

**McGill University**  
**Department of Chemical Engineering**



**Chemical Engineering Graduate Student Handbook**  
**2015-2016**

**Graduate Studies Advisory Committee**  
**August 2015**

## TABLE OF CONTENTS

1	REGULATIONS GOVERNING GRADUATE PROGRAMS .....	1
A.	INTRODUCTION & GENERAL REGULATIONS .....	1
1.	Degree Programs .....	1
2.	General Regulations .....	1
3.	Deferred grade, Course failures, Forced withdrawal .....	2
4.	Voluntary Withdrawal from a Program .....	2
B.	MASTER OF ENGINEERING (PROJECT OPTION, General) .....	3
1.	Requirements .....	3
2.	Projects and Project Reports .....	3
3.	Area of Concentration .....	4
C.	MASTER OF ENGINEERING (THESIS OPTION) .....	5
1.	Requirements .....	5
2.	Starting Research .....	6
3.	Thesis Proposal .....	6
4.	Research Progress .....	7
5.	Time for Completion and Thesis Length .....	7
D.	DOCTOR OF PHILOSOPHY .....	8
1.	Requirements .....	8
2.	Ph.D Thesis Proposal .....	9
3.	Ph.D. Proposal Defence .....	9
4.	Ph.D. Seminar .....	10
5.	Guidelines Regarding the Conduct of Research .....	10
6.	Time for Completion .....	11
7.	Ph.D. Thesis Length .....	11
2	ADMINISTRATION OF PROGRAMS .....	12
A.	Departmental Administration .....	12
B.	Graduate Studies Advisory Committee (GSAC) .....	12
C.	Graduate Courses .....	12
D.	Teaching Assistantships .....	12
E.	Financial Support .....	13
F.	Seminar Procedures .....	13
G.	Vacation Policy .....	14
H.	Thesis Preparation and Submission .....	14
I.	Completion of M.Eng. (Project Option) Programs .....	14
J.	Advancing to a New Program .....	15
3	SUPPORT SERVICES .....	17
A.	Office and Laboratory Space .....	17

B. Photocopies .....	17
C. Telephone and Fax .....	17
D. General Store and Receiving Area .....	17
E. Laboratory Safety and Security .....	18
F. Machine Shop and Electronics Shop .....	18
G. Instrumental Analysis .....	19
H. Software and Computer Support .....	19
APPENDIX A – Chemical Engineering Staff.....	22
APPENDIX B – Graduate Courses planned for 2015-2016.....	23
APPENDIX C – List of All Chemical Engineering Courses .....	24
APPENDIX D - Description of CHEE 690 Research Techniques.....	25

## PREFACE

Welcome to the Chemical Engineering Department!

The purpose of the Graduate Student Handbook is to provide Chemical Engineering graduate students with a concise summary of the regulations, guidelines, procedures and services specific to the Chemical Engineering Department. More information on chemical engineering graduate students resources can also be found on the ChemEWeb section of our website (<http://www.mcgill.ca/chemeng/chemeweb>). Information on facilities and services outside the Department is not included.

The GSAC, professors and staff members of the department wish you the best for the pursuit of your graduate studies.

Prof. Phillip Servio  
Graduate Program Director  
Chair of the Graduate Studies Advisory Committee

Prof. Anne Kietzig  
Graduate Studies Advisory Committee

Mrs. Louise Miller-Aspin  
Graduate Program Coordinator

# 1 REGULATIONS GOVERNING GRADUATE PROGRAMS

## A. INTRODUCTION & GENERAL REGULATIONS

### 1. Degree Programs

The Department of Chemical Engineering offers graduate programs leading to the degrees of Doctor of Philosophy (Ph.D.) and Master of Engineering (M.Eng.). Two routes to the M.Eng. degree are available: the Project Option (see Section B) and the Thesis Option (see Section C).

The **M.Eng. (Project Option)** consists primarily of graduate courses with a time-limited design or research project. The objectives of the M.Eng. (Project Option) are to extend the student's knowledge in fundamental and specialized areas of chemical engineering and to provide an independent project experience. One concentration is offered in the M.Eng. (Project Option) program: the General concentration.

The **M.Eng. (Thesis Option)** consists primarily of a research project leading to a Master's thesis combined with some graduate coursework. The objectives of the M.Eng. (Thesis Option) are to extend the student's knowledge of the fundamentals of chemical engineering and to provide significant exposure to research via a well-defined project.

The **Ph.D.** is a research degree whose broad objective is to prepare students to work as independent researchers. Students achieving the Ph.D. will have demonstrated the capability for independent research of high quality on a problem of importance to chemical engineering, have gained expertise in one or more specialized areas and have become self-reliant researchers.

### 2. General Regulations

Graduate students are registered through the Graduate and Postdoctoral Studies Office (GPSO) in the Ph.D. and M.Eng. programs. All graduate students are governed by the regulations administered by the GPSO ([www.mcgill.ca/gps/](http://www.mcgill.ca/gps/)). These regulations may be found in the booklet *General Information, Regulations and Research Guidelines (The Red Book)* published annually by the GPSO. Important deadlines for registration, course withdrawal, and other important dates are posted on the Graduate Studies and Postdoctoral website under Calendar of Dates.

The time limits for graduate degrees are 3 years for the M.Eng. and 6 years for the Ph.D. The GPSO will approve registration as M.Eng. 4 or Ph.D. 8 only under special circumstances and only upon recommendation of the Department.

The requirements for a Master's degree are specified in terms of credits. Students must satisfactorily complete a minimum of 45 credits for the M.Eng. (Thesis Option) and the M.Eng. (Project Option). The requirements for the Ph.D. are listed individually and there is no total credits requirement for the Ph.D. degree.

### **3. Deferred grade, Course failures, Forced withdrawal**

A grade of L (deferred) in a course may be given for reasons such as illness at the time of an examination only if approval is received from the GPSO. Approval will be granted upon presentation of a medical certificate either before or immediately after the examination.

The minimum passing grade for a graduate student is a B- (65%) in courses graded with letters (percentages). A student may fail one course required in her/his program and still complete the degree. The failed course must be repeated or replaced by a course approved by the GPSO upon recommendation of the Department. A student failing a second time, either in a retaken course or another required course, must withdraw from the graduate program.

### **4. Voluntary Withdrawal from a Program**

If you decide that you will not complete your program, you should withdraw officially from the university. Failure to do so will mean that you will be assessed fees (as if you were still in your program, but failed to register). In order to withdraw, you must complete the *Withdrawal Form/Formulaire d'abandon universitaire* and submit it to the GPSO with notification to the department.

