The University of Texas at Tyler
Department of Electrical Engineering

Course: EENG 4302 – Measurement and Instrumentation Systems (Elective)

Syllabus

Catalog Description:

EENG 4302: Instrumentation and Measurement Systems: An introduction to instrumentation and measurement systems. Generalized instrument characteristics, signal condition, and sensors for measurement of various physical quantities.

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[1]: 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];

[1]*Numbers in brackets refer to method(s) used to evaluate the course objective.*

Relationship to Program Outcomes (only items in dark print apply)[2,3]: This course supports the following Electrical Engineering Program Outcomes, which state that our students will:

1. have the ability to apply knowledge of the fundamentals of mathematics, science, and engineering **(1)**;
2. have the ability to use modern engineering tools and techniques in the practice of electrical engineering **(2)**;
3. have the ability to analyze electrical circuits, devices, and systems **(3)**;
4. have the ability to design electrical circuits, devices, and systems to meet application requirements **(3)**;
5. have the ability to design and conduct experiments, and analyze and interpret experimental results **(1)**;
6. have the ability to identify, formulate, and solve problems in the practice of electrical engineering using appropriate theoretical and experimental methods;
7. have effective written, visual, and oral communication skills;
8. possess an educational background to understand the global context in which engineering is practiced, including:
   a. knowledge of contemporary issues related to science and engineering;
   b. the impact of engineering on society;
   c. the role of ethics in the practice of engineering;
9. have the ability to contribute effectively as members of multi-disciplinary engineering teams;
10. have a recognition of the need for and ability to pursue continued learning throughout their professional careers.

[2]*Numbers in parentheses describe the degree to which the Program Outcome is supported by this course.*
(1): Program Outcome is a minor focus of this course;
(2): Program Outcome is a significant focus of this course;
(3): Program Outcome is a major focus of this course.

[3]*Numbers in brackets refer to course objective(s) that address the Program Outcome.*

Contribution to Meeting Professional Component: (in semester hours)

Mathematics and Basic Sciences:		hours
Engineering Sciences and Design:	3	hours
General Education Component:		hours

Prepared By: David M. Beams Date: Aug. 29, 2011