The University of Texas at Tyler
Department of Electrical Engineering

EENG 4109.031 – Electronic Circuit Analysis II Laboratory (Required)

Syllabus

Catalog Description:

Structure of a simple operational amplifier; active filters; feedback concepts and oscillators; small-signal analysis; introduction to nonlinear electronic circuits; transfer characteristics of CMOS digital circuits; introductory LabVIEW programming.

Prerequisites: EENG 4309 (co-requisite)

Credits: (0 hours lecture, 3 hours laboratory per week)

Text(s): None

Additional Material: None

Course Coordinator: Seyed Ghorshi, PhD

Topics Covered: (paragraph of topics separated by semicolons)

Measurement of amplifier gain and input and output resistances; pole-zero locations and frequency response; construction and test of a simple operational amplifier; active filter design and test; LabVIEW programming of a simple 4-bit ADC; transfer characteristics of a CMOS inverter;

Evaluation Methods: (only items in dark print apply):

1. Examinations / Quizzes
2. Homework
3. Reports
4. Computer Programming
5. Project
6. Presentation
7. Course Participation
8. Peer Review

Course Learning Objectives[1]: By the end of this course students will be able to:

1. Measure the mid-band characteristics (input resistance, output resistance, and voltage gain) of a single-stage amplifier and compare them to expected values [3].
2. Compute the frequency response of a linear network from its pole/zero locations and compare those to empirical measurement [3].
3. Simulate the effects of negative feedback (extended bandwidth, effects on input and output impedances, stabilization of closed-loop gain, improved disturbance rejection) [3].
4. Measure the electrical characteristics (input-bias current, input-offset voltage, slew rate, output voltage range, and gain-bandwidth product) of a simple operational amplifier [3].
5. Design simple active filters [3].
6. Validate the performance of simple active filters [3]

7. Analyze feedback circuits and determine when a feedback circuit will oscillate [3].
8. Measure the transfer characteristics of an MOS inverter [3].
9. Use modern engineering tools including modeling and simulation software and virtual instruments [4]
10. Perform experiments as members of a team [3,4]
11. Utilize engineering literature such as technical manuals and product datasheets to select components to meet experimental or prototype requirements [3]
12. Prepare laboratory reports that clearly communicate experimental information in a logical and scientific manner [3]

[1]*Numbers in brackets refer to method(s) used to evaluate the course objective.*

Relationship to Program Outcomes (only items in dark print apply)[2]: This course supports the following Electrical Engineering Program Outcomes, which state that our students will:

1. have the ability to apply knowledge of the fundamentals of mathematics, science, and engineering
2. have the ability to use modern engineering tools and techniques in the practice of electrical engineering [9]
3. have the ability to analyze electrical circuits, devices, and systems [2,7]
4. have the ability to design electrical circuits, devices, and systems to meet application requirements [5]
5. have the ability to design and conduct experiments, and analyze and interpret experimental results [1,4,6,8]
6. have the ability to identify, formulate, and solve problems in the practice of electrical engineering using appropriate theoretical and experimental methods [3]
7. have effective written, visual, and oral communication skills [12]
8. possess an educational background to understand the global context in which engineering is practiced, including:
    a. knowledge of contemporary issues related to science and engineering;
    b. the impact of engineering on society;
    c. the role of ethics in the practice of engineering;
9. have the ability to contribute effectively as members of multi-disciplinary engineering teams [10]
10. have a recognition of the need for and ability to pursue continued learning throughout their professional careers [11].

[2]*Numbers in brackets refer to Course Learning Objective(s) that address the Program Outcome.*

Prepared By: Seyed Ghorshi Date: 11 January 2019

The University of Texas at Tyler
Department of Electrical Engineering

EENG 4109.031: Electronic Circuit Analysis II (LAB)

Outline

Course Description

This course covers small-signal models of semiconductor devices and amplifier circuits including op-amps at the transistor level. Electronics topics include BJT and MOSFET circuits and extend to the frequency response of transistor amplifiers and the use of cascaded amplifiers to increase gain and bandwidth. Emphasizes real devices and their performance, analog IC design concepts, and building blocks.

Course Content

Transistor Amplifiers
Frequency Response
Feedback
Differential- and Multi-stage Amplifiers
Operational Amplifier Circuits
Filters
Signal Generators
MOS Digital ICs

Text Books

Sedra, A. S., and Smith, K.C. Microelectronic circuits, 7hth Ed. Oxford University Press, 2014.

Assessment

Laboratory Assignment: 100%