## B. MASTER OF ENGINEERING (PROJECT OPTION, GENERAL)

### 1. Requirements

The minimum credit requirements are:

	<u>Credits</u>
A) CHEE 695 Project in Chemical Engineering	6
B) Chemical Engineering courses (500- or 600-level)	18
C) Courses comprising an Area of Concentration	9
D) Additional courses	<u>12</u>
Total credits	45

### Notes

- Students applying to this program must have **secured a research supervisor before they can be admitted.**
- An area of concentration consists of 9 credits in a technical area (engineering or science), which may be outside of chemical engineering.
- In category (D), the following courses may be chosen:
  - Graduate courses in engineering, science or management.
  - Credits over 18 in category (B) may be counted in (D).
- CHEE 690 Research Techniques may not be used for course credits.
- Courses taken more than 6 years before entry to the program are not permitted as credits for the degree. Courses taken previously, passed at the graduate level, and not considered as required credits for an earlier degree or diploma, may be counted towards the degree requirements, to a maximum of 12 credits.

### 2. Projects and Project Reports

Project in Chemical Engineering (CHEE 695) and Extended Project (CHEE 696) involve time-limited independent work on a design or research project. Each project is rated at 6 credits.

All projects must be supervised by a full-time professor of the Chemical Engineering Department. Before a student is accepted into the program, she/he must have secured a supervisor for their research project. No student shall be admitted into the program without having a supervisor. There may also be a co-supervisor, not necessarily a McGill professor; this is desirable in projects involving an industrial problem. Project topics may be professor initiated, student initiated, or suggested by industrial contacts. For projects related to the student's employment, written permission must be obtained from the employer to submit a report to the Department, and a copy of this authorization must be submitted with the final report. This does not imply permission to publish results in the open literature. Students or staff wishing to publish results of industrial projects should negotiate this in advance with the company involved, and involve the personnel from the Office of Technology Transfer (OTT) of McGill University in cases where intellectual property protection is an issue.

The final project report must be submitted by the last day of lectures for the term to the McGill supervisor, and other co-supervisor(s). The report should contain an abstract, a statement of objectives, a concise review of relevant literature, a description of methods used, a discussion of the results obtained and conclusions. The report is evaluated by the McGill supervisor and co-supervisor(s). The McGill supervisor assigns the grade (after discussion with the co-supervisor(s)) and submits it to the GSAC (Prof. Kietzig). A grade of K (Incomplete) will be reported only if the report requires major revision or if there were extenuating circumstances for late submission. Normally, failure to submit a final report by the last day of lectures will result in a mark of F.

If a student and supervisor agree, a second 6-credit project (CHEE 696) may be taken. A report on the first project (CHEE 695) must be submitted and marked before the second project begins. Special registration procedures are followed to accommodate students taking two related projects in a single term. The projects will, in fact, run sequentially; the first project must be completed satisfactorily by the date specified by GSAC before the second project begins. If a student wishes to register for two unrelated projects in one term, permission may be granted to allow the projects to run concurrently, provided compelling reasons are presented.

### **3. Area of Concentration**

The 9-credit area of concentration may be in an area outside the core of the student's program (chemical engineering). Before beginning an area of concentration, students should get approval from their advisor for the courses they plan to take.



## C. MASTER OF ENGINEERING (THESIS OPTION)

### 1. Requirements

Graduate courses and a thesis are required. In addition, each student must give one seminar to the Department near the end of her/his program. The minimum credit requirements are:

#### Required research credits

	<u>Credits</u>
A) CHEE 681 Laboratory Safety 1	1
CHEE 682 Laboratory Safety 2	1
B) CHEE 697 Thesis Proposal	6
C) CHEE 698 Thesis Research I	12
CHEE 699 Thesis Research II	13
D) CHEE 687 Research Skills & Ethics	2

#### Complementary course credits

E) Graduate courses as defined below:	10
→ A minimum of one Chemical Engineering Fundamentals course (see list below, 4 credits each)	
→ A minimum of one Chemical Engineering course at the 500-level or higher (3 or 4 credits each)	
→ Any remaining credit requirements in this category may be fulfilled from courses in Engineering (Chemical or other Engineering disciplines) or Sciences at the 500-level or higher (3 or 4 credits each)	
Total credits	45

#### **List of Chemical Engineering Fundamentals courses**

CHEE 611	Heat and Mass Transfer (4 credits)
CHEE 621	Thermodynamics (4 credits)
CHEE 631	Foundations of Fluid Mechanics (4 credits)
CHEE 651	Advanced Biochemical Engineering (4 credits)
CHEE 641	Chemical Reaction Engineering (4 credits)
CHEE 662	Computational Methods (4 credits)
CHEE 672	Process Dynamics and Control (4 credits)

#### Notes

- Students must register for CHEE 697 and CHEE 681 in their first semester in the M.Eng. (Thesis) program and must complete CHEE 682 by the end of the first year of their degree.
- Students must register for CHEE 697, CHEE 698 and CHEE 699 consecutively. Students may decide not to register for CHEE 698 or CHEE 699 during summer terms (Canadians

and Permanent Residents of Canada are not obliged to register during summer semesters. International students have to register in order to maintain a full-time status).

- Courses CHEE 695 and CHEE 696 may not be used for course credit.
- Additional courses may be required by the thesis supervisor(s).
- One graduate chemical engineering course, at the appropriate level, may be taken for credit at another university provided that no equivalent is offered at McGill.
  
- Courses completed at McGill or another university before a student entered the M.Eng. program may not be used for credit. In case of transfer from another program, the situation must be analyzed by the Director of the Graduate Program.
- M. Eng. (Thesis Option) students may take the Research Techniques course (CHEE 690). See the description of this course in Appendix D (Page 26).
- In certain circumstances it is possible to transfer to the Ph.D. program without submission of the M.Eng. thesis. See Section 2.J, Advancing to a New Program.

## **2. Starting Research**

All M.Eng (Thesis Option) students must register for CHEE 681 Laboratory Safety 1 and CHEE 697 Thesis Proposal in their first semester. In order to ensure that new Master's students are presented with well-defined research problems, the supervisor is required to prepare a written statement (1-2 pages) of the problem together with a list of key references. This statement is to be supplied to the student within one week of starting work with the research supervisor.

## **3. Thesis Proposal**

The objectives of CHEE 697 are to enable the student to start research quickly and to provide the student and research supervisor with feedback at an early stage of the project. The course is marked Pass/Fail. Ideally, a preliminary Research Proposal is submitted to the research supervisor by the middle of the term. A meeting of the research group should be held upon preliminary submission of the proposal for discussion and constructive criticism of the proposal. The student should then modify the proposal to take into account the criticism of the research group and/or the results of the research work done during the remaining portion of the semester.

