Electrical and Computer Engineering
ELECENG 4FJ4
Devices and Antennas for Wireless Systems
Fall 2023

McMaster University
ENGINEERING

Instructor Information

Natalia K. Nikolova
Email: talia@mcmaster.ca
Office: ITB-A308
Office Hours:
Monday from 1:30 pm to 3:30 pm in ITB-A308
By appointment or once a week on fixed hours, in-person or online (MS Teams):

Mondays from 1:30 pm to 3:30 pm

The A2L course webpage will announce any changes that may occur in the Office Hours.

Teaching Assistants

- **Roxana Nikoukar**, nikoukar@mcmaster.ca
- **Guanchen (Trevor) Li**, lig47@mcmaster.ca

Course Information

Lectures:

Monday 9:30 am to 10:20 am

Tuesday 10:30 am to 11:20 am

Thursday 9:30 am to 10:20 am

Lectures will be recorded on Echo 360. Pre-recorded lecture previews are available through YouTube. Links to the YouTube videos are provided through the Avenue To Learn (A2L) course webpage. Watching the lecture previews is recommended before the in-person lecture.

Tutorials:

Friday 9:30 am – 10:20 am

Tutorials will be recorded on Echo 360 if AV equipment in room allows for it.

Labs:

Five lab modules in total involve microwave and antenna measurements. The labs are carried out in from 2:30 pm to 5:30 pm. Labs do not depend on the lecture or tutorial material but require self-preparation through the provided DISCUSSION section in each Lab Module Workbook. Since lab sections are scheduled every other week, the labs stretch over a 10-week period. Details are provided below.

- Lab modules are timed for 3 hours, which include the completion of the Lab Report.
- Each Lab Module will be offered for a period of two weeks.
- Lab sessions start on Monday Sep. 18 (week 3) and end on Friday Dec. 1, 2023 (week 12).
- Changing the regular lab attendance time slot is permitted but must be completed by Friday Sep. 15, 2023. The schedule must aim at spreading out attendance to no more than 4 persons per session. This ensures quality interaction with the TA and individual access to measurement equipment.
- One-time change of lab section is allowed after Friday Sep. 15, 2023, provided the student obtains a permission from the Administrator TA.
- Missed lab work can be completed during the last week of the term (week 13), from Dec. 4, 2023, to Dec. 6, 2023, inclusive. Students are encouraged to schedule a 3-hour time slot in advance with the Administrator TA.

- Lab sections are numbered from L01 to L10, where odd-numbered sections start on Monday Sep. 18, 2023, whereas even-numbered sections start on Monday Sep. 25, 2023. See table below for details.

Start on Monday Sep. 18	Start on Monday Sep. 25
L01 Mondays 2:30 pm – 5:20 pm	L02 Mondays 2:30 pm – 5:20 pm
L03 Tuesdays 2:30 pm – 5:20 pm	L04 Tuesdays 2:30 pm – 5:20 pm
L05 Wednesdays 2:30 pm – 5:20 pm	L06 Wednesdays 2:30 pm – 5:20 pm
L07 Thursdays 2:30 pm – 5:20 pm	L08 Thursdays 2:30 pm – 5:20 pm
L09 Fridays 2:30 pm – 5:20 pm	L10 Fridays 2:30 pm – 5:20 pm

Course Dates: 09/05/2023 - 12/06/2023
Units: 4.00
Course Delivery Mode: In Person
Course Description: This course provides the fundamentals of the technology of wireless communications. transmission lines and waveguides, scattering parameters, impedance matching, power dividers, directional couplers, microwave resonators and filters, microwave sources and active devices, antenna fundamentals, microwave and antenna measurements. Three lectures, one tutorial, one lab every other week; first term Prerequisite(s): ELECENG 2FL3 or ELECENG 3FK4 or ELECENG 2CF3

Hours of Study: The material for this course will be delivered through pre-recorded lecture summaries (available through YouTube), in-person lectures and tutorials (recorded through Echo360), and 5 in-person laboratories (in ITB-155). The course also contains a design/fabrication project, which is carried out as a take-home assignment. The project prototype measurements will be carried out in the last week of the term in ITB-155 with the assistance of a TA. The platform for each component is noted at the end of each line below with more detail regarding the mode of delivery and the procedures.

