## TABLE OF CONTENTS

- Introduction ............................................................................................................................ 4  
- Contact Information .................................................................................................................... 4  
- Graduate Degrees ....................................................................................................................... 5  
- Financial Assistance ................................................................................................................... 6  
  - Health Insurance ....................................................................................................................... 7  
- International Students ............................................................................................................... 7  
  - English Language Proficiency ................................................................................................. 7  
- Minimum Course Requirements .................................................................................................. 7  
  - Transfer Credit .......................................................................................................................... 8  
  - Non-Matriculated Student ......................................................................................................... 8  
- Supervisory Committee and Research Topic ............................................................................. 8  
- Distinguished Lecture Series and Seminar ................................................................................. 8  
- Core Coursework ....................................................................................................................... 9  
  - GPA Requirements .................................................................................................................. 9  
- Master of Science (non-thesis) ................................................................................................. 10  
  - Proof of Employment .............................................................................................................. 10  
- Core and Electives ..................................................................................................................... 10  
  - Advanced Design Project (3 Semester Hours) ....................................................................... 10  
  - Final Examination ................................................................................................................... 10  
- MBA/MS Engineering ................................................................................................................ 11  
  - MBA/ MS Program Description .............................................................................................. 11  
  - MBA/ Engineering Options: ................................................................................................. 11  
  - Program Details ....................................................................................................................... 11  
  - Core and Electives in ChemE ................................................................................................. 11  
- Typical MS/MBA Program .......................................................................................................... 12  
- Master of Science (thesis) ......................................................................................................... 13  
  - Core and Electives .................................................................................................................. 14  
  - Graduate Seminar Sequence ................................................................................................. 14  
  - Preliminary Exam .................................................................................................................... 14  
  - Teaching Assistant Experience ............................................................................................... 14
Final Examination................................................................. 14
Forms and Filing Procedure .................................................. 14
Doctor of Philosophy.............................................................. 14
Core and Electives.................................................................. 14
Graduate Seminar Sequence .................................................. 15
Preliminary Exam .................................................................... 15
CH EN 7973 Thesis Research – Ph.D. (minimum of 14 semester hours) .................................................................................. 15
Teaching Assistant Experience................................................. 16
Qualifying Exam ...................................................................... 16
Research Proposal ................................................................... 17
Final Examination ................................................................... 18
Graduate Presentations and Technical Papers ............................ 18
Miscellaneous ........................................................................ 19
Forms and Filing Procedure .................................................. 19
Teaching Assistant Experience ................................................ 19
Policy for Terminating a Student’s Assistantship ...................... 20
Office Space and Mailboxes .................................................... 20
Computer Programming ......................................................... 20
Key Policy ............................................................................ 21
Safety ................................................................................... 21
Student Advisory Committee (SAC) ......................................... 21
Introduction

We welcome you to the Department of Chemical Engineering. This handbook should provide students with all necessary information and guidelines to successfully navigate their graduate studies. All graduate students are responsible for understanding the policies and procedures of both the department and the University of Utah Graduate School. Please contact any of the following individuals for additional information:

Contact Information

Dr. Mikhail Skliar, Director of Graduate Studies
3290 G MEB – (801) 581-6918 – mikhail.skliar@utah.edu

Dr. Mikhail Skliar is the Director of Graduate Studies for the Department of Chemical Engineering. As such, he is the preliminary advisor for students prior to their arranging for a research advisor and supervisory committee. For general matters, Dr. Skliar is available to answer questions for students who are unable to contact the Academic Advisor.

Tracey Farnsworth, Academic Advisor
3290 B MEB – (801) 585-7175 – tracey.farnsworth@utah.edu

Tracey assists students in all aspects of academic procedure. She is the primary contact for admissions. All students in the department must meet with Tracey during their second semester of coursework (excluding summer) to review academic plans. In addition, students should schedule appointments with and correspond regularly. She assists students with questions concerning policy, procedure, and graduation.