The following points must be addressed in the Research Proposal (typically 25 pages in length):

- Background of the problem and concise review of key literature
- Objectives of the thesis
- Plan of the work
- Time Plan for the work
- Discussion of constraints and possible delays
- References cited in an appropriate format

No later than the last day of lectures, the student must submit to her/his research supervisor the final copy of her/his Research Proposal. The supervisor may request the opinion of a second

reader. The supervisor communicates the grade (Pass, Fail or Incomplete) to the GSAC (Prof. Kietzig). Since CHEE 697 has a weight of 6 credits, the final report represents about 250 hours of work, or about 18 hours per week. This is taken into account in the grading. Students should begin working at this pace from the start of the term, to avoid conflicts between research work and course work in the latter part of the term.

#### **4. Research Progress**

M.Eng. (Thesis Option) students must register in CHEE 698 in the second semester of their programs and in CHEE 699 in the third semester. Canadians and Permanent Residents of Canada are not obliged to register to CHEE 698 or CHEE 699 during summer semesters. International students must register in each semester in order to maintain a full-time status. These research courses are carried on the student's transcript as IP (in progress) until the thesis is submitted.

M.Eng. (Thesis option) students must complete the course CHEE 682 Laboratory Safety 2 by the end of the first year of their degree.

Each M.Eng (Thesis Option) student must present a seminar to the Department near the end of the thesis work - see Section 2.F, Seminar Procedures.

#### **5. Time for Completion and Thesis Length**

The expected time for completion of the M.Eng. degree is 16-24 months. To permit smooth progress leading to early thesis submission, it is essential that the student and supervisor consult frequently. A formal progress review may be required for students in M.Eng. 3 according to the following procedures:

In the first semester of registration as M.Eng. 3, each student must submit with her/his supervisor a joint one-page report giving a timetable for completing the degree. If the plan anticipates submission of the thesis within the year of M.Eng. 3 registration, no action is taken. If the plan extends beyond the year of M.Eng. 3 registration, the GSAC will schedule a formal progress review meeting with the student and supervisor.

Note that the GPSO must approve registration as M.Eng. 4. Approval is given only in exceptional circumstances upon recommendation by the Director of the Graduate Program.

The length of Master's theses in Chemical Engineering is restricted to 125 pages including Appendices, but excluding the essential front matter such as the abstract, contents, etc.

## D. DOCTOR OF PHILOSOPHY

### 1. Requirements

The requirements for the Ph.D. are:

- A thesis, examined according to the procedures of the GPSO.
- Proficiency in English: A student not fluent in English must take English courses until her/his research supervisor is satisfied with the student's level of English.
- Presentation of two seminars to the Department; the first as required by CHEE 797, the second nearing the completion of the thesis (no registration required for the 2<sup>nd</sup> seminar).
- Completion of the courses listed below.

<u>Required research credits</u>	<u>Credits</u>
A) CHEE 681 Laboratory Safety 1	1
CHEE 682 Laboratory Safety 2	1
B) CHEE 687 Research Skills & Ethics	2
C) CHEE 795 Ph.D. Thesis Proposal	
D) CHEE 796 Ph.D. Proposal Defence	
E) CHEE 797 Ph.D. Seminar	

#### Complementary courses

- F) Three courses from the “Chemical Engineering Fundamentals” (see list below) must be taken during the Master’s and/or PhD programs. At the very least, a minimum of two Chemical Engineering courses (500-level or higher) must be taken during the PhD. CHEE 681, CHEE 682 and CHEE 687 are not considered complementary courses.

Chemical Engineering Fundamentals courses taken during the Master’s program in Chemical Engineering at McGill, or at another institution if judged equivalent, will be taken into account in meeting part of the requirement in (F).

#### **List of Chemical Engineering Fundamentals courses**

CHEE 611	Heat and Mass Transfer (4 credits)
CHEE 621	Thermodynamics (4 credits)
CHEE 631	Foundations of Fluid Mechanics (4 credits)
CHEE 641	Chemical Reaction Engineering (4 credits)
CHEE 651	Advanced Biochemical Engineering (4 credits)
CHEE 662	Computational Methods (4 credits)
CHEE 672	Process Dynamics and Control (4 credits)

#### Notes

- PhD student who obtained a Masters degree from our department are not required to register for CHEE 681, CHEE 682 or CHEE 687. They must still perform a safety demo (if their apparatus or procedure has changed from their Masters project) but need not register for the course.

- PhD students from other departments must register for CHEE 681 and CHEE 687 in their first semester of their PhD program and must complete CHEE 682 by the end of the second year of their degree.
- Ph.D. students must register for CHEE 795 (Ph.D. Thesis Proposal) in the first semester of the program, for CHEE 796 (Ph.D. Proposal Defence) in their second semester and for CHEE 797 (Ph.D. Seminar) in the year following completion of CHEE 796.
- Courses CHEE 690, 694, 695 and 696 cannot be used for credits.
- Courses completed while the candidate was an undergraduate student or at another university may not be used for credit.
- Additional courses may be required by the supervisor(s) or the Ph.D. Proposal Examination Committee.
- Students who do not perform at the Ph.D. level in research can be required to withdraw regardless of performance in courses.

## 2. Ph.D Thesis Proposal

Ph.D. students must register for CHEE 795 (Ph.D. Thesis Proposal) in the first semester of the program. The submission of a formal Research Proposal (typically 25 pages in length) to the student's research supervisor on the last day of lectures completes the requirements for CHEE 795. This course is graded Pass/Fail; no K grade shall be awarded.

The following items must be included in the Research Proposal:

- Introduction/Background - A concise literature review to justify the research objectives.
- Objectives - Clear research objectives, preferably in point form.
- Plan of Work - The plan to achieve the research objectives.
- Time Plan - A detailed plan for 6 months and a general plan to completion.
- Original Contributions - A statement of the anticipated contributions to knowledge.
- Research Progress - A brief outline of research progress.
- References - Literature cited in a suitable format.

## 3. Ph.D. Proposal Defence

Ph.D. students must register for CHEE 796 (Ph.D. Proposal Defence) in their second semester. The requirements of the course are to defend successfully the Research Proposal according to the guidelines given below.