Pre-Requisite(s) and Anti-Requisite(s)

Pre-requisite(s): ELECENG 2FL3 or 3FK4

Anti-requisite(s): None

Important Links

- Mosaic
- Avenue to Learn
- Student Accessibility Services - Accommodations
- McMaster University Library
- eReserves

Course Learning Objectives

For accreditation reasons, these learning outcome statements must be tied back to CEAB graduate attributes (GAs), including those that are measured in this course. If you are unsure how to do this, please contact the Associate Chair Undergraduate in your department.

- By the end of this course, students should be able to: • understand the operational principles and the system architecture of the radio-frequency receiving and transmitting equipment (Indicator 2.1); • perform analysis and design of simple impedance-matching circuits using the Smith Chart (Indicator 4.3); • perform microwave circuit analysis in terms of scattering parameters (Indicator 2.1); • use basic microwave test instrumentation (signal generators, oscilloscopes, spectrum analyzers and vector network analyzers) to measure single-port and multi-port microwave devices and antennas (Indicators 4.3, 5.2); • use professional design software for microwave circuit analysis and design (Indicators 2.1, 4.3, 5.2); • use professional design software for antenna analysis and design (Indicators 2.1, 4.3, 5.2); • fabricate and test simple circuit and antenna prototypes using microstrip technology (Indicators 2.1, 4.3, 8.2, 9.1); • understand fabrication tolerances and their impact on the circuit performance (Indicators 2.1, 5.2, 8.2); • write technical documentation and propose further improvements on existing wireless technology solutions (Indicators 8.2, 9.1).

CEAB Graduate Attributes (GAs)

The CEAB Graduate Attributes (GAs) defined in this section are measured throughout the course and form part of the Department's continuous improvement process. They are a key component of the accreditation process for the program and will not be taken into consideration in determining a student's actual grade in the course. For more information on accreditation, please ask your instructor or visit: http://www.engineerscanada.ca

Attributes	Indicators		Measurement Method(s)
	Number	Description	
Problem Analysis	2.1	Identifies and states reasonable assumptions and suitable engineering fundamentals, before proposing a solution path to a problem	Final Exam mark
Design	4.3	Develops models/prototypes; tests, evaluates, and iterates as appropriate	Design Project mark
Use of Engineering Tools	5.2	Demonstrates an ability to use modern/state of the art tools	Lab mark
Professionalism	8.2	Integrates appropriate standards, codes, legal and regulatory factors into decision making	Assignment 1 mark (RF Safety: Standards, Measurements, Compliance)
Impact of Engineering on Society and the Environment	9.1	Evaluates the environmental impact of engineering activities, identifies uncertainties in decisions, and promotes sustainable design	Overall Assignment mark

Assumed Knowledge

- Wave Equation and Maxwell’s Equations
- Fundamentals of Transmission Line Theory

Course Learning Goals

- understand the operational principles and the system architecture of the radio-frequency receiving and transmitting equipment
- perform microwave circuit analysis in terms of scattering parameters
- perform analysis and design of simple impedance-matching circuits using the Smith Chart
- use basic microwave test instrumentation (signal generators, oscilloscopes, spectrum analyzers and vector network analyzers) to measure single-port and multi-port microwave devices and antennas
- use professional design software for microwave circuit analysis and design
- use professional design software for antenna analysis and design
- fabricate and test simple circuit and antenna prototypes using microstrip technology
- understand fabrication tolerances and their impact on the circuit performance
- write technical documentation and propose further improvements on existing wireless technology solutions

