Course Description

Small signal analysis, transistor amplifier design, frequency response, feedback system analysis, output stage design, signal generation and waveform shaping circuits. Three hours lecture and one laboratory session per week.

Grading Policy

Exam # 1  20 %
Exam # 2  20 %
Exam # 3  20 %
Projects (4)  40 %

For both undergraduate and graduate students the following grading scale will be used:

A = 90 - 100
B = 80 - 89
C = 70 - 79
D = 60 - 69
F = < 60
**Required Texts**

Microelectronic Circuits, Seventh Edition  
Oxford University Press  
Adel C. Sedra and Kenneth C. Smith  
ISBN Number: 978-0-19-933913-6

**Administrative Issues**

Based on University Class Attendance Policy 119: 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](http://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.

**Graduate Credit**

Students taking ECE476 for graduate credit will be required to complete ONE additional problem on each of the three exams. The problem will be worth 10 points. All students taking the course for undergraduate credit will receive full credit for the problem without having to solve the problem. The additional problem will be made more difficult and will bear less resemblance to problems worked in homework. Examples of past exams with "GRADUATE ONLY" exam problems are available on the instructor’s website.

Moreover, for the final project in the class, graduate students will be need to design a circuit with additional functionality. For example, while undergraduates may be required to design a switching regulator, graduate students will need to modify the circuit so that it can be used as a battery charger. The first three design projects in the class will be same for both undergraduate and graduate students.
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 SIUE’s 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 University's 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
T Jan 19  Sec. 7.2  Small-Signal Operation and Models
          Sec. 7.3  Basic Configurations
          Sec. 7.5  Discrete Circuit Amplifiers
R Jan 21  Sec. 7.5.2  A Common-Emitter (CE) Amplifier
          Sec. 7.5.3  CE Amplifier with Emitter Degeneration
PROJECT  CE Amplifier with Emitter Degeneration

WEEK 2
T Jan 26  Sec. 7.5.3  CE Amplifier with Emitter Degeneration
          Sec 7.5.5  Emitter Follower Amplifier
R Jan 28  Sec 8.2  Current Sources and Current Mirrors
          Sec 8.2.3  BJT Circuits

WEEK 3
T Feb 02  Sec 8.6.4  The Widlar Current Source
          Sec 8.7.2  The Darlington Configuration
R Feb 04  Sec 9.2  The BJT Differential Pair
          Sec. 9.2.1  Basic Operation

WEEK 4
T Feb 09  Sec. 9.2.2  Input Common-Mode Range
          Sec. 9.2.3  Large-Signal Operation
R Feb 11  Sec. 9.2.4  Small-Signal Operation
          Sec. 9.2.4  Common-Mode Rejection
PROJECT  Time-to-Voltage Converter

WEEK 5
T Feb 16  Sec. 10.1  Low-Frequency Response of Discrete Circuit Amplifiers
          Sec. 10.1.2  The Method of Short-Circuit Time Constants
          Sec. 10.1.3  The CE Amplifier
R Feb 18  Sec. 10.2  Internal Capacitive Effects and High Frequency Model
          Sec. 10.2.2  The BJT
          Sec. 10.3.2  High Frequency Response of CE Amplifier
          Sec. 10.3.3  Miller’s Theorem
WEEK 6
T Feb 23  Sec. 10.4  Useful Techniques for Analysis of High-Frequency Response
          Sec. 10.4.3  The Method of Open-Circuit Time Constant Analysis
R Feb 25  *****  EXAM #1 (Chapters 7, 8, 9)  *****

WEEK 7
T Mar 02  Sec. 10.4.5  Application of Method to CE Amplifier
R Mar 04  Sec. 11.1  The General Feedback Structure
          Sec. 11.1.1  Signal-Flow Diagram
          Sec. 11.1.2  The Loop Gain
          Sec. 11.1.4  Summary

WEEK 8
T Mar 09  Sec. 11.2  Some Properties of Negative Feedback
          Sec. 11.2.1  Gain Desensitivity
          Sec. 11.2.2  Bandwidth Extension
          Sec. 11.2.3  Interference Reduction
          Sec. 11.2.4  Reduction in Non-linear Distortion
T Mar 11  PROJECT  Heart Rate Monitor Project (Part I)

WEEK 9
T Mar 16  PROJECT  Heart Rate Monitor Project (Part II)
R Mar 18  Sec. 11.3  The Feedback Voltage Amplifier
          Sec. 11.4  Systematic Analysis of Feedback Voltage Amplifiers

WEEK 10
T Mar 23  Sec. 11.5  Other Feedback Amplifier Types
          Sec. 11.5.1  Basic Principles
          Sec. 11.5.2  Transconductance Amplifier
          Sec. 11.5.3  Transresistance Amplifier
R Mar 25  Sec. 11.5.4  Current Amplifier
          Sec 11.7  The Stability Problem
          Sec. 11.9  Stability Using Bode Plots

WEEK 11
T Mar 30  Sec. 18.4  Bistable Multivibrators
          Sec 18.4  Generation of Square and Triangle Waveforms Using an Astable
R Apr 01  *****  EXAM #1 (Chapters 10 and 11)  *****
WEEK 12

R Apr 06  Sec. 18.7  IC Timers
     Sec. 18.7.1  The 555 Circuit

T Apr 08  Sec. 18.7.3  Implementing an Astable Using a 555
     PROJECT  Simple Remote Control (Transmitter)

WEEK 13

T Apr 13  PROJECT  Simple Remote Control (Receiver)

R Apr 15  Sec. 17.1  Filter Transmission, Types, and Specification

WEEK 14

T Apr 20  Sec. 17.2  The Filter Transfer Function

R Apr 22  Sec. 17.3  Butterworth and Chebyshev Filters

WEEK 15

T Apr 27  Sec 17.4  First-Order and Second-Order Filter Functions

R Apr 29  REVIEW  Review for Final Exam