

## Course Outline

### 1. COURSE INFORMATION

<b>Session Offered</b>	Winter 2016	
<b>Course Name</b>	PLCs and Automation I	
<b>Course Code</b>	PROC TECH 2PL3	
<b>Date(s) and Time(s) of lectures</b>	Tu 8:30AM – 10:20AM We 10:30AM – 11:20AM	
<b>Program Name</b>	Process Automation Technology	
<b>Calendar Description</b>	An introduction to Programmable Logic Controllers (PLCs) and their use in automation applications. AC and DC motors, PLC basics, Input/output, memory addressing and program control instructions, and PLC networking, motor control protection and starting.	
<b>Instructor(s)</b>	Dr. Zhen Gao Hassanain Awadh	E-Mails: gaozhen@mcmaster.ca hawadh@mcmaster.ca Office Hours & Location: Zhen Gao: Monday 13:30 pm – 15:20 pm ETB 206 Tuesday 10:30 am – 12:30 pm ETB 206

### 2.

<b>Course Description</b>	<p>This course offers the theory and practice of Programmable Logic Controllers (PLCs). The students will understand and gain the skills of PLC programming at an introductory level including PLC addressing, components, I/O modules, basic instructions, timers, counters, math and compare instructions, program control instructions and sequential process control.</p> <p>These materials will serve to establish a foundation for the balance of the course that will consist of an in-depth study of PLC programming.</p> <p>It put more emphasis on the hands-on labs and project in which way the students is able to create and run programs based on RSLogix 5000 to solve industrial control issues including process control and motion control.</p>		
<b>Instruction Type</b>	<b>Code</b>	<b>Type</b>	<b>Hours per term</b>
	C	Classroom instruction	39
	L	Laboratory, workshop or fieldwork	39
	T	Tutorial	
	DE	Distance education	
	<b>Total Hours</b>		78
<b>Resources</b>	<b>ISBN</b>	<b>Textbook Title &amp; Edition</b>	<b>Author &amp; Publisher</b>
	N/A	N/A	N/A
	<b>Other Supplies</b>	<b>Source</b>	
	<b>LogixPro</b>	<b>LogixPro software MUST be purchased by each student from</b> <a href="http://www.thelearningpit.com/lp/logixpro.html">http://www.thelearningpit.com/lp/logixpro.html</a>	
<b>Prerequisite(s)</b>	ENG TECH 1MT3, PROCTECH 2EE3, 2IC3 and registration in level II or above of		

	Process Automation Technology.	
<b>Corequisite(s)</b>	N/A	
<b>Antirequisite(s)</b>	N/A	
<b>Course Specific Policies</b>	<ol style="list-style-type: none"> <li>Attendance in all lectures is highly recommended and lab attendance is mandatory.</li> <li>Course project is conducted individually.</li> </ol>	
<b>Departmental Policies</b>	<p>Students must maintain a GPA of 3.5/12 to continue in the program.</p> <p>In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of “out-of-class” work for every scheduled hour in class. “Out-of-class” work includes reading, research, assignments and preparation for tests and examinations.</p> <p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p> <p>The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception.</p> <p>Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class.</p> <p>Instructor has the right to submit work to software to identify plagiarism.</p>	
<b>3. SUB TOPIC(S)</b>		
Week 1	Introduction to logic and industrial automation concepts	
Week 2	Relay ladder logic and motor control	
Week 3	Introduction to the RsLogix and PLC-5000	
Week 4	PLC Addressing, I/O modules	
Week 5	Wiring and basic programming	
Week 6	Timers and applications	
Mid-term recess (Monday, February 15 to Saturday, February 20)		
Week 7	Counters and applications	
Week 8	Math instructions and applications	
Week 9	Compare instructions and applications	
Week 10	Program control instructions	
Week 11	Sequential process control	
Week 12	PLC application Projects	
Week 13	PLC application Projects	
<p>Classes end – Friday, April 8 2016</p> <p>Final examination period: Tuesday, April 12 2016 to Friday, April 29 2016</p> <p>All examinations MUST BE written during the scheduled examination period.</p>		
<b>List of experiments</b>		
Lab 1	Lab Introduction, Digital Logic and Case Study	
Lab 2	Simple Relay Logic Circuits	
Lab 3	Introduction to the Allen-Bradley PLC-5000	
Lab 4	Motor Control Logic Basics	
Lab 5	PLC Time Delay Functions	
Lab 6	PLC Time Delay and Counter Functions	
Lab 7	PLC Math and Compare Functions	
Lab 8	Digital Clock and Traffic Light Control	
Lab 9	Sequential Programming and Batch Process Control	

