ECE 5/411 CMOS Analog IC Design

Course Introduction

Vishal Saxena

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Course Outline

- **Instructor**   : Vishal Saxena
- **Time**   : Monday, Wednesday, 6:00-7:15 p.m.
- **Course dates**   : Jan 19 – May 6, 2011.
- **Location**   : MEC 206
- **Office Hours**   : Monday, Wednesday, 4:30-5:30 p.m.
- **Holidays**   : March 28 & 30.
- **Final Exam time**: (Tentative) Monday, May 9, 2011, 6:00-8:00 p.m.
- **Course TA**   : Sakkarapani Balagopal (Bala)
- **Website**   : http://coen.boisestate.edu/ams/courses/ece5411/s11/ECE5411.htm

Course Topics

❑ Analog Modeling

❑ Current mirrors

❑ Voltage references

❑ Negative feedback systems and stability

❑ Amplifiers, frequency compensation, opamps.
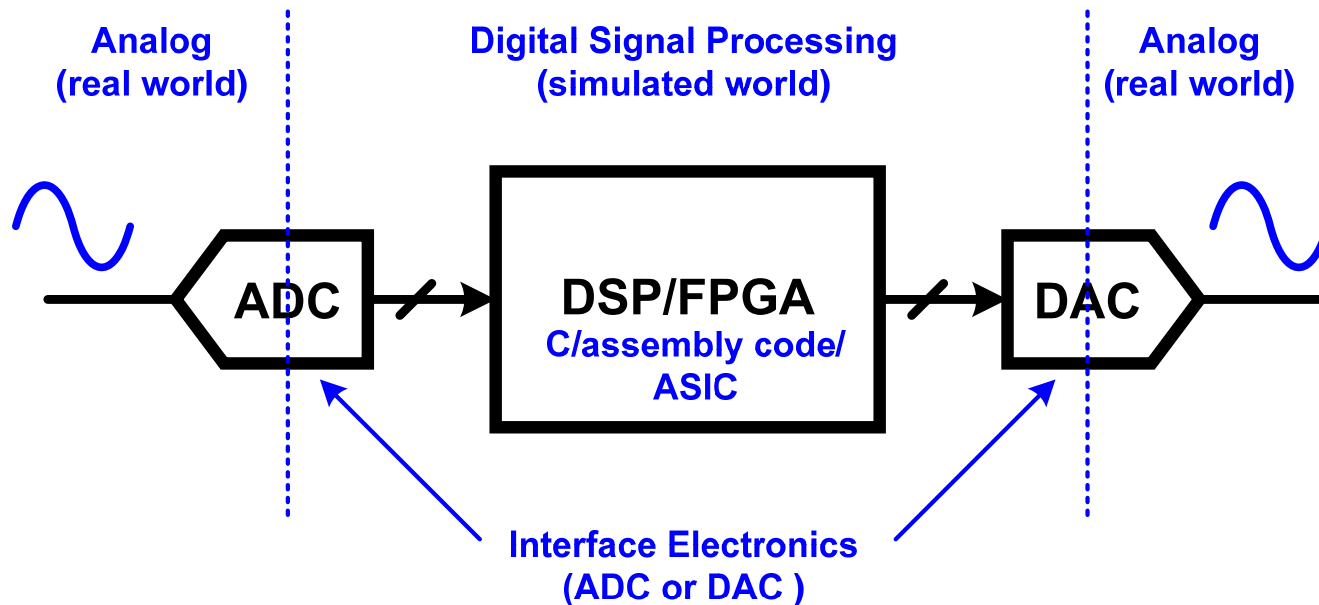
❑ PREREQ: ECE 5/410.

Textbook and References

❑ <u>CMOS Circuit Design, Layout and Simulation</u> – R. J. Baker, 3nd Edition, Wiley-IEEE, 2010.

❑ For detailed references and handouts see this <u>page</u>.

