

**Analog IC Design 1**  
EEE 5320 Sections 1553, 29GC, 7085  
**Class Periods:** MWF Period 3 (9:35 AM – 10:25AM)  
**Location:** NEB 102  
**Academic Term:** Fall 2019

**Instructor:**

Nima Maghari  
[maghari@ece.ufl.edu](mailto:maghari@ece.ufl.edu)  
352-392-2767  
Office Hours: Wednesdays 10:30am-11:30am

**Teaching Assistant/Peer Mentor/Supervised Teaching Student:**

Please contact through the Canvas website

- Troy Bryant, [tbbryant@ufl.edu](mailto:tbbryant@ufl.edu), Office hours: TBD Location: TBD

**Course Description**

Amplifier stages, active loads, output stages, op-amps, feedback, frequency response, compensation. Prereq: Analog Electronics.

Credits: 3

**Course Pre-Requisites / Co-Requisites**

*Electronics Circuits 1 & 2 (or equivalent knowledge of the topic)*

\*\*If you have not taken these courses and still would like to enroll, please contact me.

**What you need to know before taking this course:**

- Basic knowledge of circuits, KVL/KCL, first order systems (RC time constant)
- Basic knowledge of large signal and small signal analysis
- Basics of MOS transistors (DC/ac) (a detailed review will be provided)
- Bode plot and frequency response (short review will be offered)
- Fourier and Laplace Transforms

**Course Objectives**

This course explores the fundamentals of the analog IC design, ranging from single stage amplifiers to switched-capacitor networks and multi-stage frequency compensation schemes. Throughout the semester, the students will be introduced to various critical circuits which the analog IC depends upon. The state of the art applications will be discussed for each of these circuits, and the past and future challenges and the roadmap of analog IC will be tackled. In this course, the students will be introduced to Cadence® platform, an industry preferred simulation and layout engine, not only to analyze the provided circuits, but also to design several commonly used structures including switched-capacitor fully differential opamps. An extensive tutorial to Cadence will be provided to help familiarize the students with this simulation platform. The course objective is to provide a thorough background of analog circuits, discuss the real-world applications, IC design challenges and prepares students for other areas of analog and digital IC design. ***If you plan to pursue career in IC design, either analog or digital, this course is “a must”, and it is recommended by ALL IC design companies.***

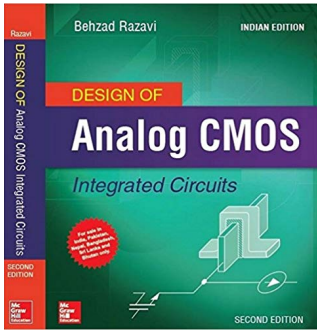
**Materials and Supply Fees**

N/A

**Required Textbooks and Software**

## Textbooks

### Recommended Materials



- Design of Analog CMOS Integrated Circuits (2nd edition)
- Behzad Razavi
- McGraw-Hill Education; 2 edition (January 20, 2016)
- ISBN number: 0072524936

### Course Schedule

Week 1:	MOS Basics / Lecturer / Corresponding Book Chapters 1/ Quizzes / Exams
Week 2:	Amplifiers (single-stage)/ Lecturer / Corresponding Book Chapters 3
Week 3:	Amplifiers (single-stage)/ Lecturer / Corresponding Book Chapters 3/ Quiz 1
Week 4:	Amplifiers (multi-stage)/ Lecturer / Corresponding Book Chapters 3
Week 5:	Cascode and Current mirrors / Lecturer / Corresponding Book Chapters 5/ Quiz 2
Week 6:	Cascode and Current mirrors / Lecturer / Corresponding Book Chapters 5/ Quiz 3
Week 7:	Differential circuits / Lecturer / Corresponding Book Chapters 4/ Midterm 1
Week 8:	Differential circuits / Lecturer / Corresponding Book Chapters 4/ Quiz 4
Week 9:	Frequency Response / Lecturer / Corresponding Book Chapters 6 / Quiz 5
Week 10:	Frequency Response / Lecturer / Corresponding Book Chapters 6/ Quiz 6
Week 11:	Feedback/ Lecturer / Corresponding Book Chapters 8/ Quiz 7
Week 12:	Feedback/ Lecturer / Corresponding Book Chapters 8/ Quiz 8
Week 13:	Voltage and Current References/ Lecturer / Corresponding Book Chapters 12/ Project
Week 14:	Review/ Lecturer
Week 15:	Review / Lecturer / Final Exam

### Attendance Policy, Class Expectations, and Make-Up Policy

Students are responsible for meeting all academic objectives as defined by the instructor. Absences count from the first class meeting. In general, acceptable reasons for absences from class include illness, serious family emergencies, special curricular requirements, military obligation, severe weather conditions, religious holidays, and participation in official University activities. Absences from class for court-imposed legal obligations (e.g., jury duty or subpoena) must be excused. Other reasons also may be approved.

Students may not attend classes unless they are registered officially or approved to audit with evidence of having paid audit fees. After the end of drop/add, the Office of the University Registrar provides official class rolls/addenda to instructors. Students who do not attend at least one of the first 2 class meetings of a course or laboratory in which they are registered and who have not contacted the academic unit to indicate their intent may be dropped from the course. **Students must not assume that they will automatically be dropped if they fail to attend the first few days of class.** The academic unit will notify students dropped from courses or laboratories by posting a notice in the academic unit office. Students may request reinstatement on a space-

available basis if documented evidence is presented. The University recognizes the right of the individual professor to make attendance mandatory. After due warning, professors may prohibit further attendance and then assign a failing grade for excessive absences. Students who have registration changes, at any time during the semester, should verify their registrations before the last day of class of the term. Retroactive drop/add or other registration changes will not be permitted.

### **Evaluation of Grades**

**\*\*NOTE:** Course evaluation components should include:

1. Homework.
2. In-class Quiz.
3. Project: Achieving the given performance metrics, report, clarity.
4. Exams

<b>Assignment</b>	<b>Total Points</b>	<b>Percentage of Final Grade</b>
Homework Sets (8)	100 each	20%
Quizzes (for on-site)(8)	100 each	10%
Mini project (remote) (4)	100 each	10%
Midterm Exam	100	20%
Final Exam	100	20%
Project	100	25%
		105% (5% extra credit)

### **Grading Policy**

The following is given as an example only.

<b>Percent</b>	<b>Grade</b>	<b>Grade Points</b>
90.0 - 100.0	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 - 83.9	B	3.00
78.0 - 80.9	B-	2.67
75.0 - 79.9	C+	2.33
72.0 - 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

### **Students Requiring Accommodations**

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### ***University Honesty Policy***

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

### ***Commitment to a Safe and Inclusive Learning Environment***

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, [rbielling@eng.ufl.edu](mailto:rbielling@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### ***Software Use***

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### ***Student Privacy***

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

### ***Campus Resources:***

## Health and Wellness

### **U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

### **Sexual Discrimination, Harassment, Assault, or Violence**

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

### **Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

## Academic Resources

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu).  
<https://lss.at.ufl.edu/help.shtml>.

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.  
<https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers.  
<https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** [https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

**On-Line Students Complaints:** <http://www.distance.ufl.edu/student-complaint-process>.