CHEMICAL ENGINEERING 3L03

Advanced Laboratory Skills

Course Syllabus

Instructor: Timothy W. Stephens

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Course Outline

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Lab Safety Co-Ordinator	Lisa Laframboise, JHE 136
Machine Shop	Justin Bernar, JHE 140
Electronics and Instrumentation	Mike Clarke, JHE 251

General Information

This course provides fundamental skills and experience in chemical engineering laboratory, technical writing, and statistical data analysis. Laboratory topics are chosen to reinforce prior or current courses such as fluid mechanics, heat and mass transfer, thermodynamics, and reactor design.

The instructor and 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 an explanation and the opportunity to comment on changes. It is the responsibility of the students to check their McMaster email and the course Avenue site weekly during the term and to note any changes.

The P.R.O.C.E.S.S.

As some of you may already be aware, the department of Chemical Engineering has a storied history of education. In addition to teaching and learning, the department is proud of our graduates not only for their academic success, but their more intrinsic traits that make them respected members of the engineering community.

Recently, several high-ranking graduates from the McMaster Chemical Engineering Program employed in various industries (oil/gas, financials, *etc*.) were interviewed to ask what traits they look for when hiring for engineering positions. Using this information, the department would like to present to you the **PROCESS**: a code of conduct that we hope will guide our students throughout this program and their careers to come.

- **P**rofessionalism
- **R**esponsibility
- **O**wnership
- **C**uriosity
- **E**mpathy
- **S**elflessness
- **S**ervice

It is up to YOU to interpret these traits and apply them to your time at McMaster and your career as you see fit. These traits will not be assessed for grades but will be strongly encouraged throughout your time at McMaster. We hope that you identify with these character traits and what they mean to you, and that you **trust the process**

Course Texts

REQUIRED – ChE 3L03 Custom Courseware (print at your own convenience)

NOTE:

- Some special material for some experiments may be required (provided in-lab or on the Avenue site for the course).
- For writing technical reports, please refer to Bliqc & Moretto “Technically-Write!” Prentice Hall. This text has been used previously for 3L03 and 4L03 and copies are available in Thode library.

Course Organization:

Table 1: Lecture and Lab section dates and times.

	Day:	Start Time:	End Time:	Room:	MS Teams Code:
Lecture C01	Friday	11:30 AM	12:30 PM	PGCLL M16	
L01	Monday	1:30 PM	4:30 PM	JHE A106	xg2oo6j
L02	Tuesday	1:30 PM	4:30 PM	JHE A106	8vhxc2v
L03	Wednesday	1:30 PM	4:30 PM	JHE A106	a28kxpa
L04	Thursday	1:30 PM	4:30 PM	JHE A106	aude45x
L05	Friday	1:30 PM	4:30 PM	JHE A106	2pd1biw

Laboratory Sessions

Lab sessions are organized in three-week Cycles. Each cycle has three 3-hour sessions. The first and second session have specific goals and endpoints that will be directed by the TA and manual. There is a Make-up week following Cycle 3 if extra sessions are needed due to weather cancellations or lab closures. The Make-up week may also be used for students who missed multiple sessions due to extenuating circumstances; permission from the instructor is required to arrange this.

The third session is an Open Lab/Self-Directed Learning (SDL) in which your group will plan and carry out one or more informed, knowledge-based learning goals. Details of the Open Lab activity and submission are provided below.

A schedule indicating all key laboratories, lectures, and meeting slots relevant for each lab section is included in this course package. Students will NOT be permitted to switch lab sections after Wednesday, January 8th.

Lectures

A weekly lecture will be held for approximately the first third of the course. The lectures are intended to introduce general background on laboratory practice, including calculations, statistics, data presentation and error analysis and writing.

Attendance to the weekly lecture is **required**. Assignments, in the form of short quizzes or other tasks, may be given in any lecture with no prior notice. In-class assignments are graded for completeness only. The student will receive full marks provided that there is *a reasonable attempt at **each** question*.
With a valid MSAF, the student is allowed to make up the in-class assignment at a later date.
It is the responsibility of the student to contact the instructor for making up assignments.