- The Ph.D. Research Proposal must be defended by the last day of lectures.
- The examination committee must include the research supervisor(s), an additional full-time professor from the Department, an examiner external to the research group who is a full-time professor from or outside McGill, and a student member. **The composition of the examination committee must be approved by the Graduate Program Director.** It is the responsibility of the research supervisor(s) and candidate to find commonly-agreed upon internal and external examiners. The role of the student member is to ensure that the defence proceeds according to the established rules and to provide useful feedback based

on her/his own experience. The student member should preferably be a senior member of the research group.

- It is the responsibility of the student to arrange the defence at a time suitable to all members of the examining committee, and to ensure that the examination date is publicized within the Department.
- The examination is open to staff and students.
- The examination consists of a presentation (typically 20 minutes) of the proposal by the student followed by questioning by committee members.
- The student will be evaluated based on the quality of the proposal, ability to carry out the proposed research as well as the likelihood that it may be completed within three years.
- The committee will grade the student on a Pass/Fail basis. In the event of a pass grade, the committee may make recommendations regarding the project and/or the need for further courses. In the event of a failure, the student will be asked to revise and resubmit the proposal. This must be done no later than one week prior to the end of the examination period. The committee will not normally reconvene for a second oral examination, but will have the right to do so if it sees fit. A second failure will result in the candidate's withdrawal from the Ph.D. program.
- The supervisor is responsible for completing the student's evaluation form which is saved in the student's file and to give a copy of this evaluation to the student. The supervisor and student should then discuss the suggestions and recommendations made by the committee and agree on a time plan for taking the required actions.

#### **4. Ph.D. Seminar**

Ph.D. students must register for CHEE 797 (Ph.D. Seminar) in the year following completion of CHEE 796. This seminar should present the objectives of the Ph.D. thesis and describe the work in progress - see Section II.F, Seminar Procedures. This seminar may be given only in the Fall or Winter semester. No registration is required for the second seminar nearing the completion of the thesis.

#### **5. Guidelines Regarding the Conduct of Research**

The supervisor shall define the project area and the overall research objectives. In the early stages of the research, the supervisor should play a leading role in suggesting reading and other background material, in proposing the direction of experimental work and checking equipment designs, in initiating meetings with the student and in establishing an effective research group. As the student's research progresses, he or she should become more self-directed.

The student should have achieved considerable expertise in the specific project area by the end of the first year of her/his Ph.D. program. The student should be deeply involved by this time, and from this time on he/she should play a leading role in carrying out the research, including experimentation, analysis of data, theoretical and computational modeling, and initiating meetings of the research group. The supervisor should act as a sounding board for new ideas and as an advisor regarding progress, keep abreast of the general field of research and become familiar with the research tools (e.g. equipment or computer programs) employed by the student.

The supervisor may suggest new experiments or directions, and these should be discussed in a cooperative manner with the student.

Throughout the research project, the supervisor shall endeavor to maintain sufficient resources for the project. The student is responsible for using all research resources in a careful and professional manner.

## **6. Time for Completion**

Ph.D. students are expected to complete the degree within 3-4 years of initial registration in the program. To promote smooth progress leading to early thesis submission, it is essential that the student and supervisor establish a regular process of progress review. Formal progress reviews may be required for students in Ph.D. 6 and above according to the following procedures:

In the first semester of registration as Ph.D. 6, each student must submit with her/his supervisor a joint report to the GSAC Chair giving plans for completion of the thesis. This report (maximum 2 pages) must contain dates for reaching key milestones, including completion of the research and submission of the thesis. If the plan anticipates submission of the thesis in the year of Ph.D. 6 registration, no action is taken. If the plan extends to Ph.D. 7, the GSAC will schedule a formal progress review meeting involving the research group, with a view to shortening the time to thesis submission.

Note that the GPSO must approve registration as Ph.D. 8. Approval is given only in exceptional circumstances upon recommendation of the Director of the Graduate Programs.

## **7. Ph.D. Thesis Length**

The maximum length of the body of the Ph.D. thesis is 225 pages. The page count excludes the essential front matter and the appendices. Each page of the thesis, including appendices must be numbered, i.e. all pages containing text, figures, or tables must be numbered as well as pages (if any) containing only captions or legends. The thesis examiners and the Ph.D. Thesis Oral Examination Committee may, but are not required to, consider the material in the appendices in their evaluation of the thesis.

## **2 ADMINISTRATION OF PROGRAMS**

### **A. DEPARTMENTAL ADMINISTRATION**

The graduate programs are administered on behalf of the Department through the Director of the Graduate Program, who is appointed by the Department Chair. The Director, Prof. P. Servio, is assisted by a Graduate Secretary, Mrs. L. Miller-Aspin, and the Graduate Studies Advisory Committee.

### **B. GRADUATE STUDIES ADVISORY COMMITTEE (GSAC)**

The Graduate Studies Advisory Committee consists of two staff members, appointed by the Department Chair, and two graduate students, elected for two-year terms by the members of the Chemical Engineering Graduate Students Society (ChEGSS). The composition of the GSAC for the 2015-2016 academic year is: Prof. P. Servio (Chair), Prof. A. Kietzig (Deputy Chair), Melissa Dick & Pierre Pascone (Graduate Students). The proceedings of the Committee are treated as confidential by its members. The duties of the GSAC are:

- GSAC reviews all aspects of the graduate program and graduate life in the Department. The Committee makes recommendations for improvements to the Department.
- The professors on the GSAC act as academic advisors to students in the M.Eng. (Project Option).
- The professors on the GSAC are responsible for ensuring that a student evaluation is completed for each graduate course.
- The Committee informs students and staff of important items affecting graduate study.
- The Committee shall meet at the call of any graduate student or professor, to hear grievances relevant to research or courses. The Committee shall act as mediator in cases of dispute between a student and her/his research supervisor. If a member of the GSAC is involved in a dispute, the Department Chair or the President of the Chemical Engineering Graduate Students Society appoints a substitute, as appropriate.
- The GSAC is responsible for keeping this Handbook up-to-date.

### **C. GRADUATE COURSES**

The graduate courses tentatively scheduled for the 2015-2016 academic year are listed in Appendix B.

### **D. TEACHING ASSISTANTSHIPS**

The Department has a limited budget for the payment of Teaching Assistants. These positions are assigned by the Department Chair at the beginning of each term, as funds permit, following procedures and pay scales described in the Collective Agreement between McGill University and A.G.S.E.M. (Association of Graduate Students Employed at McGill). Teaching Assistantships are not available to M.Eng. (Project Option) students. Teaching Assistantships are considered additional work for additional income. The Teaching Assistant and her/his research supervisor should agree on a schedule arrangement in order not to delay research activities.



