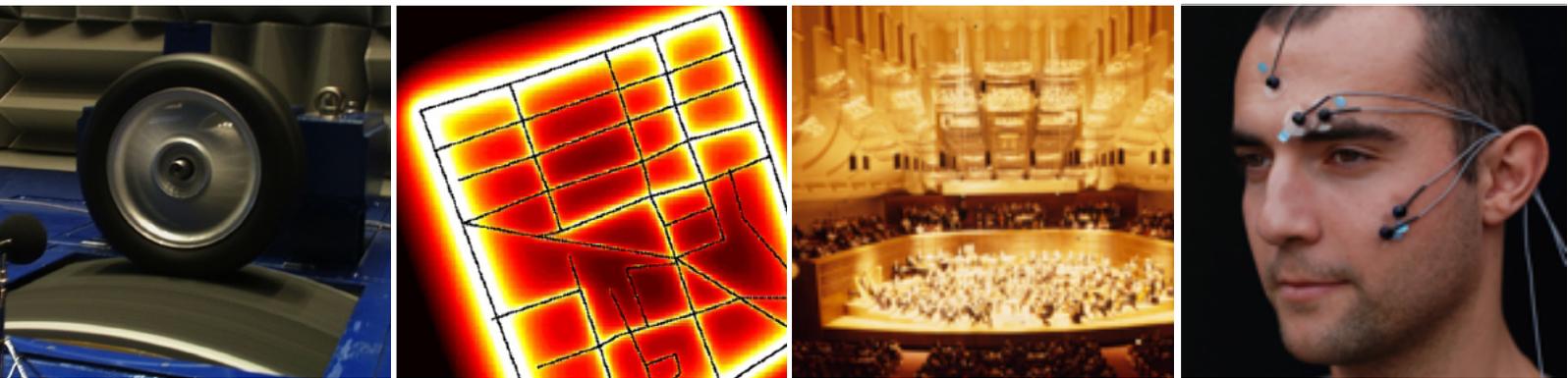


MASTER'S PROGRAMME

# SOUND AND VIBRATION



Sound and vibrations are part of our daily life. Sound and vibration properties are critical to the function and the quality of environments, products, and transportation. The Master's Programme in Sound and Vibrations includes all parts of the chain from sound sources or structural vibrations to sound propagation, and the influence on humans and society.

“As a student of the Sound & Vibration Master’s programme, I acquired broad and advanced knowledge base, which I can apply to solve sound and vibrational problems. The whole education gave me a solid foundation which will be useful for the rest of my professional career.”

Diana Gómez Olmedilla, student 2009-2011.



#### AIMS

Sound and vibrations are part of our daily life. Noise in society affects physical and mental health, and causes sleep disturbance, decreased task performance, and annoyance. Sound and vibration properties are therefore critical to the function and the quality of environments, products, and transportation. Today the design of high-speed trains, automotive vehicles, transport infrastructure, cities and buildings is strongly influenced by performance requirements with respect to sound and vibration properties.

The aim of the programme is to educate specialists in the field of sound and vibration who will contribute to a competitive and innovative industry and also to a sustainable society, where the negative effects of noise and vibration are reduced.

#### WHO SHOULD APPLY?

Sound and vibration is an interdisciplinary subject including fields such as physics, mechanics, physiology, signal processing, psychology, and electrical engineering. The programme is designed for students with high interest in this interdisciplinary work and in applying engineering skills for the comfort and health of people.

The programme is suitable for students with a Bachelor’s degree or Major in Civil Engineering, Urban Planning, Industrial Design Engineering, Electrical Engineering, Mechanical Engineering, Physics, Engineering Mathematics, Architecture and Engineering, or Architectural Engineering.

#### RESEARCH CONNECTIONS

The division of applied acoustics is one of the leading acoustic laboratories in Europe. Over the years the Division has coordinated several European (EC) projects. We have good relations with regular exchange on both MSc- and PhD-student level with most of the well-established acoustic laboratories in Europe (e.g. ISVR in the UK, ITA Berlin in Germany, and INSA de Lyon in France).

Industrial cooperation partners are the Swedish and European vehicle manufacturers such as Bombardier, Continental, Fiat, SAAB Automobile, Volkswagen, Volvo Cars, and Volvo Trucks. We also work together with major consultancies and research institutes in Sweden and abroad, for example SP Technical Research Institute of Sweden, WSP Sweden, ÅF Ingemansson, CSTB in France, and Müller-BBM in Germany.

