



Deutscher Akademischer Austauschdienst  
German Academic Exchange Service



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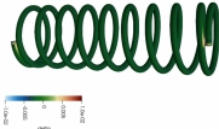
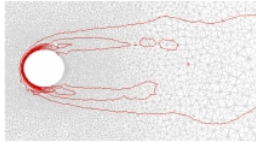
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# Master's degree



## Scientific Computing

University of Bayreuth • Bayreuth



## Overview

Degree	Master of Science (MSc)
In cooperation with	<a href="#">Elite Network of Bavaria</a>
Teaching language	<ul style="list-style-type: none"><li>English</li></ul>
Languages	English, German only on request
Programme duration	4 semesters
Beginning	Winter and summer semester
Application deadline	The application process has to be completed by <b>15 May</b> for the following winter semester or by <b>15 November</b> 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

The past several years showed that numerical simulations of phenomena in technology and the natural sciences are 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) or artificial intelligence, 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 workflow, 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.

The objective of the international Master's programme is 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 – several courses in other subject areas (biochemistry, physics, computer science, engineering, climate and environment), 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, data 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.

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## Course Details

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### 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.

The following four main areas are included in the elite Master's programme in Scientific Computing:

- Numerical mathematics (numerical methods for different types of differential equations, approximation methods, optimisation).
- Modelling and simulation of many problems from (bio)physics, (bio)computer science, chemistry, engineering sciences and climate/environmental sciences
- High performance computing (data structures, parallel systems and algorithms)
- Scientific computing (complexity reduction, fast and efficient methods, mesh-free methods, data analysis, quantification of uncertainties, multiscale problems, optimisation methods in machine learning)

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 cooperation with the Elite Network of Bavaria.

A brief overview of the modules can be found in the attached PDF file.

» [PDF Download](#)

- 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 pay a semester contribution. This payment (University of Bayreuth: 116.03 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 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 they are 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 for international students:** International students and doctoral researchers have the opportunity to apply to the [International Office](#) for a study grant. Limited funding from the State of Bavaria and the DAAD is available for this purpose. The application deadline for the **winter semester is 31 August and for the summer semester 28 February**. All grants can be awarded for up to two semesters.

Unfortunately, first-semester students cannot be funded, i.e. applications cannot be submitted until the second semester of study for [funding](#) starting in the third semester of study. Above all, academic achievements from the previous semester are decisive for the evaluation of the application.

# Requirements / Registration

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## 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

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## Possibility of finding part-time employment

There are many ways for international students to earn money while they study, but there are some restrictions. For more detailed information, please visit the [DAAD website](#).

The [University of Bayreuth's Career Services team](#) provides a central interface between student and professional life. The team offers guidance and support to students of all subjects with regard to starting their [careers](#).

For information regarding the **Corona virus**, please visit our [website](#) and also see <https://www.daad.de/en/coronavirus/>.

## 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: <https://www.uni-bayreuth.de/en/studies/accomodation/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

## Our Partners



### Corporate video of the University of Bayreuth

It all begins with a dream – a search for knowledge and insights, important changes, every great idea. Welcome to the University of Bayreuth!

» more:  
<https://www.youtube.com/watch?v=vWle6FHIR5k>

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# University of Bayreuth

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The University of Bayreuth is one of the most successful young universities in Germany.

© University of Bayreuth

#### International, innovative, and interdisciplinary in research and teaching

Top-notch research, state-of-the-art teaching methods, international influences, diversity, and a springboard to a successful career – these are all things the University of Bayreuth stands for.

The University of Bayreuth is a dynamic campus university with currently about 13,000 students. Beyond the interdisciplinary research focus and excellence in teaching, the university has a clear vision of social responsibility and entrepreneurship. In the middle of **Kulmbach**, our new satellite campus unites the perspectives of natural science, economics, law, social sciences, and behavioural science in one place in a way that has not yet been seen in Germany.

We have a close network of strategically selected **international** research partners, and we have strategic partnerships with universities around the globe. A wide range of innovative BA, MA and PhD programmes as well as our international summer schools are **conducted in English**. There are presently around 1,770 international students from more than 100 countries on the Bayreuth and Kulmbach campuses.



Focus areas in [research](#) include Nonlinear Dynamics, Polymer and Colloid Science, Molecular Biosciences, Ecology and Environmental Sciences, New Materials, African Studies, High Pressure and High Temperature Research, Cultural Encounters and Transcultural Processes, Innovation and Consumer Protection, Food and Health Sciences, Energy Research and Energy Technology, Governance and Responsibility.

