MECHANICAL ENGINEERING PROGRAM

ABET COURSE SYLLABUS

ME 410: Experimental Methods in Mechanical Design I (4) Elective

Course Description: (2013-2015 Catalog)	Bonded resistance strain gages for static and dynamic measurements; rosettes, bridge circuits, lead wire effects, special gages. Data acquisition systems, and measurement of displacement, velocity, and acceleration. Photoelastic methods including birefringent coatings. Applications in mechanical design and metrology. 3 lectures, 1 laboratory.
Prerequisite Courses:	ME 328, Recommended: ME318
Prerequisites by Topic:	Introduction to Design Recommended: Vibrations
Textbook: **(and/or other required material)**	Handouts, web resources, and technical reports.
References:	None
Course Coordinator/Instructor:	Brian P. Self, Professor of ME.
Course Learning Outcomes:	1. Use bonded strain gages to analyze real world problems 2. Understand the principles of photoelasticity and how it can be used to solve mechanical engineering design problems 3. Use accelerometers, rate gyros, and other sensors to determine accelerations, displacements, and velocities 4. Choose appropriate measurement techniques to solve mechanical design problems 5. Develop and execute a test plan to analyze a mechanical engineering design problem 6. Validate experimental measurements using analytical techniques 7. Apply statistics and uncertainty analysis to evaluate the quality of experimental results.

Relationship of Course to MECHANICAL ENGINEERING Program Outcomes:												
a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*
H	**H**	**M**	**L**	**M**	**L**	**M**	**L**	**M**	**M**	**H**	**M**	**L**

Topics Covered: (recommended number of hours each)	1. Bonded resistance strain gages, gage selection, cements. Strain gage bridge circuits 2. Strain rosettes, transverse sensitivity correction, thermal and lead wire effects. 3. Data acquisition, signal conditioning, and analog to digital conversion. 4. Experimental design and statistics. 5. Theory and application of accelerometers and rate gyros to static and dynamic measurements.
Laboratory Projects:	1. Strain gauge and lead wire application on a bending strip. 2. Design, construction, and testing of a load cell using strain gauges. 3. Applications of Labview™ to data acquisition. 4. Use of accelerometers and gyros to measure impact, accelerations, tilt, and angular velocity. 5. Multi-week final project.
Class/Lab Schedule:	Three one-hour lectures and one three-hour lab per week.
Contribution of Course to Meeting the Professional Component:	(a) College-level mathematics and basic sciences: 0 credits (b) Engineering Topics (Science and/or Design): 4 credits (c) General Education: 0 credits (d) Other: 0 credits
Prepared by: Brian Self	**Date:** 5/20/2014