## **E. FINANCIAL SUPPORT**

As a condition of acceptance, a student entering graduate studies in the Department is required to have adequate funding to finance her/his studies. Annual fees are posted on the following website: <http://www.mcgill.ca/student-accounts/fees>.

For non-research based degrees, such as the Project Option of the M.Eng. program, no financial support is offered by either the Department or by individual professors. For students pursuing research-based degrees, we currently require that each student has secured funding of \$16,500 per year, not including benefits. Regardless of the degree being sought, details of the financial arrangements agreed to by the Admissions Committee are specified in the letter of admissions sent to the student.

For research-based degrees, the Federal and Provincial governments, the University, and the Department offer a number of funding opportunities to students. Eligibility and the application procedures vary, depending upon the program. It is expected that all students will apply for scholarships and fellowships for which they are eligible while at McGill.

Students who hold scholarships from the Natural Sciences and Engineering Research Council of Canada (NSERC) or the Fonds québécois de la recherche sur la nature et les technologies (FQRNT) and are registered in a research-based degree within the Department receive an EUL or MEDA bonus award. Visit the GPSO website (<http://www.mcgill.ca/gps/students/fellowships/>) for a listing of other awards available within the University.

A research supervisor is entitled to discontinue financial support paid to a student through research funds and even to decline further supervisory responsibility if the student does not make satisfactory progress on the research or if there is inadequate mutual understanding between the student and the supervisor. For M.Eng. (Thesis Option) students, two months notice must be given to the student. For Ph.D. students, four months notice must be given.

## **F. SEMINAR PROCEDURES**

Student seminars are an important part of the graduate program. M.Eng. (Thesis Option) candidates must present one seminar towards the end of their research; Ph.D. students must present two seminars, one in course CHEE 797 and the other near the end of their Ph.D. project (no registration required for the second seminar). All graduate students and staff are encouraged to attend. A sheet of instructions on preparation of a seminar and the duties of the Session Chair can be obtained from the Department Graduate Secretary, Mrs. L. Miller-Aspin.

Graduate student seminars are held during the Chemical Engineering Research Day, taking place once per semester. No graduate student seminars are presented in the Summer semesters. The students who wish to present in any given semester must inform the GSAC (Prof. A. Kietzig) early in the semester.

## G. VACATION POLICY

Graduate students arrange the timing of their vacation in consultation with their supervisors. Following university policy, graduate students are entitled to annual vacation leave equivalent to university holidays plus 15 working days.

## H. THESIS PREPARATION AND SUBMISSION

Before beginning work on the thesis document, students should read the *Guidelines for Thesis Preparation* and *Guidelines for Thesis Submission*, obtainable from the GPSO (<http://www.mcgill.ca/gps/students/thesis/guidelines/>)

Master's theses require a single examiner and PhD theses require two examiners: internal and external. It is important to note that supervisors are no longer allowed to act as thesis examiners of Master's or PhD theses. For Master's theses, the supervisor is required to contact the potential examiner and ensure that he is willing to evaluate the thesis. For PhD theses, the supervisor (with consultation with the student) is responsible for choosing the external examiner. The GPD will then formally contact the selected external examiner and see if the individual is willing to serve on the thesis evaluation committee. The Pre-Nomination of Examiners form (available on <http://www.mcgill.ca/chemeng/chemeweb/>) can be sent by email to all chemical engineering academic staff by the supervisor or Louise Miller-Aspin. At the thesis submission, the Department forwards to GPSO the list of nominated examiners using the Nomination of Thesis Examiners form on the Graduate and Postdoctoral Studies website (<http://www.mcgill.ca/gps/students/thesis/forms/>) along with the thesis.

The GPSO deadlines for submission of the thesis are posted on the Graduate and Postdoctoral Studies website (<http://www.mcgill.ca/gps/students/convocation/>) for each convocation.

During thesis preparation, the following guidelines should govern the work.

- Before submitting draft chapters to the research supervisor for review, the student and supervisor should agree on a procedure and a timetable for the writing-review process, including a target date for submission of the thesis.
- The time required to review a chapter depends upon its length and complexity, the supervisor's other time commitments and the student's writing skill. Unless there are extenuating circumstances, the turnaround time should not exceed one week for a chapter or one month for an entire thesis. A second draft should not require as much time as a first draft. The supervisor is not expected to review more than two drafts.

## I. COMPLETION OF M.ENG. (PROJECT OPTION) PROGRAMS

To receive your degree, the *Submission Form - Non-Thesis Program* must be submitted by the Department to the GPSO approximately two months before convocation. The deadline for submission of this form may be obtained from the GPSO website (<http://www.mcgill.ca/gps/students/nonthesis>). Notify the Department Graduate Secretary, Mrs. L. Miller-Aspin, when you begin your final semester.

## J. ADVANCING TO A NEW PROGRAM

### With submission of the Master's thesis

Students completing the M.Eng. (Thesis Option) who intend to enter the Ph.D. program must make a formal application. Four months before they complete their current program, students must submit the standard graduate application form and arrange for two letters of reference. Before a student can be admitted, the previous program must be completed. Questions should be addressed to the Chair of the Graduate Admissions Committee, Prof. Viviane Yargeau.

### Without submission of the Master's thesis

In certain circumstances it is possible to transfer from the M.Eng. (Thesis Option) to the Ph.D. program without submission of the Master's thesis. The following policies and procedures apply.

1. A M.Eng. (Thesis) candidate **performing at a distinctly superior level in both research and course work**, may petition the Department to transfer into the Ph.D. program without submission of the Master's thesis. This request must have the approval of the Thesis Supervisor(s) and be made within 16 months of entry into the M.Eng. (Thesis) program. The M.Eng. candidate **must also apply online to the PhD program before the usual deadlines** (<http://www.mcgill.ca/chemeng/grad/application>).
2. The candidate requesting this transfer shall, no later than 16 months after entry into the Master's program, meet the following academic requirements:
  - Has completed (or will complete by the end of the current semester) the course requirements (12 credits).
  - Has completed the requirements for the M. Eng. Thesis Proposal (CHEE 697).
3. The candidate requesting this transfer shall, no later than 16 months after entry into the Master's program, apply online to the PhD and submit the following documents to the Graduate Program Director:
  - A copy of the M.Eng. (Thesis) thesis proposal.
  - A research statement approved by her/his thesis supervisor. This document consists of a brief description of the current research project and how this project will be extended to a Ph.D. (2 pages maximum).
  - A complete Curriculum Vitae which includes a list of publications, presentations and awards.
  - All transcripts (undergraduate and graduate studies). If some grades are not yet available, the student must provide the list of courses he/she is taking in the current semester. In the case of inter-university transfer courses, the student must also provide the names of the institution and professor in charge, and the official course description.
  - A letter of recommendation from her/his thesis supervisor.

