

The University of Texas at Tyler  
Department of Electrical Engineering

**Course: EENG 5340 – Instrumentation and Measurement Systems**

**Syllabus**

Catalog Description:

EENG 5340 – Instrumentation and Measurement Systems: An introduction to instrumentation and measurement systems. Generalized instrument characteristics, signal conditioning, and sensors for measurement of various physical quantities. Three hours lecture per week with integral laboratory.

Prerequisites: EENG 4309 (Prerequisite or co-requisite)

Credits: ( 3 hours lecture, 0 hours laboratory per week )

Text(s): Sensors and Signal Conditioning, 2nd Edition  
Ramon Pallas-Areny, John G. Webster  
Published by John Wiley & Sons, November 2000  
ISBN: 0-471-33232-1

Additional Material:

Course Coordinator: Beams, D. M.

Topics Covered: (paragraph of topics separated by semicolons)

Generalized instrument characteristics; resistive sensors (potentiometers, strain gages, thermistors, RTDs); signal conditioning for resistive sensors; chopper-stabilized amplifiers; carrier amplifiers; lock-in amplifiers; instrumentation amplifiers; thermocouples; thermocouple electronic cold-junction compensation; LVDTs; phase-sensitive demodulation; digital sensors; sensors based on semiconductor *p-n* junctions.

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<sup>1</sup>: By the end of this course students will be able to:

1. Explain the concepts of sensors and transducers [1,2];
2. Explain the dynamics of zero-, first-, and second-order measurement systems [1,2];
3. Design and analyze measurement systems employing a Wheatstone bridge [1,2];
4. Design and analyze instrumentation amplifiers [1,2];
5. Design and analyze measurement systems using strain gages [1,2];
6. Design and analyze measurement systems using thermocouples, including cold-

- junction compensation [1,2];
- 7. Explain the operation of chopper-stabilized amplifiers [1,2];
- 8. Explain the principles of coherent (phase-sensitive) demodulation [1,2];
- 9. Design and analyze measurement systems using LVDTs [1,2];
- 10. Explain the operation of digital sensors [1,2];
- 11. Explain the use of semiconductor *p-n* junctions as sensors [1,2].

<sup>†</sup>*Numbers in brackets refer to method(s) used to evaluate the course objective.*

Relationship to Program Outcomes (only items in dark print apply): This course supports the following MSEE Program Outcomes, which state that:

1. Graduates of the program will possess a breadth and depth of knowledge in electrical and computer engineering.
2. Graduates of the program will possess and demonstrate oral and written communication skills.
3. Graduates of the program will demonstrate the capability to perform independent learning and investigation.

Prepared By: David M. Beams

Date: Aug. 10, 2011