Fundamentals of Measurement and Process Control (INCR 1442)

Credit: 4 semester credit hours (3 hours lecture, 4 hours lab)

Prerequisite/Co-requisite: INCR 1402 and CETT 1405

Course Description
A study of the basic principles of process automation and their applications including basic control concepts, feedback control, sensors and transmission systems, controllers, control valves, process dynamics, tuning control systems, and cascade ratio.

Required Textbook and Materials
   a. ISBN number is 978-082-693-442-0
2. Scientific Calculator

Course Objectives
Upon completion of this course, the student will be able to:
1. Demonstrate an understanding of process dynamics.
2. Illustrate basic control concepts.
3. Tune control systems

Course Outline
A. Introduction
   1. Introduction of faculty and students
   2. Review Syllabus
   3. Review Class Policies
   4. Review Lab Assignment
B. Automatic Control
   1. Process Dynamics
   2. Control Functions
   3. Control Strategies
   4. Controller Tuning
   5. Digital Controllers
   6. Pneumatic Controllers
   7. Electric Controllers
   8. Operator Interfaces
   9. Configuration Formats
   10. Advanced Control Strategies
C. Final Elements
   1. Control Valves
   2. Regulators
   3. Dampers
   4. Actuators and Positioners
   5. On/Off Control Actions
   6. Variable-Speed Drives
   7. Electric Power Controllers
D. Safety Systems
   1. Safety Systems
   2. Individual Safety Devices
   3. Hazardous Atmosphere Detectors
   4. Electrical Safety Standards
   5. Safety Instrumented Systems
E. Applications
   1. Instrument Applications
   2. General Techniques
   3. Temperature
   4. Pressure
   5. Level
   6. Flow
   7. Analysis
Course Syllabus

8. Multivariable

Grade Scale
- 90 – 100: A
- 80 – 89: B
- 70 – 79: C
- 60 – 69: D
- 0 – 59: F

Course Requirements
1. Develop understanding of Process Dynamics.
2. Operate a Smart Communicator.
3. Use a Smart Communicator to calibrate a Smart Transmitter.
4. Configure a Digital Controller.
5. Configure a Digital Recorder.
6. Wire an instrument loop with a transmitter, controller and digital recorder.
7. Operate the Instrument Loop on manual and automatic.
8. Tune the controller using Gain, Integral, and Derivative.

Disabilities Statement
The Americans with Disabilities Act of 1992 and Section 504 of the Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights for persons with disabilities. Among other things, these statutes require that all students with documented disabilities be guaranteed a learning environment that provides for reasonable accommodations for their disabilities. If you believe you have a disability requiring an accommodation, please contact the Special Populations Coordinator at (409) 880-1737 or visit the online resource:
http://www.lit.edu/depts/stuserv/special/defaults.aspx

Student Code of Conduct Statement
It is the responsibility of all registered Lamar Institute of Technology students to access, read, understand and abide by all published policies, regulations, and procedures listed in the LIT Catalog and Student Handbook. The LIT Catalog and Student Handbook may be accessed at www.lit.edu or obtained in print upon request at the Student Services Office.

Course Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course introduction, policies and Lab</td>
<td>Handouts</td>
</tr>
<tr>
<td></td>
<td>panels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Lecture</td>
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<tr>
<td></td>
<td>- Lab: Layout of Lab panels</td>
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<tr>
<td>2</td>
<td>Automatic Control and Process Dynamics</td>
<td>Chapter 35</td>
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<td>- Lecture</td>
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### 3/4 Control Functions
- **Lecture**
- **Lab:** Sketch the Lab panel assigned and become familiar with equipment
- **Test 1**

Chapter 36

### 5/6 Controller Tuning
- **Lecture**
- **Lab:** Describe in detail four common control strategies and workbook exercises.

Chapter 37

### 7 Digital Controllers
- **Lecture**
- **Lab:** Configure a Digital Controller.

Chapter 37

### 8 Pneumatic/Electric Controllers
- **Lecture**
- **Lab:** Configure a Smart Transmitter for the Process Panel assigned

Chapter 38

### 9 Configuration Formats
- **Lecture**
- **Lab:** Configure a Smart Transmitter for the Process Panel assigned

Chapter 38

### 10 Advanced Control Strategies
- **Lecture**
- **Lab:** Workbook Exercises
- **Set up Loop for Process Panel**
- **Test 2**

Chapter 38

### 11 Final Elements
- **Lecture**
- **Lab:** Run Process panel on Manual and Auto.

Chapter 39

### 12 Actuators and Positioners
- **Lecture**
- **Lab:** Tune Controller on Process Panel assigned
- **Test 3**

Chapter 41

### 13 Safety Systems
- **Lecture**
- **Lab:** Change assignment to another Process Panel

Chapter 43

### 14 Electrical Safety Standards

Chapter 44
In INCR 1442 Course Syllabus:

- Lecture
- Lab: Run new panel assignment on auto

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Safety Instrumented Systems</td>
<td>Chapter 45</td>
</tr>
<tr>
<td></td>
<td>Lecture</td>
<td></td>
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<tr>
<td></td>
<td>Lab: Workbook Exercises</td>
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<td>Test 4</td>
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</tr>
<tr>
<td>16</td>
<td>Applications</td>
<td>Chapter 46</td>
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<td>Lecture</td>
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<td>Lab: Workbook Exercises</td>
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