

Spring 2024

ESE411: Analog Integrated Circuits

Instructor: Dmitri Donetski e-mail: dmitri.donetski@stonybrook.edu

Office hours: Tuesdays, Thursdays, 3 - 5 PM, or in Zoom by appointment

Prerequisite: ESE372 or equivalent

Description: Single-stage amplifiers biased and loaded with current sources. Frequency response. Two stage operational amplifiers designed by conventional and computer aided techniques. Negative feedback and stability. Frequency compensation of feedback amplifiers to avoid oscillation.

Lectures: Humanities, 3018, Mondays and Wednesdays, 2:30 – 3:50 PM

Learning outcomes: Ability to identify transistor configurations and functional blocks in integrated circuits. Ability to estimate voltage gain, input and output impedances of open loop amplifiers and amplifiers with negative feedback. Familiarization with design methodologies of analog circuits. Ability to design amplifiers with CAD tools.

Textbook: B. Razavi, Design of Analog CMOS Integrated Circuits, 2nd ed., 2016, McGraw Hill, ISBN-13: 978-0072524932 (recommended).

Grading: 10 homeworks (20 pts), 12 quizzes (48 pts), 4 simulation assignments (16 pts), project (12 pts), lecture activity and questions (4 pts). No final exam.

Topical outline:

1. **MOSFET and BJT parameters:** fabrication of integrated circuits, - 5%
2. **Single-ended amplifiers:** biasing, active load, frequency response, Miller's theorem, cascode amplifier - 30%
3. **Differential amplifiers:** differential pairs with active load, differential gain, common-mode gain, common-mode rejection ratio, non-ideal characteristics, frequency response - 30%
4. **Negative feedback:** four basic feedback topologies, loop gain, stability and pole location, frequency compensation - 15%
5. **Operational Amplifiers:** OpAmp architectures, two-stage and folded cascode amplifiers, DC and small signal parameters, frequency response, slew rate - 20%

References:

1. B. Razavi, Fundamentals of Microelectronics, 2nd ed., 2014, Wiley, ISBN 978-1118156322
2. A. Sedra, Microelectronic Circuits, 8th ed., 2019, Oxford, ISBN 9780190853464

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