SCHOOL OF ENGINEERING
UNIVERSITY OF GUELPH

ENGG 4280 Digital Process Control Design
Course Description 2007

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:
Sarah Cation, Michael Thompson and Ahmed Elhossini

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 assistants, 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 A. Miller, the lab technician. **Individual** lab reports are required. These will be due on Friday, March 30, 2007. Unfortunately with the large number of students in the course and the early exam date, the teaching assistants and instructor need grading time so this deadline is firm.

Evaluation:

Assignments	15%
Final Lab Report	50%
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 2007

Course Overview
- Introduction
- Review of ENGG 3410

Direct Digital Control
- Analog Conversion
- Fourier Series
- Nyquist Sampling Theorem
- Signal Conditioning (Anti-aliasing)

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 and Decoupling
- State Variables
- State Space Approach to Control System Design
- Decouplers
- Bristol Array

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