DAAD Deutscher Akademischer Austauschdienst
German Academic Exchange Service

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Master's degree 2

Scientific Computing • University of Bayreuth • Bayreuth 2

Master's degree

Scientific Computing

University of Bayreuth • Bayreuth

Overview

Degree	Master of Science (MSc)
In cooperation with	A programme in the scope of the Elite Network of Bavaria: https://www.elitenetzwerk.bayern.de/elitenetzwerk-home/elitenetzwerk-home/ The programme website "Scientific Computing" of the Elite Network of Bavaria: https://www.elitenetzwerk.bayern.de/elitestudiengaenge/elitestudiengaenge-nach-wissenschaftsbereichen/scientific-computing/?L=3^^^^^^^^^^4d2ShaseaB/a%20w^^^^^DocID%27%22
Teaching language	• English
Languages	English, German only on request
Programme duration	4 semesters
Beginning	Winter and summer semester
More information on beginning of studies	The winter semester starts in October; the summer semester begins in April.
Application deadline	The application process has to be completed by 15 May for the following winter semester or by 15 November for the following summer semester.
Tuition fees per semester in EUR	None
Combined Master's degree / PhD programme	No
Joint degree / double degree programme	No
Description/content	Over the past several years, numerical simulations of phenomena in technology and the natural sciences have been shown to be an essential tool for accelerating development cycles in industry and businesses. While researchers once had to meticulously study the properties of a product on the basis of prototypes, they are now simulated and optimised on computers. Demands for the capabilities of numerical simulation continue to grow with the need for models that are more and more precise, the incorporation of new problem areas such as data analysis (e.g., big data), and parameter-dependent problems and models with uncertain data. This was triggered by the relatively young and forward-looking research area of scientific computing. The field addresses the entire solution chain, including modelling; mathematical, numerical, and statistical analysis; optimisation; the implementation of algorithms on high-performance

computers; and the visualisation of results. However, little attention has been paid to training students in this development. Graduates of mathematics are generally still limited to a basic understanding of numerics and scientific computing. Due to the high demands of studying mathematics, there is usually not much time left for the transfer of newly acquired knowledge to neighbouring fields that represent intellectual challenges in their own right.

The objective of the international Master's programme is thus to provide a specialised range of courses that leads highly qualified, hard-working students towards the development and mathematical analysis of highly efficient numerical methods. It is a crucial point that highly complex problems are brought to a less complex numerical approximation (on parallel computers) via an understanding of their mathematical core. The Master's programme involves – and is motivated by – a number of courses in other subject areas (biochemistry, physics, computer science, and engineering), in which the simulation of demanding problems plays a crucial role. The programme is geared towards students working at the intersection of mathematics, computer science, and physics. This interdisciplinary approach enables students to achieve and apply their specialised understanding of efficient methods for solving differential and integral equations and analysing large sets of data, and to extend this know-how to other subject areas.

In summary, the foci of the Master's programme include the following four main areas:

- Numerical Mathematics (Numerical Methods for several types of Differential Equations, Approximation Methods, Optimisation)
- Modelling and Simulation of many problems known from (Bio)Physics, (Bio)Informatics, Chemistry and Engineering Sciences
- High-Performance Computing (Data Structures, Parallel Systems and Algorithms)
- Scientific Computing (Complexity Reduction, Fast and Efficient Methods, Meshfree Methods, Data Analytics, Quantification of Uncertainty)

Course Details

Course organisation

The Master's programme is organised in elective and mandatory modules. The elective modules consist of several courses, from which the participants can choose according to their interests. They have to fulfil a certain amount of credit points in these elective modules.

Each year, a modelling seminar (summer semester) and a status seminar (winter semester) will be held. Students must attend two of each of these events.

An industrial internship and a practical course on parallel numerical methods deepen the learned methods and algorithms.

One of the modules of the programme is dedicated to key skills, such as lecture and presentation techniques, literature research, teamwork or dealing with foreign-language specialist literature. Students have to attend seminars in this module for a certain amount of time.

As a conclusion of the programme, each student writes a Master's thesis on an individual research project in co-operation with industry, with international experts or under the guidance of a professor of the University of Bayreuth. For this purpose, students receive compensation for travel expenses during their research stays.

