CONCORDIA UNIVERSITY DEPARTMENT OF MECHANICAL ENGINEERING

INSTRUMENTATION AND MEASUREMENTS, MECH 373/2

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Lectures:	3 hrs/week	Laboratory: 3 hrs/alternate week		
	Section T: WF 11:45-13:00	Section X: WF 16:15-17:30		
TEXT:	Theory and Design for Mechanical Measurements, by Richard S. Figliola and Donald			
	S. Beasley, 3 rd John Wiley & Sons, Inc.			
	Lab. Manuals (to be purchased by the students)			

COURSE PLAN & OBJECTIVES

OBJECTIVE: To understand the principles of measurement systems and the methods of measuring physical quantities. The student's abilities to analyze the experimental data are emphasized through case studies and laboratory work. Analytical methods developed in the systems courses will be applied to study the dynamic performance and design requirements of different measurement systems.

COURSE OUTLINE

INSTRUCTORS:

- 1. The generalized measurement system: Definition of terms; calibration; concepts in dynamic measurements and system response.
- 2. Static and dynamic characteristics of signals.
- 3. Static characteristics of Measuring Instruments: linearity and sensitivity; nonlinear effects; threshold, resolution, hysteresis, bias, saturation, deadband; loading.
- 4. Behaviour of measurement systems: General model of a measurement system; zero-, first- and second-order measurement systems; phase linearity; coupled systems.
- 5. Analysis of experimental data: Experimental errors and error analysis; bias and precision errors; general considerations in data analysis; uncertainty analysis; Accuracy and precision; curve fitting; method of least squares.
- 4. Electrical measurement and sensing devices: Major conversion principles; analog and digital signals; data acquisition.
- 5. Displacement and motion measurement: Strain gage, strain measurement and signal conditioning; displacement transducers; velocity and acceleration; force and torque measurement systems.
- 6. Pressure measurement: Manometers; elastic; strain gage; fluid velocity; transmission effects.
- 7. Flow measurement: Static probes; Orifice and Venturi meters; Hot wire anemometer; Rotameter; miscellaneous.
- 8. Temperature measurement: Thermocouples; mechanical, electrical and radiation effects; miscellaneous.

EVALUATION SCHEME:

Assignments:	10 marks
Mid-Term Class Test:	25 marks
Laboratory Reports:	15 marks
Final Examination - Closed Book	50 marks

NOTE: It is <u>compulsory</u> to obtain a passing grade (normally 50% mark) in <u>each</u> of the above components to obtain a passing grade in the course.

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<u>Chapter</u>	Sections
1	1.1 to 1.5
2	2.1 to 2.4
3	3.1 to 3.7
4	4.1 to 4.8
5	5.1 to 5.7
6	6.4, 6.5, 6.6 , 6.8
7	7.1, 7.2, 7.6, 7.7
8	8.1 to 8.7
9	9.1 to 9.8
10	10.1 to 10.8
11	11.1 to 11.6
12	12.1 to 12.9