Required Materials and Texts

Textbook Listing: https://textbooks.mcmaster.ca

preview lectures available on YouTube

Authors: Natalia K. Nikolova
Links to videos provided in the course A2L shell

lecture notes and lecture/tutorial solved examples posted on course A2L webpage
Authors: Natalia K. Nikolova

laboratory workbooks posted on course A2L webpage
Authors: Natalia K. Nikolova

Fundamentals of Microwave and RF Design
ISBN: 1469656884
Authors: Michael Steer
Publication Date: 2019
Edition: 3rd
made freely available by author at https://repository.lib.ncsu.edu/handle/1840.20/36776 (look under “Files in this item”)

AWR Microwave Office: Software tool for microwave circuit analysis and design
Software is freely available to McMaster students for a period of 6 months. Instructions for download and installation are provided on the course A2L webpage.

Altair FEKO: Software tools for antenna analysis and design
Software student version is freely available. Instructions for download and installation are provided on the course A2L webpage.

Optional Course Materials

Textbook Listing: https://textbooks.mcmaster.ca

Microwave Engineering
ISBN: 0470631554
Authors: D. M. Pozar
Publisher: Wiley
Publication Date: 2011
Edition: Any

Copies available in THODE

Microwave and RF Design: A Systems Approach
ISBN: 189112188X
Authors: Michael Steer
Publisher: SciTech
Publication Date: 2010
Edition: Any
Copies available in THODE

Class Format

In Person

Lectures, tutorials, laboratory sessions, midterm test, and the final exam will be carried out in person.

Lectures and tutorials will be recorded on Echo 360.

Instructor's office hours are also in person unless otherwise arranged in advance.

Course Schedule

Week	Topic	Readings
1	Radio Systems: An Overview Tech. Brief: WiFi and Bluetooth RF Systems	lecture notes and courseware
2	Maxwell's Equations in Phasor Form; Complex Constitutive Parameters; Microwave Power and Energy Tech. Brief: Complex Permittivity of Human Tissue	same
3	Principle of Radiation; Polarization Tech Brief: Microwave Field Interaction with the Human Body	
4	TEM and Quasi-TEM Transmission Lines, PUL Parameters, Voltage & Current Waves	same

	Tech. Brief: Microstrip Technology	
5	Terminated Transmission Lines; The Smith Chart and Basic Impedance-Matching Methods Tech. Brief: Baluns	same
6	Scattering Parameters and Signal Flow Graphs Tech. Brief: The Vector Network Analyzer	same
7	1-port and 2-port Passive High-frequency Components: Capacitors, Inductors, Terminations, Attenuators Tech. Brief: Microwave Filters	same
8	3-port and 4-port Passives: Power Dividers, Directional Couplers and Hybrids Tech. Brief: Circulators	same
9	Microwave Waveguides Tech. Brief: Waveguide Couplers	same
10	Active High-frequency Components: Schottky, PIN and Gunn Diodes; High-frequency Transistors Tech. Brief: Low-noise Amplifiers	same
11	The Dipole Antenna; Antenna Characteristics Tech. Brief: Anechoic Chambers	same
12	Propagation Models: Friis Equation; System Noise; Receiver Sensitivity Tech. Brief: Link Budget and Link Margin	same
13	Printed Antennas; Cell-phone, Bluetooth and WiFi Antennas Tech. Brief: Antenna Arrays	same

At certain points in the course, it may make good sense to modify the schedule. The instructor may modify elements of the course and will notify students accordingly (in

class, on the A2L course website).

Course Overview

McMaster UG Calendar:

This course provides the fundamentals of the technology of wireless communications. transmission lines and waveguides, scattering parameters, impedance matching, power dividers, directional couplers, microwave resonators and filters, microwave sources and active devices, antenna fundamentals, microwave and antenna measurements.

Three lectures, one tutorial, one lab every other week; first term

Instructor:

Fundamentals of the technology of wireless communications: transmission lines and waveguides, scattering parameters, impedance matching, power dividers, directional couplers, microwave resonators and filters, antenna fundamentals, microwave and antenna measurements.

