

ME 391: Measurements and Instrumentation Laboratory
Experiment Title: SM – Strain Measurement

1. Purpose

The student will learn the basic operating principles of strain gauges and the use of the Wheatstone bridge for accurate strain measurement. The experiment uses a cantilever beam (with gauges already attached) and the student will measure and calculate the axial and transverse strains as well as the deflection in the beam. Young's modulus and Poisson's ratio for the beam material will be calculated using experimental data. The student will also gain experience in collecting experimental data via a USB interface.

2. Learning Objectives

- a. Become familiar with the operation of resistive strain gauges.
- b. Understand the use of the Wheatstone bridge.
- c. Measure and calculate the surface strains and deflection of a cantilever beam, given the dimensions and material of the cantilever and the location of the strain gauges.
- d. Connect a strain gauge readout box for quarter-bridge and half-bridge configurations.
- e. Calculate Young's Modulus and Poisson's ratio from experimental data.
- f. Use an oscilloscope for dynamic strain measurements.
- g. Measure resonant frequency and compare to theoretical results.

3. References

Beckwith, *Mechanical Measurements*, 6th ed., Pearson/Prentice Hall, 2007
Student Manual for Strain Technology, Bulletin 309D, Vishay Measurement Group, Inc.

4. Equipment

Cantilever Beam Apparatus	Vishay P3 Strain Gauge Box	Caliper
Oscilloscope	Dial indicator	Flat beam (Alum. 6061-T6)
Set of weights	Ruler	BNC cable
Strain gauges attached to beam	Scale	USB cable
2 jumper wires for P3		

Sm Experimental Method I M T B

Les Kirkup



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Sm-1 Hands-On Labs,2007-02 *Concise Handbook of Experimental Methods for the Behavioral and Biological Sciences* Jay E. Gould,2001-12-20 Although there are many books written on the principles and methods of experimentation few are written in a succinct comprehensive outline format The Concise Handbook of Experimental Methods for the Behavioral and Biological Sciences is based on a popular course taught by the author for more than two decades to assist advanced undergraduate and *Experimental Method and Measurement* S. D. Probert,J. P. Marsden,T. W. Holmes,1971

Experimental Methods Les Kirkup,1996-01-09 This concise and easy to read text introduces first year students to the analysis and presentation of experimental data Written for students taking introductory physics courses at tertiary level Experimental Methods will be a vital resource for all students involved in experimental or laboratory work It will be equally useful for other quantitative subjects such as chemistry engineering and geology Topics of fundamental importance such as keeping a laboratory notebook analysing experimental data and report writing are often dealt with in separate texts This book integrates these topics and provides many of the tools that students will need at first year level and beyond

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