Ribana Milas, Administrative Officer
3290 C MEB – (801) 585-1811 – milas@eng.utah.edu

Jeri Schryver, Administrative Manager
368 INSCC – (801)581-8712 – jeri@eng.utah.edu

The administrative officer oversees the Tuition Benefit Program and Student Health Insurance Benefit Program. The administrative officer and administrative manager work with faculty advisors to manage student Research Assistant salaries. All students should correspond regularly with the administrative officer concerning tuition benefits and eligibility.

All University of Utah students are responsible for updating personal information (such as a change in address, name, phone number, or email address) with both the University through the Campus Information System and with the department through the academic advisor.
Graduate Degrees

The Department of Chemical Engineering confers the following graduate degrees:

- Doctoral Degree in Chemical Engineering
- Master of Science in Chemical Engineering (thesis)
- Professional Master of Science (non-thesis)
- Master of Science in Chemical Engineering/ Master of Business Administration (dual degree)

When applying for admission to the Graduate School, a student should decide to pursue a M.S., or Ph.D. degree. Degree requirements are outlined in greater detail in this handbook.

Admissions

Application materials are electronic. The Department of Chemical Engineering at the University of Utah requires that potential graduate students complete the on-line application found at https://app.applyyourself.com/?id=uou-eng. As part of this application, students submit three letters of recommendation. These letters are submitted electronically through the graduate application. Students must also have their official GRE scores sent to department by Educational Testing Service (ETS). GRE scores are required from ALL applicants.

The Admissions Office requires international applicants to achieve a minimum score of 500 (173 on computer-based exam) on the TOEFL (Test of English as a Foreign Language). TOEFL scores (if applicable) and transcripts must be sent directly to the Admissions Office.

Applicants whose bachelor’s degree is in a related field-- chemistry, physics, mathematics, or another branch of engineering -- may seek an advanced degree in chemical engineering provided that they demonstrate equivalent knowledge in the following subjects:

- Physical and Organic Chemistry (2 semesters)
- Calculus, Ordinary Differential Equations
- Computer Language
- Material and Energy Balances (CH EN 2800)
- Fluid Mechanics (CH EN 3353)
- Engineering and Equilibrium Thermodynamics (CH EN 2300 and 3853)
- Reaction Engineering (CH EN 3553)
- Heat Transfer (CH EN 3453)
- Mass Transfer and Separations (CH EN 3603)

Students lacking background in these areas may need to take appropriate courses to prepare for entry into the graduate core curriculum in chemical engineering. The student must initially consult with the Director of Graduate Studies and instructors of each of the core graduate courses to determine what remedial preparation will be required prior to enrolling in those courses.
Financial Assistance

Financial assistance is available to graduate students through a number of avenues, including sponsored-research assistantships, graduate fellowships, and teaching assistantships.

Students on a research assistantship are expected to work on the research project as instructed by the research supervisor. The University of Utah Research Committee awards a few Graduate Research Fellowships to graduate students in all colleges and departments of the University that offer advanced degrees. Students are nominated by the department in early March; contact the Academic Advisor for more information.

National Science Foundation (NSF) Graduate Fellowships and Minority Graduate Fellowships are offered for study or work leading to advanced degrees in Chemical Engineering. Graduate fellows are selected by the NSF on the basis of ability from among persons who are citizens or nationals of the United States. Applicants should request application cards from the Graduate Fellowship Office in October, complete the cards, and send them directly to the National Science Foundation. NSF will send each applicant an application to be completed and returned to NSF by the first week in December (exact date set by NSF each year). The Graduate Record Examination is required. No dependency allowances will be paid. Tuition and fees are covered.

The College of Engineering administer separate funds for small short-term loans. Student loans are approved on the basis of merit and need. Application is made through the college.

Tuition Benefit Program

Graduate students having assignments as teaching assistants, research assistants, graduate assistants or graduate fellows may qualify for tuition benefits. Full-time, matriculated, graduate students whose salary or fellowship meets minimum support requirements may have 50, 75, or 100 percent of graduate tuition covered. Students should contact the department if additional information is needed. This benefit applies to graduate courses in the student’s program of study, only. The benefit does not cover special fees.

