

Texas A&M University–Corpus Christi
College of Science and Technology
Engineering Technology

Course Number and Title: ENTC 3444 Principles of Measurements

Weekly Schedule: 3 hours lecture and 3 hours laboratory

Prerequisites: ENTC 3415 Circuit Analysis II

Course Description:

Fundamental principles and methods of measurements and control; characteristics of sensors and transducers; electronic devices; signal conditioning; flow, temperature, pressure, force, level, and motion measurements.

Textbooks

1. Introduction to Control System Technology, 7th Edition, Robert Bateson, Prentice Hall, 2002.
2. Sensors for Measurement and Control, Peter Elgar, Henry Ling Ltd, available from Prentice Hall, 1998.

Course Objectives

This course is designed to enable students to:

- Model a feedback control system.
- Use common semiconductor components/devices such as transistors, diodes, voltage regulators, waveform generators, etc.
- State the principles of measuring devices and describe how they work.
- Identify linear and nonlinear components and systems.
- Design and analyze op-amp circuits.
- Design signal conditioning circuits.
- Design and analyze analog-to-digital converter circuits.
- Design and analyze digital-to-analog converter circuits.
- Describe various techniques/methods for measuring temperature, level, flow, pressure, force, displacement, and motion.
- Design and analyze sensor-based circuits for measurement and control.

Assessment

	Points		If	Grade
Quiz	5		$90 \leq \text{Total} < \text{XX}$	A
Midterm 1	20		$80 \leq \text{Total} < 90$	B
Midterm 2	20		$70 \leq \text{Total} < 80$	C
Homework	10		$60 \leq \text{total} < 70$	D
Lab exercises/research paper	10		$\text{xx} < \text{Total} < 60$	F
Project	10			
Final	25			

Total	100		
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Topics Covered

Introduction to measurements and control, Diode circuits, Transistor fundamentals, Electronic devices: JFETs, voltage regulators, comparators, waveform generators, Common elements of system components, Measuring instrument characteristics, Op-Amp circuits, Signal conditioning,

Data sampling and conversion, Position, motion and force measurements, Temperature and flow measurements, Pressure and level measurements, Representation and display of data, Selecting sensors, Sensor specifications.

Laboratory Exercises/Experiments*:

Lab 1 Diode Characteristics

Lab 3 Approximating Diode Characteristics with Equations

Lab 4 Transistor Characteristics and Circuits

Lab 5 First Order and Second Order Dynamic Systems with Operational Amplifiers

Lab 6 Frequency and Transient Responses of First and Second Order Dynamic Systems

Lab 6 High Voltage Level Indicator Circuit

Lab 7 Inverting Op-Amp Circuit and Voltage Gain Control

Lab 8 Part I: Designing a Analog to Digital Conversion Circuit

Lab 9 Part II: Building and Testing a Analog to Digital Circuit

Lab 10 Part I Designing a Digital to Analog Circuit

Lab 11 Part II Building and Testing a Digital to Analog Circuit

Lab 12 Part I Designing a ON/OFF Temperature Control Circuit

Lab 13 Part II Building and Testing a ON/OFF Temperature Control Circuit

Prepared by: Ray Bachnak

Date: _____