Department: ME

Course No.: 260W

Title: Measurement Techniques

Credits: 3

Contact: Marty Wood

WQ: W

Catalog Copy: ME 260W Measurement Techniques. Second semester. Three credits. Two class periods and one 2-hour laboratory period. Prerequisite: ECE 220: ENGL 105 or 110 or 111 or 250.

Theory and practice of measurement including analysis and application of electromechanical transducers. Methods of measuring length, area, time, pressure, temperature, force and strain. The determination of the phase relation between a driving potential and the response of a system. The application of statistical methods to analysis of experimental data.

W Criteria: This course emphasizes the student's ability to apply their knowledge in mathematics, strength of materials and dynamics to the experimental phenomena associated with the indicated topics. The students are expected to utilize energy principles, Newton's 2nd Law, statistics and differential equations as applied to mechanical systems.

The five to seven laboratory experiments demonstrate principles covered in the lectures and reading assignments. Each lab report consists of multiple typed finished pages totaling at least 4000 words in length. Each report must contain diagrams/figures generated by computer and must be embedded in the report. Modeling activities/diagrams may require the use of software packages such as MATLAB. The sum of the individual labs comprises 60% of the final course grade. Failure to complete the written portion of the course satisfactorily will result in failure of the course.

Students must integrate previously learned theory, knowledge of equipment operations and data acquisition and analytical and writing skills to produce a well-organized, concise, precise and comprehensive report. So that students can conduct an experiment, analyze the associated data, identify the fundamental system model and analyze the model and compare the response of the model to the response of the system. The laboratories are selected from the below topics:

- 1 Visual Interface Construction using LabVIEW Software
- Principles of Strain Gages and Strain Measurement
- Time Response of First Order Systems, Theory and Experiments
- Time Response of Second Order Systems, Theory and Experiments
- Vibrations of Continuous Systems: Beams
- Precision Positioning Using Piezoelectric actuators and LVDT

- Design of Experiments
- Statistics (including Gaussian distribution, confidence intervals, linear regression and T-Distributions)

The primary modes of written instruction to students are:

- Formal classroom instruction supplemented by a handout prescribing a format or an example.
- Written commentary from the teacher of record or faculty project advisor
- Individual/group conferences
- Oral presentation instruction is by example

The reports will be graded based on both technical content and the quality of writing and returned to the student before or during the subsequent laboratory period. So that feedback on the previous report can be reviewed and incorporated into the next laboratory report.

Role of Grad Students: The TA's, usually two per section, are responsible for attending and grading pre-lab oral conferences with students and for overseeing laboratory safety and equipment operation during all experiments. They do not grade the written reports. Faculty instructors supervise them.

Supplementary Information: The entire written components of this W-course results from the experimental laboratory setting. In the lab, the maximum number of students is 16 with a faculty member; therefore, the student to teacher ratio for the W portion of the course is less than 19:1.