1. ***Department, number, and title of course***
Department of Civil Engineering, CENG 2353, Civil Engineering Measurements

2. ***Required Course***

3. ***Course (catalog) description***
Principles and methods of measurement of loads, load effects, environmental variables, and performance of civil engineering systems. Lab exercises provide students with an introduction to sensors, basic electrical circuits, data acquisition systems, and data analysis methods used in civil engineering.

4. ***Prerequisite(s)***
ENGR 1200: Engineering Methods; and
Co-Requisites: MENG 3306: Mechanics of Materials

5. ***Textbook(s) and/or other required material***
No Prescribed Textbook.

6. ***Course Objectives***
   a. Develop an organized approach to design an experimental measurement system and conduct a physical experiment to solve civil engineering system analysis and design problems.
   b. Analyze DC circuits consisting of combinations of series and parallel connections using Kirchoff's Voltage Law and Current Law and get their equivalent circuit using the current loops methods.
   c. Explain the process, components, and principles involved in a measurement system, data acquisition system, analog and digital recording instruments, sensors and transducers, signal conditioning circuits, the resolution of the A/D converter and systems filters.
   d. Explain resistance-type strain gages and strain measurement, analyze the Wheatstone bridge, interpret strain gage bridges, and perform calibration of measurement systems using simple/multiple linear regression models, and time series analysis.
   e. Use spreadsheets, math solving programs, MATLAB, and programming as tools to perform the mathematical operations required in civil engineering measurements.
   f. Use Excel spreadsheets and MathCAD programs as tools to perform system calibration, run regressions, understand the results, and interpret the models required in civil engineering measurements.

7. ***Topics Covered***
   - Introduction and application of measurement, precision and accuracy
   - MathCAD, Excel, MatLAB, programming language
   - Analysis of DC circuits
   - Analog and digital recording instruments
   - Sensors and transducers
   - Signal conditioning circuits
   - Resistance type strain gages
   - Force and moment measurement
   - Pressure measurement
   - Displacement, velocity, acceleration and vibration
   - Similitude and dimensional analysis
   - Linear regression analysis

8. ***Class/laboratory schedule, i.e., number of sessions each week and duration of each session***
LESSONS: 30 @ 50 min (2 att/wk) LABS: 15 @ 150 min (1 att/wk)

9. Contribution of course to meeting the requirements of Criterion 5

3.0 Credit Hours (ES=2.0, ED=1.0)

This course is an engineering topics course that really helps tie many mathematical and science principles together as the course focuses on the measurement techniques within the civil engineering field. The course incorporates government and industry standard equipment and software for civil engineering measurement. It provides the principles of measurement techniques needed in civil engineering industry design and analysis.

10. Relationship of course to program outcomes

The course director's assessment of how this course contributes to the civil engineering program outcomes is listed below. The following scale is used:

1=No Contribution; 2=Small Contribution; 3=Average Contribution; 4=Large Contribution; 5=Very Large Contribution

CIVIL ENGINEERING PROGRAM OUTCOMES	Course Director Assessment
Program Outcomes Students who qualify for graduation with a civil engineering major will demonstrate:	
Can apply knowledge of traditional mathematics to solve problems	4
Can apply knowledge of traditional science (calculus-based physics, Chemistry, additional science) to solve problems	5
Can apply knowledge of traditional engineering skills to solve problems	4
Can use modern engineering tools to solve problems	5
Can design and conduct experiments, as well as analyze and interpret data in more than one civil engineering discipline	5
Can design systems, components, and processes considering standards and engineering constraints	3
Can recognize the strengths and areas for possible improvement of their creative designs	3
Can work independently as well as part of a multidisciplinary design team	3
Can identify, formulate, and solve engineering design problems using engineering models in the discipline of structural engineering	3
Can identify, formulate, and solve engineering design problems using engineering models in the discipline of transportation engineering	1
Can identify, formulate, and solve engineering design problems using engineering models in the discipline of construction management	1
Can identify, formulate, and solve engineering design problems using engineering models in the discipline of hydrology and hydraulic design	3
Can identify, formulate, and solve engineering design problems using engineering models in the discipline of environmental engineering.	1
Can analyze a situation and make appropriate professional decisions	1
Can analyze a situation and make appropriate ethical decisions	1
Have effective oral, written, and graphical communication skills	4
Demonstrate a commitment to learning and continued professional development outside the classroom	3
Incorporate contemporary issues during problem solving	2
Determine the impact of engineering solutions in a global and societal context	2
Can explain professional practice issues	2
Can explain leadership principles and attitudes	1
Can explain management concepts and processes	1
Can explain concepts of business practices	1
Can explain public policy and public administration	1

11. Person(s) who prepared this description and date of preparation

Dr. Peter D. Rogers, PE, Assistant Professor, 9 June 2008.