

THE UNIVERSITY OF BRITISH COLUMBIA

Department of Chemical and Biological Engineering

GRADUATE STUDENT HANDBOOK



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MESSAGE FROM THE GRADUATE ADVISORS

This document was prepared to act as a guide to new graduate students in Chemical and Biological Engineering. It contains information about the various graduate (i.e., Ph.D., M.A.Sc. and M.Eng.) programs offered by the Department as well as a few facts about some of the facilities, services and activities available within the University and, more specifically, within Chemical and Biological Engineering. It also includes an introductory section which tells new students what they need to know in order to successfully negotiate their first few days at UBC.

The handbook should be brought to the attention of the Graduate Advisors on a yearly basis, so that improved editions can be brought out every year. Also, suggestions for additional material, which would make the handbook even more useful and comprehensive, would be greatly appreciated by the faculty and graduate students.

Finally, a warning message. Graduate students are issued a copy of the Handbook only at the beginning of their program of studies. They should be aware that the rules and regulations governing each program are in a continuous state of flux. As you approach the end of your studies, you should obtain updated versions of the applicable sections of the Handbook from the Graduate Secretary. Each graduate student has the ultimate responsibility for ensuring that his/her program of studies satisfies all current requirements.

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About the Department of Chemical and Biological Engineering

Chemical and Biological Engineering (CHBE) is one of the six departments of UBC Engineering, Faculty of Applied Science (APSC).

Chemical Engineering was established at UBC in 1915, as the first Canadian chemical engineering program west of Ontario, and a separate Department of Chemical Engineering was established in 1954. The Department of Chemical and Biological Engineering was established in 1999, and reflects the growing need for engineers in the fields of biotechnology, biomedical and bio-resource engineering.

Biological Engineering evolved from Agricultural Engineering and Agricultural Mechanics established at UBC in 1945. In 1975, the name and degree were changed to Bio-Resource Engineering. In 1996, the Department of Chemical and Bio-Resource Engineering was formed from the merger of these two separate departments. In 1999, the name was changed to the Department of Chemical and Biological Engineering and a single undergraduate program is now offered with options in process, environmental and biological engineering.

The Department of Chemical and Biological Engineering at UBC has an established worldwide reputation for its accredited undergraduate programs, innovative research and the quality of its graduates and faculty. At present there are 27 full-time faculty in the Department of Chemical and Biological Engineering, together with a support staff of 17. There are approximately 280 students in the final three years of the undergraduate programs, including the Co-op program. Graduates are awarded the degree of Bachelor of Applied Science (B.A.Sc.) and are eligible, after appropriate industrial experience, for registration as Professional Engineers.

In addition, roughly 175 students are studying in graduate programs. The Department offers programs leading to the Master of Engineering (M.Eng.), Master of Science (M.Sc.), Master of Applied Science (M.A.Sc.) and Doctor of Philosophy (Ph.D.) degrees in a number of areas of specialization within chemical and biological engineering. The Department is actively engaged in applied research in chemical and biological engineering, supported in part by external funding of about \$2.7 million a year.

CHBE Vision: To be nationally and internationally recognized as an excellent engineering department for study, research and work.

CHBE Mission: The Department of Chemical and Biological Engineering is committed to providing outstanding undergraduate and graduate degree programs in chemical, environmental and biological engineering, to training essential work force engineers for the established industries of Canada, to being recognized internationally as a leader in select fields of research, and to creating new technologies for the industries of British Columbia and Canada.

CHBE Values:

Excellence in research and teaching

Innovation - Integrity, ethical conduct and respect for the individual

Sustainability - Social, environmental and economic responsibility

Collegiality and communication

1. UPON ARRIVAL

This section lists, in approximately chronological order, some of the more important details you should take care of in the first few days following your arrival in Vancouver. First you need to get into the city from the airport (assuming you arrive by air) and find temporary accommodation for the next few nights. Next, you should proceed to the Department of Chemical and Biological Engineering (2360 East Mall) on the UBC campus to pick up your registration package from the graduate secretary (Helsa Leong in CHBE 253), meet your supervisor(s) and receive further instructions from the graduate advisor(s). Over the next short period, your priorities should be to arrange permanent accommodation, to register and pay your fees and to look after other details such as obtaining a social insurance number (if you are not a Canadian), health insurance, U-Pass, student card, office space and building keys.

1.1 International Arrivals

If you let your supervisor or the graduate advisor know, in advance, your flight number and expected arrival time, we will arrange to have you picked up at the Vancouver International Airport. Watch for someone bearing a card with your name on it in the greeting area of the airport (just after the customs and immigration area). You can make your private arrangements for reaching your destination.

1.2 On-Campus Housing

For information about on-campus housing, visit

- * <http://www.housing.ubc.ca/vancouver>
- * <http://www.housing.ubc.ca/other-housing/housing-options-on-campus>

1.3 Off-Campus Housing

Rental listings and temporary off-campus housing:

- * <http://www.housing.ubc.ca/other-housing/rental-listings>
- * <http://www.housing.ubc.ca/other-housing/off-campus-short-term-stays>

1.4 Social Insurance Number and Study Permit

If you are neither a Canadian citizen nor a landed immigrant of Canada and expect to be appointed as a Graduate Research Assistant (GRA) and/or Graduate Teaching Assistant (GTA), or are offered any other type of employment at the University, you will require a

social insurance number (SIN). Before obtaining your SIN you must see Helsa Leong for an “Employment Contract” (signed by the graduate advisor) indicating your offer of employment from the department.

Application for a Canadian Social Insurance Number *must be made in person* at any Service Canada Office. The nearest one to the UBC campus is at 125 East 10th Avenue, Vancouver, B.C. (telephone: 604-872-7431). Since the SIN application takes several weeks to process, you should receive an “Acknowledgment of SIN Confirmation” form which should then be passed on to the graduate secretary, Helsa Leong. She needs to attach a copy of this acknowledgment to your GRA and GTA appointment forms before you can get paid. Please make a copy of your SIN card when received and pass this to Helsa.

You will need to take your passport, valid study permit, and valid contract of employment with you. Also take a textbook to read while you wait. A thick one.

Directions: If you are planning to take the bus from UBC, take the #9 or #99 and get off at Broadway and Main. Walk one block south to 10th Avenue.

Remember that both the study permit and SIN has expiry dates. Having up-to-date copies of these two forms in your file allows Helsa to monitor their status and to provide warnings when their expiry dates approach. Can be renewed at least 3-4 months before your current permits expire (see Helsa for a letter). However, the ultimate responsibility for maintaining up-to-date employment and immigration documents lies with the student. *Working without a valid employment authorization or studying without a valid student authorization is a serious offence* which can land you in a great deal of trouble with Canada Immigration. The procedure for renewing the study permits and work permits is applying online or mail your extension application to the Case Processing Centre in Vegreville, Alberta (online application: www.cic.gc.ca/english/e-services/epass.asp., It is also the student's responsibility to ensure that his/her student visa and passport remain current.

1.5 Health Insurance

All registered students are required to have approved hospital and medical insurance. *Medical costs in Canada are very high; therefore health insurance is essential.* If you are a B.C. resident, health care is provided by the Medical Services Plan of B.C... Students from other provinces of Canada should continue their own provincial plan and services will be billed directly to it. Students from Quebec should also continue their provincial plan, but must pay for services received in B.C. and then apply for reimbursement. Non-Canadian students are eligible for the B.C. Plan, but only after they have been resident in the province for 3 months. In the meantime, iMED: Health Insurance for new international students is covered for the 3-month waiting period before

they become eligible for MSP. Information and application forms for both are available <http://www.health.gov.bc.ca/msp/infoben/faqas.html#options> and www.david-cummings.com/imed *you should apply for the Provincial Medical Plan as soon as possible after you arrive in British Columbia.*

All BC residents are advised to have medical coverage through the BC Medical Services Plan (MSP). To register for Fair PharmaCare, visit health.gov.bc.ca/pharmacare/# or call 604-683-7151.

Please note that there is a three-calendar-month waiting period before you can be enrolled with MSP. During this time, you will be covered under the private medical insurance through IMED. Your IMED card will be emailed to you. Should you run into any problems, drop by the International House. Your study levy fees will include the medical and dental fees. Please note as it takes 3 months for MSP to process your application for medical coverage you are also strongly encouraged to apply for MSP coverage as soon as you arrive.

1.6 Registration and Fees

Graduate students must maintain continuous registration at UBC throughout all years until their degrees are completed. Students will normally have their registration materials sent to them. The graduate secretary will have a package for you when you arrive (Helsa Leong, CHBE 253).

Students can register through the Student Service Center on the web (www.students.ubc.ca/ssc). To log onto SSC, you'll need your student number and Personal Identification Number (PIN), which is initially set to your birth date (YYMMDD). The student number and PIN together provide the password to access your student information. Students should change their PIN to protect the privacy and security of their registration and grades information. You can change it to any six digits as often as you like. Note: In order for graduate students to maintain their student status, they must register for either the thesis section or breadth essay if they are not taking any courses.

Since course selection may take some time and should be carried out in consultation with your supervisor(s), you are advised to register as soon as possible after arrival by signing up for the two mandatory courses: CHBE 598 (for everyone) and either CHBE 699 (for Ph.D. students), CHBE 599 (for M.A.Sc. candidates), CHBE 549 (for M.Sc. candidates) or CHBE 596 (for M.Eng. students). Other courses can be added later via INTERNET but note that there are deadlines listed in the Academic Year section of the UBC Calendar for adding or dropping Term 1 or two-term courses. Note also that the seminar course (CHBE 598) and the thesis or report courses (CHBE 596, 599 or 699) must be registered for each year until your graduation. To fulfill the requirements of CHBE 598, *each graduate student must attend all department seminars* during his/her period of residency at UBC.

Annual tuition fees can be paid as a lump sum at the beginning of the Winter Term or as three equal installments in early September, January and May. Please note that you must register and pay fees for the academic year, September to April, in September and January and also register and pay fees for the summer session May to August, in May. The deadlines for fee payment are listed in the Academic Year section of the Calendar. Graduate students may also apply to have their Tuition Fee deducted/fee deferral. Application form can be downloaded from the web at http://students.ubc.ca/finance/download/fees_tuitiondeferral.pdf. Applications for fee deferment will only be considered if:

- Students receiving award money that covers all or most of their tuition fees are **not** eligible for this payment option.
- The student will be employed as a Research or Teaching Assistant and wishes to have tuition fees deducted from his/her monthly salary.