#### CAREER OPPORTUNITIES

The educational profile will make it easy for you to find working opportunities as specialist all over the world, but especially in Europe where there is a clear need for sound and vibration specialists.

Graduates from the Sound and Vibration programme have typically started careers in:

- Acoustic consultancies working with product development, environmental noise, architectural acoustics, or building acoustics;
- Industries (especially the vehicle industry), which have their own divisions to manage sound and vibration;
- The communication industry, where sound is important for the quality of products and services;
- Public organisations concerned with envi-

ronmental issues, housing, traffic planning, and health.

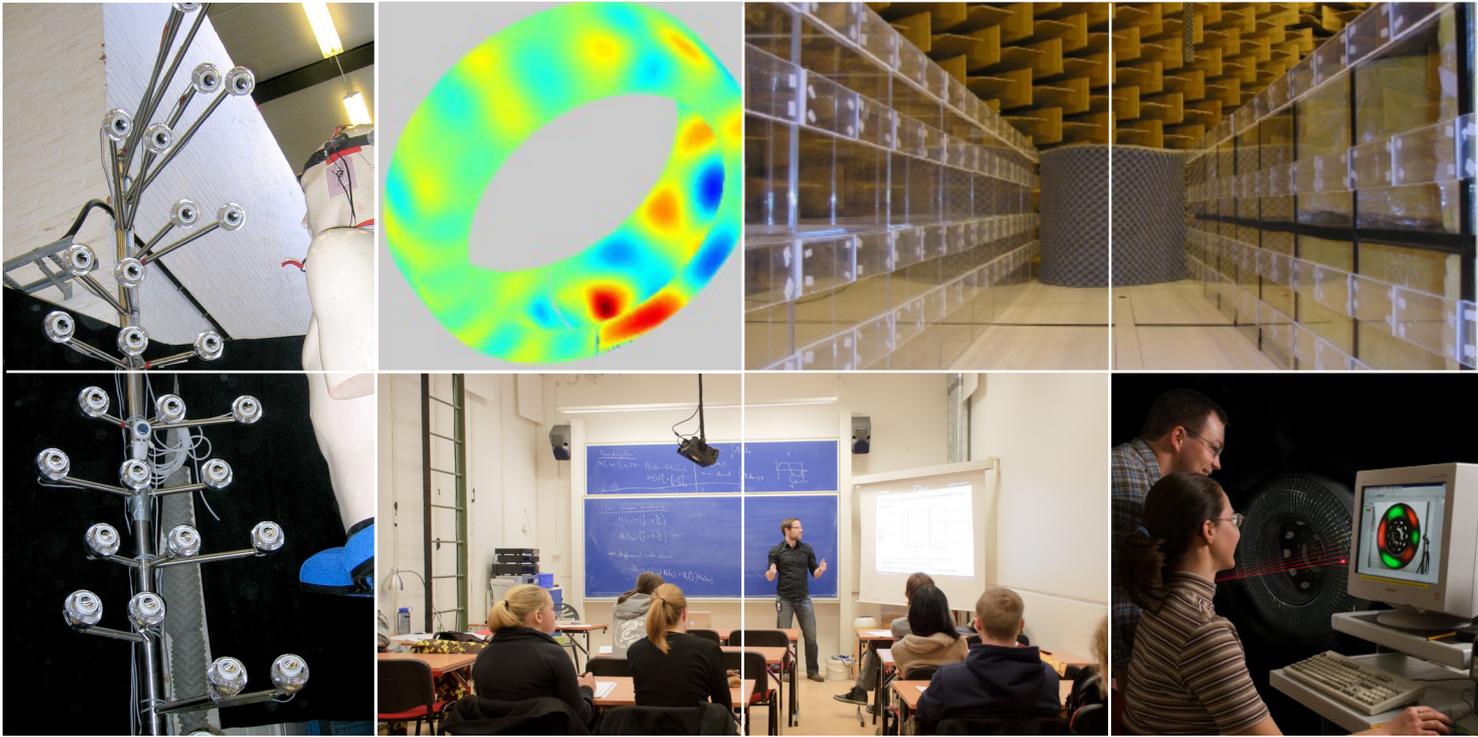
#### EDUCATIONAL METHODS

The programme at Chalmers has a strong focus on the link between theory and practical application. The focus is on identifying and solving problems by using experimental investigations, physical reasoning, analytical models and numerical methods. This is accomplished through project work in small groups guided by experienced teachers, as well as through access to experimental facilities especially suited to this purpose.

