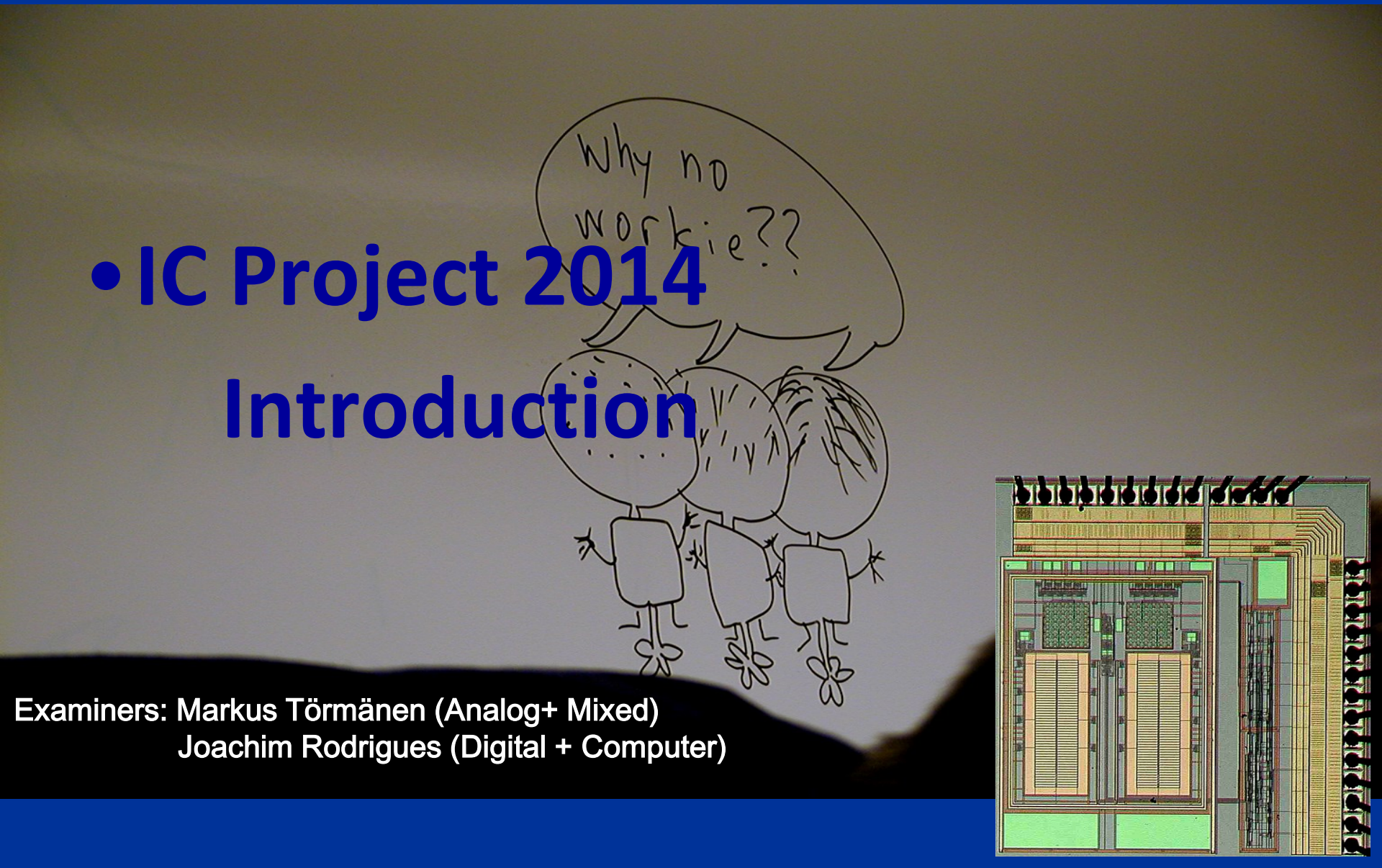
ETIN35 & ETIN40 – IC Project 1 & 2

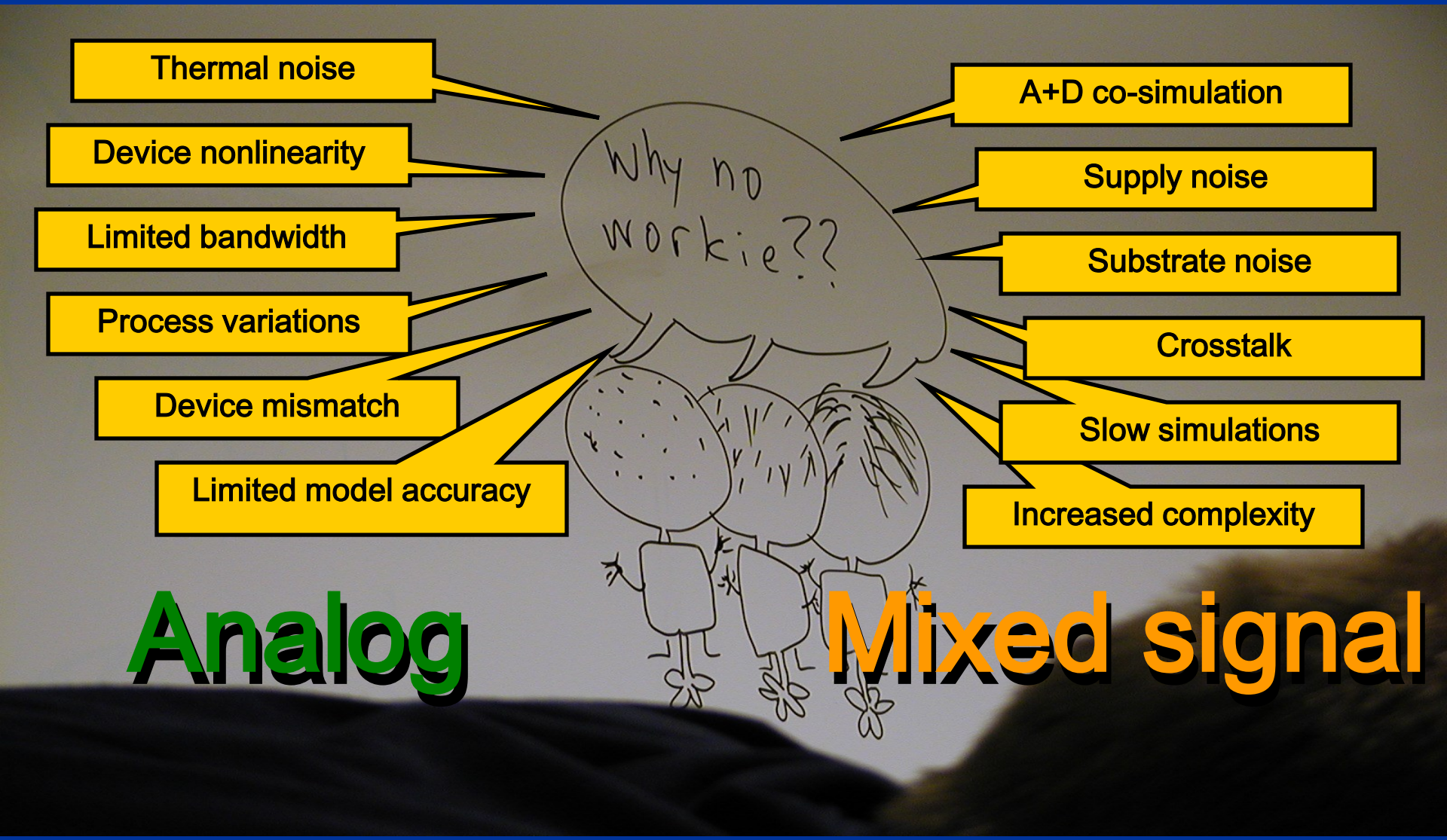


- **IC Project 2014**

  Introduction

Examiners: Markus Törmänen (Analog+ Mixed)
Joachim Rodrigues (Digital + Computer)

IC Design Challenges



Large project

Time frame:

