

**FRIEDRICH-ALEXANDER-UNIVERSITÄT ERLANGEN-NÜRNBERG**  
INSTITUT FÜR INFORMATIK (MATHEMATISCHE MASCHINEN UND DATENVERARBEITUNG)

**Lehrstuhl für Informatik 10 (Systemsimulation)**



**High Performance Computing Education for Students in  
Computational Engineering**

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## Abstract

Numerical simulation using high performance computing has become a key technology for many scientific disciplines. Consequently, high performance computing courses constitute an essential component within the undergraduate and graduate programs in Computational Engineering at University of Erlangen-Nuremberg. These courses are also offered as optional courses in other degree programs, such as for majors in computer science.

## 1 The Erlangen Computational Engineering Program

The courses in high performance computing at University of Erlangen-Nuremberg are primarily motivated by the the *Computational Engineering* (CE) program that has been initiated by the Department of Computer Science in 1997 as a prototype two-year postgraduate program leading to a Master degree. The corresponding undergraduate program has been started in 1999. Together these two programs are accepting approximately 30 new undergraduate students and 45 graduate students, annually.

The traditional German university degree in the sciences and the engineering disciplines is the *Diplom* which corresponds approximately to the academic level of a Master degree in the US educational system. Currently the system is being reformed according to the so-called *Bologna Process*, a political agenda that is aimed at introducing a Europe-wide, standardized university degree system by 2010. This reform process will lead to an educational structure with a first degree on the Bachelor level, on top of which graduate programs leading to the Master and Doctorate can be built.

The Erlangen Computational Engineering programs are prototype implementations of this new system, since they already award Bachelor and Master degrees. Generally, the Bachelor-Master structure of academic programs is still in an experimental stage in Germany, but the transition away from the Diplom degree will accelerate during the next couple of years. All core courses of the CE Master program are taught in English and are thus open to international students without knowledge of German.

The CE program is built around a core of computer science and mathematics courses. Additionally, each student must select a *technical application* field. Currently CE in Erlangen offers application specializations in

- Mechanical Engineering
- Micro Electronics
- Information Technology
- Automatic Control
- Thermo- and Fluid Dynamics
- Material Sciences
- Sensor Technology

The curriculum requires approximately an equal number of credits in mathematics, computer science, and the application field. The university education system in Germany traditionally puts