

Electro-Pneumatics

Mechanical and Transportation Technology

Course Number: ROB8311	Contribution to Program: Vocational	Normative Hours: 60
Applicable Program(s): 0550X01FWO EME Technician - Robotics	AAL: 2	Core/Elective: Core
Prepared by: Philippe Beaulieu Professor		Approval Date: 28/08/2012
Co-Requisites N/A		Approved by: Misheck Mwaba, PhD., P.Eng. Chair, Mechanical and Transportation Technology
Pre-Requisites ROB8201		Approved for Academic Year: 2012-2013

COURSE DESCRIPTION

Students demonstrate theoretical Electro-Pneumatic knowledge. Students use simulation software to design task specific Electro-Pneumatic circuits then select hardware to implement their designs. Circuit applications mimic real life industrial situations. Adaptation and modification criteria cause students to be resourceful and to think outside the box. Curriculum includes exposure to Units of measure, types of directional control valves, solenoids, flow control, various actuators timers and ladder diagrams.

RELATIONSHIP TO VOCATIONAL LEARNING OUTCOMES

This course contributes to your program by helping you achieve the following Vocational Learning Outcomes:

EME Technician - Robotics 0550X01FWO

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| 1 | Fabricate mechanical components and assemblies, and assemble electrical components and electronic assemblies by applying workshop skills and knowledge of basic shop practices in accordance with applicable codes and safety practices.(T,CP) |
| 3 | Select and use a variety of troubleshooting techniques and test equipment to assess electromechanical circuits, equipment, processes, systems, and subsystems.(T,A) |
| 4 | Modify, maintain, and repair electrical, electronic, and mechanical components, equipment, and systems to ensure that they function according to specifications.(T,CP) |
| 5 | Apply the principles of engineering, mathematics, and science to analyze and solve routine technical problems and to complete work related to electromechanical engineering.(T,A,CP) |
| 8 | Apply, install, test, and troubleshoot a variety of mechanical, electrical, and electronic control systems.(T,A,CP) |
| 12 | Select for purchase electromechanical equipment, components, and systems that fulfill the job requirements and functional specifications.(CP) |
| 14 | Perform all work in accordance with relevant law, policies, codes, regulations, safety procedures, and standard shop practices.(CP) |

T: Teach **A:** Assess **CP:** Culminating Performance

ESSENTIAL EMPLOYABILITY SKILLS

The course contributes to your program by helping you achieve the following Essential Employability Skills:

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| 2 | Respond to written, spoken or visual messages in a manner that ensures effective communication.(A) |
| 4 | Apply a systematic approach to solve problems.(T,CP) |
| 5 | Use a variety of thinking skills to anticipate and solve problems.(T,CP) |
| 6 | Locate, select, organize and document information using appropriate technology and information systems.(CP) |
| 7 | Analyze, evaluate and apply relevant information from a variety of sources.(CP) |
| 9 | Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals. (CP) |
| 10 | Manage the use of time and other resources to complete projects.(CP) |
| 11 | Take responsibility for one's own actions, decisions and consequences.(CP) |

T: Teach **A:** Assess **CP:** Culminating Performance

COURSE LEARNING REQUIREMENTS/EMBEDDED KNOWLEDGE AND SKILLS

COURSE LEARNING REQUIREMENTS When you have earned credit for this course, you will have demonstrated the ability to:	EMBEDDED KNOWLEDGE AND SKILLS
1. Discuss the differences between pneumatics and hydraulics. Analyze manual hydraulic and electrohydraulic circuits.	<ul style="list-style-type: none"> 1 An understanding of the principles of hydraulic power transmission. 1 Understand and use ISO standard hydraulic diagrams. 1 Calculate actuator speeds, flow rates and forces within hydraulic circuits. 1 Familiarization with metering methods and different circuit configurations that impact force, speed and operation of hydraulic circuits. 1 Familiarization with software to simulate hydraulic and electrohydraulic circuitry.
2. Conduct independent and collaborative research into various electro-pneumatic devices. Analyze, design, simulate and construct electro-pneumatic circuits.	<ul style="list-style-type: none"> 1 Troubleshooting of electro pneumatic equipment and circuits. 1 Interpret, draw and build ISO ladder diagrams and circuits for electronically controlled pneumatics. 1 Know coordinated motion and control diagrams including sequence control.
3. Design, build and select componentry needed to satisfy all aspects of complex logic, including motion control and sequential electronic applications.	<ul style="list-style-type: none"> 1 Select and understand the use of sequence and /or pressure sensing sensors used to accomplish coordinated motion. 1 Construct electronic and physical circuitry to address power outage concerns using specific circuit design and components such as accumulators. 1 Understand the applications and implications of using delay on and delay off relays, electronic counters and different types of electronic sensors.

LEARNING RESOURCES

The books for this course are downloadable from FESTO Inc. The website is festodidactic.com. Look under courseware-pneumatics-textbooks or workbooks. The REQUIRED TEXT is #573030. The REQUIRED BOOK of EXERCISES is # 570693.

