BCIT®

' *POLYTECHNIC INSTITUTION*

School of: Manufacturing, Electronics and Industrial Processes
Program: Mechanical Technology
Option: Mechanical Systems

MSYS 4450
Instrumentation and Controls

Start Date:	January 2006			**End Date:**	March 2006		
Total Hours:	40	**Total Weeks:**	10	**Term/Level:** 4		**Course Credits:**	2.5
Hours/Week:	5	**Lecture:** 2	**Lab:** 3	**Shop:**		**Seminar:**	**Other:**

Prerequisites:		**MSYS 4450 is a prerequisite for:**
Course No.	**Course Name**	**Course No.** **Course Name**
ELEX 2845	Electrical Equipment	

■ **Course Description (required)**

Provides an overview of automatic control systems and how they are applied in HVAC industry. Also included are principles of operation and applications of various types of instrumentation for temperature, pressure, fluid viscosity, and flow rate measurement and controls.

■ **Evaluation**

Assignments and Labs	30 %	Comments:
Midterm Exam	30 %	
Final Exam	40 %	
TOTAL	100 %	

■ **Course Learning Outcomes/Competencies**

Upon successful completion, the student will be able to:

- Discuss various stages of automation and describe different types of control of machines and processes.
- Compare open and closed loop control systems.
- Describe and apply transfer function in control systems analysis.
- List and discuss typical sensors used in HVAC.
- Compare ON/OFF, proportional and PID controllers.
- Demonstrate awareness of commercial hardware and software for HVAC applications.
- Create logical diagrams for control applications.
- Write specifications for system controls.
- Use basic instrumentation terminology and symbols.
- Demonstrate knowledge of process instrumentation and controls.
- Describe functions of DDC controls and relays.
- Apply DDC controls and relays to HVAC applications.
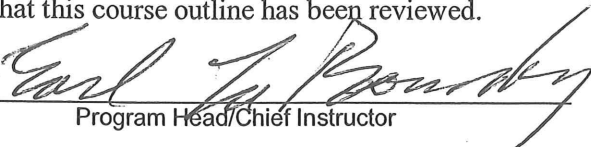- Design an automatic control system for HVAC installation.

■ **Verification**

ı verify that the content of this course outline is current.

_____   Jan 3, 2006
       Authoring Instructor   Date

I verify that this course outline has been reviewed.

_____   Jan 3   2006
     Program Head/Chief Instructor   Date

I verify that this course outline complies with BCIT policy.

_____   2006/01/04
       Dean/Associate Dean   Date

Note: Should changes be required to the content of this course outline, students will be given reasonable notice.

ꞁ **Instructor:**

Taco Niet   Office Location: SW9-205   Office Phone: 604-456-8032

                   Office Hours: TBA   e-Mail Address: tniet@my.bcit.ca

■ **Learning Resources**

Required:

1. Selected chapters from *Control Systems and Application for HVAC/R*. Thomas Horan. Prentice Hall, 1997 (Supplied)

2. Laboratory manual (Supplied)

Recommended:

■ **Information for Students**

Note: Please refer to BCIT policy number 5002, Student Regulations Policy, for additional information. Policies are available at http://www.bcit.ca/about/administration/policies.shtml.

Ethics: BCIT assumes that all students attending the institute will follow a high standard of ethics. Incidents of cheating or plagiarism may, therefore, result in a grade of zero for the assignment, quiz, test, exam or project for all parties involved and/or expulsion from he course.

Assignments: Assignments, lab reports or projects must be done on an individual basis unless otherwise specified by the instructor. Late assignments, lab reports or projects will be devalued 20% per day late to a maximum of 3 days late.

Assignments should be handed in at the **beginning** of the class or lab period in when they are due. Late assignments can be handed in to the assignment drop box under the stairs in SW9 and an e-mail sent letting the instructor know it is there. Assignments left in the drop box will be considered not submitted if an e-mail is not sent to inform the instructor it is in the box.

Makeup Tests, Exams or Quizzes: There will be **no** makeup tests, exams or quizzes. If you miss a test, exam or quiz, you will receive zero marks. Exceptions may be made for **documented** (using the BCIT official medical certificate – see below) medical reasons or extenuating circumstances. In such a case, it is the responsibility of the student to inform the instructor **immediately**.

Attendance: The attendance policy as outlined in BCIT Policy 5002 will be enforced. Attendance will be taken at the beginning of each session. Students not present at that time will be recorded as absent.

Illness: If you miss an evaluation such as an assignment, quiz, exam, or project, or you miss three (3) or more consecutive days of class, you must provide the department with a BCIT Student Medical Certificate (http://www.bcit.ca/admission/downloads.shtml). You may be asked to complete the work that you missed or the course evaluation may be adjusted to reflect the missed component(s).

Attempts: Students must successfully complete a course within a maximum of three attempts. Students with two attempts in a single course must get written permission from the Associate Dean to attempt the course for the third time. Students who have not successfully completed a course within three attempts will not be eligible to graduate from the program.

Advancement: Students who fail three or more courses in a term cannot advance to the next term and may be asked to discontinue from the program.

Course Outline Changes: The material or schedule specified in this course outline may be changed by the instructor. If changes are required, they will be announced in class.

■ **Assignment Details**

Assignment details will be provided in class and as part of the laboratory manual.

Tentative Schedule

Note: This schedule may be changed to meet course objectives and learning patterns.

Week of/ Number	Outcome/Material Covered	Reference/ Reading	Assignment
1 (Jan 2)	Introduction to control, open vs. closed loop control, types of control systems, control media	Chapter 1, 2, 3	--
2 (Jan 9)	Transfer functions and block diagrams of control systems, typical system response.	Chapter 4, 5	Lab 1
3 (Jan 16)	Control modes: On/Off, PID	Chapter 8	Lab 2
4 (Jan 23)	Sensor specifications (span, accuracy, repeatability, resolution, linearity), sensors for HVAC control (temperature, pressure, humidity)	Chapter 7	Lab 3
5 (Jan 30)	Midterm Review, Midterm Exam		Lab 4
6 (Feb 6)	Controller hardware, microcontrollers, PLCs and DDC systems	Handout	Lab 5
7 (Feb 13)	Computer interfacing (parallel, serial, networking, signal interference)	Handout	Lab 6
8 (Feb 20)	HVAC actuators (pneumatic valves and dampers) and their performance curves	Chapter 9, 10	-- (PD Day)
9 (Feb 27)	HVAC control strategies (mixing damper control, heating and cooling control, humidity control)		Lab 7
10 (Mar 6)	Final Review, Final Exam		--

Note: The basic concepts of PLC programming will be introduced and discussed during the lab sessions.