Table 2: Overall Course Schedule (Some Lecture topics/dates TBA)

Week	Day & Time	Content
January 5 2026	Friday Wednesday noon	Lecture 1 (no labs this week) Finalize Lab Session Choice
January 12	Friday Your lab Day 11:59 PM 2 days after lab	Lecture 2 Cycle 1 Lab 1 Progress Log 1 due (MS Teams)
January 19	Friday Your lab day 11:59 PM 2 days after lab	Lecture 3 Cycle 1 Lab 2 PL2 and Open Lab Plan Due (MS Teams)
January 26	Friday Your lab day	Lecture 3 Cycle 1 Lab 3
February 2	Friday Your lab Day 11:59 PM 2 days after lab 11:59 PM 8 days following Cycle 1 72 hours after Report 1 completion	Lecture 4 Cycle 2 Lab 1 PL 1 due (MS Teams) **Lab Report 1 Due (A2L)** **Peer Evaluation Due (A2L)**
February 9	Friday Your Lab Day 11:59 PM 2 days after lab	Lecture 5 Cycle 2 Lab 2 PL2 and OLP Due (MS Teams)
February 16	**Midterm Recess**	
February 23	Friday Your lab day	Lecture 6 (Final lecture) Cycle 2 Lab 3
March 2	Your lab day 11:59 PM 2 days after lab 11:59 PM 8 days following Cycle 2 72 hours after Report 2 completion	Cycle 3 Lab 1 PL 1 due (MS teams) **Lab Report 2 Due (A2L)** **Peer Evaluation Due (A2L)**
March 9	Your lab day 11:59 PM 2 days after lab	Cycle 3 Lab 2 PL2 and OLP Due (MS Teams)
March 16	Your lab day	Cycle 3 Lab 3
March 23	Make up week (cancelled/missed labs) 11:59 PM 8 days following Cycle 3	**Individual Short Report 3 Due (A2L)**
March 30	Make up week (cancelled/missed labs)	
April 6	**Tuesday, April 7**	Classes end Deadline for make-up lab reports

Course Assessments and Grading

The course will be graded based on the following scheme:

Table 3: Course assessment weight distribution.

Evaluation:	Weight (%):
Assignments	5 %
Lab Preparation	5 %
Cycle 1 Laboratory Full Report (*Group*)	30%
Cycle 2 Laboratory Full Report (*Group*)	30%
Cycle 3 Laboratory Short Report (*Individual*)	30%

Report Marking Summary (out of overall grade):

Table 4: Laboratory cycle assessment weight distribution.

Evaluation:	Weight (%):
Progress Log 1 (Group, 1 per cycle)	1.5%
Progress Log 2 (Group, 1 per cycle)	1.5%
Open Lab Plan (Group, 1 per cycle)	1.5%
Data Collection (Group, 1 per cycle)	1.5%
Cycle 1 Lab Report (Group)	24 %
Cycle 2 Lab Report (Group)	24 %
Cycle 3 Short Report (Individual)	24 %

Each student will do three laboratory experiments, each taking 3 weeks. The various experiments are listed at the end of this course outline.

Grading Rubrics for the above are posted on Avenue to Learn.

Final grades will be converted to the 12-point scale using the Senate recommended conversion scale.

Lab Preparation:

To achieve full marks in this section*, individual* students must show the TA:

- Excel spreadsheet and or experimental tables ready for experimental data input
- Smooth transition into the laboratory experiments with minimal TA assistance
- Punctual and ready to start at the beginning of the laboratory scheduled time
- Active participation in lab activities
- Demonstrated knowledge and understanding of lab manual content

Data Collection:

Student lab groups are expected to perform sufficient measurements and collect all required data over the three weeks of each lab cycle. This includes the timely recognition and correction, or flagging, of faulty data. The exact requirement varies by experiment and may be adjusted in the event of equipment issues or weather interruption. Students will achieve higher grades on this section if the data collection requirements are exceeded. Details about data collection grading are included in the report grading rubric.

Progress Log

Each group is required to keep a log of their lab progress, which is submitted to the appropriate TA for review after the 1st and 2nd lab days of each cycle.

The file is accumulative: i.e. the version submitted after the 2nd lab day must include contents from both first two lab days.

The file **must be brief**, with *no lengthy description or discussion* (which belongs to the full lab reports).

The purpose of the file is threefold:

- Require the students to (1) summarize important observations and reflect on the challenges and questions encountered and (2) turn raw data into a processed form (by performing the required calculations and data reduction) and visualize the data (by figures and/or tables) for efficient presentation, from which a full report can later be composed.
- Obligate the students to complete these data processing/analysis tasks in a timely manner, during the lab or immediately afterwards (while the whole group are together), for better organization and efficiency.
- Allow the TAs and the instructor to monitor the progress of the group and provide timely feedback between lab days.

