EMM401 INSTRUMENTATION SYSTEMS 3 Credits

Instructor: Professor Horizon Gitano

Objectives:

To familiarize the student with various transducers and techniques for making electronic measurements of physical phenomena. The student should be able to identify the fundamental physics of various common transducers, the use and limitations of the transducers. Additionally the student should understand the limitations of measurement systems including such concepts as dynamic response, voltage and temporal resolution, saturation and the effect of thermal drift. The student should be capable of designing basic measurement systems for common variables (such as flow, pressure, mass, level, temperature, and position), using existing transducers, operational amplifiers and data acquisition systems.

Prerequisites: The student must have good knowledge of basic electronics circuits

Primary Text Book:

Beckwith, Marangoni, and Lienhard *Mechanical Measurements*,Pearson Educational

Grading:

Final Exam:	60%
Course Work – Tests	30%
Course Work – Homeworks	10%

WARNING:

The following is a percentage breakdown of the letter grades (not what you are used to!):

A	90 to 100%
B	80 to 89.9%
C	70 to 79.9%
D	60 to 69.9%
F	59.9 and below

TO PASS THIS CLASS YOU **MUST PASS BOTH THE COURSE WORK AND THE FINAL EXAM!**

F + A = F F + B = F F + C = F F + D = F

Also Note: **PLAGIARISM = FAIL.** If you are caught copying you will fail the class.

Course Outline

Introduction – Why do we make electronic measurements?

Measurement Basics

- Signals
- Transducers
- Amplifiers
- Analog Displays
- Digital to Analog Conversion
- Digital Signal Analysis

Linearity and Calibration

AC Signals

- Frequency analysis
- Fourier transforms
- Band Width
- Frequency Response

Amplifiers

- Classifications of amplifiers
- Operational Amplifier circuits
- Transistors as amplifiers

========== TEST #1 ==========

Analog to Digital Conversion

- Digital to Analog Conversion
- Digital Techniques
- Data Acquisition Systems

Transducers (Sensors)

- Temperature
- Displacement
- Strain, Force and Torque
- Pressure
- Flow
- Velocity
- Acceleration
- Radiation…

Dynamic Characteristics of Measurement Systems

Errors and Error analysis in Measurement Systems

========== TEST #2 ==========

Control Systems Incorporating Sensing Elements