CE-GY 6073 INSTRUMENTATION, MONITORING, AND CONDITION ASSESSMENT OF CIVIL INFRASTRUCTURE

Course Outline
SPRING 2018

Instructor
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Class Time
Tuesdays 6:00-8:30 PM

Office Hours
Tuesdays 5:00-6:00 PM
Other times arranged by appointment

Required Reading
Notes and handouts provided by me.

Recommended References
• Hanna, T.H. (1985) Field Instrumentation in Geotechnical Engineering, Trans Tech Publications (out of print & difficult to find)
• ASCE Task Committee Guidelines for Instrumentation & Measurements for Monitoring Dam Performance
• The Internet Instrumentation Vendors Web Sites

Bulletin Description
This course covers: A systematic approach to planning and executing instrumentation, monitoring and condition assessment programs; strain measurements; civil engineering sensors (static, dynamic, optical); environmental measurements; mechatronic sensors;
signal conditioning, information measurements and error analysis; business aspects; advanced-measurement systems.

Course Objectives

- Introduce students to instrumentation & monitoring of civil infrastructure.
- Familiarize students with various sensors commonly used in civil engineering.
- Introduce students to condition assessment in civil engineering.
- Ability to design instrumentation, monitoring & condition Assessment programs
- Use instrumentation to achieve better project performance

You are encouraged and expected to participate in class by asking questions, and discussing the engineering issues involved. One of the objectives of this course is to help you develop your own communication skills.

Course Pre-Requisites

Graduate or senior standing in Civil Engineering or instructor consent.

Course Structure & Topics

The class is offered in a modular format. Each week one topic is covered. **You are strongly encouraged to research each week presentation, on line, before coming to class.** We will cover the following topics.

1. Basic Material Properties And Instrumentation Skills
2. Measurement of Strain
3. Civil Engineering Sensors for Static CE Applications I
   a. Load Cells
   b. Pressure Gauges
      i. Hydraulic Pressure
      ii. Earth Pressure
4. Civil Engineering Sensors for Static CE Applications II
   a. Displacement Gauges
   b. Tilt Meters & Inclinometers
5. CE Sensors – Optical Measurements (Surveying)
6. Data Acquisition, Signal Conditioning, and Information Management
7. Midterm (Tuesday March 6)
8. Error Analysis
9. Planning & Business Aspects of Instrumentation Programs
10. Civil Engineering Sensors – Dynamic Measurements
11. Condition Assessment of Concrete & Masonry Structures
12. Condition Assessment of Steel & Timber Structures
Grading

The minimum passing grade is 60%. I normally give a grade of As or Bs to students taking my graduate classes. However, I have given Cs and Fs when students failed to learn the material or do their assignments. The following grading policy will be in effect:

A Excellent performance
B Good/adequate performance i.e. perform the assigned work without distinguishing one’s self.
C Deficient but passing performance
F Failing
I Incomplete grade is given for valid reasons such as illness or other critical emergency, such as death of a close family member. Work related excuses are never a critical emergency. If work is not completed in one year, the registrar automatically changes an I to become an F.

The grade will be distributed as follows:

• Case history paper = 25%
• Mid Term = 25%
• Home Works = 10%
• Final = 40%

Homework assignments will typically include material covered in this class but may assume knowledge of material covered in a typical undergraduate civil engineering curriculum. Assignments are due one week later, unless noted otherwise. Please make copies of all HW assignments. I do not return HW, but will post a solution key to MY homeworks. Homework will not be accepted after a solution has been posted.

The midterm and final exams will cover lectures and homework. These exams are intended to help you synthesize the material presented in class. The best preparation for the exams is to read your handouts, pay attention in class, and participate in class discussions. The final will cover material already covered on the midterm.

As an engineer (or soon to be one) you are expected to conduct yourself professionally. Engineers are inherently neat and organized. In this class professional conduct includes timely submission of assignments, punctual attendance, and professional communications. Engineering employers often consider communication skills to be as important as engineering skills in rating prospective employees. At this stage of your career you should become accustomed to professional presentation tools such as word processors, spreadsheets, charting and drafting software, and presentation software. Your assignments
and project report should take the format of consulting letters and reports, respectively, submitted to your client (your instructor).

**Computer Facilities**

I assume that everyone has access to a computer. Tandon has a number of computer labs, which are equipped with standard business and engineering software. You are expected to use computers to present your work and encouraged to make use of the university computer facilities.

**Library Facilities**

NYU’s Bern Dibner Library at the Metrotech as well as NYU Bobst Library are available for your use. As a student at Poly, you have access to electronic search facilities through the library web page. If a paper or a book is not available at the library, you can request that the librarian get you a copy by fax or inter-library loan, respectively. The New York Public Library science section located at Madison and 34’th in Manhattan is also a useful resource available to you.

Linda Hall Library of Science, Engineering & Technology is dedicated to providing the most comprehensive science, engineering, and technology collections, in the United States. The Library is open to the public and provides excellent document services including same day delivery of scanned documents in pdf through its web site (www.lindahall.org or www.lhl.lib.mo.us)

You will need to order a few research papers in order to prepare for your case history paper. Tandon’s Librarians need time to provide with papers for free. You will need to plan ahead in order for you to use Poly services. If you procrastinate you can obtain papers from Linda Hall. Linda Hall can offer fast service for a significant premium. Planning will save you money.

**Substitute Class Times**

Every effort will be made to maintain all the university scheduled class times. However, substitute classes may be required to make up for snow emergencies or instructor out of town professional travel commitments. **I will let you know in advance of any rescheduled classes.**
Academic Honesty

Integrity, which starts in school, is a key ingredient of becoming a professional. Academic Honesty is assumed of all students; a zero-tolerance policy will be enforced with respect to cheating, which is defined to include any act to misrepresent someone else’s work as your own. Anyone caught cheating will automatically fail this class. Please refer to the university code of conduct available at http://engineering.nyu.edu/academics/code-of-conduct and also ASCE code of conduct available at: http://www.asce.org/code-of-ethics/ for further details.

Final Comment

Good luck to all of you in this course. Please do not hesitate to ask questions in class, or contact me outside of class. Any specific comments on how this class may be improved are particularly welcomed.