Computational Methods

Civil Engineering M.Sc.
Over the last few decades, computational methods in civil engineering have grown to become an essential tool for engineers. Nowadays, nearly every engineering problem can be solved solely with this tool. As a reaction to the ever-growing importance of computational methods for the modern civil engineer, the Faculty of Civil Engineering at RWTH Aachen University has developed the new specialization Advanced Computational Methods in Civil Engineering (AdCom) for the Civil Engineering Master’s degree program. Taught completely in English, this specialization lends itself to not only the tendencies of present-day engineering, but also the future of civil engineering. AdCom graduates are able to apply and develop numerical methods and simulations for the realization of innovative civil engineering structures. The curriculum is interdisciplinary with courses from the faculties of Civil Engineering, Mechanical Engineering and Mathematics. This allows students to obtain a deeper understanding in the key-skills in structural mechanics, fluid mechanics, and numerical mathematics.

Students will learn to master challenges such as those, which arise from the use of new resource-conserving materials and advanced composite materials as well as those, that arise from the trend towards extremely light load-bearing structures. The development of state-of-the-art lightweight structures, which are subject to dynamics loads such as wind and traffic, will be just one many expertise that our students possess. The knowledge and use of numerical methods, mechanical principles and the development of software codes account for just a fraction of skills that make up our students repertoire, which enables them to assess the strength and limits of numerical modeling in civil engineering.

The curriculum of Advanced Computational Methods in Civil Engineering is highly scientific and research-oriented and thus prepares graduates for a Ph.D. program and ultimately a scientific career in research or in industry. To prepare students for such a future, a new research module and a scientific mini-thesis are a part of the curriculum in addition to the Master’s thesis.

Studying at RWTH Aachen

RWTH Aachen University is one of the largest and best technical universities in Germany. It is a place where the future of the industrialized world is thought out, proving itself as a hotspot with increasing international recognition where innovative answers to global challenges are developed. Not only does RWTH Aachen University offer an outstanding reputation, accompanied by excellent research facilities and staff, but also a multi-national community, where diverse cultures are embraced.
Strong in Theory and Practice

Responsible Institutes

Chair of Structural Analysis and Dynamics (LBB)

The Chair of Structural Analysis and Dynamics (LBB) is part of the Faculty of Civil Engineering. The lectures of the LBB have multiple focuses including current numerical methods for nonlinear structural analysis (e.g. isogeometric analysis), scaled boundary finite element method (SB-FEM), and special techniques of the finite element method. Furthermore, the institute focuses on the analysis of structural dynamics problems, such as the analysis of nonlinear single-degree-of-freedom systems or multiple-degree-of-freedom systems, and the fundamentals of soil dynamics, soil-structures and interaction as well as random vibrations in their teaching.

The Chair of Structural Analysis and Dynamics strives to familiarize students with the application of the theory to practical problems as well as with the implementation of problems in structural analysis and dynamics as an important focal point.

www.lbb.rwth-aachen.de

Institute of Applied Mechanics (IFAM)

The Institute of Applied Mechanics (IFAM) is part of the Faculty of Civil Engineering. To highlight the ever-growing importance of computational methods within civil engineering IFAM offers lectures for degree programs that share key concepts and goals with this specialization, such as Simulation Sciences and Computational Engineering Science.

Lectures are related to the modeling of nonlinear behavior of engineering materials including visco-elasticity, elasto-plasticity, and damage. In addition, the robust and efficient implementation of material models into the finite element method, while making use of modern technologies to prevent locking as well as to increase efficiency, accuracy and robustness, is a further focal point of the offered lectures.

The aim of all lectures is to enable students to understand complex material models and their numerical treatment within structural computations with practical relevance.

www.ifam.rwth-aachen.de

Head of Chair
Univ.-Prof. Dr.-Ing. habil. Sven Klinkel

Head of Chair
Univ.-Prof. Dr.-Ing. habil. Stephanie Reese
Advanced Computational Methods in Civil Engineering

Exemplary study plan

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<tr>
<td>Structural Steel III (8)</td>
<td>Nonlinear Structural Analysis (8)</td>
<td>Advanced Structural Analysis (8)</td>
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The number in brackets denotes the number of ECTS CP.

Prerequisites

One of the prerequisites to start studying this master’s degree program is a first university degree, which proves the necessary background education. Applicants must have a profound knowledge in mathematical and mechanical subjects as well as in statistics. Thorough knowledge in at least two of the following areas of civil engineering is also required: structural engineering, water management and hydraulic engineering, construction management and geotechnics, or transport engineering.

In addition to the subject related prerequisites, applicants must show proof of a profound level of the English language, at least equivalent to B2 level of the Common European Framework of Reference for Languages (CEFR).

Non-EU-citizens need to apply for a visa for their stay and have to send their application for the degree programm by 1 March. EU-citizens need to send an application by 15 July.
The master’s program has a strong focus on research, that is accompanied by an excellent international reputation. This is especially present in the second year, where students work side by side with university researchers, thus gaining unique insights and experience in modern scientific methodologies.

Engineers with expertise in computational methods are multidisciplinarily trained professionals. They are able to pursue a successful career in academics as well as in an industrial environment, that may range from classic civil engineering to the various areas of mechanical engineering.

**Studying with perspective**

**Going Abroad**

International experience for civil engineers specialized in advanced computational methods is important and often a deciding factor for one’s career path. Not only do studies or internships abroad teach advanced technical knowledge, and cultural and communication skills, but they also allow for international networking, which is vital for any student specialized in AdCom, given that the specialization often leads to a later career in research.

The Faculty of Civil Engineering offers partnership programs with outstanding European and non-European universities. Study opportunities offered within the EU by means of the ERASMUS+ program are often coupled with financial aid. The Faculty’s membership in various research associations makes it possible to complete course components, research modules and final projects in one of many international programs.

RWTH students profit not only from the Faculty’s exchange programs but also from the University’s strategic partnerships with international universities. For example, they can complete short stays at one of the IDEA League universities while completing a term paper.

All of RWTH’s partnership programs are listed on the study abroad pages. Subject-specific details are available from the Faculty of Civil Engineering International Office.

**Career Prospects**

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At a glance

More Information on www.rwth-aachen.de/go/id/otcz

Contacts

Academic Program Management
bau@fb3.rwth-aachen.de

Student Council of the Faculty of Civil Engineering
fs-bau@rwth-aachen.de

International Office at the Faculty of Civil Engineering
international@fb3.rwth-aachen.de
www.fb3.rwth-aachen.de/international

International Office at the RWTH Aachen University
international@rwth-aachen.de
www.rwth-aachen.de/international

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