Important Note:

It is recommended that the student consult with the Professor before buying books, as the title and edition can change without notice. The teacher will announce the books that you will use in class. Some of these texts and workbooks are downloadable from FESTO.com

The professor will post various pertinent resources available online on Blackboard.

FESTO Hydraulic Video

LEARNING ACTIVITIES

During this course, you are likely to experience the following learning activities:

For the duration of this course, you will be in a very much "hands-on" environment. You will be constructing, demonstrating and modifying numerous real life applications of fluid power circuitry. It is recommended that you wear appropriate clothing.

Safety eyewear is mandatory whenever you are in the lab...no exceptions. Non-compliance will result in expulsion from the lab.

The course is presented in a modular format. Emphasis is on the lab portion with the theory portion presented mainly through practical demonstrations, research projects and discussion. Peer discussion is encouraged.

EVALUATION/EARNING CREDIT

The following will provide evidence of your learning achievements:	This activity validates the following Course Learning Requirements and/or Essential Employability Skills:
10% - Quizzes. 20% - Written theory tests. 30% - Hands on practical tests.	<ul style="list-style-type: none"> 1 Conduct independent and collaborative research into various electro-pneumatic devices. Analyze, design, simulate and construct electro-pneumatic circuits. - [CLR 2]

15% - Lab work.
05% - Research papers.
15% - Final Project.
05% - Participation.

- 1 Discuss the differences between pneumatics and hydraulics. Analyze manual hydraulic and electrohydraulic circuits. - [CLR 1]
- 1 Design, build and select componentry needed to satisfy all aspects of complex logic, including motion control and sequential electronic applications. - [CLR 3]
- 1 Take responsibility for one's own actions, decisions and consequences. - [EES 11]
- 1 Use a variety of thinking skills to anticipate and solve problems. - [EES 5]
- 1 Apply a systematic approach to solve problems. - [EES 4]
- 1 Locate, select, organize and document information using appropriate technology and information systems. - [EES 6]
- 1 Analyze, evaluate and apply relevant information from a variety of sources. - [EES 7]
- 1 Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals. - [EES 9]
- 1 Manage the use of time and other resources to complete projects. - [EES 10]
- 1 Respond to written, spoken or visual messages in a manner that ensures effective communication. - [EES 2]

Note: All lab assignments are time sensitive. This means that all lab work must be completed and signed off by the professor by the due dates that are assigned via the CSI (Course Section Information). The lab signoff sheet is on BlackBoard (Bb). These dates are always the end of the last class **before** the corresponding test date. Tests should only be attempted by students who have completed the required (assigned) lab work. If a student does not have the required labs done for the test, penalties will be occur. See the Lab and Testing policy on Bb. for clarification.

- 1 Manage the use of time and other resources to complete projects. - [EES 10]
- 1 Take responsibility for one's own actions, decisions and consequences. - [EES 11]

COLLEGE GRADING NUMERICAL EQUIVALENT TABLE

Final Grade	Mark Equivalent	Numeric Value	Final Grade	Mark Equivalent	Numeric Value
A+	90-100%	4.0	C+	67-69%	2.3
A	85-89%	3.8	C	63-66%	2.0
A-	80-84%	3.6	C-	60-62%	1.7
B+	77-79%	3.3	D+	57-59%	1.4
B	73-76%	3.0	D	53-56%	1.2
B-	70-72%	2.7	D-	50-52%	1.0
			F	0-49%	0
			FSP	0	0

OTHER COURSE INFORMATION

Students are required to respect the confidentiality of employer, client and/or patient information, interactions, and practices that occur either on Algonquin College premises, or at an affiliated clinical/field/co-op placement site. Concerns regarding clients, patients, and/or employer practices are to be brought to the attention of the program coordinator, or designated field/clinical/co-op placement supervisor so that they may be resolved collaboratively. Such concerns are not to be raised publically either verbally, in writing, or in electronic forums. These matters are to be addressed through established program communication pathways.

PRIOR LEARNING ASSESSMENT AND RECOGNITION

Students who wish to apply for prior learning assessment and recognition (PLAR) need to demonstrate competency at a post-secondary level in all of the course learning requirements outlined above. Evidence of learning achievement for PLAR candidates includes:

- 1 Portfolio
- 1 Challenge Exam
- 1 Performance Test
- 1 Project/Assignment

RELATED INFORMATION

The following information is course-specific:

Required Equipment:

Safety Glasses
Closed-toed shoes

Refer to your CSI under Course Information on Blackboard for an updated Lab and Testing Policy

The following information is school/department-specific:**GENERAL CLAUSES - School of Advanced Technology**

Harassment/Discrimination/Violence will not be tolerated. Any form of harassment (sexual, racial, gender or disability-related), discrimination (direct or indirect), or violence, whether towards a professor or amongst students, will not be tolerated on the college premises. Action taken will start with a formal warning and proceed to the full disciplinary actions as outlined in Algonquin College Policy - HR22.

