Instructor: Dr. George L. Engel (EB-3043)

Time: M, W (1:30 PM - 2:45 PM)

Location: EB-3009

Phone: 650-2806

Email: gengel@siue.edu

Website: www.siue.edu/~gengel

Office Hours: M, W 3:00 PM - 4:00 PM and T, R 2:00 - 3:00 pm

Course Description

Course material includes the study of the operating principles of CMOS analog integrated circuits, physics of MOS devices, linearized models of MOSFETs, and circuit design techniques for realizing CMOS operational amplifiers, current references, voltage references, etc.

Grading Policy

Midterm Exam 25 %

Final Exam 25 %

Midterm Project 25 %

Final Project 25 %

Administrative Issues

Based on University Class Attendance Policy 1I9: It is the responsibility of students to ascertain the policies of instructors with regard to absence from class, and to make arrangements satisfactory to instructors with regard to missed course work. Failure to attend the first session of a course may result in the students place in class being assigned to another student.

If you have a documented disability that requires academic accommodations, please go to Disability Support Services (DSS) for coordination of your academic accommodations. DSS
is located in the Student Success Center, Room 1270; you may contact them to make an appointment by calling (618) 650-3726 or sending an email to disabilitysupport@siue.edu. Please visit the DSS website located online at www.siue.edu/dss for more information.

Students are expected to be familiar with and follow the Student Academic Code. It is included in the SIUE Policies and Procedures under Section 3C2.2.

**Required Texts**

Analog Integrated Circuit Design
John Wiley & Sons
Tony Carusone, David A. Johns, Kenneth W. Martin
ISBN Number: 978-0-470-77010-8
COVID-19 Pandemic Policies Related to Classroom Instruction (Spring 2021)

Health and Safety
Consistent with the Illinois Board of Higher Education guidance contained in Safely Launching Academic Year 2020 released on June 23, 2020 and guidelines established by Governor J. B. Pritzker and Restore Illinois, Southern Illinois University Edwardsville has implemented a new policy to help ensure the safety of all students, faculty and employees during the pandemic. The measures outlined below are required and any student who does not comply may be in violation of the COVID-19 People-Focused Health and Safety Policy, as well as the University’s Student Code of Conduct. The full text of the COVID-19 People-Focused Health and Safety Policy can be found here: https://www.siue.edu/policies/Covid.shtml.

Classrooms, Labs, Studios, and Other Academic Spaces
While in the classroom, lab, studio, or other academic spaces, students shall practice social distancing measures by maintaining a distance of at least six feet from others in the classroom and wearing a face covering. Extra care should be taken upon entering and leaving the classroom spaces. Classroom furniture should not be rearranged, and furniture that has been taped off or covered should not be used.

Students who forget to wear a face mask or face shield will be reminded of their obligation to comply with SIUEs COVID-19 People-Focused Health and Safety Policy and temporarily asked to leave the class until they are able to conform to the policy. Students who forget or lose their face coverings may be able to obtain replacements from a friend, a faculty member, or a nearby departmental office. Face coverings are also available for purchase in the Cougar Store (MUC).

Students who refuse to wear a face covering will be asked to leave the classroom and referred to the Dean of Students for non-compliance with community health and safety protocols. Repeated non-compliance may result in disciplinary actions, including the student being administratively dropped from an on-ground/face-to-face course or courses without refund if no alternative course format is available.

If a student has a documented health condition which makes wearing a face covering medically intolerable, that student should contact ACCESS to explore options with the understanding that ACCESS will not grant accommodations which excuse the need for a face covering while on campus or in the classroom. ACCESS will work with qualifying individuals to find reasonable alternatives, whenever such solutions are available. Please call or contact the ACCESS Office via email to schedule an online appointment to discuss potential alternatives. ACCESS office (Student Success Center, Room 1203, 618-650-3726, and myaccess@siue.edu).
General Health Measures

At all times, students should engage in recommended health and safety measures, which include:

- Conducting a daily health assessment. If you have COVID-19 symptoms, but not yet tested positive, have had COVID-19 close contact exposure, or are COVID-19 diagnosed as presumptive or confirmed positive, stay home and contact your health provider or SIUE Health Service at cougarcare@siue.edu or 618-650-2842. More information is available on the SIUE COVID-19 website.