The deadline for applying for fee deferment is also listed in the Calendar and is usually before September 1. Unfortunately, because the deferment application must be accompanied by the GRA or GTA appointment notice, it makes matters very awkward for International Students who arrive after or even just before the deadline has passed. If you wish to take advantage of the fee deferment but miss the application deadline, please seek advice from the graduate advisor. Note that fee deferments are not granted on a continuous basis, but must be reapplied for with each new academic year.

1.7 UBC Card

<https://www.ubccard.ubc.ca/>

1.8 Office Space and Keys

Office and laboratory space is assigned by Michelle Tobin (Administrative Assistant, CHBE 218). Since all space in the Building is at a premium, you should arrange for office space as soon as possible after your arrival. Most new students are given a desk in one of the offices closer to their lab space.

Graduate students are permitted to have keys for the building, for their own office and for any other rooms (e.g., laboratories, computer rooms, etc.) to which they need access for study and research. Note that *all keys must be returned before your graduation*.

1.9 Financial Tips

You should bring with you sufficient funds, in the form of cash and traveller's cheques, to cover the costs of local transportation, meals, temporary accommodation, etc. during your first two weeks in Vancouver. Larger sums needed to support you until you receive your first pay cheque (likely at the middle of September) can be transferred through a local

bank or, if you are coming from outside Canada, by means of a bank draft. If you have insufficient money to carry you through to the first salary payment, consult with your supervisor; he/she may be able to arrange an advance payment.

Graduate research and teaching assistants, as well as those receiving scholarships and fellowships, should be aware that they will be required to pay Canadian income tax which, unless other arrangements are made, will likely be deducted automatically from their monthly salaries. International students should also be aware that, unlike many countries around the world, the advertised price of many goods and services in Canada does not include additional taxes which must be collected by the retailer and paid to both the federal and provincial governments. The Canadian Government Goods and Services Tax (HST) is currently set at 12% in most items. For information on how to fill out a tax return and other useful information please check the following links. The links below have information that can save graduate students money, so please encourage them to file their tax returns and claim their refunds.

Article P105, "Students and Income Tax"

<http://www.cra-arc.gc.ca/E/pub/tg/p105/p105-10e.pdf>

Topics/services specifically for students.

<http://www.cra-arc.gc.ca/tx/ndvdl/sgmnts/stdnts/menu-eng.html>

Under "Tuition and Education amounts"

Individual Income Tax, Line 323, Education amounts

- If you were enrolled full-time, you can claim \$400 per month.
- If you were enrolled part-time, you can claim \$120 per month.

If you're an international student studying in Canada, you may have to file a Canadian income tax return.

Please visit www.cra.gc.ca/internationalstudents

If you were a student who was enrolled at a foreign university, college, or other post-secondary educational institution outside Canada, see Information Sheet RC192, *Information for Students – Educational Institutions Outside of Canada*.

www.cra-arc.gc.ca/E/pub/tg/rc192/README.html

For individual income tax enquiries, please contact Canada Revenue Agency, Vancouver Tax Services Office

Office/ mailing address:

1166 West Pender Street
Vancouver BC V6E 3H8
Fax: 604-689-7536

Office hours:

8:15 a.m. to 4:30 p.m.
Service by appointment only
1-800-959-8281

Shortly after arrival in Vancouver, you will probably want to open a bank account. Once you have a bank account, (provide Helsa Leong a VOID cheque/print out of your account) and your monthly will be deposited there. There are several banks on campus: Bank of Montreal (BMO), Canadian Imperial Bank of Commerce (CIBC), and Royal Bank of Canada (RBC) branches are located in or near the University Village. There are also many other banks and credit unions (which offer the same services as banks) close to the UBC campus (e.g., there are 5 near the corner of 10th Avenue and Sasamat Street). If you open a bank account, you should acquire a banking card, which allows access to automatic teller machines located all over Vancouver and open 24 hours per day.

2. ACADEMIC MATTERS

The primary purpose of this handbook is to familiarize graduate students with the rules and regulations governing the four Chemical and Biological Engineering graduate programs. In the first three subsections which follow, you will find information about course requirements, supervisory committees and examination procedures for the Ph.D., M.A.Sc. (thesis Master's), M.Sc. (thesis Master's – non-engineering students), M.Eng. (course Master's) programs offered by the Department. Much of this information is based on regulations or guidelines specified by the Faculty of Graduate Studies and listed in the UBC Calendar and/or a document entitled "Faculty of Graduate Studies Policies and Procedures". A few other points of more general interest have also been excerpted from the latter document and are compiled in Subsection 2.4.

2.1 Ph.D. Candidates

Course Requirements: All Ph.D. candidates must complete CHBE 697 (Proposal preparation- 2 credits), CHBE 598 (Seminar- I credit) and enrol in CHBE 699 (Ph.D. Thesis). Aside from these, the student must take at least 3 credits of course work appropriate to the student's thesis topic. The student's supervisory committee must approve the choice of course. Depending on their background, the student's supervisory committee may require them to take additional courses if these are deemed to be essential to their thesis work. Ph.D. candidates who have a "thesis-based" M.A.Sc. degree and have taken less than 3 graduate level courses must complete at least 6 credits of graduate level courses (to be specified by the graduate supervisor in consultation with the graduate advisor) in addition to the normal requirement of 6 credits of courses for PhD candidates.

Full candidates without a previous degree in Chemical and Biological Engineering may need to take Essential Background Materials (EBM) and the Core Areas in Chemical and Biological Engineering (CA-CHBE) courses, to improve their background knowledge

about this area of applied science. Such make-up courses will be selected by the Graduate Advisor in consultation with the Candidate and his/her supervisor(s) and will not normally be credited as part of the student's graduate program. For non-engineering background students, at least two courses have to be taken with one from each category (EBM and CA-CHBE). There is no minimum number of courses required for students with an engineering background, but determined by the supervisor in consultation with the graduate advisor. In addition, the supervisory committee may suggest that the student take additional graduate courses within or outside the Department of Chemical and Biological Engineering.

Candidates with Master's degrees who are admitted on a provisional basis will be required to complete a number of courses (specified by the Graduate Advisor in consultation with the Candidate's supervisor(s)) in order to qualify for full standing. Students transferring directly from a Master's program to the Ph.D. program must, during the first year of graduate study, complete 12 credits of courses with a first class average. Of these 12 credits, at least 6 credits must be from the core graduate courses. However, once transferred to PhD program, those students still need to complete the remaining credits required by the MASc program (18 credits in total). Note that Ph.D. candidates must achieve a minimum mark of 68 % (B-) in all courses taken for credit.

Ph.D. Thesis Committee: The Thesis Committee shall consist of the Candidate's supervisor(s) plus at least two other members. At least one of the latter should be a Chemical and Biological Engineering faculty member while another would normally be a faculty member from a different department at UBC. The Committee should be struck by the supervisor(s) within 6 months of the Candidate's arrival and its membership conveyed immediately to the Graduate Secretary. The purpose of the Committee is to help the Candidate develop an appropriate program of study, to provide advice on matters relating to his/her thesis, to review, on a periodic basis, the progress of the thesis and to examine the Candidate's comprehensive research proposal and thesis. In order to properly fulfill these duties, the Thesis Committee should meet with the Candidate at approximately 6-12 month intervals at the request of the candidate or his/her supervisor(s).

Comprehensive Research Proposal: Each Ph.D. Candidate in Chemical & Biological Engineering is required to present in writing, and to defend orally, a research proposal in fulfillment of his/her Comprehensive Examination requirement. The purpose of the research proposal and its subsequent oral examination is to demonstrate to an examining committee that the Candidate has the basic knowledge and the potential ability to pursue research in his/her chosen field. The comprehensive exam will include questions of a fundamental nature that are relevant to the proposed research topic. To be prepared for this exam, students are expected to know the material covered in EBM and CA-CHBE, as well as the relevant core graduate level courses. For candidates admitted directly to the Ph.D. program, the oral examination of the research proposal must be scheduled within 12 months of the admission date if 6 credits or less of courses are taken during that period and within 15 months of the admission date if more than 6 credits are taken. For candidates who transfer into the Ph.D. program from an M.A.Sc. program, the proposal examination should take place within 6 months of the transfer date. Written letters need

to be submitted to the graduate advisor from the student and their supervisor if an extension for the comprehensive exam is required for special cases, with a maximum of one-year extension.

The research proposal will consist of a type-written main body (i.e., excluding cover page, contents list, tables, figures and reference list) not exceeding 15 double spaced pages, and possibly an appendix (containing other, more peripheral material) of the same maximum length. It will normally be based on a thorough literature survey in the field selected for study, and will include a critical evaluation of previous work, a clear delineation between what is known and unknown, and the selection of a well defined problem area for investigation. A method of attacking the problem should be proposed (e.g., description of the experimental apparatus, development of the underlying theory, etc.), and any preliminary results which help validate this approach should be presented. The proposal should end with a justification of the research as a potentially significant contribution to knowledge. Also, the appendix should include a schedule indicating the various stages of the proposed research program as well as the estimated time for completing each stage.

The written proposal, if acceptable to the Candidate's supervisor(s), will be made available to the Committee as well as to all other interested faculty members at least 10 calendar days before the scheduled date of the examination. The defense of the research proposal will be chaired by a faculty member other than the research supervisor(s) or committee member (appointed by the departmental PhD advisor) and will consist of a brief (no more than 20 minutes) oral presentation by the Candidate summarizing the highlights of the proposal, followed by a longer period of questions from the enlarged examination committee as well as from other students who may wish to take part. The Candidate may be examined on background knowledge relevant to the proposed work as well as about the contents of the proposal itself. After the question period is over, the Candidate and the other students will be asked to leave the examination room. The Examining committee will then discuss the Candidate's performance and decide on one of the following possible outcomes:

1. The Candidate passes unconditionally, in which case he/she would be expected to proceed immediately with research in the area proposed.
2. The Candidate passes, but only conditionally. Because of perceived weaknesses in his/her background understanding or research plans, the candidate will be required to fulfill certain requirements specified by the Committee (e.g., remedial courses, supplemental literature reviews, etc.) in addition to carrying out the proposed thesis work. The supervisor(s) will be responsible for monitoring the Candidate's progress and for ensuring that these additional requirements are satisfactorily completed.
3. The Candidate is asked to appear for re-examination at a date to be set by the examination committee. He/she may be asked to improve or modify all or parts of his/her proposal and to present it again at that time, and/or he/she may be asked to study areas of basic science and/or engineering underlying the proposal (where

knowledge in such areas is deemed to be inadequate and to demonstrate at the re-examination that he/she is now proficient therein.

4. The candidate fails and is asked to withdraw from the program.

Once the Comprehensive Research Proposal has been successfully defended, the Faculty of Graduate Studies will be notified and the Candidate will be formally Admitted to Candidacy. Note that successful completion of the Comprehensive Research Proposal may be another stipulation applied to those entering the Ph.D. program with provisional status.