At the beginning of the programme, a mentor is provided to every student. This mentor can be chosen among the involved lecturers. With the help of the mentor, the participants of the programme are able to design an individual study plan in accordance with their interests. Furthermore, the mentors act in an advisory capacity in the studies or the research interests of their students and can recommend themes for Master's theses.

More details on the modules and a recommended curriculum can be found on the programme website:
https://www.scientific-computing.uni-bayreuth.de/en/module-overview/index.html

The course organisation and the modules were created in corporation with the Elite Network of Bavaria.

Types of assessment	Lectures: written or oral exams Seminars and practical courses: talk/presentation and a written report
International elements	• International guest lecturers • Specialist literature in other languages • Language training provided • Study trips • Courses are led with foreign partners • Projects with partners in Germany and abroad
Integrated internships	Industrial internship
Special promotion / funding of the programme	• Other (e.g. state level)
Course-specific, integrated German language courses	Yes
Course-specific, integrated English language courses	Yes

Costs / Funding

Tuition fees per semester in EUR	None
Semester contribution	In Germany, students at all higher education institutions must pay a semester contribution. This payment (at the University of Bayreuth: 107.81 EUR per semester) has nothing to do with tuition fees; rather, it covers your contributions to student services and the student government. At the University of Bayreuth (which combines the campus in Bayreuth and our new faculty VII located in Kulmbach), it includes a "semester ticket" that allows you to use public transport in the region.
Costs of living	The cost of living in Germany, e.g., accommodation, food, clothing and recreational activities, is about average compared to other European countries. Living expenses are significantly lower than in countries like Denmark, Luxembourg or Switzerland but rather high compared to countries like Poland, the Czech Republic or Italy. Compared to other large German cities, such as Munich, Berlin or Hamburg, Bayreuth's low cost of living and affordable housing make the city and the region particularly attractive to young people and families.The DAAD website will tell you what living expenses to expect in Germany: https://www.daad.de/deutschland/nach-deutschland/voraussetzungen/en/9198-financing/
Funding opportunities within the university	Yes
Description of the above-mentioned funding opportunities within the university	Scholarships awarded via the International Office You can apply for the scholarships (monthly payments: 300 EUR) starting in the third semester of study; scholarship funding cannot be provided during the first two semesters of study. You must submit the following documents next to your application: Enrolment certificate | Copy of passport and residence permit | Letter of recommendation from an instructor at the University of Bayreuth | Evidence of coursework completed at the University of Bayreuth, including grades | CV

Please check: http://www.international-office.uni-bayreuth.de//en/come-to-bayreuth/scholarships/index.html

Requirements / Registration

Academic admission requirements	1. A **Bachelor's degree** in mathematics, computer science, engineering science or physics (or a degree with equivalent content) with a final grade of 1.9 or better 2. **Sufficient specialised knowledge in** numerical mathematics of at least 16 credits
Language requirements	Certification of **proficiency in English** at level B2 according to the Common European Framework of Reference of Languages is required.
Application deadline	The application process has to be completed by 15 May for the following winter semester or by 15 November for the following summer semester.
Submit application to	Please apply via the online platform CampusOnline of the University of Bayreuth.

Services

Possibility of finding part-time employment	There are many ways for international students in Germany to earn money while they study, for example, as wait staff, academic assistants or private tutors, but there are some restrictions. For more detailed information, please visit: https://www.daad.de/deutschland/in-deutschland/arbeit/en/9148-side-jobs/.
Accommodation	**Accommodation for students** Bayreuth and Kulmbach have a number of student dormitories (both private dormitories and dormitories offered by the Association for Student Affairs) and a vast array of private rooms available. Under no circumstances should you assume that you will be assigned a room in the student dormitories! You will need to actively search for a room on your own – either in a private dormitory or on the private market. More information regarding accommodation for students is available here:www.uni-bayreuth.de/en/studies/accommodation/index.html. Please also read the DAAD's information. **Accommodation for international guests** All other international guests are requested to register via the Welcome Services Database (WelSe). **Accommodation for short visits** For short visits, we recommend searching for accommodation on Airbnb. In addition, a limited number of apartments are available in the Alexander von Humboldt Guest House.
Specific specialist or non-specialist support for international students and doctoral candidates	• Tutors • Accompanying programme • Specialist counselling • Visa matters

Contact

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Disclaimer
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