❑ Other references:

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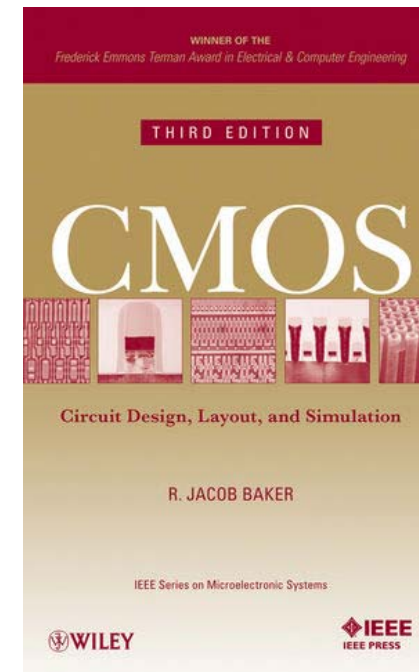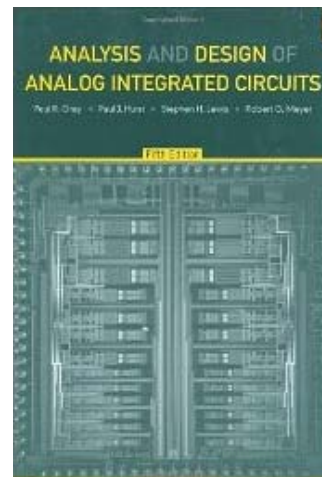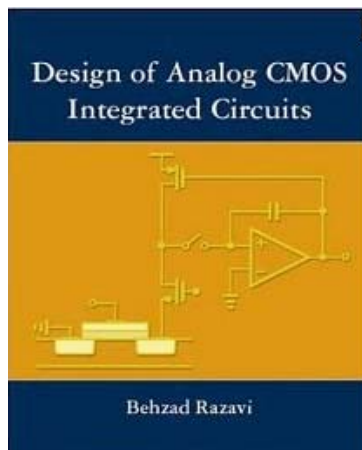
Course Pedagogy, Grading and Policies

❑ Combination of lecture notes, slides and simulation
- ✓ Lecture notes will be posted online
- ✓ Additional slides, Matlab code etc will also be posted.

❑ Workload (Grading)
- ✓ Homeworks (20%): Weekly assignments.
- ✓ Midterm Exam1 (20%)
- ✓ Midterm Exam2 (20%)
- ✓ Project 1 (20%): Opamp design and characterization
- ✓ Final (20%)

❑ Policies
- ✓ No late work.
- ✓ Neither the final exam nor final project will be returned at the end of the semester.
- ✓ Plagiarism is not acceptable.

Why Analog ?

**Analog
(real world)** **Digital Signal Processing
(simulated world)** **Analog
(real world)**

ADC → **DSP/FPGA
C/assembly code/
ASIC** → **DAC**

**Interface Electronics
(ADC or DAC)**

❑ Real world is analog.

❑ Digital world: Discrete-time, discrete-amplitude signal representation.

  ✓ Interface circuits: ADC and DACs.

❑ High speed circuits are analog (Serial IOs, 60 GHz RF)

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Analog Circuits in Modern VLSI Systems

❑ Analog to digital conversion

❑ Digital to analog conversion

❑ Amplification

❑ Analog filters

❑ Signal processing circuits at high frequencies

  ✓ RF, Serial IO, etc.

❑ **Power management-voltage references, voltage regulators**

❑ **Oscillators, PLL, DLL**
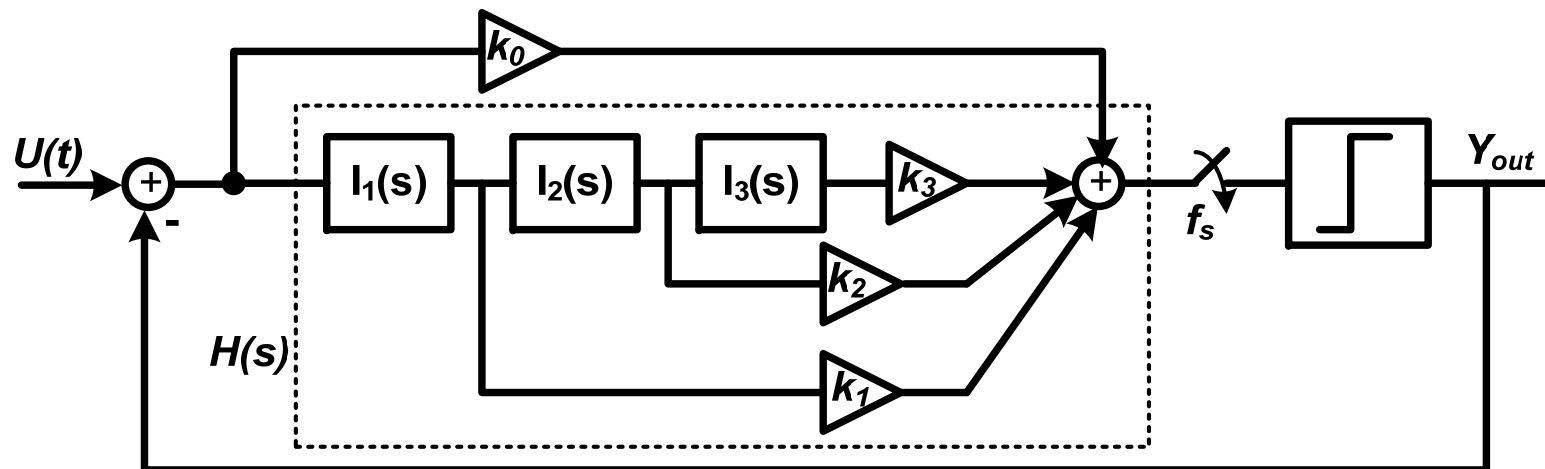
  ✓ The last two are found even on many "digital" ICs