Laboratory Overview

Modules	Topic	Readings
1	Introduction to Scattering Parameters and Vector Network Analyzers (VNAs): 1-Port Calibration, Instrument Noise Floor, and Measurements of 1-Port Devices	Lab Workbook 1
2	VNA 2-Port Calibration, Instrument Noise Floor, and Measurements of 2-port Devices	Lab Workbook 2
3	VNA Measurements of Multi-port Passive Devices	Lab Workbook 3
4	Antenna Measurements with a VNA	Lab Workbook 4
5	Wireless Link: Effects of distance, antenna gain, polarization mismatch and presence of obstacle on signal strength	Lab Workbook 5

Laboratory Operation

- Each student in the course is required to pass the lab safety quiz prior to attempting any of the laboratories. The quiz will be available on Avenue to Learn.
- Access to all labs is restricted in the interest of security and safety. Information on accessing and using the lab can be found on this webpage: https://www.eng.mcmaster.ca/ece/labs-and-health-safety#Labs-Access-and-Use
- Minimum Lab Mark: Overall Lab Mark below 50% leads to failure of the course.
- Lab Experiments: Every student conducts the lab experiment during her/his lab section time slot in ITB-155.
- Lab Requirements: Students need to submit their Lab Reports on Avenue to Learn and notify the TA about their submission. Feedback and a mark will be provided within one week of the submission. The A2L Lab Report Dropboxes will remain open until the end of classes (Dec. 6, 2023 11:59 pm).

Course Evaluation

Component	Weight	Notes
Design Project	**10%**	**1 project**
Assignments	**25%**	**8 modules, assignment mark averaged over all 8 marks**
Laboratory	**20%**	**5 modules, lab mark averaged over all 5 marks**
Quizzes	**10%**	**About 10 quizzes, quiz mark averaged over all marks**
Midterm Exam	**15%**	**1 midterm test**
Final Exam	**20%**	**1 final exam**
Total	**100%**	

Course Evaluation Details

BONUS Components (optional):

- ASSIGNMENT 3 BONUS (Mixer Design) (3% toward final course grade)
- HI-SCI BONUS (3 theoretical problem sets) (5% toward final course grade)

QUIZ NOTES: Quizzes will be posted and announced at the end of a lecture. A quiz answer must be submitted by the end of the day (11:59 pm) of the announcement through the respective Dropbox on A2L.

GRADING AND EVALUATION POLICIES

- If ALL three marks for final exam, midterm test and quizzes, are below 50% (mark out of 100%), the overall course grade is fail (F). Example A: Final Exam Mark 45%, Midterm Test Mark 40%, Quiz Mark 45% → Course Grade F. Example B: Final Exam Mark 45%, Midterm Test Mark 40%, Quiz Mark 55% → Course Grade determined according to the weighting scheme in the Table above, provided Lab Mark exceeds 50%.
- Midterm test and final exam papers can be viewed in person (after marking is completed) during the Instructor's Office Hours.
- If the Lab Mark is below 50%, the overall course grade is fail (F).
- Deferred exams may be oral.
- All grades are final unless error in marking is proven.
- Marking scheme is flexible only if the final-exam mark ≥ 89 %.
- Late submissions of assignments are subject to 50% penalty per day (less than one day is counted as one day)
- No make-up midterm tests will be granted.
- Weight of missed midterm test will be transferred to final exam provided MSAF is filed. If MSAF is not filed, the midterm test mark is 0.
- Weight of missed quizzes will be transferred to the weight of the rest of the quizzes, provided MSAF is filed. If MSAF is not filed, the quiz mark is 0.
- Weight of missed assignments will be transferred to the weight of the rest of the assignments, provided MSAF is filed. If MSAF is not filed, the assignment mark is 0.