- Projects start now
- Circuits sent for fabrication: ~June 2014
- Circuits back for measurements: ~September 2014

Groups:

- 2-3 students per group

Important:

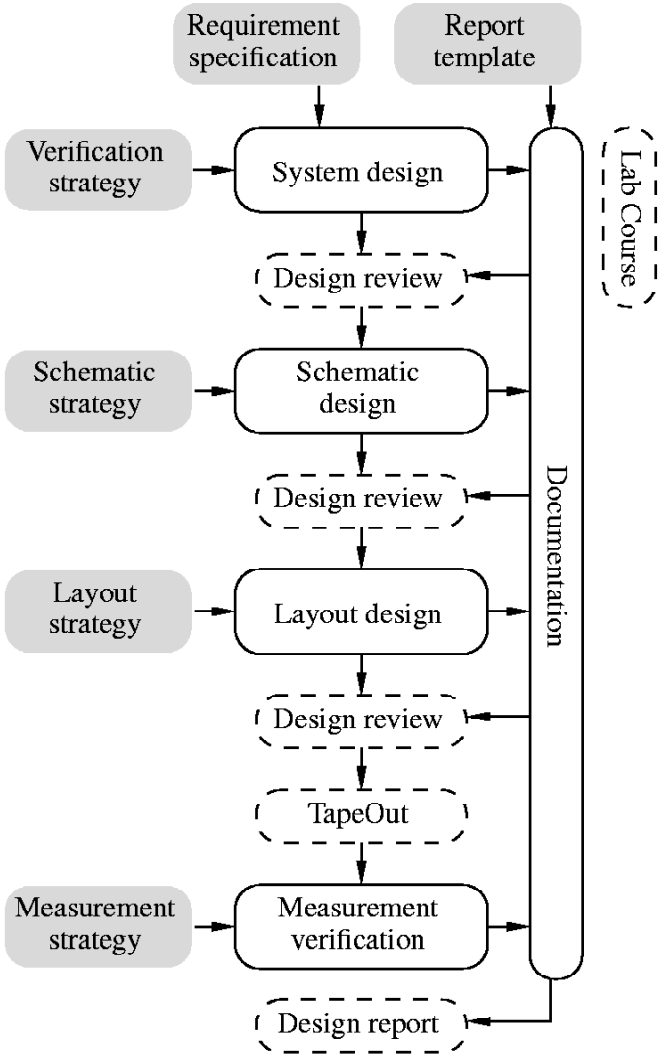
- Make & follow time-plan
- Systematic approach

Time plan bullets

- Literature search and studies
- System simulations
- Choice of circuit topologies, hand calculations
- Circuit simulations
- Layout work
- Measurements
- Writing of report (distributed)

Recommend 1 meeting/week with supervisor

Teaching Top Down Design Methodology through IC Design Projects



Project input

Project execution

Project examination

Analog & Mixed IC Projects 2014 Rough Timeplan

- 2014 VT1 – **System model review**.
  Study phase as well as designing and simulating a structural **system model.**

- 2014 end of VT1 – **Schematic design review**. **Schematic level design** and simulations

