ROLPHTON
NUCLEAR TRAINING CENTRE

COURSE 136

NUCLEAR TRAINING COURSE

COURSE 136

1 - Level
3 - Equipment & System Principles
6 - INSTRUMENTATION & CONTROL

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Instrumentation and Control - Course 136

STUDENT OBJECTIVES FOR COURSE

Following course completion, the student will be able to:

136.00-1 Equipment Review

1. Discuss the various types of electronic pressure transmitters.
2. Explain the requirements and concepts of a typical electronic controller.
3. Discuss the selection of control valve characteristics for particular circuit applications.
4. Explain methods of increasing the speed of response of control valves.
5. Discuss choice of fail action for control valves.

136.00-2 Control Theory Review

1. Explain the concept of feedback control and be able to sketch and describe a typical control loop such as level or pressure.
2. Represent a loop in block form and determine the resulting close loop control ratio.
3. Describe the concept of loop gain and phase angle, and know the particular values which will result in marginal stability.
4. Present and explain a formula representing three mode control.
5. Justify the presence of offset in a porportional control system by logical discussion or by mathematical example.
6. Explain the term Reset Wind-Up, and state the resulting effect on the controlled variable.
7. Explain the result of including derivative mode control for a fast responding process.
8. Show the general format for a cascade control system and know a working example.

136.00-3 Control Mode Settings

1. Describe two methods of controller tuning and be able to state advantages and disadvantages of each method.

2. Describe the general effect of capacitance and dead time on a control system response.

3. State the general rules regarding proportional band adjustment in the case of capacitance and dead time.

136.00-4 Introduction to Frequency Response

1. Describe the concept of frequency response testing.

2. Explain the first order amplitude ratio and phase lag formula.

3. Sketch first order Bode Plots and know two examples related to instrumentation applications which can be classified as first order.

4. State the definition of gain margin and phase margin, and be able to demonstrate these concepts on a Bode Plot of a system.

5. Describe how to obtain the particular proportional band necessary to provide a given gain or phase margin from a Bode plot using the decibel and magnitude ratio table.

6. Explain the effect of the different control modes on a system Bode plot.

7. Describe the general second order transfer function and state two practical examples related to control applications which can be classified as second order.

136.00-5 Computer Control Concepts

1. Explain the concept of Analog and Digital Data Representation.

2. Discuss the principles of Analog to Digital and Digital to Analog conversion.

3. Describe the basic algorithms used in control by Digital Computer.

4. Discuss Sampling Rates and Aliasing Error.

D. Tennant