A POLYTECHNIC INSTITUTION

Course Outline

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

FPWR 1050
Industrial Pneumatics

Start Date: Sept. 30, 2006 **End Date:** Oct. 21, 2006

Total Hours: 24 **Total Weeks:** 4 **Term/Level:** **Course Credits:** 2
Hours/Week: 6 **Lecture:** 3 **Lab:** 3 **Shop:** **Seminar:** **Other:**

Prerequisites

Course No.	Course Name
General technical knowledge and basic physics.	

FPWR 1050 is a Prerequisite for:

Course No.	Course Name
FPWR 2050	Control of Pneumatic Circuits

■ Course Description

Introduces the concepts of control and transmission of power by means of pneumatics (compressed air). The course delivery combines hands-on practical exercises with discussions of typical industrial applications and lectures. Simple control circuits will be developed using ISO and JIC schematic symbols, and tested using up-to-date pneumatic equipment.

■ Evaluation

Assignments/Labs	40%	Comments:
Course Exam	60%	
TOTAL	100%	

■ Course Learning Outcomes/Competencies

Upon successful completion, the student will be able to:

1. define pneumatics as a method of power transmission and identify key components of a typical pneumatic system.
2. describe types of pressure and temperature present in pneumatic systems.
3. use both SI and imperial units in analysis of pneumatic systems.
4. relate pressure, temperature and volume using gas laws.
5. discuss the diagram of compression and relate it to the operation of an air compressor.
6. describe air humidity and typical methods of air drying and cooling.
7. describe pneumatic plumbing and calculate line pressure losses.
8. discuss rating of airflow in CFM and SCFM.
9. discuss and calculate the C_v factor.

10. describe the filter, regulator and lubricator (FRL) unit.
11. describe and apply pneumatic AND, OR and NOT logic elements.
12. describe pressure-sequencing circuits and apply pneumatic pressure control valves.
13. describe speed control circuits and apply pneumatic flow control valves.
14. describe and apply pneumatic directional control valves.
15. describe and apply pneumatic cylinders.
16. represent pneumatic circuits using ISO and JIC schematic symbols.
17. develop the control strategy for multiple actuators circuits using the motion/sequence diagrams.
18. develop, assemble and test various industrial pneumatic control circuits.

■ Verification

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

Authoring Instructor — 29. Sept. 2006 — Date

I verify that this course outline has been reviewed.

Program Head/Chief Instructor — 29. Sept. 2006. — Date

I verify that this course outline complies with BCIT policy.

Dean/Associate Dean — 2006/10/02 — Date

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

■ Instructor(s)

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■ Learning Resources

Required:

Course manual including all lab exercises (supplied), and Automation Studio, software package, available at BCIT computer lab

Recommended:

Learning Resources Recommended: Basic Pneumatics — manual by SMC Pneumatics Ltd

■ Information for Students

(*Information below can be adapted and supplemented as necessary.*)

Assignments: Late assignments, lab reports or projects will **not** be accepted for marking. Assignments must be done on an individual basis unless otherwise specified by the instructor.

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** medical reasons or extenuating circumstances. In such a case, it is the responsibility of the student to inform the instructor **immediately**.

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 the course.

Attendance: The attendance policy as outlined in the current BCIT Calendar 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: A doctor's note is required for any illness causing you to miss assignments, quizzes, tests, projects, or exam. At the discretion of the instructor, you may complete the work missed or have the work prorated.

Attempts: Students must successfully complete a course within a maximum of three attempts at the course. Students with two attempts in a single course will be allowed to repeat the course only upon special written permission from the Associate Dean. Students who have not successfully completed a course within three attempts will not be eligible to graduate from the appropriate 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

Schedule

Session	Outcome/Material Covered
1	• Power transmission using Pneumatics and Pascal's law. • Types of pressures present in Pneumatics: absolute, atmospheric, gauge, and vacuum. • Absolute and gauge temperature. • Gas laws: Boyle's law, Charle's law, Gay Lusac's law. • Introduction to pneumatic single and double acting cylinders. • Introduction to directional control valves. • Development, assembly and testing of direct and indirect (pilot) control pneumatic circuits.
2	• Diagram of compression. • Types of air compressors. • Calculation of air flow rate in CFM and SCFM. • Calculation of compressed air consumption and sizing of air receivers (tanks) • More on directional control valves: ways, positions, methods of actuations, and port numbering. • Development, assembly and testing of automatic directional control circuits.
3	• Operation of air filters and lubricators. • Operation of air pressure regulator and FRL unit. • Pneumatic logic elements: OR (shuttle valve), AND (dual-pressure valve), and NOT (normally open valve). • Representation of logic elements using truth tables and ISO and ANSI graphic symbols. • Functional layout technique for graphical representation of pneumatic circuits. • Development, assembly and testing of circuits using the pneumatic logic elements.
4	• More on circuits using the pneumatic logic elements. • Pneumatic plumbing: typical materials, layout, and calculation of pressure losses. • More on pneumatic cylinders: different mounting styles and sealing. • Development, assembly and testing of circuits using the quick exhaust and idle-roller return.
5	• Calculation of cylinder forces. • Calculation of the C_v factor and performance matching of pneumatic components. • Development, assembly and testing of circuits for the control of machine tools.
6	• Air humidity, dew point, and cooling and drying equipment. • Speed control in pneumatic circuits. • Development, assembly and testing of the meter-in and meter-out pneumatic speed control.

Session	Outcome/Material Covered
7	• Pneumatic timers. • Development, assembly and testing of circuits using the pneumatic delay-on and delay-off timers. • Pressure control valves. • Development, assembly and testing of circuits using the pressure-sequencing valve.
8	• Sequence/motion control diagram. • Development, assembly and testing of circuits with two or more cylinders. • Course exam.