A POLYTECHNIC INSTITUTION

Course Outline

School of Manufacturing, Electronics and Industrial Processes
Program: Mechanical Design, Manufacturing Technologies, Robotics and Automation, and Plastics
Option:

MECH 2350
Fluid Power 1

Start Date:	September, 2006					**End Date:**	December, 2006		
Total Hours:	45	**Total Weeks:**	15			**Term/Level:**		**Course Credits:**	3.0
Hours/Week:	3	**Lecture:**	1	**Lab:**	2	**Shop:**		**Seminar:**	**Other:**

Prerequisites

Course No.	Course Name
MECH 1141	Engineering Mechanics 1

MECH 2350 is a Prerequisite for:

Course No.	Course Name
MECH 3451	Fluid Power 2

■ Course Description

Introduces power transmission using pneumatic and hydraulic systems. Function, construction, methods of control, and sizing calculations for typical system components are covered. Laboratory sessions examine and apply various component and system attributes in the development and testing of simple and sequential control circuits.

■ Detailed Course Description

Introduce students to pneumatic and hydraulic principles and components, and simple pneumatic control circuits.

■ Evaluation

Midterm Exam	30%
Assignments/Labs	30%
Final Exam	40%
TOTAL	100%

Comments: Please see the section entitled "Information for Students" on page 3 of this outline for evaluation notes.

■ Course Learning Outcomes/Competencies

Upon successful completion, the student will be able to:

1. identify typical safety hazards in pneumatic and hydraulic systems.
2. explain the operating principle of basic fluid power components.
3. analyze the circuit logic and prepare control schematic diagrams.
4. calculate pressure and flow requirements in simple fluid power circuits.
5. compare pneumatic and hydraulic systems.
6. describe the benefits and limitations of fluid power transmission.

■ Verification

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

Authoring Instructor — Date: Sep. 01, 2006

I verify that this course outline has been reviewed.

Program Head/Chief Instructor — Date: Sep 5th., 2006

I verify that this course outline complies with BCIT policy.

Dean/Associate Dean — Date: 2006/09/05

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

■ Instructor(s)

Cristian Mesteru	Office Location:	SW9–202	Office Phone:	604-434-5734 ext 5218
	Office Hrs.:	As posted	E-mail Address:	Cristian_Mesteru@bcit.ca

■ Learning Resources

Required:

1. *Industrial Hydraulics Manual* by Vickers/Eaton
2. Supplemental handouts, Lab Exercises and Assignments posted on the Web page http://www.eng.bcit.ca/mechinfo/mech2350/index.html
3. *Automation Studio*, software package (available at BCIT labs), Famic Technologies Inc, 2005.
4. Industrial Hydraulics online course at http://www.bcit.ca/distance/webcthelp
5. Handouts and shareout of supplemental course materials
6. *Basic Pneumatics* by SMC Training

Recommended:

- *Basic Fluid Power* by Dudley Pease and John Pippenger
- *Fluid Power with Applications* by Anthony Esposito, Prentice Hall, 1997
- *Using Industrial Hydraulics* by T.C. Frankenfield
- *Hydraulics and Pneumatics Magazine* (BCIT library)

■ 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, Paul Morrison. 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.

■ Information for Students (cont'd.)

- You must attend at least 90% of the labs in order to write the final exam.
- Homework assignments are an important part of this course and must be prepared and submitted on an individual basis.
- Lab reports, homework assignments and design projects will be required to be handed in on time for marking.
- Late penalties will apply, or work may not be accepted if late in handing in.
- Instructor's drop box for work assignments is located under the stairs in the lobby of building SW9.
- Attendance of lectures and labs and completion of assignments is requisite for attaining a grade in this course.

■ Assignment Details

Schedule

Outcome/Material Covered
1. Introduction to Fluid Power Transmission • Describe mechanical, electrical and fluid power transmission. • List key components of a fluid power transmission system. • Describe different methods of pressure and temperature measuring. • Discuss fluid flow. • Explain Pascal's Law.
2. Properties of Compressed Air • Distinguish between gases and liquids. • Explain and illustrate applications of Boyle's and Charle's Gas Laws. • Discuss diagram of compression.
3. Production and Distribution of Compressed Air • List typical air compressors. • Explain operation of reciprocating piston, rotary and blower type compressors. • Discuss typical industrial compressed air distribution system. • Discuss air humidity and drying.
4. Hydraulic Power Unit • List functions and describe construction of hydraulic reservoir. • Describe operation of gear, vane and piston type hydraulic pumps. • Compare pressure ratings, capacity and efficiency of different pumps. • Calculate pump power requirements and select pumps for typical applications.
5. Fluid Power Cylinders • Describe single acting cylinders. • Describe double acting cylinders. • Discuss cylinder accessories, seals, mounting and cushions. • Calculate cylinder forces and velocities.
6. Pressure and Flow Control Valves • Describe operation of a pressure relief valve. • Describe pneumatic pressure regulator. • Describe operation of simple flow resistor (needle valve).
7. Directional Control Valves • Describe poppet valves. • Describe spool valves. • Select directional control valves to control pneumatic and hydraulic cylinders.
8. Pneumatic Control Circuits • Design and demonstrate control of single and double acting cylinders. • Design and demonstrate pneumatic control using OR, AND, NOT logic elements. • Design and demonstrate circuits with pneumatic timers. • Design and demonstrate pressure-sequencing circuits.

Outcome/Material Covered
9. Hydraulic Control Circuits • Design and demonstrate circuit to analyze pressure/flow relationship in hydraulic system. • Discuss series and parallel hydraulic circuits.