

**The University of Texas at Tyler**  
**Department of Electrical Engineering**

**EENG 4309 – Electronic Circuit Analysis II (Required)**

**Syllabus**

**Catalog Description:**

CMOS digital circuits; structure of operational amplifiers; feedback concepts; oscillators; small-signal analysis; load-line analysis; introduction to nonlinear electronic circuits.

**Prerequisites:**

EENG 3306, EENG 3106, EENG 3305

**Credits:**

( 3 hours lecture, 0 hours laboratory per week )

**Text(s):**

Sedra, A. S., and Smith, K.C. *Microelectronic circuits, 8<sup>th</sup> Ed.* Oxford University Press, 2014. ISBN 978-0199339136.

**Additional Material:**

Behzad Razavi, *Fundamental of Microelectronics, 3<sup>rd</sup> Ed.* Wiley Press

**Course Coordinator:**

Azadeh Izadi

**Topics Covered:** (paragraph of topics separated by semicolons)

Single- and multi-stage amplifiers for IC implementation; differential amplifiers and operational amplifiers; feedback concepts; criteria for oscillation in feedback circuits; oscillator circuits; active and passive filters; introduction to nonlinear electronic circuits.

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

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

**Course Objectives<sup>2</sup>:** By the end of this course students will be able to:

1. Analyze single- and multi-stage amplifiers. [1]
2. Analyze the transfer characteristics of a differential amplifier. [1,2]
3. Analyze a simple operational amplifier. [1]
4. Analyze systems involving feedback and determine their closed-loop gain, input impedance, output impedance, and frequency response. [1,2]
5. Design simple active filters to meet frequency-response requirements. [1,5]
6. Determine the conditions under which circuits with feedback will oscillate. [1,2]
7. Design simple nonlinear oscillator circuits to meet specified requirements. [1,5]
8. Derive the transfer characteristics of a CMOS inverter by graphical or analytical methods. [1,2]
9. Determine  $V_{IL}$ ,  $V_{IH}$ ,  $V_{OL}$ ,  $V_{OH}$ , and noise margins of a CMOS inverter from its voltage-transfer characteristic. [1,2]
10. Design simple logic gates using static CMOS, pseudo-NMOS, pass-transistor logic, and dynamic logic. [1]

<sup>2</sup>Numbers in brackets refer to method(s) used to evaluate the course objective.

Relationship to Student Outcomes (only items in dark print apply)<sup>3</sup>: This course supports the following Electrical Engineering Student Outcomes, which state that our students will possess:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics [1-4, 9];
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors [5, 6, 7,10];
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions [8];
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

<sup>3</sup>Numbers in brackets refer to course objective(s) that address the Program Outcome.

Contribution to Meeting Professional Component: (in semester hours)

Mathematics and Basic Sciences:	0	hours
Engineering Sciences and Design:	3.0	hours
General Education Component:	0	hours

Prepared By:

David M. Beams  
Revised by Yasser Mahgoub  
Revised by Yasser Mahgoub  
Revised by Azadeh Izadi

Date:

14 January 2018  
13 January 2020  
05 January 2021  
01 January 2023