**Texas A&M University–Corpus Christi**
**College of Science and Technology**
**Engineering Technology**

**Course Number and Title:** ENTC 4448 Control Systems II

**Weekly Schedule:** 3 hours lecture and 3 hours laboratory

**Prerequisites:** ENTC 4446 Control Systems I

**Course Description:**
Continuation of Control Systems I: Control systems design; controller mode selection; control loop tuning; data acquisition systems; distributed control systems; supervisory control; data transmission; networks; analysis and specification of complete control systems.

**Textbooks**
1. Introduction to Control System Technology, 7th Edition, Robert Bateson, Prentice Hall, 2002.

2. Principles and Practice of Automatic Process Control, 2nd Edition, Smith and Corripio, Wiley, 1997.

3. LabView 6i Student Edition, Robert Bishop, Prentice Hall, 2001, ISBN: 0-13-032550

4. Process Control Workshop Reference Manual, 37-001-2M5, Feedback—available in the lab.

5. MATLAB Student Version Release 12 and Control Toolbox, The MathWorks – optional.

**Course Objectives**
This course is designed to enable students to:
- Specify and design multi-loop control systems.
- Apply control loop tuning methods.
- Apply control concepts to the operation of automatic control systems.
- Describe the use and operation of distributed control systems (DCS) and supervisory control for the control of manufacturing and processing systems.
- Design and develop data acquisition systems for process and industrial applications.
- Apply the concepts of fuzzy logic to control applications.
- Characterize the media used to communicate control loop signals and describe the use of fieldbus for process control.
- Use LabVIEW for measurements, virtual instrumentation, and instrument control programming.

**Assessment**

| | Points | | If | Grade |
|---|---|---|---|---|
| Homework | 05 | | 90 ≤ Total < XX | A |
| Lab exercises/reports/posttests | 05 | | 80 ≤ Total < 90 | B |
| Quiz | 04 | | 70 ≤ Total < 80 | C |
| Midterm 1 | 15 | | 60 ≤ total < 70 | D |
| Midterm 2 | 15 | | xx < Total < 60 | F |
| Paper draft | 02 | | | |
| Project research paper | 05 | | | |
| Project progress report | 02 | | | |
| First project presentation | 02 | | | |
| Project report/presentation/demo | 20 | | | |
| Final | 25 | | | |
| **Total** | **100** | | | |

**Topics Covered**

Cascaded systems, LabVIEW basics, Ratio control, Feedforward control, Virtual instruments, Multi-variable process control, Override and selective control, Editing and debugging virtual instruments, Self-tuning adaptive controllers, Tuning of feedback controllers, Controller design, Design of multi-loop control systems, Structures, Fuzzy logic controllers, Supervisory control, Arrays and clusters, Networks, Fieldbus for process control, Distributed control systems, Charts and graphs, Data acquisition systems, Pneumatic control, Analytical devices: analyzers.

**Laboratory Exercises/Experiments:**

| LabVIEW Programming | Exercises/experiments | Training CDs |
|---|---|---|
| LabVIEW basics | Pulse flow transmitter | Single loop control |
| Virtual instruments (VIs) | On/Off Control | Tuning loops |
| Editing and debugging VIs | Proportional Control: Level | Pneumatic control |
| SubVIs | Proportional Control: Flow | Introduction to DCS |
| Programming with Structures | PI and PID: Level Control | Networks |
| Arrays and clusters | PI and PID: Flow Control | Field devices: analytical |
| Charts and graphs | Tuning PID Controllers | |
| Data acquisition and control | Process Controller Programming | |

**Prepared by:** Ray Bachnak **Date:** _____