SCHOOL OF ENGINEERING
UNIVERSITY OF GUELPH

ENGG 4280 Digital Process Control Design

Course Description 2009

Course No.	Name	Semester	Hours	Weight
ENGG 4280	Digital Process Control Design	Winter	3-2	0.75

Faculty:
G.L. Hayward, Room 2339, Thornbrough Building, Ext. 53644.

Teaching Assistants:
Rami Alhamad

Calendar Description:
Design, analysis, synthesis and simulation of process control and automation systems. Automation hardware, process compensation techniques and PID controllers, design and dynamics of final control elements, computer control and the microprocessor.

Textbook:
No text has been specified as the material comes from a rather wide variety of sources. There are many references available, therefore the reading of other material will be expected. The chapter that I wrote for "Computerized Control Systems in the Food Industry" (G.S. Mittal, ed.) is a review of the material in ENGG 3410 as well as this course. I will make my notes available. (www.soe.uoguelph.ca/webfiles/ghayward/)

Laboratory:
Rather than a series of short experiments, the laboratory will consist of a controller design project. The lab periods will consist of group work and informal consultation with the instructor and lab assistant, where progress and problems may be discussed. The work is to be performed in groups of 2 and can be scheduled at other times in consultation with H. Ma, the lab technician in charge of the lab. Two reports are required. The lab progress reports (group reports) will be due on February 13th and **individual** final lab reports on March 28th. These deadlines are firm.

Evaluation:

Assignments	15%
Lab Progress Report	20%
Final Lab Report	30%
Final Exam	35%

The assignments and laboratory reports will be graded for both their technical content and for their grammar and writing style.

The regulations outlined in the student handbook regarding academic misconduct will be strictly enforced.

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Course Outline 2009

Course Overview
- Introduction
- Review of ENGG 3410

Direct Digital Control
- Analog Conversion
- PID Controllers
- Difference Equations
- Response Characterization
- Tuning and Objective Functions

Advanced PID Control
- Self Tuning PID Controller
- Cascade Control
- Feed Forward Control
- Dead Time Compensation

Z-Transforms
- Introduction to Z-Transforms
- Z-Transform Control System Design

Multivariable Control Systems
- The need for Decoupling
- State Variables
- State Space Approach to Control System Design
- Decouplers
- Bristol Array Diagnostics

Fuzzy Control
- Membership Functions
- Fuzzification and Defuzzification
- Max-min Operations
- Rule Based Control Design
- Fuzzy P and PI Controllers