Grading Scale

Grade	Equivalent Grade Point	Equivalent Percentages

Grade	Equivalent Grade Point	Equivalent Percentages
A+	12	90-100
A	11	85-89
A-	10	80-84
B+	9	77-79
B	8	73-76
B-	7	70-72
C+	6	67-69
C	5	63-66
C-	4	60-62
D+	3	57-59
D	2	53-56
D-	1	50-52
F	0	0-49

Laboratory Overview, Operation, and Safety

The Faculty of Engineering is committed to McMaster University's Workplace and Environmental Health and Safety Policy which states: "Students are required by University policy to comply with all University health, safety and environmental programs and policies". It is your responsibility to understand McMaster University's Risk Management system, which is supported by a collection of Risk Management Manuals (RMMs) that contain programs and policies in support of the Risk Management System. The RMMs are available from https://hr.mcmaster.ca/employees/health_safety_well-being/our-safety/risk-management-manuals-rmms/.

It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for specific experiments (see course lab manuals) and the laboratory equipment **[instructor to link to department specific lab safety manuals]**.

The safety requirements for [Room # where lab takes place] are listed below: **[instructor to insert – it may be useful to have a menu of rooms with SOPs pre-written for instructors to choose from – this keeps info consistent and accurate]**.

Additionally, McMaster University's workplace health and safety guidance related to COVID-19 must always be followed (available from https://hr.mcmaster.ca/resources/covid19/workplace-health-and-safety-guidance-during-covid-19/).

Late Assignments

- Late submissions of assignments are subject to 50% penalty per day (less than one day is counted as one day).

Absences, Missed Work, Illness

- No make-up midterm tests will be granted.
- Weight of missed midterm test will be transferred to final exam provided MSAF is filed. If MSAF is not filed, the midterm test mark is 0.
- Weight of missed quizzes will be transferred to the weight of the rest of the quizzes, provided MSAF is filed. If MSAF is not filed, the quiz mark is 0.
- Weight of missed assignments will be transferred to the weight of the rest of the assignments, provided MSAF is filed. If MSAF is not filed, the assignment mark is 0.

Turnitin.com

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.

Course Modification

No major modifications are expected.

Generative AI: Use Prohibited

Students are not permitted to use generative AI in this course. In alignment with McMaster academic integrity policy, it "shall be an offence knowingly to … submit academic work for assessment that was purchased or acquired from another source". This includes work created by generative AI tools. Also state in the policy is the following, "Contract Cheating is the act of "outsourcing of student work to third parties" (Lancaster & Clarke, 2016, p. 639) with or without payment." Using Generative AI tools is a form of contract cheating. Charges of academic dishonesty will be brought forward to the Office of Academic Integrity.

APPROVED ADVISORY STATEMENTS

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-proceduresguidelines/

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

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. Avenue to Learn, 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.

Courses with an On-line Element

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn, 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.

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 to make

arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

Academic Advising

For any academic inquires please reach out to the Office of the Associate Dean (Academic) in Engineering located in JHE-Hatch 301.

Details on academic supports and contact information are available from:

https://www.eng.mcmaster.ca/programs/academic-advising

Requests for Relief for Missed Academic Term Work

In the event of an absence for medical or other reasons, students should review and follow the Policy on 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.

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, Avenue to Learn and/or McMaster email.

Electrical and Computer Engineering Lab Safety

Information for Laboratory Safety and Important Contacts

This document provides important information for the healthy and safe operation of ECE instructional laboratories. This document is required reading for all laboratory supervisors, instructors, researchers, staff, and students working in or managing instructional laboratories in ECE. It is expected that revisions and updates to this document will be done continually. A McMaster University lab manual is also available to read in every laboratory and online: https://hr.mcmaster.ca/app/uploads/2019/07/2019-McMaster-Lab-Manual.pdf

General Health and Safety Principles

Good laboratory practice requires that every laboratory worker and supervisor observe the following whether conducting lab work at school or at home:

1. Food and beverages are not permitted in the instructional laboratories.

2. A Laboratory Information Sheet on each lab door identifying potential hazards and emergency contact names should be known.

