Instructor: Dr. Tony Cahill  
Email: tcahill@civilmail.tamu.edu

Office: 205J WERC  
Phone: 862-3858

Class Web Site: We are using the CENOTES system, which can be accessed at cenotes.tamu.edu. You must register with this system, and you will be able to access all class handouts and your grades through it.

Texts: No single text covers the material adequately. Readings will be provided by the instructor. A good (but not required) reference text is The Art of Electronics by Horowitz and Hill, 2nd ed., Cambridge, 1995. For using Matlab in the course, the text Introduction to Matlab 6 for Engineers, by Palm, McGraw-Hill, 2001 is recommended.

Prerequisites: ENGR 111, PHYS 208 or permission of the instructor

Objectives:
1. Learn how to use modern sensors used in civil engineering practice and research.
2. Understand the principles behind measurement technologies, and the existence of measurement noise and uncertainty.
3. Understand how to analyze your measured data in the context of specific civil engineering problems.

Outcomes: The material in this course addresses the following ABET outcomes outlined by the department
   a. Ability to apply knowledge of basic mathematics, science, and engineering to solving civil engineering problems
   b. Ability to design and conduct experiments, as well as to analyze critically and interpret data in more than one recognized major civil engineering area
   d. Ability to function on multi-disciplinary teams
   e. Ability to formulate and solve civil engineering problems
   g. Ability to communicate effectively in oral and written forms
   i. Recognition of the need to engage in life-long learning including continuing education
   k. Ability to use modern tools, techniques, and computation methods necessary for civil engineering practice
   l. Ability to apply probability, statistics, and economics in civil engineering decisions

Supported software: There are two languages used in this course. For analysis, the language is Matlab. For the instrument control boards, we will use Labview. You will be expected to write programs. If you want to work with another computer language, you need to run it by me first.
Course Topics: Some of the topics we will cover include -

- Measurement
  - Why measure anything and what sort of measurements are typically used in civil engineering?
    - Temperature
    - Displacement
    - Strain
    - Chemical concentration
    - Velocity
    - Pressure
    - Acceleration
  - Basic electricity review
    - Voltage, current and resistance
  - Analog-digital difference (records/tapes versus CDs)
    - Computers are digital & how they work
  - Analog-digital conversion
    - How a A-D converter works, Gain and offset
    - How the Matlab toolbox (which we have been using already) works
  - Types of measurement devices
    - Thermocouples and resistance thermometers
    - Strain and displacement gages
    - Accelerometers
    - Pressure transducers (and microphones)
    - Optical sensors
    - Lasers
    - Etc…
  - Signal Processing (all done in Matlab environment)
    - Errors and noise
    - Filtering
    - Time Series Analysis
    - Fourier Transform and Spectrum
    - Wavelets (?)
  - Communication and Networks of Devices
    - Multiplexing
    - Wireless systems
  - Data assimilation
    - Kalman Filter

We will cover additional material as time, interests and resources permit.

Grading policy: Homework, quizzes, classroom participation 30%
Exam 20%
Project 30%
Final 20%

Final grades will be on the grade basis
- A = 90-100%
- B = 80-89.9%
- C = 70-79.9%
- D = 60-69.9%
- F < 60%

I have not listed a date for the midterm exam, because 1) it will take place after we have covered sufficient material, and that date depends on how fast we go, and 2) I like to choose the exam date in negotiation with you, so that it does not conflict with other exams. We will discuss this further as the term progresses.
Ground rules:

Homework: Homework is due on the assigned day. If homework is handed in late, the maximum possible credit will be 60%, unless there is a valid university excuse. For problems without assigned programs, partial credit will be given for a "good faith effort" in which work is shown to evaluate effort. For programs, you must submit development work, source code listing, and evidence that the program ran correctly (use formatted input and output with labels).

Project: The last three weeks of the course will be spent with students working on a project of their design. The project will involve implementing a sensor-system for a civil engineering question of their choice, using available class sensors and other equipment. Basically, you will be designing and performing a civil engineering experiment. This work can be in any field in civil engineering – if you’re interested in structures, set up strain gauges, if you’re interested in transportation, set up vehicle detection loops, etc…. More information on the project will be provided.

Office Hours: Please come see me with any questions you might have. I don’t keep formal office hours, so you should feel free to come by and see me. If I’m terribly busy, I’ll ask you to come back later, but in general, I am available. I’m happy to schedule appointments to see students as well.

Official Notices

ADA Statement: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides reasonable accommodation of their disabilities. If you believe you have a disability requiring accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Room 126 of the Koldus Building, 845-1637.

Academic Integrity and Aggie Honor Code: “An Aggie does not lie, cheat, or steal or tolerate those who do.” Students are expected to understand and abide by the Aggie Honor Code presented on the web at: http://www.tamu.edu/aggiehonor. No form of scholastic misconduct will be tolerated. Academic misconduct includes cheating, fabrication, falsification, multiple submissions, plagiarism, complicity, etc. These are more fully defined in the above web site. Violations will be handled in accordance with the Aggie Honor System Process described on the web site.

The handouts used in this course are copyrighted. By “handouts,” I mean all materials generated for this class, which include but at not limited to syllabi, notes, quizzes, exams, in-class materials, review sheets, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy the handouts unless I expressly grant permission. We are using CENOTES to provide a level of security for
the course materials (including your grades). You must not give out your CENOTES password to anyone, since this would allow general access to the copyrighted materials.

Cheating on quizzes and exams will not be tolerated. Cheating will be reported and handled in accordance with the Aggie Honor System Process. Some or all examinations will be closed book; “looking at another student's examination or using external aids (for example, books, notes, calculators, conversation with others, or electronic devices)” during these examinations is a violation of Texas A&M Aggie Honor Code, Cheating, unless specifically allowed in advance by the instructor.

Unless specifically allowed in advance by the instructor, all assignments and homework in this class are expected to be completed based on individual effort. Copying the work of others, including homework, is a violation of Texas A&M Aggie Honor Code, Cheating.