Our university has an outstanding staff-to-student ratio. Our high performance levels, multidisciplinary collaborations and scientific excellence result in [high ranking positions](#). In the 2021 THE ranking of “475 under 50”, the University of Bayreuth once again achieved a top position among the best universities in Germany. We have proven expertise in campus and curriculum [internationalisation](#), which is confirmed by the results of the extended internationalisation audit conducted by the German Rectors’ Conference, a close and successful project cooperation with the German Academic Exchange Service (DAAD) and a number of Alexander von Humboldt Awards for our international management and [service](#).

### **Welcome to our one-of-a-kind [campus](#) in Bavaria!**

It is both the heart of our university and a source of inspiration. It is where friendships are made, collaboration is initiated, and ideas are conceived, ensuring that our university remains a beacon of innovation. Scientific exchange profits tremendously from the wide variety of disciplines our communicative campus brings together.

### **Coronavirus**

Be sure that there is a **comprehensive and high-quality range of courses** in all degree programmes that will enable students to successfully begin and continue their studies – on campus or online.



## University location

### **Welcome to Bavaria!**

Seventy-six thousand people from **145 nations** chose the city of Bayreuth as their new home, and those numbers are steadily rising. Because of its 13,000 students, Bayreuth is the **third-youngest city in Germany**. Living here means not getting stuck in traffic jams every morning. The short distances in Bayreuth allow you to leave your car at home and to walk or ride your bike to work and to campus.

### **Career & Networking**

The [Welcome Service](#) at the University of Bayreuth is here to assist you with any questions regarding living and [working](#) in the region of Bayreuth. The team of our International Office provides guidance and support for all international students, scholars, and their families before, during and after their stay at the University of Bayreuth. The aim is to ensure a quick, trouble-free and thus successful start as well as an unforgettable stay on our friendly campus in Bayreuth and Kulmbach.

### **A good climate for your entrepreneurial spirit**

The University of Bayreuth takes its role as a regional motor of innovation very seriously. The [Office of Entrepreneurship & Innovation](#) was set up to help students gain [the necessary qualifications](#) in the area of entrepreneurial and innovative thinking and acting. In doing so, we nurture our students’ willingness and ability to start their own companies. Our [Adviser for Start-Ups](#) provides start-ups and prospective start-ups with confidential guidance and support. Strong **innovation and research** institutions combined with high-performance medium-sized companies make for a steady rise in workforce and a guarantee for job security.

### **Your new home away from home**

Bayreuth and Kulmbach offer a fast variety of childcare services as well as affordable **living space**. Step outside your front door and enjoy the **recreational activities**. Scenic northern Bavaria is great for sports activities: cycling, hiking, mountain-climbing, canoeing, rafting, and skiing are all excellent ways to enrich your leisure time. However, if you do happen to crave the feel of a bigger city now and then, Nuremberg is only a one-hour train ride away and Munich is only two-and-a-half hours away. You can reach Berlin in four hours by car or bus and Leipzig in half that time.

**Have a great start. We look forward to meeting you!**

# Contact

## University of Bayreuth

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🌐 Course website: <https://www.scientific-computing.uni-bayreuth.de/en/index.html>

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🌐 <https://de.linkedin.com/school/university-of-bayreuth/>

📷 <https://www.instagram.com/uni.bayreuth/>

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# International Programmes in Germany - Database

[www.daad.de/international-programmes](http://www.daad.de/international-programmes)  
[www.daad.de/sommerkurse](http://www.daad.de/sommerkurse)

## Editor

DAAD - Deutscher Akademischer Austauschdienst e.V.  
German Academic Exchange Service  
Section K23 – Information on Studying in Germany  
(responsible: Esther Kirk)  
Kennedyallee 50  
D-53175 Bonn  
[www.daad.de](http://www.daad.de)

## GATE-Germany

Consortium for International Higher Education Marketing  
[www.gate-germany.de](http://www.gate-germany.de)

## Disclaimer

The data used for this database was collected and analysed in good faith and with due diligence. The DAAD and the Content5 AG accept no liability for the correctness of the data contained in the "International Programmes in Germany" and "Language and Short Courses in Germany".

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Federal Ministry  
of Education  
and Research