The programme has over 10 years of experience and is continuously developed. In student evaluations the Sound and Vibration programme receive very good ratings. Almost 90 percent of the students were satisfied or very satisfied with our programme and it was stated by an overwhelming majority that we clearly reach the goals of the programme. More details of the evaluations can be found at [www.ta.chalmers.se](http://www.ta.chalmers.se).

#### PROGRAMME PLAN

The Sound and Vibration programme comprises a block of fundamental courses, which are compulsory for all students. The programme offers both a broad education in acoustics as well as the opportunity to specialise in the field of Noise Control Engineering, Architectural Acoustics or Environmental Acoustics. In addition to the specialisations offered at Chalmers, cooperation within other Scandinavian Universities allows for a wider range of specialisation (e.g. underwater acoustics, flow acoustics, musical acoustics). The



courses are designed to cover all parts of the chain from noise source and structural vibrations to sound-radiation, propagation and transmission, to the influence it has on humans and society.

**COMPULSARY COURSES**

*Audio Technology and Acoustics*

The student will learn the fundamentals of acoustics and audio technology.

*Individual Preparation Course*

Help the students to prepare for the programme offering topics which might not have been covered in their Bachelor degree, but are essential for the programme (e.g. signal processing, MATLAB programming, basic physics).

*Sound and Vibration Measurements*

Prepare the students to handle typical measurement tasks in the field of sound and vibration through laboratory work.

*Technical Acoustics I*

Focuses on physical understanding of sound propagation in structures and the radiation of sound by structures. Analytical and numerical methods used for the prediction and control of vibrations and sound radiation.

**TENTATIVE COURSES**

*Active Noise Control*

Introduces the principles of active control of sound and vibration, including control strategies and filter design. The students design and implement their own ANC system to a real-life case.

*Building Acoustics and Community Noise*

Advanced course on building acoustics and community noise preparing for working as a consultant in the area of environmental noise.

*Design of Silent Products*

By applying knowledge obtained in previous courses, the sound and vibration properties of a product provided by industry is analysed. Designs for improvement are proposed, experimentally investigated and discussed with the industrial partner

*Electro Acoustics and Ultrasonics*

In depth introduction regarding electrical transducers for acoustics and vibration, such as microphones, hydrophones, accelerometers, loudspeakers, vibrators and ultrasonic projectors.

*Human Response to Sound and Vibration*

Gives a fundamental understanding of the complexity of human response to sound

and vibration. The students will learn methods for analysing data concerning people's response to sound and vibration.

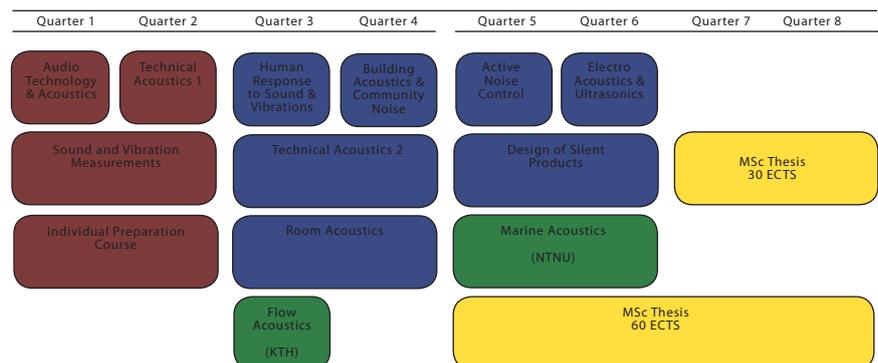
*Room Acoustics*

Includes subjective response to voice and music in rooms and methods for designing rooms with high acoustic quality. As a mandatory part of the course the students will participate in a building design project organised by the Acoustical Society of America. The project is made in collaboration with students from Architecture.

*Technical Acoustics II*

Gives the students the opportunity to train the theoretical base presented in Technical Acoustics I by applying knowledge and tools to a real life problem.

For further questions contact;  
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“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](http://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](http://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](http://studyinsweden.se)



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