CE @ FAU Erlangen

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GAMM Workshop CS&E Education
Rostock, 14/15. Nov. 2013
Computational Engineering

- International Master Program started in 1997
  - with DAAD support
- Bachelor program (in German) since 1999
- Highly international program with students from more than 50 countries in the last 14 years
- Required: Good Bachelor degree in science, engineering or computer science.
- Most courses in English.
International CE Students 1997-2009

Frauen: 96 + 11*)
Männer: 256 +

Σ = 352 + 40*) aus 56 Ländern

*) Started in 2009
Studierendendstatistik Bachelor

WS 13/14 | WS 12/13 | WS 11/12 | WS 10/11 | WS 09/10 | WS 08/09 | WS 07/08
---|---|---|---|---|---|---
31 | 25 | 33 | 21 | 24 | 29 | 34

Bachelor CE 1. FS
Bachelor CE Gesamt
Studierendenstatistik Master

![Bar chart showing student numbers for Master CE over different years]

- Master CE 1. FS
- Master CE Gesamt

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Rostock CS&E Workshop, Nov. 14/15, 2013
Computational Engineering – Concept

Problem formulation, modeling.

Foundation and methods for problem solving.

Algorithms for simulation, software design and implementation.

FAU
FRIEDRICH-ALEXANDER UNIV.
ERLANGEN-NÜRNBERG

LSS
### Possibilities in CE Master Studies

#### CE Master Degree

<table>
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<tr>
<th>Regular CE Master Studies</th>
<th>BGCE Elite program</th>
<th>DAAD Double Degree with KTH Stockholm</th>
<th>ERASMUS MUNDUS Program “COSSE”</th>
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</thead>
</table>
Possibilities in CE Master Studies

CE Master Degree

Regular CE Master Studies

BGCE Elite program

DAAD Double Degree with KTH Stockholm

ERASMUS MUNDUS Program COSSE
CE Master – Contents I

- Total 120 ECTS in 4 (3+1) Semesters:
  - 30 ECTS: Mathematics:
    - **Numerical Analysis**: Elementary Numerical Methods (1st sem.), Numerics of PDEs I/II, Numerical Linear Algebra (1st or 3rd sem.)
    - **Applied Math**: Optimization for Engineers, Functional Analysis (1st sem.), multigrid, other courses from applied math
    - **Seminar** (5 ECTS)
CE Master – Contents

- Total 120 ECTS in 4 (3+1) Semesters:
  - 30 ECTS: Computer Science:
    - **Scientific Computing:** Advanced Programming Techniques (1st sem.), Simulation and Scientific Computing I/II, high-performance computing
    - **Computer Science:** computer graphics, pattern recognition, computer architecture, visualization or other computer science courses
    - **Simulation project:** Numerical simulation of fluids (1st or 3rd sem.), high end simulation in practice, computational optics
CE Master – Contents

- Total 120 ECTS in 4 (3+1) Semesters:
  - 30 ECTS: Technical Application Field:
    - Automation and Control (Prof. Moor)
    - Computational Optics (Prof. Peschel)
    - Information Technology (Prof. Kellermann)
    - Mechatronics (Prof. Rupitsch)
    - Solid Mechanics and Dynamic (Prof. Mergheim)
    - Thermo and Fluid Dynamics (Prof. Delgado)
    - Material Science (Prof. Bitzek)
    - Medical Technology
  - 30 ECTS: Master Thesis
# Possibilities in CE Master Studies

## CE Master Degree

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BGCE – Bavarian Graduate School of Computational Engineering

- Joint program with TU Munich within the Elite Network of Bavaria: [http://www.elitenetzwerk.de](http://www.elitenetzwerk.de)
- Started in 2005 and extension until 2015
  - (provided external review on Nov 19 will be positive)
- For exceptionally talented and motivated students.
- Motto: “Do more, get more!”
- Awarded with degree “Master of Science with Honours“.
- Regular CE master program plus additionally 30 ECTS:
  - 10 ECTS for project work,
  - 10 ECTS for CE specific lectures and
  - 10 ECTS for soft skill courses.
BGCE Additional Courses

- CE-Specific Scientific Courses:
  - Block tutorials, e.g.
    - Hyperbolic Equations (J. Oppelstrup, KTH Stockholm).
    - Simulation in microfluidics (S. Chakraborty, IIT Kharagpur)
    - Adaptiev Methods (L. Stals, Australian National University)
  - Summer Schools:
    - Ferienakademie Sarntal, Southern Tirol.
    - Indo-German Winter School, hosted by the IITs.
  - BGCE Research Days, once a semester at each site (Erlangen, Garching, Munich).
Possibilities in CE Master Studies

CE Master Degree

- Regular CE Master Studies
- BGCE Elite program
- DAAD Double Degree with KTH Stockholm
- ERASMUS MUNDUS Program “COSSE”
DAAD Double Master Degree

- Started in 2008 together with the Royal Institute of Technology in Stockholm.
- Idea:
  - First half of the master studies are done in Erlangen,
  - the second half is done in Stockholm (or vice versa).
  - The graduates get degrees from both universities.
- Provides international experience with respect to research and intercultural exchange.
- Graduates become more competitive in industry and research.
- Gain profit from existing expertise in CSE at both universities.

The program is more than the sum of two excellent programs.
Possibilities in CE Master Studies

CE Master Degree

- Regular CE Master Studies
- BGCE Elite program
- DAAD Double Degree with KTH Stockholm
- ERASMUS MUNDUS Program “COSSE”
COSSE – Study Plan

1st and 2nd Sem.

Compulsory core courses
- Numerical Analysis: 15 ECTS
- Applied Mathematics: 15 ECTS
- Scientific Computing: 15 ECTS

Joint Workshop
- Preparatory courses for specializations: 15 ECTS

3rd Sem.
- Bio Mod alt.: 15 ECTS
- Mat Sci: 15 ECTS
- Num Lin Alg alt.: 15 ECTS
- CFD: 15 ECTS
- Electives: 15 ECTS
- Electives: 15 ECTS
- Control alt.: 15 ECTS
- Optimization: 15 ECTS
- Electives: 15 ECTS

4th Sem.
- Master Thesis Project: 30 ECTS
- Joint home and host university

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Rostock CS&E Workshop, Nov. 14/15, 2013
Problems

• Scientific Coherence lacking in some fields
  • Some Technical Application Fieds are not CS&E
  • they only in the program for historical or „political“ reasons

• Support depends on individuals
  • not structurally ensured
  • often young faculty that come and go
  • permanent changes in the curriculum

• Internal competition
  • e.g. with Technomathematik
  • perceived by colleagues and faculty as a „a variant of“ Informatik (which it is not supposed to be)
  • tendency to collect „dropouts“ form other programs