EE 521 Course Syllabus

Course title:

Instrumentation and Measurements

Instructor:

Dr. Anders M. Jorgensen
Workman 227
Phone: 505-835-5450
e-mail: anders@nmt.edu

Class hours:

Wednesday 9:30-11:45

Classroom location:

Workman 117

Office hours:

Wednesday 12-14

Textbooks:

1. Robert B. Northrop: Introduction to Instrumentation and Measurements, 2nd ed, CRC press ISBN 0-8493-3773-9 (I recommend buying it at www.barnesandnoble.com, where it costs $99.95, or $79.95 if you are a member)
2. John R. Taylor: An Introduction to Error Analysis, 2nd ed ISBN 0-935702-75-X (If you know error analysis well and have a different book, you don't need this book, but I recommend it. You can also buy it from Barnes & Noble for $40).
3. Handouts

Learning objectives:

1. Understand the fundamental principles of measurement and uncertainty.
2. Understand how measurement systems are designed, calibrated, characterized, and analyzed.
3. Gain an understanding of some of the specific sensor systems trade-offs that must be made in commercial and scientific measurement systems.
4. Survey modern sensor systems for measuring a variety of physical quantities.

Prerequisites:

EE 308, EE 322, and EE 342 (or equivalent with consent of instructor)

Topics covered:

1. Measurement units and definitions.
2. Error analysis: meaning of uncertainty, estimating uncertainty, uncertainty propagation, and uncertainty distributions.
3. Noise and interference.
4. Signal conditioning and filtering.
5. Transducers.
6. Sensor applications.
7. Data acquisition, digital interfaces.
8. Discussion of specific sensor systems.

Course work:

1. Course readings and discussion problems. You are expected to come to class prepared to discuss the assigned readings and problems.
2. Homework. Written homework will be assigned approximately every week.
3. Research paper. A written paper will be required. In it you will discuss a sensor system that you choose.
4. Laboratory exercises. Several laboratory exercises will be assigned during the semester, to be arranged in class.
5. Final exam. There will be a take-home final exam.

Grading policy:

1. Homework 30%
2. Active participation in class 10%
3. Research paper and presentation 15%
4. Laboratory exercises 30%
5. final exam 15%

Schedule: (tentative)

Date	Topic	Preparation	Hand in
Aug 22	Course overview		
Aug 29	Introduction	Northrop Chapter 1	
Sep 5	Error analysis	Taylor	
Sep 12	Analog signal conditioning	Northrop Chapter 2	
Sep 19	Noise and interference	Northrop Chapter 3	
Sep 26	Noise and interference	Northrop Chapter 3	
Oct 3	Null measurements	Northrop Chapters 4 & 5	
Oct 10	Transducers	Northrop Chapter 6	
Oct 17	Transducers	Northrop Chapter 6	
Oct 24	Sensor applications	Northrop Chapter 7	
Oct 31	Sensor applications	Northrop Chapter 7	
Nov 7	Basic electrical measurements	Northrop Chapter 8	
Nov 14	Digital interfaces	Northrop Chapter 9	
Nov 21	Student presentations		
Nov 28	Student presentations		
Dec 5	Review		
Dec 14	Final exam		

Laboratory exercises:

There will be computational and practical labs which will be assigned at regular intervals during the semester by arrangement.