Bachelor and Master Curriculum

COMPUTER ENGINEERING
(TECHNISCHE INFORMATIK)

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Academic year 2014/15
Computer Engineering applications once…

- Systems-on-Chip
- Cyber-physical Systems
- Real-Time Systems
- Fault-Tolerant Systems
- Distributed Systems
- HW/SW Codesign
CE Challenges

Interdisciplinarity:

- Computer science
- Mathematics (also continuous!)
- Electrical engineering
- Physical/technical application knowledge

Integrative View:

- Hardware/software
- Signal processing
- Communications
- Dependability
- Real-time processing
- Security
- Energy/resource efficiency
CE Research

Experimental

Theoretical

Technological

CE

Round $K$ Perception Matrix

proc 2's perception of 1's broadcast data $V_t$

proc 1's view

at most additional $f_{(f_{(t_1)})}$

receive link failure/row

send link failures/column

0: VAR $k$: integer := 0;
1: /* Initialization */
2: send tick(0) to all [proc];
3: if received tick(1) from at least $f + 1$ distinct processes with $f > k$;
4: $\frac{\ln f_{(f_{(t_1)})}}{1 - f_{(f_{(t_1)})}} - \frac{\ln f_{(f_{(t_1)})}}{1 - f_{(f_{(t_1)})}}$
5: /* Non-correctable*/
6: /* Symmetric*/
7: /* Asymmetric*/

additional $f_{(f_{(t_1)})}$

proc 1's view

receive link failures/row

send link failures/column

proc 2's perception of 1's broadcast data $V_t$

additional $f_{(f_{(t_1)})}$
TI Curricula
TI Curricula at TU Vienna

✓ Bachelor Technische Informatik (BTI, 535)
  • Typical number of students
    – 50-70 beginners
    – 40-50 in 3rd semester
    – 30-40 graduates
  • Some courses imported from ETIT faculty
  • Most first year courses shared with other Informatik-Bachelors

✓ Master Technische Informatik (MTI, 938)
  • Typical number of students
    – 30 in 2nd semester
    – 20 graduates
  • Individual selection of optional courses
Qualifications Bachelor CE

- Advanced development of embedded systems
  - VLSI Design
  - Microcontroller/DSP software development
  - Dependable systems
- Applications engineering
- Research assistance
Some Austrian CE companies

- **ABB** (Wien): SCADA Systems, Verkehrstechnik, …
- **AVL** (Graz): Verbrennungsmotoren, Testbeds und Meßequipment, Simulation, …
- **Bosch** (Wien): Einspritztechnik, ABS, Fahrer-Informationssysteme, …
- **Elektrobit** (Wien): Zuverlässige Computersysteme mit Fokus auf „by-wire“ Applikationen im Auto
- **Frequentis** (Wien): Kommunikationssysteme für Flugsicherung, Rettung, Feuerwehr, Schiffahrt, …
- **Infineon** (Wien, Klagenfurt): Chip-Technologie
- **Keba** (Linz): Roboter-Handhabungsgeräte, SB-Banking, Lotterieterminals, …
- **Magna** Graz): Fahrzeugtechnik
- **RUAG Space** (Wien): Elektronik, Signalverarbeitung & Kommunikation für Satelliten
- **TTTech** (Wien): Zeitgesteuerte Echtzeittechnologie für kritische Anwendungen
## Overview Courses Bachelor CE

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<th>Course</th>
<th>ECTS</th>
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<td>Program construction (8.8 ECTS)</td>
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<tr>
<td>Foundations of Digital Systems (6 ECTS)</td>
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<tr>
<td>Analysis (6 ECTS)</td>
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<tr>
<td>Algebra and discrete math. (9 ECTS)</td>
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<tr>
<td>STEG (0.2 ECTS)</td>
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<tr>
<td>Algorithms and data structures (9)</td>
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<tr>
<td>Foundations of electrical engineering (7.5)</td>
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<td>Analysis II (7.5)</td>
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<tr>
<td>Theoretical Computer Science and Logics (6)</td>
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<tr>
<td>Probability theory and stochastic processes (7.5)</td>
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<tr>
<td>Computer architecture and operating syst. (9)</td>
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<td>Modeling in Physics (6)</td>
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<tr>
<td>Signals und Systems (4.5 + 4.0)</td>
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<tr>
<td>Program and system verification (6)</td>
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<td>Dependable real-time systems (6)</td>
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<td>Microcontrollers and operating systems (10)</td>
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<td>Digital Design (3 + 9)</td>
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<td>Control theory (6)</td>
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<td>Optional courses (6)</td>
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<td>Scientific working (3)</td>
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<td>Distributed Automation (6)</td>
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<td>Optional courses (6)</td>
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<td>Bachelor project (10)</td>
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1. **Programming**
2. **Hardware**
3. **Signals & Systems**
4. **Dependable Systems**
Target group

✓ BTI is probably the most challenging Bachelor-program of the Faculty of Informatics, and hence particularly interested in excellent students.

