ET 272 Electronic Devices II

Course No. and Tiltle: ET 272 Electronic Devices II

Credit Hours: 4 (3 + 3P)

Course Description: This is the second course in the analog electronics sequence and therefore builds up on the first course. It concentrates on more advanced electronic concepts such as frequency response and op-amp theory along with more applications.

Pre-requisite: ET 246 Electronic Devices I **Pre-requisite:** MATH 235 **Required Course**

Textbook: Electronic Devices and Circuits by Bogart, Beasley, and Rico, 6th edition, Prentice Hall

Objective: To continue studying modern analog electronic circuits with emphasis in operational amplifier theory and applications.

Note: This course relates to ABET program outcomes a, b, c, d, e, f, and g as follows:
(a, b) Operational amplifier circuits are thoroughly analyzed using circuit theory and mathematical derivations.
(c, d) A number of lab experiments require the students to determine component values based on design requirements before running the experiments. They then verify if experimental results are as expected.
(e) All students work in teams in laboratory and projects.
(f) Students have to work on homework, exams, and lab problems.
(g) Students need to write lab reports using proper written language.

COURSE TOPICS:

	Class hours
Introduction Quick review on ac sources, capacitive and inductive reactance, RC and RL circuits.	2
Frequency Response Frequency response of RC networks, decibels, log-log and semi-log plots, low-frequency and high-frequency response of amplifiers, Miller-effect capacitances, amplifier transient response.	6
Op-amp Theory Non-ideal op-amp theory: closed-loop gain, input and output resistance, frequency response, slew rate, rise time, offset parameters. Design of op-amp circuits based on meeting or exceeding required performance parameters	8
Advanced Op-amp Circuits Applications Ideal integrators, ac integrators, phase-shift circuits, instrumentation amplifiers, basic active filters.	6

Wave generation and Shaping 6

Comparators, voltage-level detectors with noise immunity, astable multivibrators, sine-wave oscillators, Barkhausen criterion, clipping and clamping circuits, the 8038 function generator IC.

Digital/Analog and Analog/Digital Conversion 4

Basic conversion circuits, resolution, input-output relationship, flash and successive-approximation converters, practical considerations.

Class/Laboratory Schedule

Class meets three times a week for 50 minutes each time. Alternately, class could meet twice a week for 75 minutes each. The laboratory session is 2.5 hours once a week.

Laboratory Practice:

Major topics in the course are extensively practiced in laboratory through experiments designed by the instructors. Students are required to write lab reports that include measurements, observations, and answers to questions. Typical electronic instruments in the laboratory include: CADET breadboard, TEKTRONIX digital oscilloscope, TEKTRONIX function generator, FLUKE digital multimeters. Lab session duration: 2.5 hours

List of Lab Experiments:

- A Lead-Lag RC network
- Coupling Capacitors and Their Frequency Effects
- Rise Time and Sagging
- Op-amp Offset Parameters
- Op-amp Frequency Response
- Rise Time and Slew Rate in Op-Amps
- The Op-Amp Integrator
- A Phase-Lag Op-Amp Circuit
- Voltage Comparators
- An Astable Multivibrator

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