



# Components, Basic Circuits & Simulation (MScTI\_ANASIM)

Prof. Dr. P. Fischer

Lehrstuhl für Schaltungstechnik und Simulation  
Technische Informatik der Uni Heidelberg



# Organization

- Lecture & Exercise:
- Points            6 Credit Points
- Time:            **Monday (new!), 14:00 – 17:15 (15' break)**
- Location:        CIP Pool of new Physics Institute
- Teacher:        Prof. Dr. P. Fischer  
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- Internet:        <http://sus.ziti.uni-heidelberg.de/Lehre>
  
- Examination: written examination ('Klausur')  
The exercises are part of the exam!



# Exercises

- Mainly in 2<sup>nd</sup> block (but also in 1<sup>st</sup>...)
- Homework can be done remotely
  - In student room in Mannheim, B6, 26, room 3.01
  - In CIP Pools (KIP, PI, ...)
  - Remote via NX Client (will be explained...)
- All students need an account at the chair of circuit design
  - Will be distributed in one of next lectures
- For using the umc180 technology, a non-disclosure agreement has to be signed!



# Content

- **Basics**
  - Voltage and current sources, Thévenin equivalent
  - Bode plot, transfer function, low- and high pass
- **Devices**
  - Semiconductor properties
  - Diode and transistor operation
- **Schematic Entry & Simulation:**
  - Symbols & Schematics, multiple instances, hierarchy
  - Modeling of Diode und MOS, large / small signal models
  - Analogue simulation (dc, ac, transient, sub-circuits)
- **Circuits:**
  - current mirror, gain stage, cascode, source follower, differential pair, switch
  - Differential amplifiers (maybe folded cascode)



## Further Comments

- The lecture is a mandatory element of major ‚chip design‘
- Focus is on design of analogue circuits as a preparation of the VLSI Design lecture



## Literature

- **Einführung in die Halbleiter Schaltungstechnik**  
H. Göbel (Author of the 'Smile' Applets), Springer, ISBN 3-540-23445-4, ~50€  
Easy to understand, nice level CD with Applets & PSPICE.
- **Analysis and Design of Analog Integrated Circuits**  
P. R. Gray, P. J. Hurst, S. H. Lewis, R. G. Meyer, 4th edition, Wiley & Sons, New York, 1993. 129.25 €  
Classic for analogue Design. Easy to read, but high level.
- **Principles of CMOS VLSI Design**  
Neil H. E. Weste, K. Eshraghian, Addison-Wesley 1994, ISBN 0-201-53376-6, 91 € (Amazon)  
Classic for CMOS Design, easy to read, not really up to date but sufficient for beginners.