Departmental Ph.D. Thesis Examination: Upon completing the thesis work to the satisfaction of the Thesis Committee, the Candidate will undertake the preparation of his/her doctoral dissertation. A general set of instructions for preparing graduate theses has been devised by the Faculty of Graduate. Since the thesis must be approved and accepted by the Faculty of Graduate Studies before a degree can be conferred, these instructions should be followed vigorously.

In the Department of Chemical & Biological Engineering, the examination of Ph.D. theses takes place in two stages. Once the Candidate and his/her supervisor(s) feel that the thesis is presentable, there is first a Departmental Oral Examination during which the thesis is defended before an extended examination committee whose makeup is specified below. After this requirement has been completed, the corrected thesis is forwarded to an External Examiner selected by the Dean of Graduate Studies in consultation with the department. Then, upon receipt of the External Examiner's report, the Candidate must pass a Final Oral Examination which is open to all members of the university community and which is held in one of two special examination rooms located in the Graduate Student Centre. Because the External Examiner must have access to the thesis for a reasonable length of time, there is a minimum period of 6 weeks required between the submission of the approved thesis to the Faculty of Graduate Studies and the Final Oral Examination.

For the Departmental Oral Examination, a committee of at least four examiners shall be struck by the Candidate's supervisor(s). This examining committee will normally include the Candidate's Thesis Committee, and shall have a majority of its members from the Department of Chemical and Biological. At least one member of the committee must be a Departmental faculty member other than the supervisor(s). Normally, at least one member of the examining committee will be from outside the Department. The purpose of these arrangements is to ensure that there is some external input to the examining process, but that Departmental members play a decisive role in its outcome.

The supervisor(s) shall check with all other faculty members of the Department to determine if any of them is also interested in participating in the examination, which shall be scheduled accordingly. It is the responsibility of the Candidate to ensure that each member of the examining committee, as well as other faculty members who wish to attend, have access to the thesis for a period of at least 10 calendar days prior to the date

of the examination. The examination itself will follow a similar format to that described above for the Comprehensive Research Proposal: a 20 - 30 minute presentation by the Candidate followed by an extended session of questions from the examiners as well as from any others, including students, who may wish to take part. The possible outcomes of the Departmental Oral Examination are:

1. The thesis is judged to be satisfactory except for typographical and grammatical errors as well as a few editorial changes whose revision can be overseen by the Candidate's supervisor(s).
2. The thesis is judged to be satisfactory subject to the implementation of more substantive revisions. Such changes must be reviewed by the Candidate's supervisor(s) and may need the approval of one or more of the other members of the examination committee.
3. The examination is adjourned and the Candidate is asked to appear for re-examination at a date to be set by the examination committee. The reasons for this course of action may include the need for more experimental or theoretical work, for major revisions to the thesis or for the Candidate to be better prepared for the examination.
4. The Candidate fails the examination and is asked to withdraw from the program. Assuming that the oral defence is successful, the Candidate shall immediately revise the thesis according to the instructions of his/hers supervisor(s), then deliver two bound copies of the revised manuscript to the Faculty of Graduate Studies for forwarding to the External Examiner and to the Chair of the Final Oral Examination. As soon as possible after the Departmental Oral Examination takes place, its outcome, successful or otherwise, should be communicated by a written memorandum from the supervisor(s) to both the Department Graduate Advisor and to the Dean of Graduate Studies.

Final Oral Examination: The last requirement on the long road towards obtaining a doctoral degree is the Final Oral Examination, which is a public defence of the Candidate's thesis. The examination committee of the Final Oral consists of a Chair, two University Examiners, two to four members of the Candidate's Thesis Committee (including the supervisor(s) and possibly the External Examiner. The Chair is appointed by the Dean of Graduate Studies as a representative of the Faculty. It is the responsibility of the Candidate's supervisor(s) to recommend to the Dean of Graduate Studies two alternate choices for the External Examiner (at least 3 months before the completion of the thesis) as well as two University Examiners (at least 6 weeks before the Final Oral Examination). One of the latter is normally a faculty member from the Candidate's department while the other must be from another department; neither should have been connected in any way with the supervision of the thesis. It is also the supervisor(s) responsibility to set the date and time of the examination as well as to ensure that all members of the Examining Committee (except the Chair) have a copy of the thesis in advance and that there is a quorum at the examination. It is the Candidate's responsibility to prepare an Examination Programme and to submit it to the Faculty of Graduate Studies at least 3 weeks before the oral defense. The information needed for preparing the Examination Programme is specified in the Graduate Studies document, "A Guide to

Procedures on the Completion of the Ph.D., Ed.D. and D.M.A. Degrees", a copy of which can be obtained from the Graduate Secretary.

The procedure followed for the Final Oral Examination is similar to that employed for the departmental thesis oral. The candidate is first asked to present a 20 - 30 minute synopsis of the thesis. Then members of the examining committee, starting with the External Examiner, if in attendance, and ending with the supervisor(s), are called upon to ask questions of the Candidate. If the External Examiner is absent, the Chair, or someone delegated by the Chair, will put to the Candidate all of the substantive questions raised in the External Examiner's report. (Note that the contents of the External Examiner's report cannot be discussed with the Candidate until after the Final Oral Examination is finished.) Once all visitors have had an opportunity to ask questions and after a second round of queries from the examination committee, the Candidate and the visitors are asked to withdraw from the room so that the committee can discuss the results of the examination and determine a recommendation to be submitted to the Dean of Graduate Studies. The possible outcomes of the Final Oral Examination are:

1. The dissertation is satisfactory, provided suitable revisions are made (if required).
 - a. No revision or only minor revisions are required.
 - b. The committee charges the research supervisor to verify that the required changes have been made.
2. Substantive revisions are required. The committee chooses two or more of its members, including the research supervisor, to verify that the required changes have been made.
3. The dissertation is unsatisfactory. Major rewriting and rethinking are required.
4. The dissertation is unacceptable; it is fundamentally flawed and therefore beyond revision.

Once the thesis has been approved and all recommended revisions have been made and all members and supervisor have signed the Doctoral Dissertation Approval form, electronic submission of the thesis to the Faculty of Graduate studies is required. The candidate should check with the graduate secretary on the requirements or consult with the Faculty of Grad Studies (<http://www.grad.ubc.ca/current-students/final-dissertation-thesis-submission>). Note that, before leaving the University, all successful or unsuccessful Ph.D. students must obtain a clearance form and have it signed by appropriate members of the Department Faculty or staff.

The learning outcomes for the PhD students are listed in Appendix A in Table A.1.

Summary of the course credits requirements for MASC and PhD students in CHBE.

Category	MASC program	PhD program	Additional (Minimum requirement)	Total
MASC students	18 (15+2+1)*			18
MASC students with a non-CHBE BASC degree	18 (15+2+1)		0	18
MASC students with a BSc degree	18 (15+2+1)		6 (3xx, 4xx)	24
PhD students		6 (3+2+1)#		6
PhD students directly transferred from MASC	18 (15+2+1)	6 (3+2+1)		24
PhD students with a non-CHBE BASC degree and a Master's degree		6 (3+2+1)	0	6
PhD students with a BSc degree and a MSc degree		6 (3+2+1)	6 (3xx, 4xx)	12
PhD students with a thesis-based MASC degree with less than 3 graduate courses taken		6 (3+2+1)	6 (5xx)	12

* MASC students are required to take five 3-credit course, plus the 2-credit proposal preparation course and the 1-credit seminar course (i.e. 15+2+1)

PhD students are normally required to take one 3-credit course, plus the 2-credit proposal preparation course and the 1-credit seminar course (i.e. 3+2+1).

2.2 M.A.Sc. Candidates

Course Requirements: M.A.Sc. students are required to complete CHBE 597 (thesis proposal preparation course - 2 credits), CHBE 598 (Seminar- 1 credit), CHBE 599 (M.A.Sc. Thesis - 12 credits) as well as 15 credits of other courses. At least 9 out of these 15, credits must be for graduate courses (500 level) taken in the Chemical and Biological Engineering Department at UBC. A maximum of only 6 credits can, come from 300- or 400-level undergraduate courses, selection of which needs approval from the student's supervisory committee. All M.A.Sc students must successfully complete at least two of the following core graduate courses (3 credits each):

- o CHBE 550 Advanced Reactor Design
- o CHBE 551 Chemical and Biological Engineering Thermodynamics
- o CHBE 553 Mathematical Operations in Chemical and Biological Engineering
- o CHBE 554 Momentum, Heat and Mass Transfer

Potential M.A.Sc. candidates with Bachelor's degrees from other engineering or science programs, and provisional candidates may be asked to take appropriate undergraduate courses to improve their background knowledge, in the case of the former, or to qualify for full standing, in the case of the latter. Such courses will be selected by

the Graduate Advisor in consultation with the Candidate and his/her supervisor(s), and will not normally be credited as part of the student's graduate program.

Note that M.A.Sc. students must achieve a minimum of 60% in any course taken for credit in order to be granted Pass Standing. However, only 6 credits of Pass Standing may be counted towards a Master's program; for all other courses credited to the program, at least 68% must be obtained.

M.A.Sc. Thesis Committee: The Thesis Committee shall consist of the Candidate's supervisor(s) plus two other members. One of the latter must be a Chemical and Biological Engineering faculty member, while the other may be a faculty member from outside the Department. All three Thesis Committee members must be faculty members at UBC. The Committee should be struck by the supervisor(s) within three months after the Candidate registers and its membership transmitted immediately to the Graduate Secretary. The purpose of the Committee is to help the Candidate develop an appropriate program of study, to provide advice on matters relating to his/her thesis, to review, on a periodic basis, the progress of the thesis and to take part in the thesis examination. In order to properly fulfill these duties, the Thesis Committee should meet with the Candidate within 12 months after his/her admission date and, subsequently at 6 month intervals or even more frequently if requested by the student or supervisor(s).

M.A.Sc. Thesis Examination: As the end product of the research project undertaken by the Candidate, an M.A.Sc. thesis elaborating the purpose, methods and results of this research will be prepared. A general set of instructions for the preparation of graduate theses has been devised by the Faculty of Graduate Studies and is included in this handbook as Appendix A. Since the thesis must be approved and accepted the Faculty of Graduate Studies before a degree can be conferred, these instructions should be followed rigorously.