System Level View
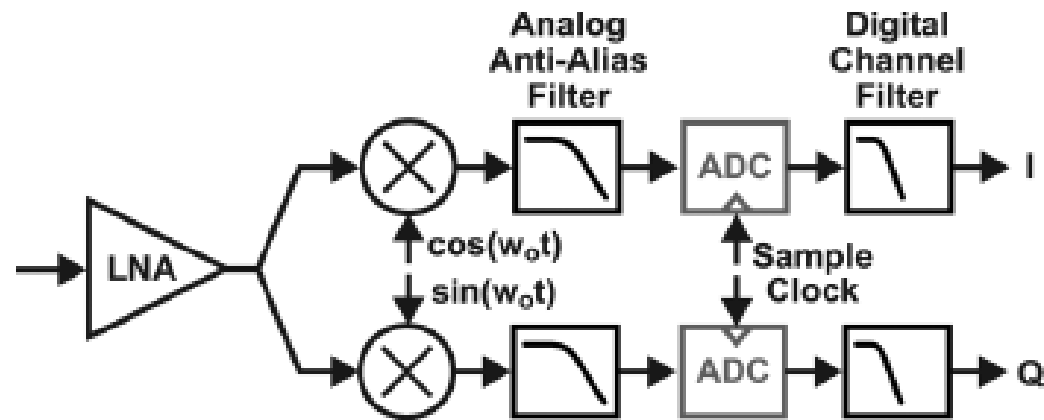
❑ Top-down approach is used in system design.
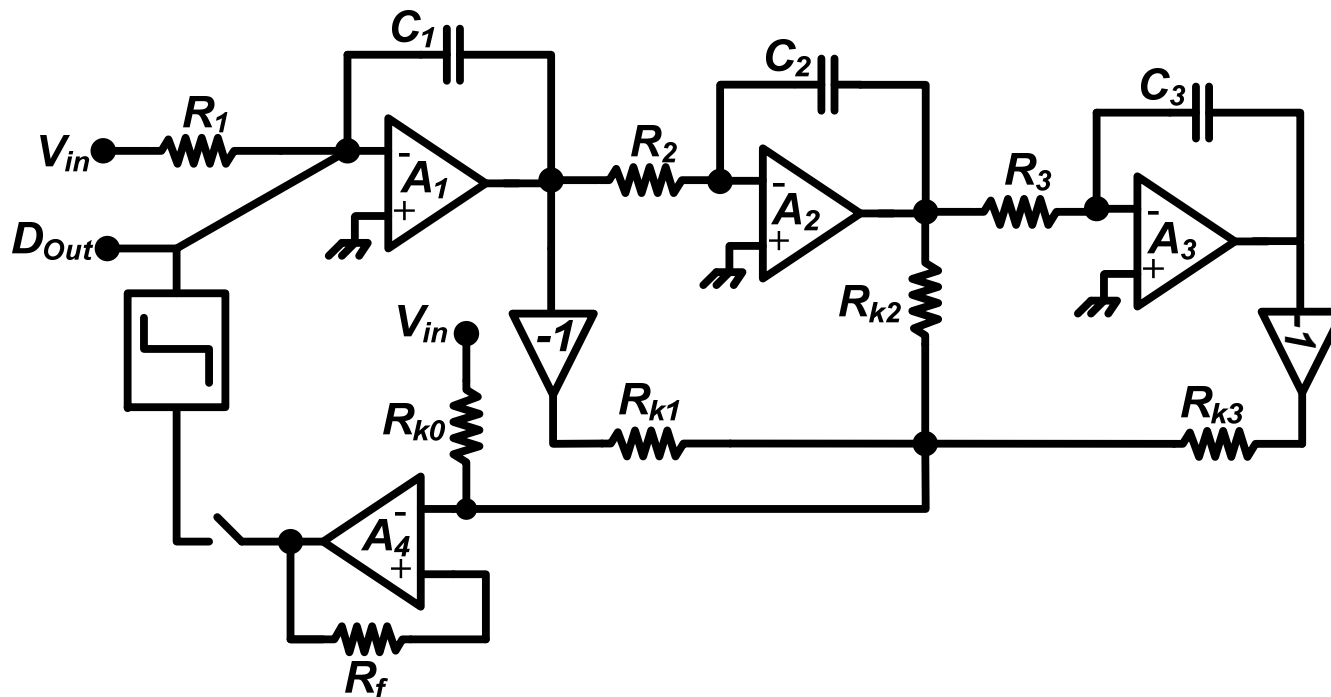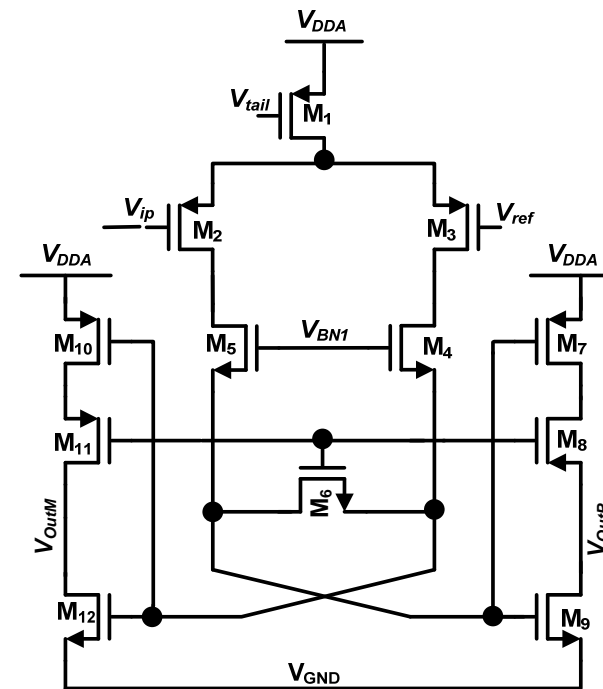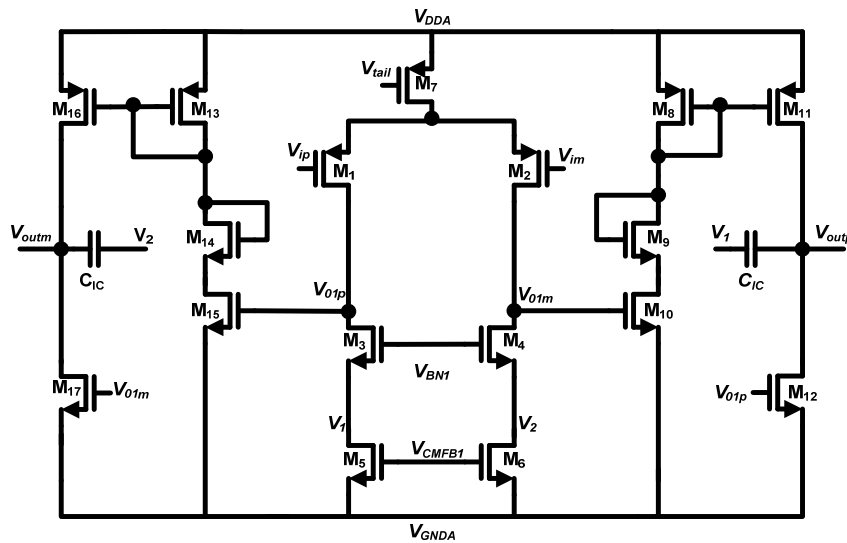❑ Scope: Thesis/dissertation work.

Block Level View

❑ Scope: Data converters, Advanced Analog courses.

Circuit Level View

☐ Scope: Advanced Analog, Active Filter Design, Mixed-Signal courses.

Transistor Level View

❏ In this course, we will deal with basics of transistor-level analog design.