Why Computational Science and Engineering?

Computational Science and Engineering (CSE) is the multidisciplinary field of computer-based modeling, simulation, and data exploration for the purpose of investigating scientific phenomena and engineering applications. Modeling and simulation help to validate theory, and make it possible to analyze scenarios that would otherwise be too time-consuming, expensive, or dangerous to study by experiment. Data exploration helps to turn numbers into insight – which is especially challenging in times of Big Data.

The increasing quest for higher levels of detail and realism does not only require enormous computational capacities, but also advanced programming skills, sophisticated models, as well as efficient numerical, visualization, and data analysis methods. Traditional programs in computer science, mathematics, and engineering often do not offer an education that meets all of these requirements.

An International Experience

CSE established itself in 2001 as the first international Master’s program in the Department of Informatics at the TUM. Over the years, students from over 40 countries have joined the program, contributing to a rich multicultural atmosphere. Being part of such a diverse group of talented students will allow you to exchange ideas, strengthen your communication skills, broaden your understanding of other cultures, and, if you come from abroad, share your difficulties with the German language!

Profile of the Program

Duration of studies: 4 semesters  
Degree: Master of Science  
Start: Winter semester  
Application deadline: May 31  
Application: Further information: www.cse.tum.de/applying  
Teaching language: English  
Further Information: www.cse.tum.de

Contact

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Focus

As an interdisciplinary course, the CSE program is based on three pillars: applied mathematics (especially numerical analysis), computer science, and applications in science and engineering. In applied mathematics, CSE teaches skills in mathematical modeling and numerical analysis. In computer science, CSE focuses on efficient numerical algorithms, their (parallel) implementation, and the exploration of the results via visualization and, for instance, data mining. The scientific and engineering applications cover a huge range of temporal and spatial scales, from the simulation of molecular dynamics to computations in astrophysics. For this reason, high performance computing plays an important role in CSE.

Due to its strong focus on engineering and scientific applications, CSE is not to be confused with a computer science program. Talented students interested in pure computer science are encouraged to apply to the Informatics Master’s at the TUM (also in English).

Application Areas

The spectrum of applications in science and engineering covers various fields of high industrial relevance. These include computational fluid dynamics, computational structural mechanics, computational physics/chemistry/electronics, and computational methods in bioscience, as well as fields related to computer science, such as 3D visualization and imaging in medicine. We also encourage the study of stochastic methods (for example, for financial applications). Our academic offerings are increasing constantly, incorporating subjects from many different departments at the TUM.

BGCE

Together with its partner programs “Computational Mechanics” (at TUM) and “Computational Engineering” (at the University of Erlangen-Nuremberg), the CSE program forms the “Bavarian Graduate School of Computational Engineering” (BGCE). This honors program is part of the Elite Network of Bavaria, an initiative of the Bavarian state government to encourage highly qualified students. The BGCE offers additional courses to its most capable and dedicated students. The cornerstones of this elite program are:

- Extensive project work as a junior team in current research projects, or in cooperation with an industry partner.
- Summer/winter academies and block tutorials for a deeper understanding of the students’ fields of interest.
- Seminars on soft skills, such as presentation and communication skills, teamwork, management, and leadership.

Thus, the elite program strives to advance both the scientific education and the interpersonal skills of the students. For more details, see: www.bgce.de

Reasons for Studying at the TUM

Competence: one of the largest and most important Informatics Departments in Germany, research and teaching in nearly all related disciplines

Quality: top rankings from alumni, employers, as well as human development experts

Industrial collaborations: industrial collaborations with established international companies, EU Atlas of ICT hotspots: Munich ranks in 1st place

Practical experience: student research projects in companies

Individual support: national and international summer schools, mentoring, TUM: Young Academy, participation in 4 Bavarian elite graduate programs

Interdisciplinary skills: teamwork, presentation techniques, management and personality training, language courses

Study abroad: over 70 European and 100 international partner universities worldwide

Direct and individual: small tutorial groups, student advisory service, infopoint, career services

Family-friendly department: flexible child care, study program leave of absence due to family reasons, lectures are partly available online

Munich as a versatile place of study: one of the most favored places of study in Germany, many possibilities for cultural, sporting and leisure activities

Excellent career prospects: due to a shortage in skilled personnel in the field of information technology