For the purpose of examining an M.A.Sc. thesis, a committee of at least three examiners shall be setup by the Candidate's supervisor(s). This committee shall be made up of the Candidate's supervisor(s), and at least two other faculty members, of whom one may be from outside the Department; i.e., it will usually coincide with the Candidate's Thesis Committee. When the supervisor(s) cannot be present, then the examining committee should consist of at least four faculty members. In either case, the majority of its members should be from Chemical & Biological Engineering in order to ensure that Departmental members play a decisive role in the outcome of the examination.

The supervisor(s) shall check with all other faculty members of the Department to determine if any of them is also interested in participating in the examination, which shall be scheduled accordingly. It is the responsibility of the Candidate to ensure that each member of the examining committee, as well as other faculty members who wish to attend, have access to the thesis for a period of at least 10 calendar days prior to the date of the examination.

The examination will normally be chaired by the Candidate's supervisor(s) and will consist of a brief (no more than 20 minutes) oral presentation by the Candidate summarizing the highlights of the thesis, followed by a period of questions from the members of the examination committee as well as from other students who may wish to participate. The Candidate should be prepared to answer questions not only about the contents of the thesis but also about background knowledge upon which the thesis is based. After the question period is over, the Candidate and the other students will be asked to leave the examination room. The examining committee will then discuss the Candidate's performance and decide on one of the following possible outcomes:

1. The thesis is judged to be satisfactory except for typographical and grammatical errors as well as a few editorial changes whose revision can be overseen by the Candidate's supervisor(s).
2. The thesis is judged to be satisfactory subject to the implementation of more substantive revisions. Such changes must be reviewed by the Candidate's supervisor(s) and may need the approval of one or more of the other members of the examination committee.
3. The examination is adjourned and the Candidate is asked to appear for re-examination at a date to be set by the examination committee. The reasons for this course of action may include the requirement of major revisions to the thesis or the need for the Candidates to be more adequately prepared for the examination.
4. The Candidate fails the examination and is asked to withdraw from the program.

Assuming that the thesis is satisfactory, the examination committee will determine mark for the M.A.Sc. thesis (i.e., for CHBE 599) according to the following weighting scheme:

1. If the number of supervisors is less than the number of non-supervisors 50 % of the total mark will be allocated to the Candidate's supervisors and 50% to the other members of the examining committee.
2. If the number of supervisors is greater than or equal to the number of nonsupervisory, 60% of the total mark will be allocated to the Candidate's supervisors and 40% to the other members of the committee.

In general, the mark of each supervisor will be weighted equally as will the mark of each non-supervisor. As soon as possible after the M.A.Sc. Thesis Examination has been successfully completed, the outcome, including the student's mark (out of 100%), should be transmitted in writing to the Dean of Graduate Studies.

Once the revised thesis has been approved by the supervisor(s), one copy of the thesis should then be electronically submitted to the Faculty of Graduate Studies (<http://www.grad.ubc.ca/current-students/final-dissertation-thesis-submission>) and another copy (electronic or hard) to the Chemical & Biological Engineering Graduate Secretary. When the Dean of Graduate Studies has been informed that the thesis has been accepted by the Library, he/she will, on approval by the Faculty, recommend to the UBC Senate that the Candidate be awarded the degree of M.A.Sc. in Chemical and Biological.

Submission deadlines for the May and November Convocations are listed in the Academic Year section of the Calendar. Note that, before leaving the University, all successful or unsuccessful M.A.Sc. students must obtain a Clearance Form and have it signed by appropriate members of the department faculty or staff.

The learning outcomes for the MASc students are listed in Appendix A in Table A.2.

2.3 M.Eng. Candidates

Course Requirements: The M.Eng. is not a research degree and is intended primarily for candidates who have work experience in addition to a bachelor's degree in Chemical and Biological Engineering. The degree requires advanced course work equivalent to 30 credits with the following requirements:

- Six credits of an engineering report based on an appropriate engineering project in his/her chosen area of interest. Students should approach individual professors for potential topics for the M.Eng. project.
- Twenty-four credits of courses which are further divided as:
 - o At least 12 credits of core CHBE graduate courses. Students should consult the department for the most updated list of core CHBE graduate courses at the beginning of the term.
 - o The remaining credits are considered technical electives which should be taken from within CHBE department. Non-CHBE technical electives are allowed but require prior written approval by the M.Eng. graduate advisor.
 - o The Faculty of Graduate Studies allows a maximum of 6 credits at the 300 or 400 levels. The rest must be at 500-level or above.
- If students wish to broaden their education to include business and management skills, they are encouraged to enroll in the Faculty of Applied Science's Engineering Management Specialization. However, courses taking for this specialization are in addition to the above CHBE M.Eng. course requirements.

Full candidates, with Bachelor's degrees from other engineering or science programs, and provisional candidates may be asked to take additional courses. See section for MASc students with Bachelor's degrees from other engineering or science programs.

Faculty Advisor: Each candidate is expected to review the areas of research of individual professors in the department. The candidate should approach potential project supervisors for consultation. Once a mutual agreement has been reached between the candidate and the potential supervisor, a memo from the potential supervisor should be sent to the graduate advisor for approval and to the graduate secretary for record keeping. The supervisor will assist the candidate in the selection of a suitable topic and/or courses will provide guidance of the project work and report writing. The supervisor will also set up an examining committee for, as well as, chair the Engineering Report Examination.

Engineering Report and Examination: As one of the requirements of the M.Eng. degree, each candidate must submit and be examined on an Engineering Report. The report is an essay of at least **3000 words** on a technical topic selected by the Candidate in consultation with the Faculty Advisor. Engineering Reports are typically based on reasonably comprehensive literature searches, engineering design calculations/computations, short experimental/theoretical projects arising out of M.A.Sc. or Ph.D. theses, and so on.

For the purpose of examining the Engineering Report, the Candidate's advisor shall set up a committee of three examiners, two of whom (including the advisor) must be from the Department. It is the Candidate's responsibility to ensure that each member of the examining committee receives a copy of the Report at least 7 calendar days prior to the date of the examination.

The examination will normally be chaired by the Candidate's advisor. It will begin with a brief oral presentation of about 15 - 20 minutes summarizing the highlights of the Report. After the presentation, the Candidate should be prepared to answer questions on any subject related directly or indirectly to the contents of the Report. Based on their assessment of the written Report and the Candidate's comprehension of the subject matter, the examination committee will decide by a majority vote on one of the following outcomes:

1. The Candidate passes the examination subject to minor revisions of the Report which should be reviewed by the Faculty Advisor.
2. The Candidate passes the examination subject to major revisions of the Report. These require the approval of the Candidate's Advisor and, possibly, both other members of the examining committee.
3. The examination is adjourned with the requirement that the Candidate be re-examined on the same material at a later date. The conditions for re-examination may include significant revisions of the Report and/or better preparation by the Candidate.
4. The Candidate fails the examination and, consequently, the M.Eng. program.

Upon successful completion of the Engineering Report Examination, the Candidate must submit a copy of the revised report to the Graduate Secretary. The Candidate's advisor or the Graduate Advisor should immediately inform Faculty of Applied Science that this requirement of the M.Eng. program has been successfully completed. Assuming that the student has met all of the other requirements of the program, the Dean will, on the approval of the Faculty of Applied Science, recommend to the UBC Senate that the Candidate be awarded the degree of M.Eng. in Chemical Engineering. Submission deadlines for the May and November Convocations are listed in the Academic Year section of the Calendar. Note that, before leaving the University, all successful or unsuccessful M.Eng. students must obtain a clearance form and have it signed by appropriate members of the Department faculty or staff.

2.4 M.Sc. Candidates

The M.Sc. is specially designed for non-engineering students. The degree requires an 12-Credit thesis and 18 credits of advanced coursework in which 12 of the 18 credits must be selected from graduate courses (500 level) inside or outside the Chemical and Biological Engineering program, approved by the student's supervisor and the Department Head. The program must also include the seminar course (CHBE 598 – Seminar 1 credit) and the proposal preparation course (CHBE 597 – Proposal Preparation 2 credits). Part-time students may enrol in the M.Sc. program.

Note that M.Sc. students must achieve a mark of 60% in any course taken for credit in order to be granted Pass Standing. However, only 6 credits of Pass Standing may be counted towards a Master's program; for all other courses credited to the program, at least 68% must be obtained.

The requirements for the thesis committee and the thesis examination for M.Sc. students are identical to those for M.A.Sc. students

The learning outcomes for the MSc students are listed in Appendix A in Table A.2 and they are the same with those of MASc.

2.5 Faculty of Graduate Studies Regulations

Residency Requirements: For Ph.D. candidates, (i) those admitted with a Bachelor's degree are normally required to spend a minimum of three sessions, each of uninterrupted duration of at least 8 months, in full-time status at UBC, (ii) those admitted with a Master's degree are normally required to spend a minimum of two such sessions in full-time status, and (iii) those admitted with a Master's degree and relevant professional experience may apply to have the residency requirement reduced to 12 consecutive months on campus. Full-time M.A.Sc. or M.Eng. students must spend at least one uninterrupted 8 month session (i.e., one Winter Session) studying at UBC. There is no residency requirement for part-time M.A.Sc. or M.Eng. candidates.

Maximum Length of Program and Extensions of Time: University regulations establish a 6 year time limit for the completion of a doctoral program and a 5 year limit for the completion of a Master's program. The period during which the student is on leave does not count in the determination of the time limit. Leave of up to one year for Master's candidates and two years for doctoral candidates may be granted when a student is best advised for personal, health or other reasons (including financial need) to have time completely away from his/her academic responsibilities.

Students exceeding the maximum program time can request a one year extension. This will normally be received favorably as long as it is supported by the Department. A request for a second year's extension will be looked upon far less favorably. It requires a strong recommendation from the Department (including assurances that the Candidate has a high probability of finishing the degree in the second extended year) and an explanation of the special circumstances that would justify such an exception. Requests for a third

extended year will not be considered and the Candidate will be asked to withdraw from the program.

Withdrawal from Program and Appeals: The progress of all candidates for the Ph.D., M.A.Sc. and M.Eng. degrees is reviewed at least once per year by both the Department and the Faculty of Graduate Studies. A Ph.D. candidate may be asked to withdraw from the program if (i) a course grade of less than 68% (B-) is obtained, (ii) the Comprehensive Research Proposal is failed or not completed in the required time, (iii) progress with the research work and/or thesis is not satisfactory, (iv) the Departmental Oral Examination is failed, (v) the Final Oral Examination is failed, or (vi) the thesis or some other requirement of the program is not completed in the approved time. M.A.Sc. and M.Eng. candidates may be asked to withdraw if (i) an excessive number of course marks below 68% (B-) are obtained, (ii) progress on the thesis or graduating essay is unsatisfactory, (iii) the examination of the M.A.Sc. Thesis or the M.Eng. Engineering Report is failed, or (iv) all of the requirements of the program are not satisfied in the approved time.