3. Laboratory equipment should only be used for its designed purpose.

4. Proper and safe use of lab equipment should be known before using it.

5. The course TA leading the lab should be informed of any unsafe condition.

6. The location and correct use of all available safety equipment should be known.

7. Potential hazards and appropriate safety precautions should be determined, and sufficiency of existing safety equipment should be confirmed before beginning new operations.

8. Proper waste disposal procedures should be followed.

9. Personal ergonomics should be practiced when conducting lab work. https://bit.ly/3fOE71E

10. Current University health and safety issues, and protocols should be known. https://hr.mcmaster.ca/resources/covid19/workplace-health-and-safety-guidance-during-covid-19/

Location of Safety Equipment

Fire Extinguisher

On walls in halls outside of labs

First Aid Kit

ITB A111, or dial “88” after 4:30 p.m.

Telephone

On the wall of every lab near the door

Fire Alarm Pulls

Near all building exit doors on all floors

Who to Contact	
Emergency Medical/Security:	On McMaster University Campus, call Security at extension 88 or 905-522-4135 from a cell phone.
Non-Emergency Accident or Incident:	Immediately inform the TA on duty or Course Instructor.
University Security (Enquiries/Non-Emergency):	Dial 24281 on a McMaster phone or dial 905-525-9140 ext. 24281 from a cell phone.
See TA or Instructor:	For problems with heat, ventilation, fire extinguishers, or immediate repairs.
Environmental & Occupational Health Support Services (EOHSS):	For health and safety questions dial 24352 on a McMaster phone or dial 905-525-9140 ext. 24352 from a cell phone.

In Case of a Fire (On Campus Dial 88)

When calling to report a fire, give name, exact location, and building.

1. Immediately vacate the building via the nearest Exit Route. Do not use elevators!

2. Everyone is responsible for knowing the location of the nearest fire extinguisher, the fire alarm, and the nearest fire escape.

3. The safety of all people in the vicinity of a fire is of foremost importance. But do not endanger yourself!

4. In the event of a fire in your work area shout “Fire!" and pull the nearest fire alarm.

5. Do not attempt to extinguish a fire unless you are confident it can be done in a prompt and safe manner utilizing a hand-held fire extinguisher. Use the appropriate fire extinguisher for the specific type of fire. Most labs are equipped with Class A, B, and C extinguishers. Do not attempt to extinguish Class D fires which involve combustible metals such as magnesium, titanium, sodium, potassium, zirconium, lithium, and any other finely divided metals which are oxidizable. Use a fire sand bucket for Class D fires.

6. Do not attempt to fight a major fire on your own.

7. If possible, make sure the room is evacuated; close but do not lock the door and safely exit the building.

Clothing on Fire

Do not use a fire extinguisher on people.

1. Douse with water from safety shower immediately or

2. Roll on floor and scream for help or

3. Wrap with fire blanket to smother flame (a coat or other non-flammable fiber may be used if blanket is unavailable). Do not wrap a standing person; rather, lay the victim down to extinguish the fire. The blanket should be removed once the fire is out to disperse the heat.

Equipment Failure or Hazard

Failure of equipment may be indicative of a safety hazard - You must report all incidents.

Should you observe excessive heat, excessive noise, damage, and/or abnormal behaviour of the lab equipment:

1. Immediately discontinue use of the equipment.

2. In power labs, press wall-mounted emergency shut-off button.

3. Inform your TA of the problem.

4. Wait for further instructions from your TA.

5. TA must file an incident report.

Protocol For Safe Laboratory Practice

In general, leave equipment in a safe state when you finish with it. When in doubt, consult the course TA.

Defined Roles

TA	The first point of contact for lab supervision	
ECE Lab Supervisor	Steve Spencer- ITB 147	spencers@mcmaster.ca
ECE Chair	Mohamed Bakr- ITB A111	mbakr@mcmaster.ca
ECE Administrator	Shelby Gaudrault- ITB A111/B	gaudraus@mcmaster.ca
ECE Course Instructor	Please contact your specific course instructor directly	