BUT:

✓ Not at all out of reach also for „mere mortals“ !
✓ Not at all „reserved“ for HTL graduates only !
✓ Possible switch from BTI to other Informatics-Bachelor during the 1. Jahr with marginal loss easy !
✓ Continuing with other Informatics-Master (like Software und Information Engineering) easily possible !
Highlights

✓ Except for the common first-year courses, BTI and MTI offer student-to-staff ratios comparable to first-rate international universities!

✓ Both national and international companies are desperately looking for excellent TI experts → excellent job perspectives!

✓ Multidisciplinary work is intellectually challenging and satisfactory → guarantees life-long interest!
Checklist „Bachelor TI 4 Me“?

- Interest in electrical engineering and „technical“ applications?
- Interest in mathematics (including calculus)?
- Holistic view?
- Enjoy solving puzzles?
- Written and oral communication skills, in particular, towards other disciplines?
- Ability to (also) work in teams?
Qualification Master CE

- Scientific research
- Industrial research
- Design and Analysis of complex embedded systems
Overview Courses Master CE

Key areas: Dig. design  Sig.& systems  Dep.systems  Verification

1. Discrete Mathematics (9 ECTS)  HW/SW Codesign (6 ECTS)  Stochastic signal processing (4.5 ECTS)  Formal Methods in Computer Science (6 ECTS)


3. Optional courses (9)  Embedded Systems Engineering (6 + 6)

4. Optional courses (6)  Master thesis (30)

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FAKULTÄT FÜR INFORMATIK
Admission to Master CE [Requirements]

For every listed subject (= course in Bachelor CE), at least the given number of ECTS must have been earned on comparable Bachelor-level. Otherwise, the missing Bachelor CE course(s) must additionally be passed successfully before completing the Master program.

- **Predecessor Inf/ET/Math/Physics Bachelor („generic“)**
  - 9 Algebra und Diskrete Mathematik
  - 6 Analysis
  - 6 Wahrscheinlichkeitstheorie und Stochastische Prozesse
  - 9 Algorithmen und Datenstrukturen
  - 6 Theoretische Informatik und Logik
  - 7,5 Elektrotechnische Grundlagen
  - 9 Rechnerstrukturen u. Betriebssysteme oder 10 Microcontroller u. Betriebssysteme
  - 12 Digital Design
  - 8,5 Signale und Systeme
  - 6 Zuverlässige Echtzeitsysteme

- **Predecessor BSI**
  - 7,5 Elektrotechnische Grundlagen
  - 12 Digital Design
  - 8,5 Signale und Systeme
  - 6 Zuverlässige Echtzeitsysteme

- **Predecessor BMI, BZI**
  - 7,5 Elektrotechnische Grundlagen
  - 6 Betriebssysteme
  - 12 Digital Design
  - 8,5 Signale und Systeme
  - 6 Zuverlässige Echtzeitsysteme

- **Predecessor Bachelor ETIT**
  - 9 Algorithmen und Datenstrukturen
  - 6 Theoretische Informatik und Logik
  - 9 Rechnerstrukturen und Betriebssysteme
  - 6 Zuverlässige Echtzeitsysteme
Checklist „Masterstudium TI 4 Me ?“

☑ Bachelor-level basic knowledge in computer science and electrical engineering (ideal: Bachelor TI) ?
☑ Interest in scientific research ?
☑ Formal-mathematical inclination ?
☑ Interdisciplinary interest ?
☑ Holististic view ?
☑ Writing Skills ?
☑ Self-organization ?
Further Info

- TI-Portal: http://ti.tuwien.ac.at
- Faculty: http://www.informatik.tuwien.ac.at
- BTI & MIT info: http://ti.tuwien.ac.at/institute/teaching
- Studienpläne: http://www.informatik.tuwien.ac.at/lehre/studienplaene