Students that qualify for the Tuition Benefit are required to adhere to the policy outlined by the Graduate School. The qualifications and the policy can be found at http://www.utah.edu/graduate_school/index.html. It is essential that students understand the following specifics extracted from the policy:

- Students receiving the benefit must be registered for at least 9 semester hours during the fall and spring semesters (all classes must be approved by the student’s Supervisory Committee) to be eligible, and can register up to a maximum of 11 hours. The Chemical Engineering Department requests that students who are receiving the Tuition Benefit Program register for 11 hours (courses plus research hours). Students only receive 3 semester hours of tuition benefit during the summer semester.

- Students adding or dropping courses after the published university deadline are responsible for paying any and all fees incurred.

- Students in a master’s program are limited to 2 years (4 semesters) of tuition benefit support.

- Students in a doctoral program who entered with a Bachelor’s degree are limited to 5 years (10 semesters) of tuition benefit support.

- Students in a doctoral program who also received a master’s degree at the University of Utah are limited to 5 years of tuition benefit support (2 years for a master's and 3 additional years for a doctorate).

- Students entering a doctoral program with a master’s degree from another university are eligible for four years (8 semesters) of tuition benefit support.
After all course requirements are completed, students may retain their full-time status by registering for at least 3 thesis research hours. If a graduate student (domestic and international) has used their eligible tuition benefits but must register for thesis credit hours, the resident tuition rate will be charged. Students must be registered for a minimum of three credit hours for the semester in which the thesis/dissertation defense takes place.

Students should consult with the Administrative Officer to determine how many tuition benefits they qualify for.

Health Insurance

The Department of Chemical Engineering takes part in the Graduate Student Health Insurance Benefit Plan (HIBP). The University will provide an 80% subsidy on a single student basic insurance premium for full time Research Assistants. More information about the HIBP can be found at http://www.utah.edu/gradschool/. Students should consult with the Administrative Officer about these benefits.

International Students

The Department of Chemical Engineering is proud to accept a number of international students each year. International students are responsible for keeping their visas in status. International students must attend an international student orientation. International students should report to the International Center (Student Union room 410, 581-8876) as soon as they arrive in Salt Lake City. International students must report all vacation semesters (including summer) to the International Center.

English Language Proficiency

All graduate students are expected to have, or to develop a proficiency in, both written and oral English. All students whose first language may be required to take one or more English as a Second Language classes; more advanced students may be excused.

Minimum Course Requirements

All graduate students must maintain minimum registration of three (3) hours per semester (summer is optional) from the time of formal admission through completion of all requirements for the degree they are seeking unless granted an official leave of absence (see the Bulletin of the University of Utah Graduate School and the General Catalog for details). Students not on campus and not using University facilities are not expected to register for summer term. If students do not comply with this continuous registration policy and do not obtain an official leave of absence, their supervisory committee is terminated and their records are inactivated. To reactivate a file at a later time, the student is required to reapply for admission to The Graduate School. Students who are not planning to maintain minimum registration must consult with the academic advisor and administrative manager.

Students should be aware of minimum continuous registration requirements that apply to the Graduate Tuition Benefit Program: student must be full-time to qualify for Tuition Benefits. To be full time, a student must have at least 1 year (2 consecutive semesters) of full-time academic work. A full-time course load is a minimum of 9 credit hours.

The University of Utah Graduate School rules for registration can be found at http://www.utah.edu/gradschool/.

The option to enroll in some courses on a credit or no credit (CR/NC) basis instead of graded basis is available. With the CR/NC classes, students may extend their studies to areas outside their major and take classes that they might not otherwise take if competing with majors for a letter grade. During the student’s study in graduate school, the student may register for no more than three classes on a CR/NC basis subject to the conditions below:

- The choice of courses to be taken on a CR/NC basis is subject to the approval of the student’s Supervisory Committee.
• Chemical Engineering thesis research hours must be taken CR/NC.

