The University of Texas at Tyler
Department of Electrical and Computer Engineering

EENG 4309.001 – Electronic Circuit Analysis II (Required)

Syllabus

Catalog Description :

CMOS digital circuits; structure of operational amplifiers; frequency response of operational amplifiers and multi-stage 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): 1. Sedra, A. S., and Smith, K.C. Microelectronic *circuits, 7th Ed. Oxford* University Press, 2019. ISBN 9780190853464.

2. Albert Malvino and David Bates, Electronic Principle, 8th Ed. ISBN 978-0-07-337388

Additional Material: Engineering paper, scientific calculator; access to circuit-simulation software (Multisim), MATLAB, and Excel

Course Coordinator: Md Masud Rana

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[2]: By the end of this course students will be able to:

1. Analyze single- and multi-stage amplifiers. [1,2,7]
2. Analyze the transfer characteristics of a differential amplifier. [1]
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. [1,7]
6. Determine the conditions under which circuits with feedback will oscillate. [1]
7. Design simple nonlinear oscillator circuits to meet specified requirements. [1]

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]
10. Design simple logic gates using static CMOS, pseudo-NMOS, pass-transistor logic, and dynamic logic. [1]

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

Relationship to Program Outcomes (only items in dark print apply)[3]: This course supports the following Electrical Engineering Program Outcomes, which state that our students will:

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.

[3] *Numbers in brackets refer to course objective(s) that address the Program Outcome.*

Prepared By:	David M. Beams Revised by Shawana Tabassum Revised by Md Masud Rana Revised by Md Masud Rana	Date:	14 January 2018 09 December 2020 21 December 2024 5 January 2026