- 2014 VT2 – **Tape-Out design review**.
  Layout and post layout simulations

- 2014 fall HT1-HT2
  Measurement verification & **design report**

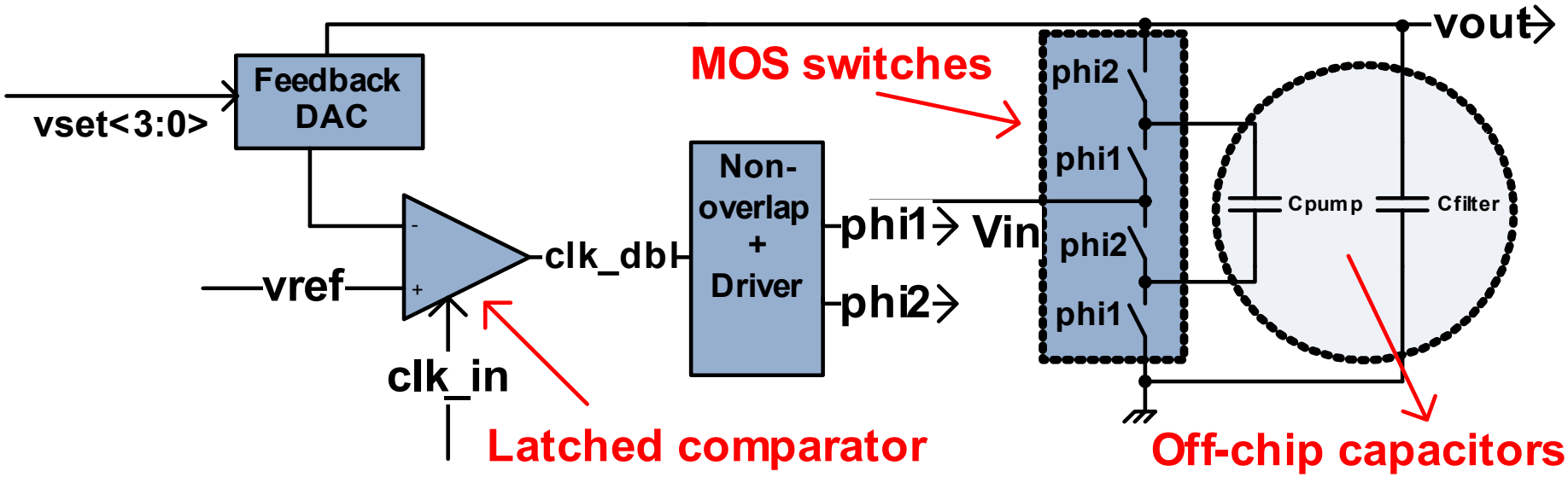
Requirements

- *Passed Analog IC exam*
- *(Passed Digital IC exam)*

- **ETIN35 - 7.5 credits:**
  - Design and implementation of a circuit prototype in UMC 130-nm CMOS
  - 3 Design reviews (project milestones)
  - Written design report

- **ETIN40 - 7.5 credits:**
  - Measurement verification & report

Project 1: Switched cap. regulated voltage doubler

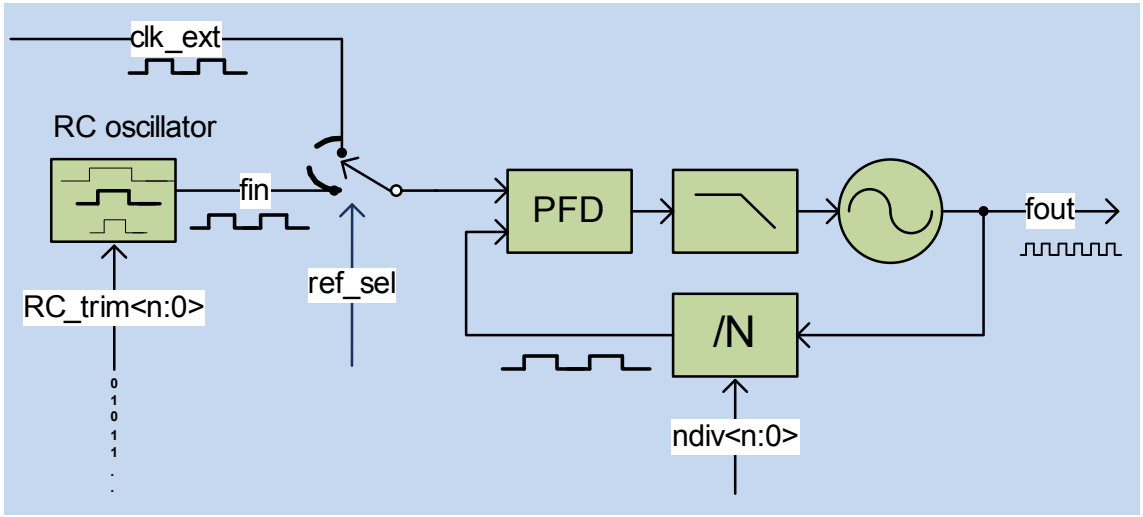


Initial Specifications:

Vin	1.2V
Vout(unloaded)	1.6V to 2.4V(50mV steps)
Rout	10Ω
clock frequency	2MHz
Iload(max)	5mA
Efficiency	>90%
Cpump	220nF(external)
Cfilter	4.7uF(external)

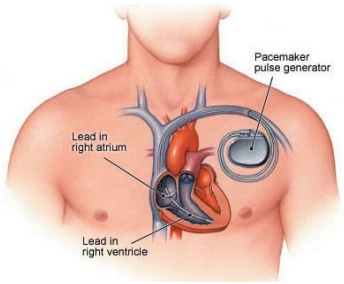
Supervised by Waqas Ahmad or Mohammed Abdulaziz

Project 2: Ultra low-power clock generator



Initial Specifications:

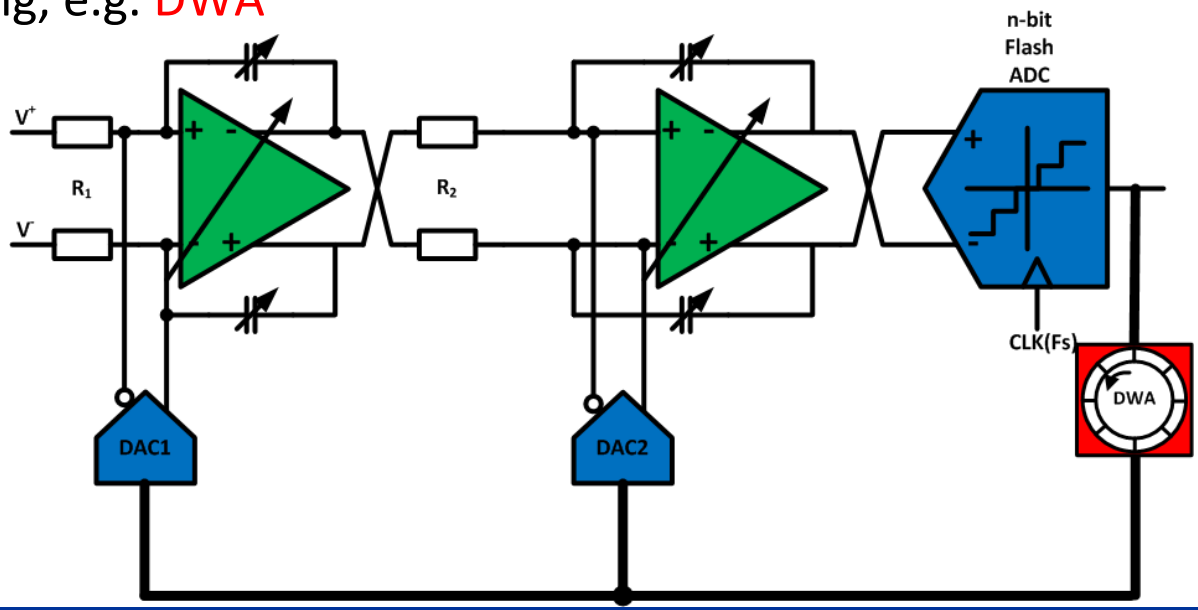
Parameter	value
fout	32MHz(N=32)
Phase Noise	-90dBc/Hz@250kHz
Current cosumption	40uA
dfin/dTemp(RC osc.)	±0.2% (-10C<Temp<60C)



Supervised by Waqas Ahmad or Mohammed Abdulaziz

Project 3: Continuous Time ΔΣ Modulator

- Reconfigurable for different bandwidth
  - GSM: 200kHz
  - Bluetooth: 1MHz
  - WCDMA: 5MHz
- Reconfigurable Op-amp for power saving
- Multi-bit quantizer + DAC
- Dynamic element matching, e.g. DWA



Apply for a project now!

Talk to the supervisors:

- Waqas Ahmad
- Mohammed Abdulaziz
- Xiaodong Liu

or to the course manager Markus Törmänen

Participants

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