4. The evaluation committee consists of the Graduate Program Director, the Chair of the Department, the Thesis Supervisor and a fourth committee member, chosen by the Graduate Program Director, who conducts research activities in a field closely related to the candidate's. The evaluation criteria are based on academic achievement (at both undergraduate and graduate level) and research progress during the Masters.
5. The evaluation committee meets within two weeks after receiving the request so that a decision can be taken before the beginning of the next semester. The Graduate Program Director will immediately inform both the candidate and the GPSO of the decision.
6. If the candidate is successful, he/she will register for the Ph.D. program at the beginning of the following semester. The student will then follow the normal procedures of the Ph.D. program.
7. An unsuccessful candidate will continue her/his M.Eng. (Thesis) program. The candidate will not be reconsidered for the transfer.

The total number of course credits required of Ph.D. candidates transferring from the M.Eng. program is the same as for students who have entered the Ph.D. program with a M.Eng. degree. Additional courses may be required by the candidate's supervisor(s) or the evaluation committee.

### 3 SUPPORT SERVICES

#### A. OFFICE AND LABORATORY SPACE

For students in the M.Eng. (Thesis Option) and Ph.D. programs, office space is assigned by the research supervisor and laboratory space by the professor responsible for the laboratory (usually the research supervisor). Office space for students in the M.Eng. (Project Option) is assigned by Prof. R. Leask, if office spaces are available.

Request forms for keys for the M.H. Wong Building and the Pulp and Paper Research Centre are obtained from Mrs. Jo-Ann Gadsby. Keys are obtained upon payment of a refundable deposit.

#### B. PHOTOCOPIES

A photocopier, located on Floor 3A outside Room 3060, is available for use by graduate students having proper authorization. Authorization may be obtained by presenting an account number from the student's supervisor to Mrs. Jo-Ann Gadsby.

#### C. TELEPHONE AND FAX

Research-related calls made from Department telephones require an Authorization Code which ensures that the call is automatically charged to the appropriate account number. An authorization code may be obtained from Ms. E. Musgrave, upon request from a student's research supervisor. A fax machine (514-398-2753) is available for student use in Room 3270 (Chemical Engineering store). The procedures are identical to those for telephone calls.

#### D. GENERAL STORE AND RECEIVING AREA

An inventory of frequently used materials and supplies is stocked in the General Store and Receiving Area (Room 3270). The store is open from 9:00 - 12:00, Monday - Friday (except in the summer when it is closed on Fridays). The storekeeper, Mrs. M. Gorman, can help you use the following items or services:

- A collection of catalogues from chemical and laboratory supply companies.
- A database of the apparatus and instruments purchased by the Department. Only some equipment purchased by professors from their own research funds is included.  
*Good practice: Make sure a copy of the instruction/maintenance manuals of each new piece of important equipment you buy is archived at the store. This action will save you or a colleague some precious time...*
- A toolbox containing an assortment of tools may be borrowed for the duration of a research project. The borrower is required to pay for the replacement of missing tools when the toolbox is returned.
- Single tools may be borrowed for a short time.
- Procedures for ordering chemicals and equipment from outside suppliers.

## **E. LABORATORY SAFETY AND SECURITY**

Policies relating to safety in laboratories, shops and offices are the responsibility of the Department Safety Committee (Prof. Milan Maric, Chair and Mr. F. Caporuscio, Coordinator). Each laboratory has a Laboratory Safety Officer who is responsible for maintaining safety standards and updating the occupancy list.

Research laboratories are inspected by the Safety Committee at least twice a year. Spot checks by the Safety Committee are also performed if problematic safety issues are identified.

Safety is of prime importance to all in the Department of Chemical Engineering. The research supervisors and safety officers for each laboratory are responsible for enforcing safety policies and for ensuring that all new graduate students become aware of the established policies and hazards specific to the laboratory they will be working in. Every graduate student is required to complete the Departmental Safety Questionnaire and perform a laboratory demonstration in front of the Safety Committee members before receiving approval for the continuation of her/his research activities. Such demonstration shall be performed once the experimental set-up for the project is operational, and before the data gathering phase of the project begins. The safety demonstrations will be done within the first year for Masters' students and within the first two years for Doctoral students and form part of the required safety courses CHEE 681/682. If experimental procedures change during the course of the project, a new safety demonstration is required to account for the changes. Mr. Frank Caporuscio is responsible for archiving the Departmental Safety Questionnaires. Departmental Safety Questionnaire forms can be downloaded from the [departmental safety website](#). Also, useful demonstrations regarding proper safety practices for gas cylinder transportation, fume hood operations, etc. are also available on the departmental safety website.

***!!! A piece of laboratory equipment can be replaced. Not a human being!!!***

Every year, research equipment is stolen from our laboratories. Most of the time, this is due to the fact that laboratory doors are left unlocked. The recommended best practice is that the last person leaving a laboratory area, whenever this happens, closes and locks the door. It is recommended to work when others are in the laboratory as a safety precaution. When working during off hours, it is recommended to inform security you will be in the laboratory by calling x3000 from any McGill landline phone. Any suspicious activity should also be reported to McGill security (x3000).

## **F. MACHINE SHOP AND ELECTRONICS SHOP**

The Department Machine Shop is located in Room 3260. This shop provides fabrication and maintenance services for equipment used in teaching and research. Thesis students should consult the technical staff in Room 3260 in the early stages of developing their equipment designs. They will explain the work order procedure and the job priority system and help with mechanical design.

The Department Electronics Shop, located in Room 3250, is directed by Mr. L. Cusmich. He will help in the design and assembly of electronic instrumentation. See him in the early stages of your design. He is also responsible for maintenance and repair of departmental electronic and computer equipment.

Users of Machine or Electronics Shop services are charged an hourly rate. The rate schedule may be obtained from Mr. Cusmich.

## **G. INSTRUMENTAL ANALYSIS**

Instrumentation available for general use in thesis research is located mainly in Rooms 4080 and 4170 under the supervision of Mr. R. Roy. Policies related to instrumentation are developed by the Department Analytical Committee comprising two professors appointed by the Chair, Mr. Cusmich and one graduate student elected from among the authorized users of the instruments.

The current membership of the Committee is Prof. R. Leask (Chair), Mr. L. Cusmich and Mr. H. Erythropel (student member).

Users of analytical services are charged an hourly rate. The rate schedule may be obtained from Mr. Cusmich.

