



Department of Electrical and Computer Engineering
Faculty of Engineering and Applied Science

Course Outline

ECE 8210

Winter 2022

ECE 8210: Supervisory Control and Data Acquisition

Instructor Mohsin Jamil **Teaching Assistants:** 1. Sheikh Usman Uddin

E-mail mjamil@mun.ca **E-mail:** 1. suddin@mun.ca

Phone 864-2751 **Phone :**
Office Location CSF-3124 **Office Location :** TBA
Office Hours TBD **Office Hours** TBD

Communication Email: mjamil@mun.ca

Website <http://online.mun.ca> (D2L)

CALENDAR ENTRY:

ECE 8210 Supervisory Control and Data Acquisition examines data acquisition and intelligent field devices; distributed control systems and fieldbus technology; remote terminal units; programmable logic controllers and programming standards; operator control interface; communication system for supervisory control and data acquisition; and cyber security for industrial control systems.

PR: ECE 5200

LH: Four 3-hour sessions per semester

LAB EXPERIENCE: Hands on using Open-Source Software's.

Mandatory lab experiments are completed by groups of two students under the watch of teaching assistants. Students perform analysis and design of programmable logic controller (PLC) and Supervisory Control and Data Acquisition (SCADA) software's with communication interface circuits, implement, debug and test the circuits. Written report is submitted by each group within one week from the scheduled day of the lab.

CREDIT VALUE: 3 credit hours

COURSE TYPE: Elective

ACCREDITATION UNITS: 3/1/0

CONTENT CATEGORIES:

Math	Natural Science	Complementary Studies	Engineering Science	Engineering Design
			75%	25%

SCHEDULE: LECTURE: Monday, Wednesday, Friday 9:00-9:50am, Room: Online
 LABS: Wednesday 2:00-5:00pm, Room: Online



RESOURCES:

1. Industrial Sensors and Controls in Communication Networks, Dong-Seong Kim and Hoa Tran-Dang, Springer 2019 (MUN online access)
2. Understanding and Using the Controller Area Network, Marco Di Natale et al., 2012, SpringerLink (MUN online access)
3. CAN system engineering from theory to practical applications, Wolfhard Lawrenz, Springer 2013 (MUN online access)
4. John C. Eidson: Measurement, Control and Communication Using IEEE 1588
5. Industrial Ethernet, Perry S. Marshall and John S. Rinaldi, 2ed (MUN online access)
6. <https://smt.at/wp-content/uploads/smt-handbuch-keithley-switching-englisch.pdf>
7. Dominique Paret: Multiplexed Networks for Embedded Systems: CAN, LIN, FlexRay, Safe-by-Wire, ISBN-10: 0470034165
8. Handouts-Provided by instructor and posted on D2L

Open Access Software's: WPL Soft (Delta PLC), WinTr SCADA, Mod Bus Simulator

MAJOR TOPICS:

- Data Acquisition and Industrial Control
- Communication Protocols (Serial bus, RS 232, RS485, Modbus I2C, CAN bus)
- Signal Interfacing (Industrial Ethernet, Fiber Optics, Wireless Network)
- Programmable Logic Controllers
- Distributed Control Systems (DCS)
- Supervisory Control and Data Acquisition (SCADA)
- Security Issues in Industrial Control
- Case Studies

LEARNING OUTCOMES:

Upon successful completion of this course, the student will be able to:

	LEARNING OUTCOMES	GRADUATE ATTRIBUTES. LEVEL OF COMPETENCE	METHODS OF ASSESSEMENTS
1	Demonstrate an understanding of SCADA systems	KB-A	Tests, Exam
2	Explain common SCADA architectures used in industry	KB-D	Tests, Exam
3	Select appropriate engineering tools for SCADA demonstration in lab	KB-A, Tools-A, Des.-A	Labs
4	Operate and program networked PLC's	KB-D, PA-D, Inv.-D	Tests, Exam, Labs



5	Demonstrate knowledge of communication standards for SCADA	KB-A, Tools-A	Tests, Exam
6	Establish and demonstrate a low-cost SCADA system in Lab	Prof-A, Team-A, Des.-A	Labs
7	Explain security issues of industrial control systems	Inv-D, Des-I Tools-A	Tests, Labs
8	Demonstrate practical knowledge of SCADA and PLC programming	KB-D, PA.-D, Des.-A	Labs, Tests, Exam

Each Graduate Attribute for each learning outcome is rated at a Content Instructional Level of I=Introductory, D=Developed, or A=Applied).

See <http://www.mun.ca/engineering/undergrad/graduateattributes.pdf> for more information on the 12 Graduate Attributes you are expected to be proficient in upon graduation.

ASSESSMENT:

Approximate Due Dates

Assignments (2)	5%	
Assignment 1		Feb 10
Assignment 2		Mar 24
Quizzes (4)	10%	
Quiz 1		Jan 28
Quiz 2		Feb 14
Quiz 3		Mar 11
Quiz 4		Mar 25
Midterm Exam	15%	Mar 02
Design Project	25%	Stepwise Deadlines
		• Proposal (Week 3)
		• Mid Report (Week 5)
		• Final Report (Week 11)
		• Oral Presentation (Week 12)
Lab Work (4)	20%	
Lab 1		Week 3 (24 Jan-28 Jan)
Lab 2		Week 6 (14 Feb-18 Feb)
Lab 3		Week 9 (07 Mar-11 Mar)
Lab 4		Week 11 (21 Mar-25 Mar)
Final Exam	25%	TBD (April 13- April 23)



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QUIZZES/TERM TESTS:

There will be no deferred or make-up quizzes or tests.

Changes and updates in the course will be announced in class and posted on the course D2L site.

CALCULATOR POLICY:

Only basic, non-programmable scientific calculators are allowed as aids during tests and exams. Other electronic aids, programmable calculators (e.g. TI-83 and TI-84) or calculators with symbolic manipulation, text storage and graphics capabilities, as well as other aids (books, notes, formula sheets electronic translators and devices, smart phones, etc.) are NOT allowed in term tests and final examinations. Unauthorized use of the above aids or devices during quizzes, test and examination will be considered as an academic offence.

ACADEMIC INTEGRITY AND PROFESSIONAL CONDUCT:

Students are expected to conduct themselves in all aspects of the course at the highest level of academic integrity. Any student found to commit academic misconduct will be dealt with according to the Faculty and University practices. More information is available at www.engr.mun.ca/undergrad/academicintegrity.

Students are encouraged to consult the Faculty of Engineering and Applied Science Student Code of Conduct at <http://www.engr.mun.ca/policies/codeofconduct.php> and Memorial University's Code of Student Conduct at <http://www.mun.ca/student/home/conduct.php>.

Individual work is expected of each student. Even if students work in groups, or discuss with others, assignments and reports should be independently prepared.

INCLUSION AND EQUITY:

Students who require physical or academic accommodations are encouraged to speak privately to the instructor so that appropriate arrangements can be made to ensure your full participation in the course. All conversations will remain confidential.

The university experience is enriched by the diversity of viewpoints, values, and backgrounds that each class participant possesses. In order for this course to encourage as much insightful and comprehensive discussion among class participants as possible, there is an expectation that dialogue will be collegial and respectful across disciplinary, cultural, and personal boundaries.

STUDENT ASSISTANCE: Student Affairs and Services offers help and support in a variety of areas, both academic and personal. More information can be found at www.mun.ca/student.