Students who wish to protest decisions relating to their academic studies may do so. The following is intended to summarize the University's appeal procedures; a detailed account is provided in the General Information section of the Calendar. In general, it is expected that the student's concerns will be dealt with as close to the source of difficulty as possible. Course evaluation is the responsibility of the instructor, although graduate students may apply to the Registrar for a review of the assigned standing in a course. Such requests must reach the Registrar within 4 weeks after the announcement of the course results and the applicant must state clearly why he/she deserves a higher grade; pleas on compassionate grounds should not form part of this statement. A fee will be charged for each course appealed and only two courses can be reviewed in any academic year. The evaluation of the performance and progress in the program of Ph.D. and M.A.Sc. candidates is the responsibility of his/her Thesis Committee or, in the case of any oral examinations, of the Examination Committee. The evaluation of the program status of M.Eng. candidates is the responsibility of the Faculty Advisor (in consultation with the Graduate Advisor) or the examination committee of the student's Engineering Report. A student's concerns related to his/her status in the program should first be communicated to the supervisor(s), advisor or Thesis Committee. If the matter cannot be satisfactorily resolved, the next levels of appeal should be the Department Head and then the Dean of Graduate Studies. Appeals based on academic judgement are the responsibility of the Department and will not be heard by the Dean of Graduate Studies. The Dean will only consider appeals based on alleged prejudice or bias in the evaluation, or improper procedures in the evaluation process. All appeals to the Department Head should be made within 3 months of the original decision. In cases of alleged bias or improper procedure, the student must make the appeal in writing to the Dean of Graduate Studies within 10 working days after a negative decision by the Department Head. If such an appeal cannot be resolved satisfactorily by the intercession of the Dean, the student may then lodge a written notice of appeal with the Senate Committee on Academic Standing, within 10 days of being informed in writing of the Dean's decision. Senate appeals must be in writing and must include evidence supporting alleged bias or improper procedures. The student has the right to legal counsel in an appeal to the Senate Committee. The

policies and procedures for Senate appeals on academic standing are given in detail in the University Calendar.

Transfer from M.A.Sc. to Ph.D.: Student's who wish to transfer from a Master's to a Doctoral program must have completed at least 18 credits of courses with an overall average of at least 80%. Of these 18 credits, at least 12 must be at the 500 level and at least 12 must be of First Class standing. The student must show clear evidence of research ability and must have the approval of his/her research supervisor(s). Transfer directly into a Doctoral program is not normally permitted after the first year of study and will not be allowed after the completion of the second year in the M.A.Sc. program.

A student wishing to make such a transfer must apply in writing to the Department Head. The application must be accompanied by a letter of recommendation from the Candidate's supervisor(s). If the Department Head approves of the transfer, he/she will then communicate the Department's recommendation to the Dean of Graduate Studies. Any conditions of transfer must be clearly specified by the Department in its memorandum to the Dean.

If a student transfers from a Master's program to a Doctoral program without completing the Master's degree, the initiation of the Doctoral program will be from the date of transfer. However, in this case, the total time from the beginning of the Master's program to the completion of the Doctoral program may not be more than eight years. If a student transfers from one area of specialization to another in a Master's program or in a Doctoral program, the normal time limit for completing the degree is not affected.

2.6 Graduate Financial Support in the Department of Chemical and Biological Engineering

In the department of chemical and biological engineering at the University of British Columbia, in addition to the regular research assistantships (see below), there are two types of scholarships: (i) the prestigious 4-year UBC Doctoral Fellowship or 4YF and (ii) the Graduate Students Initiative Scholarships or GSI . Both scholarships are awarded to incoming new graduate students (4YF and GSI) and currently enrolled graduate students (4YF). Each year, the departmental scholarship committee evaluates all students to make the selection or nomination.

4YF (4-year Doctoral Fellowship): Each year, the department selects a few outstanding PhD graduate students who are either incoming or in their first or second year of their PhD program for the UBC 4-year Doctoral Fellowship (4YF) valued at \$20,100/year (\$16,000 plus tuition fee of \$4,100) for a maximum of 4 years. All PhD students **with a first class standing** in the two most recent academic years are eligible to be considered for this fellowship. Those PhD students who missed the competition in the first year or transferred from MASc to PhD program in their second year are also eligible for this scholarship. Recipients will be selected based on the evaluation of their academic

excellence, research ability and potential, and communication, interpersonal and leadership potentials. Detailed description of this scholarship is available at www.grad.ubc.ca/awards

GSI (Graduate Student Initiative Scholarship): GSI scholarships of \$5,000 each are awarded to incoming students. All students **with a first class standing** in the two most recent academic years are eligible to receive this award. **NSERC scholarship recipients** are guaranteed a GSI award, and an additional minimum top up of \$5,000 is provided by the thesis supervisor. In addition, NSERC-PGSD recipients will automatically receive a tuition fee waiver at a current value of \$4,100/year. Furthermore, while the GSI is a one-time award, the supervisors are expected to continue paying \$5,000/year (minimum) as long as the students retain their NSERC scholarship. See more information on top-up financial packages for NSERC scholarship recipients in www.nserc.ca.

The Department of Chemical and Biological Engineering now offers *guaranteed minimum* top-up financial packages to new NSERC CGS-M, PGS-M, CGS-D and PGS-D scholarship recipients—either current or incoming students with an NSERC scholarship start date on or after January 1, 2009. These packages are on top of the NSERC financial awards.

Master's students will receive a top-up stipend of \$6,000 per year for the duration of their NSERC scholarship. CGS-D recipients will receive a top-up stipend of \$10,000 per year for the duration of their NSERC scholarship. PGS-D recipients will receive a top-up stipend of \$6,000 per year plus a tuition award valued at approximately \$4,000 per year (for a total of approx. \$10,000 per year) for the duration of their NSERC scholarship.

Research Assistantships: Research assistantships in the amount(s) (minimum) of \$19,000/year for Ph.D. students and \$17,500/year for M.A.Sc. and M.Sc. students, respectively, are awarded to incoming graduate students having no other scholarships or sponsorship funding from external sources.

Teaching Assistantships: Teaching assistantships are available for all graduate students in the amount typically of \$1,000 to \$1,500 per year.

UBC Affiliated Scholarships: Each year, the departmental scholarship committee selects and nominates students for a number of university affiliated scholarships. For a list of those affiliated scholarships, please visit: www.grad.ubc.ca/awards

3. DEPARTMENT MATTERS

The UBC Department of Chemical and Biological Engineering offer a number of facilities and services to assist graduate students with their courses and research. However, various rules and procedures have been implemented to ensure that these privileges are not abused. This section provides information about, and sets out some of

the do's and don'ts associated with, the department office, the stores, the mechanical and electrical workshops as well as several other facilities and services found in the Department.

3.1 Department Office

Location: Room 218, Chemical and Biological Engineering Building.

- **Magnolia Flores**, administrative support. She handles office allocation and fob access for Graduate students. She also handles course scheduling with Joanne Dean, Manager, Administration, Helps the graduate secretary workload and when she is away. Also handles incoming telephone calls, amongst other duties.
- **Lori Tanaka**, undergraduate secretary. She handles all matters associated with these students and, amongst other duties, also answers incoming telephone calls,.
- **Jane Mc**, secretary to the Head and handles Faculty and Research administrative paperwork.
- **Amber Lee**, finance clerk. She is responsible for any financial issues (reimbursements, petty cash, etc.)

Location: Room 253, Chemical and Biological Engineering Building.

- **Helsa Leong**, graduate secretary. She deals with all matters associated with graduate students including applications to the graduate programs, appointment notices for GRAs and GTAs, and maintenance of graduate records. She also handles inquiries from visitors as well as incoming telephone calls, amongst other duties.

Location: Room 259, Chemical and Biological Engineering Building.

- **Joanne Dean**, manager, administration. She deals with Internal Human Resources, Finance/Budget, Operations (stores, workshop, safety, IT), course scheduling and amongst other duties.

Location: Room 257, Chemical and Biological Engineering Building.

- **Richard Zhang**, systems administrator. He deals with computer accounts and server administration, computer lab maintenance and upgrade, course page maintenance and updates, and research consultation (as time permits).

Facilities: The Department Office also contains stationery supplies, telephones and a fax machine, as well as a photocopy and mail room. Some of the rules governing the use of these facilities are as follows:

- Stationery supplies for research purposes are available to graduate students free of charge in the department office. Other approved supplies may be purchased from the Bookstore and paid for by means of a requisition form (signed by a supervisor) – see Amber Lee in the main office for details.
- Graduate students may also use the office fax machine themselves, ensuring that a record is quoted properly for billing purposes. Identify if the fax is for research or personal.
- Each graduate student is issued a photocopy ID number (see Amber) which is to be used for research copying only. Personal photocopies can be made under a special ID number which will be punched into the machine by one of the secretaries at your request. Personal photocopies must be paid for when they are made. If you require instructions for or have problems with the photocopier, please ask for help.
- Each graduate student is assigned a mailbox which should be checked regularly. Mail is delivered at about 10:00 a.m. Each working day, and fax messages received by the office are also placed in the mailboxes. There are also receptacles in the mailroom for outgoing campus and non-campus mail. Outgoing mail is picked up at about 10:00 a.m. daily and is taken to Campus Mailing Services for sorting. Personal mail can be sent using this service as long as the correct postage is affixed beforehand. Stamps for personal mail are not available in the office. Outgoing business mail without postage should be placed in the unfranked mail basket in the copier room.

3.2 STORES

Location: Room 176, Chemical Engineering Building.

CHBE stores is your ordering service, shipping/receiving centre of all goods (goods must be ordered through the stores online database) and inventory warehouse.

CHBE stores also serves as the final portal for your waste chemicals and contaminated broken glass.

Stores hours are as follows:

Pickup of orders or booked resources, Consulting/waste chemical drop off (with HSE inventory complete) – 8:00 am– 4:00 pm, Monday to Friday

Online Stores Ordering

To order, you must have a chbe account, and your supervisor must have added you to his/her speedchart (a speedchart is a four-letter code which determines which source/grant to charge for the purchase). Once you have logged into IT Resources, select “New Workshop and Online Ordering System”, then click on the “Ordering” tab, then “New Orders”, then “New Order”. If you don’t know who to order from or if you don’t know the part# then you will have to visit stores.

Waste Chemicals

Each lab is stocked with a Chemical Safety Manual. Depending on the chemical to waste, procedures change. Please refer to <http://hse2.ubc.ca/cwif/1> to obtain the correct procedures.