Harassment means one or a series of vexatious comment(s) or conduct related to one or more of the prohibited grounds that is known or ought reasonably to be known to be unwelcome/ unwanted, offensive, intimidating, derogatory or hostile.

This may include, but is not limited to: gestures, remarks, jokes, taunting, innuendo, display of offensive materials, offensive graffiti, threats, verbal or physical assault, academic penalties, stalking, slurs, shunning or exclusion related to the prohibited grounds.

For further information, a copy of the official policy statement can be obtained from the Student Association.

The Use of Electronic Devices, with the sound turned on, during classes is strictly prohibited. In particular, cell phones are not to be used to communicate during a class. The use of any electronic devices during exams and mid-term tests, other than those sanctioned by the faculty in charge of the examination, is strictly prohibited.

Anyone caught using a prohibited device will be considered to have plagiarized, and will be treated as such in accordance with College Plagiarism Policy. For further details on this directive, consult the Algonquin College Policy AA32 on the use of Electronic Devices in Class and Exams.

The School of Advanced Technology's Standard Operating Procedure on Plagiarism and Academic Honesty defines plagiarism as an attempt to use or pass off as one's own idea or product, work of another without giving credit. Plagiarism has occurred in instances where a student either directly copies another person's work without acknowledgement; or, closely paraphrases the equivalent of a short paragraph or more without acknowledgement; or, borrows, without acknowledgement, any ideas in a clear and recognizable form in such a way as to present them as one's own thought, where such ideas, if they were the student's own would contribute to the merit of his or her own work.

Plagiarism is one of the most serious academic offenses a student can commit. Anyone found guilty will, on the first offense, be given a written warning and an F on the plagiarized work. If the student commits a second offense, an F will be given for the course along with a written warning. A third offense will result in suspension from the program and/or the college.

For further details on this directive, consult the Algonquin College Policy - AA20 and the School of Advanced Technology's Standard Operating Procedure on Plagiarism and Academic Dishonesty.

Respect for Confidentiality

Students are required to respect the confidentiality of employer, client and/or patient information, interactions, and practices that occur either on Algonquin College premises, or at an affiliated clinical/field/co-op placement site. Concerns regarding clients, patients, and/or employer practices are to be brought to the attention of the program coordinator, or designated field/clinical/co-op placement supervisor so that they may be resolved collaboratively. Such concerns are not to be raised publicly either verbally, in writing, or in electronic forums. These matters are to be addressed through established program communication pathways

Disruptive Behaviour is any conduct, or threatened conduct, that is disruptive to the learning process or that interferes with the well-being of other members of the College community. It will not be tolerated.

Members of the College community, both students and staff, have the right to learn and work in a secure and productive environment. The College will make very effort to protect that right.

Incidents of disruptive behaviour must be reported in writing to the departmental Chair as quickly as possible. The Chair will hold hearings to review available information and determine any sanctions that will be imposed. Disciplinary hearings can result in penalties ranging from a written warning to expulsion.

For further details consult the Algonquin College Policy - SA07.

June 15, 2012

The following information is College-wide:**Email**

Algonquin College provides all full-time students with an e-mail account. This is the address that will be used when the College, your professors, or your fellow students communicate important information about your program or course events. It is your responsibility to ensure that you know how to send and receive e-mail using your Algonquin account and to check it regularly.

Centre for Students with Disabilities (CSD)

If you are a student with a disability, it is strongly recommended that you identify your needs to the professor and the Centre for Students with Disabilities (CSD) by the end of the first month of the semester in order that any necessary support services can be arranged for you.

Academic Integrity* & Plagiarism*

Adherence to acceptable standards of academic honesty is an important aspect of the learning process at Algonquin College. Academic work submitted by a student is evaluated on the assumption that the work presented by the student is his or her own, unless designated otherwise. For further details consult Algonquin College Policies AA18 <http://www2.algonquincollege.com/directives/files/2012/04/AA18.pdf> and AA20 <http://www2.algonquincollege.com/directives/files/2011/08/AA20.pdf>

Student Course Feedback*

It is Algonquin College's policy to give students the opportunity to complete a course assessment survey in each course that they take which solicits their views regarding the curriculum, the professor and the facilities. For further details consult Algonquin College Policy AA25 <http://www2.algonquincollege.com/directives/files/2011/10/AA25.pdf>

Use of Electronic Devices in Class*

With the proliferation of small, personal electronic devices used for communications and data storage, Algonquin College believes there is a need to address their use during classes and examinations. During classes, the use of such devices is disruptive and disrespectful to others. During examinations, the use of such devices may facilitate cheating. For further details consult Algonquin College Policy AA32 <http://www2.algonquincollege.com/directives/files/2011/11/AA32.pdf>

Transfer of Credit

Students, it is your responsibility to retain course outlines for possible future use to support applications for transfer of credit to other educational institutions.

* College policies (previously called directives) are under review and redesign. The term *directives* is being retired. As such, the policy classification nomenclature is in transition. Students, it is your responsibility to refer to the Algonquin College Directives/Policies website for the most current information available at: (<http://www2.algonquincollege.com/directives/>)