The following contents are required:

- A header listing the experiment title, authors (including full names, MacIDs, and student numbers), lab session (e.g., MondayPM), 1st or 2nd log file, and submission date. A main body that starts with a bullet point summary of the progress so far, and any issues or questions encountered.
- It is followed by all the processed data (plots and tables) to date, each with a one-liner description of the main observation (e.g., "the vapor pressure of ethanol increases with temperature"), which in no case should exceed two sentences.
- For the 2nd log only, an Open Day Lab Plan, as an Appendix

Text must not exceed one page. Figures and tables do not count against the page limit.

All raw data measured to date must be included in the appendix, which is not counted in the page limit. Sample calculations should be placed in the appendix as well.

Progress Log is due by 11:59 pm <u>two</u> days following the laboratory session. You MUST upload the PL to the group Teams Channel. An electronic copy of your graded PL will be returned to you before the beginning of the following lab session to help you with the preparation of your formal report.

Open Lab Plan:

The third lab day of each cycle is an Open Lab Day in which students are given the opportunity to determine their own lab activities.

Examples of such activities include:

- Complete any lab measurements not completed in Weeks 1 and 2;
- Conduct further measurements to establish trends more clearly.
- Conduct Self-Directed Learning (SDL), in which you test one or more variables not examined in Weeks 1 or 2.

Open Lab Plan Format:

The group should discuss their plan with the supervising TA during Week 2. The activities must cover 1.5 to 3.0 hours of lab time.

- The outline of the plan should contain the following contents:
- A specific description of what lab testing you intend to carry out;
- A summary of the methods you will use to conduct the lab work.

- The specific rationale behind the lab work, such as what trend you are trying to clarify or what new insight you are trying to obtain.

The total length **should not exceed one page,** and it must be submitted as an appendix to Progress Log 2.

Lab Reports:

The first lab will require a *group completed*, **10 page Full Report (FR1).** The second lab will require a *group completed* **10-page Full Report (FR2).** The third lab will require a*n individually completed* **6-page Short Report (SR)**.

All reports are to be computer generated, i.e. no hand-written reports allowed. All reports are to be submitted to: Avenue to Learn. Reports submitted by other means (i.e. email, teams) will not be graded. Electronic copies of reports must be uploaded no later than 11:59 pm (before midnight) on the specified deadline date to Avenue to Learn. A standard deduction of **5% per day** (starting at midnight) overdue applies; for example, a report awarded 75% but handed in 1 day late will receive a grade of 70%. The late penalty will be waived only on the presentation of an MSAF or similar. All 3 reports must be completed and handed in for course credit. Failure to hand in any one laboratory report will result in automatic course failure.

Laboratory reports will be marked according to the guidelines for report writing and the detailed grading rubric included on Avenue to Learn. Reports are expected to be clear and concise. Adjustments to report due dates for individuals, groups or sections are at the discretion of the course instructor.

Cycle 1 Full Report (FR1) – Group:

A lab report consisting of a Title Page, Table of Contents, Introduction, Results, Discussion, Conclusion, List of Symbols, References, Appendices and Pledge of Originality. The main body of the report (Intro → Conclusion) is a 10-page maximum, including figures and tables, but not including Title Page, Table of Contents, References, and Appendices It must be written with 1.5 line-spacing, 11 font Times New Roman. The Cycle 1 Report is due at 11:59 PM, 8 days after the completion of Week 3.

Cycle 2 Full Report (FR2) - Group:

A lab report consisting of a Title Page, Table of Contents, Introduction, Results, Discussion, Conclusion, List of Symbols, References, Appendices and Pledge of Originality. The main body of the report (Intro → Conclusion) is a 12-page maximum, including figures and tables, but not including Title Page, Table of Contents, References, and Appendices. It must be written with 1.5 line-spacing, 11 font Times New Roman. The Cycle 2 Report is due at 11:59 PM 8 days after the completion of Cycle 2 Week 3.

Cycle 3 Short Report (SR) – Individual:

A short lab report will contain Title Page, Table of Contents, Objectives, Results, Discussion, Conclusions and List of Symbols. Appendices and References must be included. A Pledge of Originality must be included. The main body of the report (Objectives → Conclusions) has a 6-page maximum, inclusive of figures and tables, and should be written in 1.5 line-spacing, 11 font Times New Roman. *Text in Individual Reports must be original and not copied and pasted from group PL's, including written sections, figures, tables, and captions* The Short Report is due 8 days after the completion of Cycle 3 Week 3.

