known international brands such as furniture giant IKEA and clothes retailer H&M. Sweden is also one of the largest music-exporting countries in the world.

More info at: studyinsweden.se



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