## **H. SOFTWARE AND COMPUTER SUPPORT<sup>1</sup>**

Limited software and computer support is available in the department but students must follow the rules and regulations outlined in the policy below in order to use these privileges.

Mr. L. Cusmich is the department's network administrator and is responsible for network connections of new computers. Mr. Cusmich IS NOT responsible for the following:

- Installation of software
- Assisting graduate student whose computer has been infected with a virus. The steps required to protect computers from being infected are listed in detail in the policy.

Mr. Cusmich also holds the rights to restrict Internet access to anyone abusing her/his network privileges and will report the individual to her/his supervisor for disciplinary action.

---

<sup>1</sup> This section was written in terms of Microsoft Windows since this operating software is the most exposed to security threats. The recommended practices also apply to the Mac, Linux and UNIX users communities.

## **POLICY**

### **New Computer Installation and Maintenance**

The Chemical Engineering department hosts a variety of operating systems, including Windows, Mac OS X, LINUX and UNIX. Wireless network access is available throughout the M.H. Wong building.

The installation of illegal software on McGill computers is strictly prohibited. All computers **MUST USE** software packages licensed by the University, the Chemical Engineering Department, or the research supervisor.

Our current license agreement for the Microsoft Windows operating software is limited to upgrades only. All new computers must be purchased with a valid operating system (ex: Windows XP Home Edition), which can then be upgraded legally.

The amount of viruses and security holes in operating systems being exploited on the Internet is increasing and this presents a real security problem for computers in our department. This is a particularly problematic situation for Microsoft Windows users. In order to avoid unnecessary contamination of computers, and research downtime, students must keep their virus definitions and Windows operating system up to date. The following procedure must be carried out when a new computer has been introduced to our network:

- Once Mr. Cusmich has given the new computer access to the Internet, the graduate student must install a legal copy of the Antivirus software which can be uploaded from the website: <http://kb.mcgill.ca/kb/?ArticleId=1892&source=article&c=12&cid=2> - [tab:homeTab:crumb:7:artId:1892](#). Upon successful installation of the antivirus software, the student must update the virus definitions to ensure that the computer is safe against all currently known virus threats. Once the virus definitions have been updated, the student needs to update the operating system. It is important to **INSTALL THE ANTIVIRUS SOFTWARE FIRST** since it will protect the new computer against attacks while the operating system is being updated.
- The graduate student should take the habit of checking virus definitions and operating system updates **AT LEAST** once a week and should perform these actions immediately upon receiving any news of new viruses or security issues with the operating system. Those actions can be done automatically by properly setting up Windows and Symantec Antivirus.
- The graduate student must make sure her/his Windows logins are password protected. Computers without user login passwords can easily be hacked. Those computers will be disconnected immediately from the network.



## **Installation of Licensed Software**

Certain software packages, used only on McGill computers, need to be installed by the graduate students. These software packages (ex. MATLAB, MATHWORKS) can be uploaded from the website: <http://e5.onthehub.com/WebStore/Welcome.aspx?ws=2b69d97d-59b7-df11-859b-0030487d8897&vsro=8>. The software Microsoft Office can be obtained from Mrs. Jo-Ann Gadsby (room 3060) at the Chemical Engineering Office. Students are allowed to borrow and return software between:

- 11:00 to 15:00 for daytime installation
- 15:00 to 11:00 the following day for overnight installation

The fees associated with borrowing software are \$10/software, said fees are refunded only if the student returns the software within the borrowing and return times.

Some other advanced computational software used in graduate courses will be available for installation on McGill computers. Your instructor will give you the details in class.

## APPENDIX A – Chemical Engineering Staff

<b>Academic Staff</b>	<b>Office</b>	<b>E-mail*</b>	<b>Telephone</b>
D. Berk, <i>Associate Professor</i>	4260	dimitrios.berk	4271
S. Coulombe, <i>Professor, Chair</i>	3100	sylvain.coulombe	5213
P.-L. Girard-Lauriault, <i>Assistant Professor</i>	4150	pierre-luc.girard-lauriault	4006
J. Gostick, <i>Assistant Professor</i>	4160	jeff.gostick	4301
R. J. Hill, <i>Associate Professor</i>	4280	reghan.hill	6897
C. Hoesli, <i>Assistant Professor</i>	4230	corrine.hoesli	4275
A. Kietzig, <i>Assistant Professor</i>	4140	anne.kietzig	3302
J. Kopyscinski, <i>Assistant Professor</i>	4310	jan.kopyscinski	4276
R. Leask, <i>Associate Professor</i>	4120	richard.leask	4270
M. Maric, <i>Associate Professor</i>	4270	milan.maric	4272
J.-L. Meunier, <i>Associate Professor</i>	3070	jean.luc.meunier	8331
C. Moraes, <i>Assistant Professor</i>	4330	chris.moraes	4278
S. Omanovic, <i>Professor</i>	4130	sasha.omanovic	4273
A. D. Rey, <i>Professor</i>	4100	alejandro.rey	4196
P. Servio, <i>Associate Professor</i>	4110	phillip.servio	1026
N. Tufenkji, <i>Associate Professor</i>	4300	nathalie.tufenkji	2999
V. Yargeau, <i>Associate Professor</i>	4180	viviane.yargeau	2273
R.J. Munz, <i>Emeritus Professor</i>	4210	richard.munz	4277
J. M. Dealy, <i>Emeritus Professor</i>	6130	john.dealy	4264
M. R. Kamal, <i>Emeritus Professor</i>	118 P&P	musa.kamal	4262
J. H. Vera, <i>Emeritus Professor</i>	116 P&P	juan.vera	4274
G. J. Kubes, <i>Adjunct Professor</i>	118 P&P	george.kubes	6183
<b>Technical Staff</b>	<b>Office</b>	<b>E-mail*</b>	<b>Telephone</b>
L. Cusmich ( <i>Coordinator</i> )	3250/4180	lou.cusmich	4268
F. Caporuscio, <i>Laboratory Technician</i>	4200/1310	frank.caporuscio	8274/7472
A. Golsztajn, <i>Analytical Lab. Technician</i>	4200	andrew.golsztajn	8274
L. Volpato, <i>Storekeeper</i>	3270	lisa.volpato	4267
G. Lepkyj, <i>Electronics Technician</i>	4200/3250	gerald.lepkyj	8274/4873
R. Roy, <i>Analytical Laboratory Technician</i>	4200	ranjan.roy	8274
C. Szalacsi, <i>Chief Technician</i>	3260	csaba.szalacsi	4490
R. Tariello, <i>Chief Technician</i>	3260	roberto.tariello	4490
<b>Secretarial Staff</b>	<b>Office</b>	<b>E-mail*</b>	<b>Telephone</b>
E. Musgrave, <i>Administrative Officer</i>	3090	emily.musgrave	7487
L. Miller-Aspin, <i>Graduate Coordinator</i>	3060	louise.miller	3483
J.-A. Gadsby, <i>Secretary</i>	3060	jo-ann.gadsby	4494

\* followed by @mcgill.ca

## APPENDIX B – Graduate Courses planned for 2015-2016

Note: Courses in **bold** are lecture courses. This list is tentative. Lecture courses may be cancelled if student numbers are insufficient.