Resource Booking

There are many resources available for booking. You can do this by selecting “Resource Scheduling Application” on the chbe home IT Resources menu. It will require you to login again; simply use the same username and password as you do when logging into chbe home. There are two types of bookings available: resources and rooms.

Resources

The following resources can be booked through the online system. These bookings do not need subsequent approval, but *do* need to be booked up to 24 hours in advance.

We have:

- 1 Multimedia Projectors
- 2 Laptops with wireless capability
- 1 Canon Compact Digital Camera

In the case of the Toyota truck, you must provide the WORKSHOP with a completed “Truck Walk Around Sheet” and your driver’s license. All tickets and infractions will be charged to the speedchart (if applicable). Finally, please always return the truck inside the courtyard gates (not out near the bins).

Please be timely in the return of the equipment booked. If the truck is not returned by 4pm you will be charged an extra day and may have your booking privileges suspended.

Rooms

The building has rooms managed through the online system. 24hr notice is required in booking these rooms, and bookings must be approved by one of the main office staff prior to being confirmed (usually Lori). The rooms available are listed as follows:

- CHBE 202 (seminar room, capacity 90)
- CHBE 204 (meeting room, capacity 30)
- CHBE 222 (board room, capacity 8)

Please always indicate a description of the event/reason for booking. In the case of multiple (weekly) bookings, please note that bookings during term time (September to April inclusive) are only accepted one term at a time (September-December and January-April) and that any higher priority meeting requiring the space at a conflicting time may result in your meeting/event being bumped out occasionally. The department always provides as much notification as possible should such occurrences happen.

Staff:

- **Ivan Leversage** is the Safety Officer for CHBE and the Stores supervisor.. He is responsible for all lab/building safety and maintenance issues.
- **Richard Ryoo** is the Storekeeper. He is responsible for ordering and shipping/receiving.

Primary Functions of Stores

The Chemical and Biological Engineering Stores looks after all purchases of equipment and supplies by faculty, staff and students in the building. It also maintains records for all materials received by and shipped from the department. In addition, it stocks basic inventory of used equipment, chemicals, glassware, fittings, clamps, etc. Finally, it provides a number of services including the administration of first aid, the safe disposal of experimental wastes, and even a laundry service for lab coats.

Some of the procedures and rules graduate students should know about the stores operation include:

- Purchase of equipment and supplies. Stores maintains an extensive collection of manufacturer's catalogues for standard laboratory equipment and chemicals. Richard can usually suggest which catalogue is most likely to have the item you are interested in. Once you have located a source, submit the info to stores electronically through the on-line ordering form. You must provide a part# or a quote# and the full contact information of the salesperson you dealt with.
- Chemical handling, storage and disposal. All chemicals used in the building must be properly identified and should be accompanied by a copy of the MSDS (Materials Safety Data Sheet) form which specifies their composition and safe handling procedure. HSE should be consulted before *any* chemicals are disposed. More information about the safe handling and storage of chemicals as well as about the disposal of chemical and other wastes can be found in the document on "Safety Concerns" included in the handbook which can be found on-line at <http://www.chbe.ubc.ca/safety/index.php>.
- Building maintenance and instructional equipment problems. If you encounter any problems with building services (e.g., heating, lighting, ventilation, electric power, steam, compressed air, etc.) or with instructional equipment, report them immediately to Ivan Leversage Cell: 604-328-7923.
- Laboratory safety. Ivan Leversage is responsible for providing information about safe handling procedures for hazardous chemicals, for coordinating laboratory safety training and for maintaining a high level of safety awareness in the Department. Stores also stocks safety equipment such as gloves, safety glasses, ear plugs, gas masks, spill kits, etc. for laboratory use.
- Shipping and Returns. Any orders that require returning to the vendor must be accompanied by an RMA# issued by the company. Samples that require shipping should be entered as an order. The full address and phone# of the recipient is required.

- First aid. *Any injuries which occur within the building should be reported immediately to stores.* Stores also stocks first aid supplies and is responsible for the upkeep of the first aid stations located at strategic positions around the building (see Appendix C).

3.3 WORKSHOP

Location: *Room 126*, Chemical and Biological Engineering Building.

Staff:

Doug Yuen (Room 184) is the workshop team leader. He supervises the workshop operation, provides design assistance for workshop clients and is responsible for ordering shop equipment and supplies.

Graham Liebelt, Charles Cheung, Gordon Cheng and David Roberts (Room 183) are mechanical technicians. They are responsible for the construction and maintenance of research and laboratory equipment in the Department. Each has been trained in a variety of mechanical workshop skills such as machining, welding, pipe fitting, and so on.

Alex Thng and Serge Milaire (Room 186) are electronics technicians. They are responsible for maintaining research and laboratory instruments and for the wiring in all new experimental equipment.

Functions and Facilities:

The mechanical and electronics workshops are located on the first floor of the Chemical & Biological Engineering building. The mechanical workshop contains 2 milling machines, 1 water jet cutting machine, 1 CNC milling machine, 1 plasma cutter, 1 TIG welder, 3 lathes, 2 drill presses, a band saw, a cutoff saw, a table saw (for thin plastics and wood) and machinery for cutting, stamping and bending sheet metal. The electronics shop contains numerous pieces of test equipment for trouble-shooting the various instruments and electronic gadgets within the building.

The motto of the workshop staff is "If you can think of it and draw it, then we can build it". And, indeed, as far as it can be remembered, they have never failed to live up to this claim. When you need to have an apparatus constructed by the workshop staff, it is a good idea to consult with your supervisor first and then come in to the shop armed with rough sketches of what you have in mind. The staff have years of experience building research equipment and often have good ideas about better (usually simpler) ways of doing things. Once a final design has been decided upon, you should then go off and prepare a detailed engineering drawing showing all pertinent dimensions and specifying all materials of construction. Less detailed sketches will be sufficient for small, straightforward jobs. The next step is to check with the workshop about the availability of the needed materials. Generally you will also have to purchase all supplies and fittings; the workshop only keeps a small amount of these items for emergency repairs. The final step is to fill out a numbered work order (available online) to which all pertinent drawings and sketches should be attached. The work order should list the material of

construction of each component to be manufactured as well as the sources of fittings and other supplies. Note that the work order must be APPROVED by your supervisor before (ONLINE system will move your work order forward).

Your work order will be processed by online system on a priority point scheme which is based solely on the nature of the job (i.e., undergraduate laboratory; B.A.Sc., M.A.Sc. or Ph.D. research; etc.) and the estimated amount of time it takes to complete it. This system allows the workshop to fabricate small jobs ahead of large jobs. It is also completely objective; it helps the workshop staff avoid claims of favoritisms.

Note: that the Workshop does not provide tools or space for students to carry out their own minor fabrication or maintenance tasks no matter how small. If you require standard tools (e.g., screwdrivers, wrenches, pliers, etc.) for experimental purposes, ask your supervisor if you can purchase whatever you need through the stores. It is advisable to also purchase a toolbox and to store the toolbox and its contents in a lockable cupboard.

3.4 Chemical and Biological Engineering Safety Committee

Safety in the workplace is an important consideration within the department and it is incumbent on everyone to ensure that all hazards - and potential hazards - are kept to a minimum. Graduate students tend to be exposed to these hazards to a greater degree because many are involved with experimental research or simply have longer working hours in the building. Thus, they have a particular responsibility for developing an awareness of safety issues and for carrying out their activities in the safest possible way. Safe conduct within the building is monitored by the Chemical and Biological Engineering Safety Committee, a voluntary group of faculty, students and staff, including several graduate students. New graduate students are encouraged (and needed!) to serve on this committee. The Safety Committee enforces department and UBC safety policies and seeks to promote improved awareness of safety in the design and operation of experimental equipment and in laboratory practice. Nonetheless, ALL members of the department have the responsibility of keeping the occupants of the building safe and secure as well as keeping the building functioning optimally.

The departmental website contains all the information related to the Health, Safety and Environment (HSE) at CHBE. All graduate students are expected to be familiar with its contents which include all the emergency contact information and numbers, names of the members of the Safety Committee, and the Safety Handbook (<http://www.chbe.ubc.ca/safety/index.php>). In addition, ***all new graduate students must attend the department safety seminar*** as well as a two-day safety course organized by UBC Health, Safety, and Environment (HSE). Watch your mailbox for notices about upcoming safety seminars and courses.

Graduate students are particularly required to think and act safely in the following two areas:

(i) **Experimental Research.** Graduate students are required to follow existing regulations for the operation of experimental equipment and for the handling and disposal of all materials associated with their research projects. All apparatus used in the building should have a safety check at the design and construction stage and must pass a safety inspection at the commissioning stage. ***No new equipment can be operated until it has been inspected and approved by the Safety Committee.*** Students are encouraged to discuss safe design and operation early, both with their supervisor(s) and the department workshop staff (who can relate many "how not to" stories). This approach usually saves time and effort as well as ensuring smooth passage through the Safety Committee inspection. ***Students should never work alone in the laboratory.*** If you have to do experimental work in the building outside normal working hours, make sure you are accompanied. Also, laboratory equipment should be attended when it is in operation. In case this is not always possible, emergency shutdown procedures plus the student's and supervisor's(s') phone numbers must always be conspicuously posted near the equipment. It is also the student's responsibility to ensure that chemicals are properly labelled, that flammable liquids are stored in the special storage cabinets provided, that noxious or odorous chemicals are handled in a fume hood, that all wastes are disposed of in an acceptable manner and that the area around the apparatus is maintained in a clean and tidy condition. These matters are addressed in greater detail in the Departmental Safety Handbook (via department's website, the link provided above).

(ii) **Undergraduate Laboratories.** Many graduate students are involved as teaching assistants in the various undergraduate laboratory courses. Laboratory teaching assistants have direct responsibility for the safe operation of any apparatus they are in charge of. Teaching assistants are expected to be familiar with the hazards associated with their laboratory experiments. They should clearly explain to each group of students the safe procedure for carrying out these experiments, specifically pointing out the potential problems and how they can be circumvented. The teaching assistants, and the course instructor, are looked upon to act as role models in demonstrating safe and responsible practice in the laboratory setting. Note that ***laboratory teaching assistants are required to take the safety course offered by Health, Safety and Environment.***

The Department's Safety Officer is Ivan Leversage, who is the first point of contact in all matters that relate to Health and Safety within the department. Ivan is also the co-chair of the Chemical and Biological Engineering Safety Committee. He can be reached by email ileversage@chbe.ubc.ca or by cell phone: 604-328-7423. Other members of the Safety Committee can also be available to for concerns or questions you may have. All the concerns related to Safety can also be directed to the Committee by email to safety@chbe.ubc.ca. All the graduate students and researchers should send (via email) the request for the safety inspection of their equipment prior to the start of their experiments.

