RUPRECHT-KARLS-
UNIVERSITÄT
HEIDELBERG

Advanced Analogue Building Blocks

P. Fischer, Heidelberg University

Goals

- Get to know more advanced (analogue) circuits
- Understand their working principle. Be able to ‘read’ circuits.
- Be able to design, simulate and optimize circuits
- Learn how to chose good component sizes,…
- Predict and derive performance figures (speed, noise)
- Be able to study stability, PSRR, CMR,…

- Know typical circuit solution for some standard problems (Amplifiers, Comparators, ADC, DAC, PLL,…)

- Prerequisites:
  - Mandatory: Components, Circuits & Simulation or similar
  - Cadence must be known!
  - Best, but not mandatory: VLSI Design or similar

Possible Topics

- Charge Amplifiers & Noise
- Reminder & Advanced Current Mirrors
- Voltage / Current References
- Amplifier Topologies
- Comparators – time continuous and gated
- Switches, Charge Injection, Compensation, Gate Boosting
- Logic Families: CMOS, NMOS, Dynamic, Differential
- Transconductors
- DACs, ADCs
- Switched Capacitor Circuits
- PLL, DLL
- RAM, CAM
- gmC Filters, ICONs,...

Preliminary Plan

- Summary of CCS circuits
- Noise and Charge Amplifiers
- Voltage / Current References
- Reminder and some more current mirrors
- Differential Logic

Format of the Class

- There was too little active participation in exercises in last years!

- Structure (per topic):
  - Introductory Lecture & Demo
  - Definition of a project goal
  - Exercise sheet, guiding through design -> SIGNIFICANT own work!
  - Chance for questions
  - Refinement / Optimisation of circuits, discussion

- We will work on a common library
  - One category (~ subdirectory) per participant (and me)
  - Can open / discuss designs of everyone in the exercise
  - Can compare to what others do (and control…)

Caveat

- This lecture only makes sense if you invest a significant time in own work!

Examination

- Oral examination of ~30 minutes