

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

COURSE OUTLINE

Course Title: PROCESS CONTROL I \_\_\_\_\_

Code No.: ELR 204-6 \_\_\_\_\_

Program: INSTRUMENTATION TECHNICIAN \_\_\_\_\_

Semester: 3 \_\_\_\_\_

Date: SEPTEMBER, 1985 \_\_\_\_\_

Author: R. PALO \_\_\_\_\_

New: \_\_\_\_\_ Revision: X \_\_\_\_\_

APPROVED: J.P. Crozietto \_\_\_\_\_  
CHAIRPERSON DATE

ELR 204-6

PHILOSOPHY/GOALS:

To provide a basic understanding of process measurement fundamentals.

GRADING:

1) Written tests conducted at regular intervals and assigned equal weight. Missed tests are graded zero percent provided a legitimate excuse such as illness can be supported by a doctor's certificate. Comprehensive make up tests will be conducted at the end of the semester for people with missed tests and legitimate excuses.

2) Grading     A -- 80 - 100%  
              B -- 66 - 79%  
              C -- 55 - 65%  
              R -- REPEAT

3) 70% for tests  
   30% for labs

4) Lecture and lab attendance mandatory

TEXTBOOK(S):

Process Instrumentation and Control Fundamentals - Process Measurement Fundamentals by General Physics Corporation

COURSE OUTLINE

Block 1 - Fundamentals of Measurement

<u>Topic</u>	<u>Chap</u>	<u>Hrs</u>
Introduction	1	
Fundamental units		1
Basic Instrument Channel		
Direct vs Inferred Measurement		1
Process Measurement System Terminology		1
Static Characteristics		1
Dynamic Characteristics		1
		<hr/> 5

Block 2 - Pressure Measurement

<u>Topic</u>	<u>Chap</u>	<u>Hrs</u>
Introduction	2	
Definition of Pressure		
Hydrostatic Pressure		1
Pressure From Mechanical Force		
Pressure From Heat		
Units of Pressure		1
Manometer		
Bourdon Tube		1
Diaphragm Pressure Devices		
Pressure Capsules		1
Bellows Pressure Devices		
Dead Weight Gauge		1
Strain Gauge		
Capacitance Type Sensor		1
Additional Pressure Meas. Devices		
Diaphragm Seals		1
Pulsation Dampeners		
Pressure Sensor Positioning		1
		<hr/> 8

Block 3 - Temperature Measurement

<u>Topic</u>	<u>Chap</u>	<u>Hrs</u>
Introduction	3	
Temp. scales		1
Fund. of Temp. Meas.		
Factors affecting temp. meas.		1
Liquid-in-glass therm.		

Block 3 - Continued

Filled system therm.	1
Bimetallic strip therm.	
Thermocouple theory	1
Thermoelectric power	
Thermocouple metals	1
Thermocouple laws	
Thermocouple tables	1
Thermocouple construction	
Thermocouple testing	1
Thermocouple measuring ccts	
Resistance temperature detectors-rtd's	1
RTD construction	
Comparison with other sensors	1
Thermowells	
RTD measuring CCTS	1
Thermistors	
Thermistor construction	
Thermistor applicaton	1
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Block 4 - Flow Measurement

<u>Topic</u>	<u>Chap</u>	<u>Hrs</u>
Introduction	4	
Units		1
Flowmeters		
Properties of fluids		1
Flow characteristics		
Continuity of flow		1
Bernoulli's equation		
Head flowmeters		1
Primary targets		
Target flowmeters		1
The pitot tube		
Annubar tubes		1
Secondary elements		
Magnetic flowmeters		1
Ultrasonic flowmeters		
Rotameters		
Nutating Disc		1
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		8

Block 5 - Level Measurement

<u>Topic</u>	<u>Chap</u>	<u>Hrs</u>
Introduction	5	
Point-contact method		1
Gauge class		
Ball float		1
Chain float		
Magnetic bond method		1
Displacers		
Hydrostatic head pressure detectors		1
Bubbler level detector		
Differential pressure detectors		1
Capacitance type level detectors		
Ultrasonic level measurement		1
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		6
		TOTAL = 36
		HRS

Specific Objectives

Block 1

The student shall be able to recall, explain or apply:

- 1) Fundamental units in the MKS, CGS and English systems
- 2) The individual components in an instrument channel; detector, transducer, amplifier, transmitter and indicator
- 3) Static characteristics of measurement; accuracy, resolution, sensitivity, deadband, hysteresis, linearity and conformity
- 4) Dynamic characteristics of measurement; deadtime, time constant, rise time and settling time

Block 2

The student shall be able to recall, explain or apply:

- 1) The various types of pressure transducers
- 2) Types of pressure
- 3) Units of pressure
- 4) Selection of the correct pressure gauge by application

Block 3

The student shall be able to recall, explain or apply:

- 1) Types of heat transfer
- 2) Types of temperature transducers
- 3) The characteristics and applications for each type of temperature transducer

Block 4

The student shall be able to recall, explain or apply:

- 1) Bernoulli's EQN
- 2) Differential pressure across an orifice
- 3) The various types of flowmeters

Block 5

The student shall be able to recall, explain or apply:

- 1) Common direct and inferred methods of liquid level measurement
- 2) The fundamental principle upon which these are based