Pledge of Originality:

A written Pledge of Originality must accompany every full report (FR) and short report (SR) submission. The pledge should use the provided template (A2L), signed by the author(s), and appended to the full report (in the same PDF file after the last appendix). Submission without the Pledge will not be graded and **late submission of the Pledge is subject to a 5% penalty**.

Students will have the opportunity to review their graded reports with their TA. Senate regulations require that the instructor must retain file copies of the graded reports. These marks are tentative and may be raised or lowered by the instructor to account for differences in the TA's grading styles.

Mark Penalties:

Grade Penalties are applied to written reports for cases of absence without leave, late submissions, and conduct issues. Penalties are applied to the written lab report grade and may be applied individually or to the group.

- Lateness to lab of more than 15 minutes: 2% penalty to lab report (after 2nd incident)
- Single Absence from lab without MSAF or alternate arrangement: 20% penalty to lab report.
- Multiple unapproved Absences in one Cycle: zero on written report
- More than 3 hours missed in any cycle without approval: zero on written lab report
- Leaving lab before your group mates for non-valid reason: 5% penalty to lab report per incident.
- Leaving Lab space in poor condition or failure to exit before 4:30 PM: 5% penalty to lab report.
- Unprofessional Conduct: up to 10% penalty to lab report
- Handing Report in Late: 5% per day, starting at 12:00 midnight
- Handing in Pledge of Originality Late: 5%

Peer Evaluations and Feeback:

It is expected that group members will contribute an equal share on reports, progress logs, open lab plans and lab work. By default, each group member will receive the same grade on any group submission unless Peer Adjustment indicates otherwise.

A Peer Assessment Form must be submitted following each full report submission by each student (using a survey posted on A2L). The Form is submitted to a separate folder on A2L, ensuring that its contents are confidential to other students, and it will be due within 72 hours of the report deadline. Students are asked to evaluate every member's contribution to the group work in the Form. The information will be used to determine whether grade adjustment is needed. For the Cycle 3 SR, peer adjustment will only apply to the PL and OLP sections, which are group activities. *Feedback is confidential between individual students and their TA*.

If a student does not submit the form by the deadline, they relinquish their right to claim contribution to the group work. Their contribution will be determined from forms submitted by other group members.

Missed Reports

Policy: Permission for Make-up

Students have at least 8 days to complete the report after the last lab day. It is therefore their responsibility to plan their time ahead for any emergency.

Students need the permission from the instructor to make up for any missed report, which is **only** given in the case of *extreme illness or other extenuating circumstance*. **Both**

- appropriate documentation, **and**
- an MSAF

must be submitted to the instructor for it to be considered.

In no cases will the student be permitted to miss and make up for **both group reports** since group work is an indispensable training goal of the course.

Missed group reports:

5-page maximum, no figures or tables (figures and tables from the group report are to be included in an appendix – no need to reproduce). Must be originally written by the student individually with no similarity with the group report.
A minimum of 2 references (not counting the Course pack) meeting the course requirement.

Missed individual reports:

A short report in accordance with the normal report requirement must be submitted.
The due date for a Make-up report will be one week from receiving the permission for writing the make-up report from the instructor.

Disputes and Resolution

Challenging the Grade:

Reports can only be re-graded in their entirety: i.e., it is not possible to change the mark of one attribute in the rubric without reviewing all the others. Therefore, it is possible for the grade to get lower after the grade-challenge process. Because of the amount of time required, reports can only be re-graded if there is sufficient evidence that the error or unfairness of the original grading has a substantial effect on the grade. To meet this requirement, you will need to follow the procedure below.

1. Review the whole rubric and identify all attributes where the mark is challenged.
2. For each of these attributes, identify which mark you think your report deserves and provide your justifications (based on the rubric).
3. Add the mark changes from all these disputed attributes and only submit your request if the total potential change is more than 5 marks.
4. If it is a group report, obtain the consent from all group members. Copy all group members on the e-mail.
5. Submit your request in writing (including all justifications) to the grading TA by E-mail within 7 calendar days after the report was first returned to the submitter.

Disputes in Group Work:

Collaboration is an important skill to be developed in this course. Students are strongly advised to commit to their obligation to the group, behave professionally in the collaboration, and effectively communicate with one another to allocate the workload and resolve any disputes. In case of any irreconcilable dispute, **the report and/or presentation must still be submitted/given on time, and the disputes are only resolved after submission**.