3.5 Computational Facilities

The department has access to a wide variety of computational facilities ranging from 3 mainframe computers housed in the UBC Computing Centre to a variety of workstations, networked terminals and personal computers within our own building. General departmental computing facilities for graduate students can be found in the following two rooms (CHBE 314, CHBE 316).

In addition to the general use facilities described above, many faculty members in Chemical Engineering have purchased personal computers and workstations for research computing by their own students. Also, the state of the computing environment in the department is in a state of flux at the moment; the picture, even a few months from the preparation date of this document, may be quite different than the description given above.

3.6 Reading Room, Room CHBE 214

The Chemical and Biological Engineering Reading Room (The Norman Epstein room CHBE 214), located next to the Department Office on the 2nd floor, is a study resource available to all members of the Department. As well as containing a number of useful reference books, textbooks and departmental theses, it also stocks a few of the standard Chemical Engineering serials such as the Canadian Journal of Chemical Engineering, AIChE Journal, Chemical Engineering Progress, Industrial and Engineering Chemistry - Research, etc. The Reading Room also has catalogues listing the contents of all of the Engineering reading rooms on campus.

It is preferred that books and journals be read in the Reading Room; short visits to the Office next door can be made if you wish to copy material for further contemplation. Catalogued books and journals can be taken out overnight, if necessary, ***by filling out the book loan card (date, name, student number, phone number) and filing it (by call number) in the sign out box*** located on the table near the door. If it is absolutely essential to remove catalogued materials, then arrangements can be made with Lori in the Office to take them out overnight. Theses finished in the past 5 years may not yet be catalogued and on the shelves. Check with Helsa in the Office if you are unable to locate a recent thesis. ***Under no circumstances should a book be removed from the Reading Room over an extended period for one's personal use.*** Since staff assistance with the Reading Room is limited, it would be appreciated if you could reshelv any materials you have used or borrowed. If the returned book or journal volume has been signed out, remember to cross your name off the sign out card and replace it in the card holder before putting the material back on the shelf.

3.7 Lounge and Lunchroom, Room 636

This room contains a fridge and microwave, etc. for your use. . Coffee is available in Room 212 at a nominal charge, paid per cup. Students are encouraged to come out and

meet your other fellow students, staff and professors on Fridays at 2:30 p.m. in Room 212.

4. SOCIAL MATTERS

4.1 Chemical and Biological Engineering Graduate Student Club

The purpose of the Chemical and Biological Engineering Graduate Student Club is to advocate the interests of, and to organize social, recreational, and professional development events for, graduate students within the department. All graduate students in CHBE are automatically members, but it is left up to each individual to determine his/her level of involvement in the Club and the events it organizes. Please express your interest in participation in the Club to the Club President. We hope that all new graduate students will play an active role in supporting the aims and affairs of the Club.

In the past year, the Association has been active in organizing several pizza & beer get-togethers, summer hiking, soccer and softball, fall/winter volleyball, ping-pong tournament and the annual Christmas party. Some of the more recent Christmas parties, in particular, were great successes, featuring good-natured skits and multicultural talent shows. You would be surprised at the level of musical and thespian talent lurking amongst your department colleagues.

The Association also plays an active role in department affairs by sending representatives to various departmental committees. For example, there is a representative who attends all department faculty meetings to communicate graduate student concerns and to ensure that our voice is heard about any issues affecting us. The Association also sends one representative to the UBC Graduate Student Society meetings (see next section). If you would like to become actively involved in Club affairs by representing your fellow graduate students on any of these departmental committees or in the Graduate Student Society, please contact the Club President.

There is also a student chapter of the CSChE (Canadian Society for Chemical Engineering) within the department which holds meetings (occasionally with speakers from local industry) every Tuesday. Graduate students are encouraged to become student members of the CSChE.

4.2 GRADUATE STUDENT SOCIETY

All of UBC's almost 9,000 graduate students are members of the Graduate Student Society (GSS), a non-profit student organization. Along with your tuition fees, a small additional fee is collected from each registering graduate student and transferred to the GSS to fund activities. These activities include: representing and advocating graduate student interests, organizing social and recreational events, and operating the Graduate Student Centre.

The GSS employs a limited number of support staff to administer the day-to-day operations of the Society and to implement policies. However, the Society is controlled by a Council composed of representatives elected by graduate students from each department within the University.

Representatives of the Graduate Student Society voice your opinions and lobby for improvement in your conditions on various University advisory and governing bodies. The GSS sends representatives to Senate, the Board of Governors, the Faculty of Graduate Studies Council, and hiring committees for senior administrative positions.

For more information, please visit <http://gss.ubc.ca/>

The Graduate Student Centre (#225-6371 Crescent Road, 822-3203): The Grad Centre houses a ballroom, a banquet room, a number of smaller seminar and board rooms, the Fireside lounge, a year-round Friday Beer Garden, and quiet study spaces. Certain Grad Centre rooms can be booked for a small rental fee and are free-of-charge to graduate student groups. Catering and bartenders are available for functions upon request. Game facilities include: a ping-pong table, a pool table, dart boards and shuffleboard. All facilities are free to graduate students. Other services comprise: a housing and job notice board, free video nights, live entertainment (no cover) in the Fireside lounge, and a graduate student tutoring list. UBC's Graduate Student Society office, Food Services' Catering Department and the TA Union's offices are located in the Grad Centre.

4.3 International Student Development – International House

For more information regarding international student development and the International House, please visit:

<http://www.students.ubc.ca/international/index.cfm>

5. OTHER UBC FACILITIES & SERVICES

Museum of Anthropology (6393 Northwest Marine Drive, 822-5087): A top tourist attraction, the MOA has one of the world's best collections of Northwest Coast Native Art. Other items hail from areas as far away as South America, China, and Africa. Admission is free on Tuesdays. Anthropology students may get "study passes" - free admission all the time. This is definitely a pleasant break between classes.

Asian Centre (822-2746): Located in the northwest section of campus, this is a centre for research, study, and appreciation of Asia. The 200-seat auditorium, performance studio, meeting rooms, and Japanese Tea Gallery can be booked for private functions.

Bookstore (822-BOOK): One of the largest university bookstores in North America with over 70,000 titles, as well as a post office, computer shop (at student-oriented prices), and a clothing section, to name just a few.

Botanical Garden (South Campus, 822-4208): If you've never visited the Botanical Garden, you've really missed something. The oldest garden of its kind in Canada, it grows local plants and exotics from around the world. Guided walks are given regularly, and the associated Nitobe and Lam Gardens elsewhere on campus provide opportunities to view genuine Asian garden styles. Horticultural information can be obtained at 822-5858.

Daycare (5590 Osoyoos Cr., 822-5343): There are 12 child care facilities on campus intended primarily for children of students, faculty, staff, and others associated with the university. Warning: space is limited and fills quickly.

Frederic Wood Theatre (6354 Crescent Road, 822-2678): Putting on plays, musicals, and other theatre spectacles throughout the year, the Freddy Wood is one of the best theatres in the city. Season tickets go fast, so book early.

6. HEALTH MATTERS

6.1 Physical Health

Student Health Service: The Student Health Service is available to all registered students of the University for assistance with any medical problem about which they would ordinarily consult a doctor or an emergency clinic. The unit is staffed by fully qualified general practitioners and nurses. The services provided include care of illness or injury, preventative medicine, psychiatric help (see also Section 5.2), and antigen and immunization administration. More specialized medical services can be arranged by referral from the general practitioners.

The cost of these services is normally borne by the student's hospital/medical insurance. *Students without insurance will be personally billed for most services.* Student Health Service also has information about and application forms for both private and provincial health insurance plans.

The Student Health Service is located in Room M334 (Main floor, southeast corner) of the Acute Care Unit, Health Sciences Centre Hospital, 2211 Wesbrook Mall. Its hours are 7:45 a.m. to 5:00 p.m. during the Winter Session, and 8:00 a.m. to 4:00 p.m. during the Summer and during the Christmas break. The service is available on a drop-in basis or, to reduce the waiting period, appointments can be made by calling 822-7011.

Emergency Care: At times when the Student Health Service is closed, assistance with emergency medical problems can be obtained from the Emergency Department, Acute Care Unit, Health Science Centre Hospital (next to the drive-in entrance from Wesbrook Mall). Other local hospitals also have emergency units, such as the Vancouver General Hospital (855 W. 12th Avenue) and St. Paul's Hospital (1081 Burrard Street).

Ambulance assistance with any medical emergency can be obtained by dialing **911**. Emergency medical needs are also not free; if you do not have medical/hospital insurance, you will be billed for most of the costs incurred.

Dental Care: Graduate students can extend their health insurance coverage from the B.C. Medical Services Plan to include dental work at the extra, but not-so-low, rate of about \$18.00 per month. Students on this extended plan can use the services of whatever dentist they wish. Dental Offices close to the campus can be found on West 10th Avenue, Broadway and W. 41st Avenue. For those without a dental plan, inexpensive dental work is provided by the UBC Dental Clinic located in the John McDonald Building, 2199 Wesbrook Mall (822-2112) and is performed by faculty-supervised dentistry students. However, the clinic usually has a fairly long waiting list and also only takes patients who suit its teaching needs. Relatively low-cost dental care is also available at the Reach Community Health Centre at 1145 Commercial Drive (254-1331).

There is a Medical and Dental Clinic in the University Village (Suite 228 - 2155 Allison Rd Vancouver, BC V6T 1T5 Phone: 604-222-2273 Fax: 604-222-3403)

Maternity Leave: You may be granted *maternity leave without pay* for a period of time suitably agreed upon in consultation with your supervisor(s). Please make arrangements for a *leave of absence* well in advance.

6.2 Mental Health

Student Counselling and Resources Centre: The Centre provides confidential counselling for men and women with personal, relationship, and family, marital, cross-cultural, educational and career concerns. It is staffed by qualified professionals with doctorates and masters in counselling psychology. The staff work on an individual basis with students who may be experiencing difficulties with academic and career plans, problems in interpersonal relationships, conflicts about sexuality, and feelings of inadequacy, alienation and loneliness. Group counselling is also provided for students and their partners and/or families. The Centre also has a selection of University calendars, corporate literature and audio & video tapes for career planning purposes as well as a library of previous final examinations to assist students in achieving academic success.

The Student Counselling and Resources Centre are located in Room 200, Brock Hall (1874 East Mall). It is open from 8:00 a.m. to 6:00 p.m. Monday to Thursday and from 8:00 to 4:30 p.m. Friday. It is a good idea to call 822-3811 for an appointment so that initial contact with the Centre can be arranged at a mutually convenient time. However, in cases of emergency, a walk-in service is available which allows the student to be seen with minimum delay. There is no charge to students for counselling services at the Centre, although a nominal fee may be charged for testing and resource materials.

