

ELN 132
ANALOG ELECTRONICS II

COURSE DESCRIPTION:

Prerequisites: ELN 131

Corequisites: None

This course covers additional applications of analog electronic circuits with an emphasis on analog and mixed signal integrated circuits (IC). Topics include amplification, filtering, oscillation, voltage regulation, and other analog circuits. Upon completion, students should be able to construct, analyze, verify, and troubleshoot analog electronic circuits using appropriate techniques and test equipment. Course Hours Per Week: Class, 3. Lab, 3. Semester Hours Credit, 4.

COURSE OBJECTIVES:

Upon completion of this course, the student will be able to:

- a. Analyze amplifiers for frequency response
- b. Identify, select, and handle transistors and ICs
- c. Analyze feedback circuits
- d. Analyze amplifier circuits
- e. Analyze oscillator circuits
- f. Test semiconductors using a curve tracer
- g. Assess component acceptability for circuit use
- h. Operate basic test equipment
- i. Express absolute and relative power and voltage levels in decibels
- j. Perform graphical analysis of measured data
- k. Fit curves to recorded data

OUTLINE OF INSTRUCTION:

- I. Field-effect Transistor Circuit Analysis
 - A. Operation of JFET
 - B. Device characteristics
 - C. Equivalent circuit model
 - D. Basic circuit configurations: Common-drain, -source, and -gate
 - E. MOSFET and IGFET devices
- II. FET Amplifiers
 - A. FET amplifier circuit characteristics
 - B. The decibel

- C. RC coupled amplifier analysis
 - D. Bode plots
 - E. Miller effect
 - F. Gain-bandwidth product
 - G. DC amplifiers
 - H. Amplifier pairs: Darlington and emitter-coupled amplifiers
- III. Feedback Circuits
- A. Principles of feedback
 - B. Effects of feedback: noise, gain, frequency response, impedance
 - C. Types of feedback: voltage, and current.
 - D. Single stage voltage feedback
 - E. Negative feedback
- V. Sinusoidal Feedback Oscillators
- A. General operating criteria
 - B. Phase shift oscillators
 - C. Wien bridge oscillators
 - D. Crystal-controlled oscillators
 - E. Maximum frequency oscillators
- VI. Special Function ICs
- A. 555 timer
 - B. LM 317 voltage regulator
 - C. LM 318 Operational amplifier
 - D. LM 566 Voltage controlled oscillator
 - E. LM 565 Phase locked loop
- VII. Filter Circuits
- A. Passive
 - B. Active
- VIII. Operations Amplifiers
- A. Op amp operation
 - B. Differential amplifier
 - C. Inverting amplifier
 - D. Non-inverting amplifier
- IX. Voltage Regulators
- A. Voltage regulator concepts
 - B. Series voltage regulator
 - C. Shunt voltage regulator
 - D. IC voltage regulator
- X. Amplifier Frequency Response

- A. Gain and frequency measurements
- B. Low- and high-frequency response
- C. Op amp frequency response
- D. Multistage amplifiers

REQUIRED TEXTBOOKS AND MATERIALS:

Paynter, Robert. Introductory Electronic Devices and Circuits, Prentice Hall.

Paynter, Robert. Lab Manual for Introductory Electronic Devices and Circuits, Prentice Hall.

STATEMENT FOR STUDENTS WITH DISABILITIES:

Students who require academic accommodations due to any physical, psychological, or learning disability are encouraged to request assistance from a disability services counselor within the first two weeks of class. Likewise, students who potentially require emergency medical attention due to any chronic health condition are encouraged to disclose this information to a disability services counselor within the first two weeks of class. Counselors can be contacted by calling 919-536-7207, ext. 1413 or by visiting the Student Development Office in the Phail Wynn Jr. Student Services Center, room 1209.