Unequal Contribution:

If one or more members have not contributed equally to the experiment and report, the grades will be adjusted according to the relative contributions of the members. Contributions are evaluated based on the peer assessment completed by the group members. In case of significant discrepancy between information provided by members of a group, the TA or Instructor will investigate contributions by the members based on evidence such as raw and processed data, communication record, and any draft writings. It is thus important for all members to keep a record of their contributions and avoid access to key files by the alleged non-contributor(s). Group members and the supervising TA may also be interviewed during the investigation.

Unprofessional Conduct:

In addition to the lack of contribution, other unprofessional behaviors from certain group members may impede

or even sabotage the progress of the group. Examples include but are not limited to:

- holding on to important data, analysis, or text contributions and refusing to share with groupmates or not responding to such requests
- not providing "agreed upon" work and failing to notify the other members until it is too late to make up for
- rude, demanding or inconsiderate behavior in person or online, especially if this behavior discourages discussion, learning and collaboration
- Spending excessive time during lab on non-lab activities (i.e. checking social media)

Important notes:

- Except under severe extenuating circumstances, there is no excuse for not responding to or communicating with groupmates.
- Even if the student is permitted by the instructor to miss any work with legitimate documentation, they are still obliged to notify and coordinate with other group members to ensure the smooth transferring of data, information, and responsibilities.

The burden of proof lies with the other members of the group. After reviewing the evidence submitted, the instructor may impose extra penalties for unprofessional conduct in addition to that for the lack of contribution.

Accreditation Information

Learning Outcomes of the Course

1. Understand common chemical engineering unit operations, including their equipment setup, process design, and underlying chemical engineering fundamentals such as transport phenomena, thermodynamics, and reaction engineering.
2. Understand the rationale behind the design of experimental setup and measurement procedures. Acknowledge the limitation and error sources in each design.
3. Acquire hands-on experience of operating chemical process equipment, such as columns, tanks, reactors, and separators.
4. Acquire hands-on experience of using measurement devices and sensors. Understand the sources of error and uncertainty in measurement.
5. Develop the skills of planning and managing complex multi-day and multi-task projects.
6. Develop the capability of implementing project requirements and delivering outcomes based on written (manuals, guidelines, rubrics, etc.) and oral instructions.
7. Develop the skills of working in a team, including effective team management, collaboration, and communication.
8. Develop the skills of data processing, synthesis, and presentation, including proper data reduction and organization, statistical analysis, and data visualization.
9. Develop the capability of critically interpreting experiment data for scientifically valid conclusions.
10. Understand the role of experimental error and uncertainty in data interpretation.
11. Develop technical writing skills, including the use of clear, concise, and accurate scientific language, logical organization of contents, and the presentation of compelling arguments. Understand the standards of technical documents.
12. Develop critical thinking skills, including reflecting on the experimental design, understanding the sources of error, and deriving meaningful physical insight from observations.

CEAB Indicators Associated with the Course The following information is required by the Canadian Engineering Accreditation Board (CEAB). Graduating from an accredited institution has many advantages. Detailed information is found at http://www.engineerscanada.ca/accreditation.

No.	CEAB Indicator	Learning Outcomes
3.2	Synthesizes the results of an investigation to reach valid conclusions.	L.O. 8, 9, 10, and 12.
4.4	Justifies and reflects on design decisions, giving consideration to limitations, assumptions, constraints and other relevant factors.	L.O. 1, 2, 4, and 12.
1.1	Demonstrates comprehension of technical and non-technical instructions and questions.	L.O. 6.
1.2	Composes an effective written document for the intended audience.	L.O. 11.
11.2	Plans and effectively manages a project's time, resources, and scope, following business practices as appropriate.	L.O. 5.

Senate and The Faculty of Engineering Policies:

Centre for Student Development:

"Students with disabilities can receive accommodations to assist them in the completion of their assignments and exams. Please contact the Centre for Student Development for advice and for arranging assistance." Further info at: ***http://csd.mcmaster.ca***

"The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem, that cannot be resolved by discussion among the persons concerned, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible."

Plagiarism and Academic Dishonesty:

Plagiarism is a serious issue to you as an academic and a future professional and will be treated as such in this course should it occur. You will be using Avenue to Learn, which is Turnitin.com enabled, to verify the originality of your laboratory reports throughout the course. Please note the following for Turnitin.com:

1. An originality report will be generated and reviewed by the instructor.
2. Generation of the originality report may not be available until after the report is due.
3. As several years of reports on similar laboratories are in the database, it is inevitable that some identical phrases or expressions may occur between your report and previous reports – this is to be expected. We are not looking for a particular percentage of 'originality' but rather looking through the full originality report to confirm the laboratory report is your original work.

