

# ECEN 474/704: (Analog) VLSI Circuit Design

---

Spring 2018

Local Sections: TR 11:10AM-12:25PM, WEB 049 (Lecture)

Distance Learning: Lecture video will be posted online TR at ~4:00PM

<http://www.ece.tamu.edu/~spalermo/ecen474.html>

**Instructor:** Sam Palermo

**Office:** 315-E WERC

**Office Hours:** T 2:30PM-4:00PM, W 8:30AM-10AM

**Phone:** 458-4114

**E-mail:** [spalermo@tamu.edu](mailto:spalermo@tamu.edu)

**Prerequisite:** ECEN 326

**Textbook:** *Design of Analog CMOS Integrated Circuits, 2<sup>nd</sup> Edition*, B. Razavi, McGraw-Hill, 2017.

## References:

1. *Analog Integrated Circuit Design*, T. Chan Carusone, D. Johns and K. Martin, John Wiley & Sons, 2<sup>nd</sup> Edition, 2011.
2. *Analysis and Design of Analog Integrated Circuits*, P. Gray, P. Hurst, S. Lewis, and R. Meyer, John Wiley and Sons, 5<sup>th</sup> Edition, 2009.
3. *Microelectronic Circuits*, A. Sedra and K. Smith, Oxford University Press, 7<sup>th</sup> Edition, 2014.
4. Technical Papers

**Class Notes:** Posted on the web

**Objectives:** At the end of this course, students be able to

1. To discuss basic transistor models and layout techniques for design and characterization of analog integrated circuits.
2. To study the most important building blocks in CMOS technologies and understand their advantages and limitations.
3. To design basic analog IC circuits considering practical parameters.
4. To use the IC design tools, especially Cadence, Spectre, Spice, and Matlab.
5. We expect to design and fabricate some projects at the end of the semester.

## Grading:

- **Exams** **60%**
  - Three Midterm Exams (20% each)
  - Closed book
  - One double sided 8.5x11 note sheet allowed
  - No make-up exams except for university excused absences
  - No Final Exam
- **Homework** **10%**
  - You are encouraged to work together with your colleagues on the homework. However, each student must turn in an independent write-up.
  - No late homework will be graded
  - 704 students may have additional problems in the homework assignments
- **Laboratory** **20%**
- **Final Project** **10%**
  - Report and PowerPoint presentation required

### Grading Policy\*:

Letter Grade	x = Your Average
A	$x \geq 90.00$
B	$89.99 \geq x \geq 80.00$
C	$79.99 \geq x \geq 70.00$
D	$69.99 \geq x \geq 60.00$
F	$59.99 \geq x$

\*This is the lowest grade that you are guaranteed for your raw average, x. Depending on the relative performance of the class, your grade **MAY** be adjusted higher. **Undergraduate and graduate students' performance will be judged independently.**

### Preliminary Schedule\*

Topic	Week
I. Introduction and MOS models	Week 1-4
II. CMOS Technologies and Layouts	
<b>Review Session</b>	<b>Feb. 8</b>
<b>1<sup>st</sup> Exam</b>	<b>Feb. 13</b>
III. Current Mirrors and Differential Pairs	Week 5-9
IV. Voltage References and Differential Pairs	
V. OTA Design (Part 1)	
<b>Review Session</b>	<b>Apr. 5</b>
<b>2<sup>nd</sup> Exam</b>	<b>Apr. 10</b>
VI. OTA Design (Part 2)	Week 10-14
VII. Miller OpAmp Design	
VIII. Advanced Topics	
<b>Review Session</b>	<b>Apr. 26</b>
<b>Project Report Due</b>	<b>May 1</b>
<b>3<sup>rd</sup> Exam</b>	<b>May 3 (3:00PM-5:00PM)</b>

\*Exam dates are approximate and subject to change with reasonable notice.

**Laboratory safety guidelines will be distributed at the beginning of the semester, they are to be reviewed, filled out, and turned back to the department.**

### Americans with Disabilities Act (ADA) Policy Statement:

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit <http://disability.tamu.edu>.

**An Aggie does not lie, cheat, or steal or tolerate those who do.**

Honor Council Rules and Procedures: <http://www.tamu.edu/aggiehonor>

**Build the Hell Outta Analog VLSI Circuits!**