Lab Schedule	Some of the labs will be performed on a rotating basis. The actual lab schedule will be provided by the instructor. <b>The dates and times of the two lab tests will also be provided by the lab instructors</b>																		
<p>Note that this structure represents a plan and is subject to adjustment term by term.</p> <p>The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.</p>																			
<table border="1"> <thead> <tr> <th data-bbox="175 365 1123 407">4. ASSESSMENT OF LEARNING *including dates*</th> <th data-bbox="1123 365 1468 407">Weight</th> </tr> </thead> <tbody> <tr> <td data-bbox="175 407 1123 445">Lab Reports</td> <td data-bbox="1123 407 1468 445">20 %</td> </tr> <tr> <td data-bbox="175 445 1123 483">Lab Test 1</td> <td data-bbox="1123 445 1468 483">10 %</td> </tr> <tr> <td data-bbox="175 483 1123 520">Lab Test 2</td> <td data-bbox="1123 483 1468 520">15 %</td> </tr> <tr> <td data-bbox="175 520 1123 558">Individual Project</td> <td data-bbox="1123 520 1468 558">10 %</td> </tr> <tr> <td data-bbox="175 558 1123 596">Quizzes/Assignments</td> <td data-bbox="1123 558 1468 596">5 %</td> </tr> <tr> <td data-bbox="175 596 1123 634">Midterm Exam</td> <td data-bbox="1123 596 1468 634">10 %</td> </tr> <tr> <td data-bbox="175 634 1123 672">Final Exam</td> <td data-bbox="1123 634 1468 672">30 %</td> </tr> <tr> <td data-bbox="175 672 1123 709" style="text-align: right;"><b>TOTAL</b></td> <td data-bbox="1123 672 1468 709"><b>100 %</b></td> </tr> </tbody> </table>		4. ASSESSMENT OF LEARNING *including dates*	Weight	Lab Reports	20 %	Lab Test 1	10 %	Lab Test 2	15 %	Individual Project	10 %	Quizzes/Assignments	5 %	Midterm Exam	10 %	Final Exam	30 %	<b>TOTAL</b>	<b>100 %</b>
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Percentage grades will be converted to letter grades and grade points per the University calendar.																			
<b>5. LEARNING OUTCOMES</b>																			
1. Understand the relationship between digital logic and industrial process control																			
2. Solve industrial process problems using standard relay ladder logic																			
3. Understand the structure of the Allen-Bradley line of PLC-5000 systems																			
4. Design basic and advanced PLC programs using timers, counters, math, compare and messaging instructions																			
5. Solve sequential problems																			
6. Understand the relationship between digital logic and industrial process control																			
7. Solve real-world problem based on PLC independently																			
<b>6. POLICIES</b>																			
<b>Anti-Discrimination</b>																			
<p>The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.</p> <p><a href="http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&amp;Response.pdf">http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&amp;Response.pdf</a></p>																			
<b>Academic Integrity</b>																			
<p>You are required to exhibit honestly and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.</p>																			
<p>Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.</p>																			
<p>It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, located at: <a href="http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf">http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf</a>.</p>																			
<p>The following illustrates only three forms of academic dishonesty:</p>																			
1. Plagiarism. E.g. the submission of work that is not own or for which other credit has been obtained																			
2. Improper collaboration in group work																			
3. Copying or using unauthorized aids in tests and examinations.																			
<b>Requests for Relief for Missed Academic Term Work (Assignments, Mid-Terms, etc.)</b>																			

The McMaster Student Absence Form is a self-reporting tool for **Undergraduate Students** to report absences due to minor medical situations that last up to 3 days and provides the ability to request accommodation for any missed academic work. Please note, this tool cannot be used during any final examination period.

You may submit a maximum of 1 Academic Work Missed requests per term. It is YOUR responsibility to follow up with your Instructor immediately (normally within two working days) regarding the nature of the accommodation.

If you are absent for reasons other than medical reasons for more than 3 days or exceed 1 request per term you **MUST** visit your Associate Dean's Office (Faculty Office). You may be required to provide supporting documentation.

This form should be filled out immediately when you are about to return to class after your absence.  
<http://www.mcmaster.ca/msaf/>

### **E-Learning Policy**

Consistent with the Bachelor of Technology's policy to utilize e-learning as a complement to traditional classroom instruction, students are expected to obtain appropriate passwords and accounts to access Avenue To Learn for this course. Materials will be posted by class for student download. It is expected that students will avail themselves of these materials prior to class. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail account, and program affiliation may become apparent to all other students in the course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about this disclosure please discuss this with the course instructor. Avenue can be accessed via  
<http://avenue.mcmaster.ca>.

### **Communications**

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

### **Turnitin (Optional)**

This course will be using a web-based service (Turnitin.com) to reveal plagiarism. Students submit their assignment/work electronically to Turnitin.com where it is checked against the internet, published works and Turnitin's database for similar or identical work. If Turnitin finds similar or identical work that has not been properly cited, a report is sent to the instructor showing the student's work and the original source. The instructor reviews what Turnitin has found and then determines if he/she thinks there is a problem with the work. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to  
<http://www.mcmaster.ca/academicintegrity/turnitin/students/>

### **Protection of Privacy Act (FIPPA)**

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades and all other personal information at all times. For example, the submission and return of assignments and posting of grades must be done in a manner that ensures confidentiality.

<http://www.mcmaster.ca/univsec/fippa/fippa.cfm>

## Academic Accommodation of Students with Disabilities Policy

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail [sas@mcmaster.ca](mailto:sas@mcmaster.ca). For further information consult McMaster's policy for Academic Accommodation of Students with Disabilities

<http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf>

Students must forward a copy of the SAS accommodation to the instructor of each course and to the Program Administrator of the B.Tech. Program immediately upon receipt. If a student with a disability chooses NOT to take advantage of a SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. <http://sas.mcmaster.ca>

## Student Code of Conduct

The Student Code of Conduct (SCC) exists to promote the safety and security of all the students in the McMaster community and to encourage respect for others, their property and the laws of the land. McMaster University is a community which values mutual respect for the rights, responsibilities, dignity and well-being of others. The purpose of the Student Code of Conduct is to outline accepted standards of behavior that are harmonious with the goals and the well-being of the University community, and to define the procedures to be followed when students fail to meet the accepted standards of behavior. All students have the responsibility to familiarize themselves with the University regulations and the conduct expected of them while studying at McMaster University.

<http://judicialaffairs.mcmaster.ca/pdf/SCC.pdf>

<http://www.mcmaster.ca/policy/Students-AcademicStudies/StudentCode.pdf>