### NON-LECTURE COURSES GIVEN EVERY SEMESTER (Fall, Winter, Summer)

---

CHEE 681	Laboratory safety 1 (1 credit)
CHEE 682	Laboratory safety 2 (1 credit)
CHEE 690	Research Techniques (3 credits)
CHEE 695	Project in Chemical Engineering (6 credits)
CHEE 696	Extended Project (6 credits)
CHEE 697	Thesis Proposal (6 credits)
CHEE 698	Thesis Research I (12 credits)
CHEE 699	Thesis Research II (15 credits)
CHEE 795	Ph.D. Thesis Proposal
CHEE 796	Ph.D. Proposal Defence
CHEE 797	Ph.D. Seminar (not available in Summer semester)

### FALL 2015

---

<b>CHEE 510</b>	<b>Advanced Separation Processes (3 credits)</b>
<b>CHEE/MIME 515</b>	<b>Materials Surfaces: A biomimetic approach (3 credits)</b>
<b>CHEE 541</b>	<b>Electrochemical Engineering (3 credits)</b>
<b>CHEE 543</b>	<b>Plasma Engineering (3 credits)</b>
<b>CHEE 587</b>	<b>Chemical Processing: Electronics Industry (3 credits)</b>
<b>CHEE 611*</b>	<b>Heat and Mass Transfer (4 credits)</b>
<b>CHEE 631*</b>	<b>Foundations of Fluid Mechanics (4 credits)</b>
<b>CHEE 672*</b>	<b>Process Dynamics and Control (4 credits)</b>
<b>CHEE 687</b>	<b>Research Skills &amp; Ethics (2 credits)</b>
<b>CHEE 694</b>	<b>Oral Presentation Skills (1 credit)</b>

### WINTER 2016

---

<b>CHEE/CIVE 521</b>	<b>Nanotechnology and the Aquatic Environment (3 credits)</b>
<b>CHEE/MECH 563</b>	<b>Biofluids and Cardiovascular Mechanics (3 credits)</b>
<b>CHEE 584</b>	<b>Polymer Processing (3 credits)</b>
<b>CHEE 591</b>	<b>Environmental Bioremediation (3 credits)</b>
<b>CHEE 593</b>	<b>Industrial Water Pollution Control (3 credits)</b>
<b>CHEE 621*</b>	<b>Thermodynamics (4 credits) - Ecole Polytechnique</b>
<b>CHEE 641*</b>	<b>Chemical Reaction Engineering (4 credits)</b>
<b>CHEE 651*</b>	<b>Advanced Biochemical Engineering (4 credits)</b>

\* Chemical Engineering Fundamentals course

## APPENDIX C – List of All Chemical Engineering Courses

### Chemical Engineering Fundamentals (graduate students only)

CHEE 611	Heat and Mass Transfer (4 credits) - Hill
CHEE 621	Thermodynamics (4 credits) - Servio
CHEE 631	Foundations of Fluid Mechanics (4 credits) - Leask
CHEE 641	Chemical Reaction Engineering (4 credits) - Berk
CHEE 651	Advanced Biochemical Engineering (4 credits) - Hoesli
CHEE 662	Computational Methods (4 credits) - Rey
CHEE 672	Process Dynamics and Control (4 credits) - Perrier

### Specialized courses (graduate students only)

CHEE 681	Laboratory safety 1 (1 credit) – Maric
CHEE 682	Laboratory safety 2 (1 credit) – Maric
CHEE 687	Research Skills & Ethics (2 credits) – Tufenkji
CHEE 690	Research Techniques (3 credits) – Supervisors
CHEE 691,2,3	Selected Topics in ChE (1, 2 or 3 credits) – For courses pending approbation
CHEE 694	Oral Presentation Skills for Graduate Students (1 credit) - Leask

### Specialized courses (undergraduate + graduate students)

CHEE 510	Advanced Separation Processes (3 credits) – Gostick
CHEE/MIME 515	Materials Surfaces: A biomimetic approach (3 credits) – Kietzig/Cerruti
CHEE/CIVE 521	Nanotechnology and the Aquatic Environment (3 credits) – Tufenkji/Ghoshal
CHEE 541	Electrochemical Engineering (3 credits) – Omanovic
CHEE 543	Plasma Engineering (3 credits) – Coulombe/Girard-Lauriault/Meunier
CHEE 561	Introduction to Soft Tissue Biophysics (3 credits) – TBA
CHEE 562	Engineering Principles in Physiological Systems (3 credits) – TBA
CHEE/MECH 563	Biofluids and Cardiovascular Mechanics (3 credits) – Leask/Mongrain
CHEE 571	Small Computer Applications (3 credits) – Leask
CHEE 582	Polymer Science and Engineering (3 credits) – Maric
CHEE 584	Polymer Processing (3 credits) – Maric
CHEE 585	Foundations of Soft Matter (3 credits) – Hill
CHEE 587	Chemical Processing: Electronics Industry (3 credits) – Berk
CHEE 591	Environmental Bioremediation (3 credits) – Yerushalmi
CHEE 592	Industrial Air Pollution Control (3 credits) – TBA
CHEE 593	Industrial Water Pollution Control (3 credits) – Yargeau

## **APPENDIX D - Description of CHEE 690 Research Techniques**

The Research Techniques course (3 credits) is intended for M. Eng. (Thesis Option) students only. The objective of this non-lecture course is to give the graduate student an opportunity to learn a specific experimental or computational technique of relevance to her/his research project. The graduate student taking this course and her/his supervisor agree to follow the regulations below:

- Early in the semester, the graduate student agrees with her/his research supervisor on the nature of the research technique of interest and on the expectations.
- The graduate student commits an effort proportional to the credits weight (3 credits => 125 hours of research activities).
- The graduate student submits a final report to her/his supervisor by the last day of lectures.

The supervisor grades the student's effort based on the quality of the report and on the overall performance during the semester.