- Frequent washing or disinfecting of hands.

- Social distancing by maintaining a distance of at least six feet from others.

- Face masks or face coverings that cover the nose and mouth are required in indoor public spaces regardless of the ability to maintain social distance. Indoor public spaces include common spaces or community settings that anyone can access, such as reception areas with walk-in access, restrooms, hallways, classrooms, teaching and research laboratories, as well as common spaces in residence halls, conference rooms, lobbies, and break rooms.

- Adhere to directional signs and traffic flow patterns in buildings and offices. Doors for entering and exiting buildings will be designated. Where multiple doors exist, in and out doors will be marked with Entrance and Exit signs.

Plans that consider traffic flow in and out of buildings, and within buildings (i.e. stairs, hallways, etc. where possible) will be marked.

Academic Integrity

Students are reminded that the expectations and academic standards outlined in the Student Academic Code (3C2) apply to all courses, field experiences and educational experiences at the University, regardless of modality or location. The full text of the policy can be found here: https://www.siue.edu/policies/3c2.shtml.

Recordings of Class Content

Faculty recordings of lectures and/or other course materials are meant to facilitate student learning and to help facilitate a student catching up who has missed class due to illness. As such, students are reminded that the recording, as well as replicating or sharing of any course content and/or course materials without the express permission of the instructor of record, is not permitted, and may be considered a violation of the Universitys Student Conduct Code (3C1), linked here: https://www.siue.edu/policies/3c1.shtml.
Potential for Changes in Course Schedule or Modality

As the COVID-19 pandemic continues, there remains a possibility that planned classroom activities will need to be adjusted. Depending on circumstances and following state-issued recommendations, potential changes include changes in course modality (e.g., transition from face-to-face to online) or in course scheduled meetings. These changes would be implemented to ensure the successful completion of the course. In these cases, students will be provided with an addendum to the class syllabus that will supersede the original version.
Course Outline

WEEK 1
W Jan 20  MOS Transistors (Sec. 1.2)

WEEK 2
M Jan 25  Advanced MOS Modeling (Sec. 1.4)
W Jan 27  Passive Devices (Sec. 1.6)

WEEK 3
M Feb 01  Variability and Mismatch (Sec. 2.3)
W Feb 03  Analog Layout Considerations (Sec. 2.4)

WEEK 4
M Feb 08  Simple CMOS Current Mirror (Sec. 3.1)
W Feb 10  Common Source Amplifier (Sec. 3.2)

WEEK 5
M Feb 15  Source Follower (Sec. 3.3)
W Feb 17  Common Gate Amplifier (Sec. 3.4)

WEEK 6
M Feb 22  Cascode Current Mirrors (Sec. 3.6)
W Feb 24  Cascode Gain Stage (Sec. 3.7)

WEEK 7
M Mar 01  MOS Differential Pair (Sec. 3.8)
W Mar 03  Frequency Response of Linear Systems (Sec. 4.1)

WEEK 8
M Mar 08  Frequency Response of Elementary Transistor Circuits (Sec. 4.2)
W Mar 10  Midterm Exam (Chapters 1, 2, 3)

WEEK 9
M Mar 15  Cascode Gain Stage (Sec. 4.3)
W Mar 17  Source Follower Amplifier (Sec. 4.4)
WEEK 10

M Mar 22  Feedback Amplifiers Review (Chapter 5)
W Mar 24  Two-Stage CMOS Opamp (Sec. 6.1)

WEEK 11

M Mar 29  Two-Stage CMOS Opamp (Sec. 6.1)
W Mar 31  Op-Amp Compensation (Sec. 6.2)

WEEK 12

M Apr 05  Folded Cascode Opamp (Sec 6.4)
W Apr 07  Folded Cascode Opamp (Sec 6.4)

WEEK 13

M Apr 12  Analog Integrated Circuit Biasing (Sec. 7.1)
W Apr 14  Establishing Constant Voltages and Currents (Sec. 7.3)

WEEK 14

M Apr 19  Establishing Constant Voltages and Currents (Sec. 7.3)
W Apr 21  Noise Analysis and Modeling (Chapter 9)

WEEK 15

M Apr 26  Noise Analysis and Modeling (Chapter 9)
W Apr 28  Noise Analysis and Modeling (Chapter 9)