

## Course Outline

### 1. COURSE INFORMATION

<b>Session Offered</b>	Fall 2020								
<b>Course Name</b>	Advanced PLC Programming & Control								
<b>Course Code</b>	PROCTECH 3PL3								
<b>Date(s) and Time(s) of lectures</b>	Wednesdays 12:30 – 1:30 PM Fridays 10:30 – 12:30 PM Labs: Tuesdays 8-11 AM; 12-3 PM; 3-6 PM; 6-9 PM								
<b>Program Name</b>	Process Automation								
<b>Calendar Description</b>	Advanced PLC programming concepts such as batch processing, function block diagrams, structured text, analog systems control, PID, PWM and HMI integration. Lectures are designed to support the labs. All lectures AND labs will be conducted online for this year.								
<b>Instructor(s)</b>	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Rubaid Khan</td> <td style="width: 50%;">e-mail: <a href="mailto:khanru@mcmaster.ca">khanru@mcmaster.ca</a></td> </tr> <tr> <td>Hassanain Awadh</td> <td>e-mail: <a href="mailto:hawadh@mcmaster.ca">hawadh@mcmaster.ca</a></td> </tr> <tr> <td>Stephen Eagle</td> <td>e-mail: <a href="mailto:srjeagl@mcmaster.ca">srjeagl@mcmaster.ca</a></td> </tr> <tr> <td colspan="2">Office Hours &amp; Location:</td> </tr> </table>	Rubaid Khan	e-mail: <a href="mailto:khanru@mcmaster.ca">khanru@mcmaster.ca</a>	Hassanain Awadh	e-mail: <a href="mailto:hawadh@mcmaster.ca">hawadh@mcmaster.ca</a>	Stephen Eagle	e-mail: <a href="mailto:srjeagl@mcmaster.ca">srjeagl@mcmaster.ca</a>	Office Hours & Location:	
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Stephen Eagle	e-mail: <a href="mailto:srjeagl@mcmaster.ca">srjeagl@mcmaster.ca</a>								
Office Hours & Location:									

### 2. COURSE SPECIFICS

<b>Course Description</b>			
<b>Instruction Type</b>	<b>Code</b>	<b>Type</b>	<b>Hours per term</b>
	C	Classroom instruction	37
	L	Laboratory, workshop or fieldwork	39
	T	Tutorial	0
	DE	Distance education	0
	<b>Total Hours</b>		76
<b>Resources</b>	<b>ISBN</b>	<b>Textbook Title &amp; Edition</b>	<b>Author &amp; Publisher</b>
	ISBN: N/A	N/A	N/A
	<b>Other Supplies</b>	<b>Source</b>	
	CCW Software	www.ab.com	
<b>Prerequisite(s)</b>	PROC TECH 2PL3 – PLCs & Automation I		
<b>Corequisite(s)</b>	N/A		
<b>Antirequisite(s)</b>	N/A		
<b>Course Specific Policies</b>	Students MUST attend all labs in the course. Late lab report submissions will be subject to a 20% per late-day penalty.		
<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>
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<b>3. SUB TOPIC(S)</b>	
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Week 1	Introduction to CCW	
Week 2	Basic CCW programming	
Week 3	User Defined Function Blocks	
Week 4	Sequential batch processing	
Week 5	Function Block Diagrams	
Week 6	STUDY WEEK	
Week 7	Arrays and FIFO	
Week 8	Analog I/O	
Week 9	Pulse Width Modulation Control	
Week 10	PID Control	
Week 11	Fault routines	
Week 12	HMI integration	
Week 13	Practical project applications	
Week 14	Review	

Midterm Recess: Monday, October 12 to Sunday, October 18  
 Classes end: Wednesday, December 9  
 Final examination period: Thursday, December 10 to Wednesday, December 23  
 All examinations MUST be written during the scheduled examination period.

<b>List of experiments</b>	
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Lab 1	CCW installation and environment
Lab 2	UDFB reversing starter logic
Lab 3	Batch processing application
Lab 4	Sequential LLD
Lab 5	Function Block Diagrams and Structured Text
Lab 6	Batch processing FBD
Lab 7	Analog I/O
Lab 8	PWM applications
Lab 9	PID applications
Lab 10	Fault and production data processing
Lab 11	VTScada and CCW integration
Lab 12	Practical test

Note that this structure represents a plan and is subject to adjustment term by term.

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.

<b>4. ASSESSMENT OF LEARNING *including dates*</b>	<b>Weight</b>
Quizzes	16
Test 1	14
Test 2	20
Lab reports	10
Lab demonstrations	20
Practical exam	20
<b>TOTAL</b>	<b>100%</b>

Percentage grades will be converted to letter grades and grade points per the University calendar.

**5. LEARNING OUTCOMES**

1. Identify differences in PLC hardware and software vendors
2. Use simulations to test ladder logic programs
3. Apply FBD and ST techniques in addition to LLD programming
4. Program PLC's using analog inputs and outputs
5. Develop PLC programs to solve control system problems using PWM and PID
6. Design fault and data handling routines and integrate with HMI systems

**6. COURSE OUTLINE – APPROVED ADVISORY STATEMENTS**

**ANTI-DISCRIMINATION**

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.

[http://www.mcmaster.ca/policy/General/HR/Discrimination\\_Harassment\\_Sexual\\_Harassment-Prevention&Response.pdf](http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf)

**ACADEMIC INTEGRITY**

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. It is your responsibility to understand what constitutes academic dishonesty.

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. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at <https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/>

The following illustrates only three forms of academic dishonesty: The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

**AUTHENTICITY / PLAGIARISM DETECTION**

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to [www.mcmaster.ca/academicintegrity](http://www.mcmaster.ca/academicintegrity).

### **COURSES WITH AN ON-LINE ELEMENT**

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

### **ONLINE PROCTORING**

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

### **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.

### **CONDUCT EXPECTATIONS**

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

### **ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES**

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or [sas@mcmaster.ca](mailto:sas@mcmaster.ca) to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

### **REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK**

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

### **ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)**

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests. <http://www.mcmaster.ca/policy/Students-AcademicStudies/Studentcode.pdf>

### **COPYRIGHT AND RECORDING**

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

### **EXTREME CIRCUMSTANCES**

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.