Please refer to the university policy on academic dishonesty (reproduced below) for the definition of plagiarism as it pertains to this course: Please note that plagiarism cases *will be reported* and the procedures outlined below *will be followed* if an issue were to occur.

"You are expected to exhibit honesty and use ethical behavior in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity."

"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 behavior 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."

"It is your responsibility to understand what constitutes academic dishonesty. For information, the various types of academic dishonesty please refer to the Academic Integrity Policy, located at: http://www.mcmaster.ca/academicintegrity"

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one's 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.

**In particular, in this course, copying previously submitted laboratory reports or data is considered to be an extreme case of academic dishonesty/plagiarism.*

In this course, we will be using Turnitin.com and Avenue to Learn. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, usernames 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 this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

A note on the use of Generative AI:

Students are NOT permitted to use generative AI to compose reports or assignments 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 stated 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. For more information on the definition of and McMaster's policy towards generative AI, refer to https://provost.mcmaster.ca/office-of-the-provost-2/generative-artificial-intelligence/

Laboratory Safety and Safety Checklist

An overview of the principles of laboratory safety will be given in the first lecture. You are responsible for familiarizing yourself with the experiment prior to entering the laboratory to gain a preliminary understanding of the key safety issues associated with each experiment. On the first day of an experiment, your instructor or teaching assistant will be available to answer any questions that you may have about the experiment to be done. It is important that you fully understand any hazardous features of the experiment. For example:

a) Pressure, vacuum experiments

- Correct operation and handling of gas cylinders Need for eye protection with glassware Pressure limitations with large vessels
- Pressure limitations of tubing

b) Acids and bases Corrosion and burns

- Heat effects (e.g. sulfuric acid and water)
- Gloves required

c) Organic liquids

- Volatility and toxicity (fume hood or other special precautions needed?)
- Flammability – location of the nearest fire extinguisher

d) Electrical equipment Check for frayed wires

- Avoid wires trailing on the floor, Keep wires away from water

e) Large scale equipment Safe use of ladders

- Safe access to control points
- Do not climb on or roll equipment
- Correct start-up procedures
- Location of Emergency Shutdown Switch

f) Shut down of equipment

- Ensure that all equipment is completely shut down in a safe sequence at the end of each lab period. Do not leave dangerous materials lying in the open. Ensure that valuable small items (stopwatches, pipettors) are not left in the open. Ensure any hazardous material is placed inside designated containers.

No food, drink, or smoking is permitted in the laboratory areas. Coats and bags must be left in the antechamber of JHE A106 and safely out path of foot traffic. Protective eyewear must be worn – no exceptions.

Safety infractions:

- **First** infraction –oral warning
- **Second** infraction – written warning
- **Third** infraction – failure on that laboratory
- **Fourth** infraction – withdraw and course failure

This order may not be followed depending on the seriousness of the student's action and will be left at the discretion of the course instructor.

In case of emergency:

- **Remain Calm**
- **Dial 88** from a campus phone
- **Dial (+1) 905-522-4135** from a cell phone (security services direct)

In case of fire, smoke or gas:

- Pull the fire alarm
- Dial **88** or **905-522-4135**
- Leave the building
- If the fire alarm sounds:
- Leave the building
- **Do not** re-enter the building until the fire department or security approves

Familiarize yourself with the location of the nearest fire extinguisher, safety shower and eye wash station.

Prior to each experiment, you will have to complete the safety checklist (distributed in the lab), as shown on the following sheet. Read the protocols for your lab carefully prior to entering the lab to become familiar with all the hazards of the experiment and assist in completing this safety form.

ChE 3L03 SAFETY FORM

Name and Student No.:_____ Instructor:_____ Date: _____

(To be completed in the laboratory before experimental work can begin on a new project.)

Laboratory Equipment:

Fill in the key safety concerns and actions to be taken with respect to potential hazards in the following areas:

1. Pressure/Vacuum:

2. Chemicals:

3. Electrical Equipment:

4. Large-scale Equipment:

5. Start-up and Shutdown of Equipment:

6. Other:

If you perceive that you may be taking an unsafe action or are in an unsafe situation, inform the teaching assistant or instructor.

I have received instructions in and understand the safety issues associated with this experiment.

Signature:_____ Date:_____

*Available in the lab prior to each new laboratory.