Office for Women Students: This Office exists to encourage and assist women students at UBC as they pursue educational goals, explore professional options and participate in

life at the University. It addresses the needs of women students by providing personal and educational counselling, workshops and panels on women's themes, and support in women's issues and policies. A resource library is also available for research on women's issues.

The Office of Women Students is located in Room 203, Brock Hall (1874 East Mall). Its hours are 9:00 a.m. to 4:30 p.m., Monday to Friday. Call 822-2415 for an appointment to see a counsellor or drop-in any time during opening hours for discussion and relaxation. The Resource Library has self-help books available to read in the designated area (no signing out of books).

For more information about the AMS/GSS Health & Dental Plan, please visit:

<http://www.students.ubc.ca/international/international-students/health-care-and-health-insurance/amsgss-health-dental-plan/>

http://www.ihaveaplan.ca/rte/en/UniversityofBritishColumbiaAMSGSS_Home

7. OTHER SOURCES OF INFORMATION

Much of the information contained in this handbook has been compiled from other sources. As well as allowing verification of various "facts" presented in these pages, some of these alternative publications also provide information about other aspects of campus life not addressed in this somewhat narrowly-focused document. The most useful of these alternative sources, which are also generally accessible, include:

- *The GSS Handbook*, published annually by the Graduate Student Society, UBC.
- **UBC Faculty of Graduate Studies website:** <http://www.grad.ubc.ca/>
- *The UBC Calendar:* <http://www.calendar.ubc.ca/vancouver/>.
- *CHBE Department secretaries, advisors, supervisors, and fellow students.*

APPENDIX A

Table A.1. LEARNING OUTCOMES

Degree Program: PhD

	Learning Outcomes	Indicators of Achievement
Expectations	<i>Upon completion of the PhD Program, students will be able to</i>	
Knowledge, Research and Scholarship	<ul style="list-style-type: none"> • Demonstrate a mastery of knowledge of a specific academic field – with the potential to teach that knowledge at the university level. • Generate independent and high quality research that is an original and meaningful contribution to knowledge within a specific field. • Conduct critical reviews and syntheses of the current state of the art and practice in the sub-discipline related to the student's areas of research. • Generate advanced knowledge in specialised techniques (experimental, numerical modeling and/or simulation). 	<ul style="list-style-type: none"> • Results of experimental and theoretical investigations theses, publications, technical presentations and patents. Normally, the scope of research will be the equivalent of at least 3 peer reviewed papers in high quality journals. • Successful performance in graduate level courses taken for credit (a minimum of 68% (B-) must be achieved in all courses), including a proposal development course, (CHBE 597 or CHBE 697). • Successful defense of PhD thesis proposal. • Successful completion and defense of a PhD thesis.
Communication Skills	<ul style="list-style-type: none"> • Demonstrate excellent communication skills (to write, speak) to the academic community, industry, undergraduate students and the public. • Listen without interrupting others and contribute thoughtful and scholarly responses to comments. 	<ul style="list-style-type: none"> • Clear and comprehensive oral presentations during thesis proposal defense, graduate courses, departmental research seminar, conferences, and thesis defense. • Coherent, conceptual, and well referenced written progress reports, journal publications and thesis. • Articulate, precise, and thorough responses to questions while defending proposals, reports and theses. • Positive student evaluations of work as a Teaching Assistant.

Critical Thinking and Problem Solving	<ul style="list-style-type: none"> • Demonstrate critical thinking in preparing research and in the synthesis of the literature associated with the research topic. • Design problem-solving techniques in the context of economic decision-making, legal constraints, codes of practices, health and safety. 	<ul style="list-style-type: none"> • Definition of an innovative objective for the thesis, and well founded plans for solving the problem. • Successful completion of PhD qualifying exam. • Publication of a minimum of three scientific papers in high quality peer reviewed journals. • Successful completion of graduate courses that include problem solving in the form of projects.
Health and Safety	<ul style="list-style-type: none"> • Establish, promote and maintain a safe work environment. 	<ul style="list-style-type: none"> • Successful completion of safety training. • Record of safe behaviour in progress reports. • Regular safety surveys are completed in a full and timely manner. • Materials needed for safety review and committee are well and thoughtfully prepared.
Ethical Conduct & Environmental Stewardship	<ul style="list-style-type: none"> • Conduct research in a responsible manner through application of ethical responsibilities and ethical standards. • Critically assess any ethical and legal implications of research. • Contribute to the preservation of the local and global environment. 	<ul style="list-style-type: none"> • Demonstration of consistent ethical conduct, using a high level of scholarly rigour and integrity in proposing and performing research; in recording, analyzing, and interpreting data; and in reporting and publishing data and findings; • Environmental and ethical issues brought to the attention of supervisors, safety committee or others as appropriate. • Open and full cooperation with those charged with ensuring the ethical and environmental standards are met. • Attendance at relevant workshops and/or training offered by UBC or external bodies.
Professional Development	<ul style="list-style-type: none"> • Demonstrate networking, interpersonal and team working skills, and significant commercial awareness. 	<ul style="list-style-type: none"> • Participation in group meetings, seminars, field work, interactions with industry and internships,

	<ul style="list-style-type: none"> • Exemplify community service. • Expand horizons and be open to continuing learning. 	<p>interactions with outside community and other students/faculties.</p> <ul style="list-style-type: none"> • Attendance at relevant events, seminars and workshops organized by CHBE Graduate Student Club and/or other UBC or external bodies. • Articulation of plans for ongoing learning in the context of graduate program and beyond. • Management of the research project in a professional manner, meeting reasonable deadlines. • Indication of evidence of balance in professional and personal lives. • Mentorship of other graduate or undergraduate students.
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DEFINITIONS (http://www.gradsch.osu.edu/Depo/PDF/LearningGoals_11.19.12.pdf)

Learning Goals: Program learning objectives are *brief, clear, focused* statements of *intended* learning outcomes. Learning objectives come from program goals; they focus on students rather than curriculum. Each objective should be defined with outcomes assessment criteria in mind for “measuring” how well each objective has been accomplished. [Sources: Fresno State University; Western Washington University].

Learning goals may take multiple forms:

Cognitive Outcomes: *What do you want your graduates to know?*

Behavioral Outcomes: *What do you want your graduates to be able to do?*

Affective Outcomes: *How do you want your graduates to relate to their work and to others?*

Table A2. LEARNING OUTCOMES

Degree Program: MASc, MSc

	Learning Outcomes	Indicators of Achievement
Expectations	<i>Upon completion of the MASc or MSc Programs, students will be able to</i>	
Knowledge, Research and Scholarship	<ul style="list-style-type: none"> • Evaluate what is known in a particular academic field. • Conduct research in a particular academic field. • Demonstrate advanced knowledge in specialised techniques (experimental, numerical modeling and/or simulation). 	<ul style="list-style-type: none"> • Summary of results of experimental and theoretical investigations, theses, publications, technical presentations and patents. The scope of research should normally be the equivalent of at least one peer reviewed paper. • Successful performance in graduate level courses taken for credit (a minimum of 68% (B-) must be achieved in all courses), including the proposal development course, (CHBE 597).
Communication Skills	<ul style="list-style-type: none"> • Demonstrate excellent communication skills (to write, and speak clearly and coherently to the academic community, industry, undergraduate students and the public) • Listen respectfully to colleagues, faculty members, undergraduate students, and the public. 	<ul style="list-style-type: none"> • Clear and comprehensive oral presentations during graduate courses, departmental research seminar, conferences, and thesis defense. • Clear, complete, and appropriately formatted progress reports, journal publications and thesis. • Thoughtful and articulate responses to questions while defending proposals, reports and theses. • Acceptable student evaluations as a Teaching Assistant.
Critical Thinking and Problem Solving	<ul style="list-style-type: none"> • Demonstrate critical thinking about what is known in a particular academic field. • Use problem-solving techniques in the context of economic decision-making, legal constraints, codes of practices, health and safety. 	<ul style="list-style-type: none"> • Design of an appropriate methodology for solving a problem defined in the thesis. • Placement of the problem in an appropriate critical review of the literature. • Publication of at least one scientific paper in high quality peer reviewed journals. • Successful completion of graduate courses that include problem solving in the form of projects.

Health and Safety	<ul style="list-style-type: none"> • Establish, promote and maintain a safe work environment. 	<ul style="list-style-type: none"> • Successful completion of safety training. • Record of safe behaviour in progress reports. • Regular safety surveys completed in a full and timely manner. • Well prepared materials for safety review and committee.
Ethical Conduct & Environmental Stewardship	<ul style="list-style-type: none"> • Conduct research in a responsible manner demonstrating a basic understanding of ethical responsibilities and adhering to ethical standards. • Critically assess any ethical and legal implications of research. • Demonstrate concern for the preservation of the local and global environment. 	<ul style="list-style-type: none"> • Complete and accurate annual Progress Report. • Demonstration of consistent ethical conduct, using a high level of scholarly rigour and integrity in proposing and performing research; in recording, analyzing, and interpreting data; and in reporting and publishing data and findings. • Environmental and ethical issues brought to the attention of supervisors, safety committee or others as appropriate. • Evidence of open and full cooperation with those charged with ensuring the ethical and environmental standards are met. • Attendance at relevant workshops and/or training offered through the CHBE department and/or other UBC or external bodies.
Professional Development	<ul style="list-style-type: none"> • Demonstrate networking, interpersonal and team working skills. • Explain commercial awareness. • Acknowledge the importance of community service. • Identify steps needed to expand horizons and engage in continuing learning. 	<ul style="list-style-type: none"> • Participation in group meetings, seminars, field work, interactions with industry and internships, interactions with outside community and other students/faculties. • Attendance at relevant events, seminars and workshops organized by CHBE Graduate Student Club and/or other UBC or external bodies. • Identification of learning opportunities relevant to planned field of practice.

DEFINITIONS (http://www.gradsch.osu.edu/Depo/PDF/LearningGoals_11.19.12.pdf)

Learning Goals: Program learning objectives are *brief, clear, focused* statements of *intended* learning outcomes. Learning objectives come from program goals; they focus on students rather than curriculum. Each objective should be defined with outcomes assessment criteria in mind for “measuring” how well each objective has been accomplished. [Sources: Fresno State University; Western Washington University].

Learning goals may take multiple forms:

Cognitive Outcomes: *What do you want your graduates to know?*

Behavioral Outcomes: *What do you want your graduates to be able to do?*

Affective Outcomes: *How do you want your graduates to relate to their work and to others?*