• All courses, which are listed for 1 hour or less, will be graded on a simple CR/NC basis, unless the Graduate Council approves the use of regular letter grades.

• Graduate students should earn a grade of "C" or better to be entitled to "Credit." Students, who do not wish to register for credit, either the letter grade or the CR/NC option, should merely audit the course. However, they must register for the course as an audit and must pay the appropriate University fees.

Students are reminded of the importance of receiving letter grades in order to build a graduate grade point average. This is especially important if the student should apply for fellowships or traineeships on a competitive basis or should later transfer to another institution. Additionally, a minimum of 24 of the 30 credit hours must be taken during graduate resident study at the University of Utah.

Transfer Credit

Up to 6 acceptable semester hours of graduate work (completed, at most, 4 years prior to registration) may be transferred from another institution. These credits cannot be ones that were applied towards completion of a previous degree.

Non-Matriculated Student

Students can transfer up to 9 credit hours (5000+) taken as a non-matriculated student

Supervisory Committee and Research Topic

All students must have an approved Supervisory Committee by the second year of graduate work. Any student who is not supported on a research project should make appointments with the Chemical Engineering faculty to discuss and choose a possible research topic during their first semester. Students should file with the Academic Advisor a "Request for Supervisory Committee" form. The student, in consultation with his/her Research Advisor, selects potential members of the Supervisory Committee. Either the department chair or the Director of the Graduate Studies must then approve the committee choices. At this time, the Chair of the Supervisory Committee becomes the candidate's advisor on all matters.

The Supervisory Committee for a master’s degree candidate shall consist of three faculty members. At least two faculty members must be regular faculty members in the Chemical Engineering Department. The committee for a Ph.D. candidate will consist of a minimum of five members with at least three regular faculty members from the Department and at least one member outside the Department. The Supervisory Committee is appointed no later than the end of the second year of study of a student’s graduate work. Appointments may be made to the graduate Supervisory Committees of persons who are not on the regular or auxiliary faculty in the University. These members, however, must be approved by action of the Graduate Council on recommendation of the Department Chairman and the Dean of the Graduate School. Students must obtain a vita for these members and submit it to the Academic Advisor to be reviewed by the Graduate School.

The Supervisory Committee consults with the student in planning degree programs and thesis research. If a Supervisory Committee finds a graduate student’s preliminary work deficient, the student may be required to take supplementary courses.

Distinguished Lecture Series and Seminar

The Department of Chemical Engineering hosts a Distinguished Lecture Series (DLS) during the academic year. Approximately four lectures are offered in which a notable guest is invited to present a seminar on a topic related to Chemical Engineering. All students, faculty, and staff are strongly urged to attend these events.

In addition to the DLS, other seminars may be hosted by the Department of Chemical Engineering, other University of Utah departments, and non-campus organizations. All graduate students are strongly urged to attend these events as they will add to the depth and breadth of their studies.
Core Coursework

The following courses are the foundation for each of the graduate degrees conferred. It is in the best interest of students to complete these courses as soon as possible.

Core for students with previous degree in Chemical Engineering

- **CH EN 6353: Fluid Mechanics** (3) Prerequisite: CH EN 3353 or equivalent. Introduction to tensor analysis and derivation of governing partial differential equations. Solution of problems in Newtonian, laminar, incompressible flow. Introduction to potential flow, turbulence, non-Newtonian flow, and compressible flow.
- **CH EN 6603: Multicomponent Mass Transfer** (3) Prerequisite: Instructor’s consent. Diffusion in multicomponent systems, Maxwell-Stefan relations, generalized Fick’s law for multicomponent systems, linearized theory, applicability of pseudo-binary approximations. Multicomponent mass transfer coefficients, effects of mass transfer on energy transfer, mass and energy transfer models.
- **CH EN 7753 and 7755: Intro to Research Sequence** (1 credit each; 2 credits total) This series is required for the first year, Fall and Spring semesters only.
- **CH EN 7857 and 7859: Graduate Seminar Sequence** (0.5 credit each) Continuous enrollment in 7857 (Fall semester) and 7859 (spring semester) every Fall and Spring semester until graduation.

