EEE 5321 CMOS Amplifiers

Credits: 3 credits

Textbook, title, author, and year: Behzad Razavi, "Design of Analog CMOS Integrated Circuits", 2nd Edition, McGraw Hill 2017

Reference materials:. Software: OrCAD Lite (PSPICE) Version 16.6 available for free online. See http://www.ema-eda.com/products/orcad/demosoftware.aspx . ADS (available via FAU VMware)

Specific course information: Theoretical and computer-aided analysis, simulation and design of analog CMOS integrated circuits: MOS device physics, Second-order effects, Single-Stage CMOS amplifiers, Differential CMOS Amplifiers, Current Mirrors, Frequency Response and Feedback in CMOS Amplifiers, Noise Effects, Operational Amplifiers and OTAs, Switched-Capacitor Amplifiers, CMOS Fabrication and Layout Technology.

Catalog description: Analysis, simulation, and computer-aided design of basic open-loop and feedback, single-stage and differential CMOS amplifiers, taking into account frequency response, noise, and parameters tolerance. Design software includes Excel, Pspice and ADS.

Prerequisites: Prerequisites: EEE 4361 Electronics 2 or Permission of Instructor .Prerequisite Topics**:** 1) Basic understanding of MOSFET transistors Level 1 Model - DC operation as well as small-signal models 2) Basic familiarity with electronic circuits simulation, such as PSPICE - Transient, Bias-Point Detail, DC Sweep and AC Sweep Modes.

Specific goals for the course: The student will demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. 2. The student will demonstrate ability to apply knowledge of math, science and engineering. 3. The student will demonstrate the ability to communicate in writing a technical report.4. The student will demonstrate ability to identify, formulate, and solve engineering problems.

Brief list of topics to be covered:
MOSFET Level 1 I-V Relationship and Model Parameters. Analysis and Design of Common Source (CS) Amplifier: R_D Load, Diode-Connected Load, Current Source Load. Analysis and Design of Common Gate (CG) Amplifiers. Analysis of Source Follower Amplifiers. Model-Free Submicron CMOS Analog Design by Means of Transconductance Efficiency. Large Loop-Gain Design Philosophy, The Gain-Bandwidth Product, Four Amplifier Types. Noise in CMOS Amplifiers: Thermal Noise and Flicker Noise, Noise in Single-Stage Amplifiers, Noise in other Amplifiers.