COURSE NUMBER: ME 5247, 4 credits	**COURSE TITLE:** Stress Analysis, Sensing and Transducers
TERMS OFFERED: Fall	**PREREQUISITES:** AEM 3031 MatS 2001
TEXTBOOKS/REQUIRED MATERIAL: Experimental Stress Analysis, Fourth Edition, J. W. Dally and W. F. Riley, College House Enterprise, 2005	**PREPARED BY:** Professors B. Klamecki **DATE OF PREPARATION:** May 7, 2007
COURSE LEADER(S): Professors B. Klamecki	**CLASS/LABORATORY SCHEDULE:** Three 50 minute lectures per week and one 120 minute lab per week. **CONTRIBUTION OF COURSE TO MEETING PROFESSIONAL OBJECTIVES:** 100 % Engineering Topics
CATALOG DESCRIPTION: Electrical resistance strain gage theory and technology. Gage characteristics, selection, and use. Bridge circuits and temperature and stray strain compensation. Signal conditioning. Data analysis. Photoelasticity techniques. Interpretation of fringe patterns. Sensor principles and performance. Transducer design and characterization. Image analysis.	**COURSE TOPICS:** 1. Introduction to sensing, transduction and analysis 2. Performance of measurement systems 3. Concepts underlying strain gages and photoelasticity 4. Two-dimensional stress/strain 5. Practical strain gage use 6. Sensors and transducers 7. Wireless Sensing Systems 8. Polarized light for strain sensing 9. Photoelasticity 10. Accelerometers 11. Image analysis 12. Integration of Sensing in Motion Production Systems

COURSE OBJECTIVES	1. Become familiar with the use and evaluation of strain measurement techniques with regard to applicability, sensitivity and resolution, 2. Use strain/stress measurement techniques to design and produce transducers. 3. Use sensing systems in measurement and motion production systems. 4. Gain experience in defining and solving problems through project work. 5. Combine experimental results with analytic and numerical stress analyses.
COURSE OUTCOMES	**(Letters shown in brackets are linked to program outcomes a-k)** 1. Understanding of the physical processes enabling strain to be measured by use of electrical resistance strain gages and photoelasticity. [a] 2. Ability to obtain useful strain measurement data using strain gages and photoelasticity. [b, k] 3. Awareness of strain gage characteristics that enter into gage selection and performance and familiarity with photoelastic material properties. [a, k] 4. Experience in designing and constructing a measurement apparatus [b, c, i, k] 5. Familiarity with use of sensors in motion production systems [b, c, k] 6. Practical experience in applying the theory and laboratory skills learned in the course to a problem of their own choosing with results presented in written and oral formats. The course project is primarily an independent effort in defining a problem, preparing a project proposal, planning the work, producing results and writing the project report. [b, c, e, g]
ASSESSMENT TOOLS:	1. Laboratory work, including results and lab reports 2. Project work, including oral and written reports 3. Quizzes 4. Final exam

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Nature of Changes:

1. ***The required textbook edition and publisher were updated.***
2. ***Wheatstone bridge circuits, strain gauge rosettes, brittle coatings, and piezoelectric sensors were all omitted as course topics.***
3. ***Wireless Sensing Systems and Integration of sensing in motion production systems were added as course topics.***
4. ***The use of sensing systems was added as course objective #3***
5. ***Familiarity with sensor use in motion production was added as course outcome #5***