Core for students without a previous degree in Chemical Engineering

- **CH EN 6353: Fluid Mechanics**
- **CH EN 6603: Multicomponent Mass Transfer**
- **CH EN 6553: Chemical Reaction Engineering** (3) Prerequisite: CH EN 2703 and CH EN 3553 or equivalent. Development of rate equations and evaluation of parameters from data for homogeneous and heterogeneous reacting systems including catalytic reactions. Global rate equations with simultaneous heat/mass transfer with reaction. Use of transition state theory to understand and estimate rate parameters. Reactor design including changes in pressure through a reactor, non-isothermal effects, multiple reactions/reversible reactions, non-ideal flow regimes (one-dimensional models), reactor stability, and parameter sensitivity analysis.
- **CH EN 7753 and 7755: Intro to Research Sequence** (1 credit each; 2 credits total) This series is required for the first year, Fall and Spring semesters only.
- **CH EN 7857 and 7859: Graduate Seminar Sequence** (0.5 credit each) Continuous enrollment in 7857 (Fall semester) and 7859 (spring semester) every Fall and Spring semester until graduation.

GPA Requirements

All candidates for graduate degrees in Chemical Engineering must maintain an average GPA of 3.0 or better in the overall course of study in accordance with Graduate School requirements. In addition, they are required to obtain an average GPA of 3.0 (out of 4.0) or better in the Chemical Engineering 5000-, 6000-, and 7000-level courses which are used to satisfy degree requirements. Additional GPA constraints exist for the 4 core courses in Chemical Engineering. Grades below C are not acceptable in any course.
Master of Science (non-thesis)

The degree of Master of Science (non-thesis) recognizes academic achievement without an emphasis on research. A satisfactory score must be achieved on the preliminary examination. A minimum of thirty (30) semester hours is required. However, a thesis is not required. This degree is only available to students who are working full time as professional engineers. If moving from Master thesis to non-thesis research hours CANNOT be used towards the 30 credit hours required to graduate.

Proof of Employment
Proof of employment is required from current employer outlining position and to verify full time status. This form is required as part of the admission application

Core and Electives
The general requirements for the MS (non-thesis) degree are outlined in Figure 1 and summarized below

- CH EN 6353 Fluid Mechanics
- CH EN 6603 Mass Transfer
- CH EN 6553 Chemical Reaction Engineering
- CH EN 6853 Thermodynamics

= 3.0 GPA min. required in the four Core Courses
15 Additional Elective Credit Hours – at least 3 must be from ChemE Electives
CH EN 6253 Advanced Design

Advanced Design Project (3 Semester Hours)
- An advisor for this project must be selected from among the Chemical Engineering faculty. The project must be selected by the advisor and the student. A written report is required and is defended orally before the student’s three-member supervisory committee
- A minimum of 3 credit hours is required for a special Masters project that should consist of one of the following:
  - Independent study to develop a student-based project for an undergraduate course, senior projects laboratory, or senior process design. Multiple projects may be required.
  - A specific design project that may or may not be related to the student’s professional employment
  - Register for the following course. A maximum of 3 credit hours can be taken in a given semester.
  - CH EN 6253 – Advanced Design (3)

Final Examination
An oral defense of the Special Project, administered by the Supervisory Committee, serves as the final examination of the candidate. Student MUST BE REGISTERED FOR AT LEAST 3 HOURS IN THE SEMESTER THE ORAL DEFENSE IS GIVEN. The final exam must be scheduled following the completion and approval of the Special Project. Request for Supervisory Committee and Application to Candidacy forms must be filed and approved by the Graduate School before the defense.

Forms and Filing Procedure
Forms are submitted to the academic advisor by the appointed deadline. The information is entered electronically. You can track your forms through the audit link located through your campus information system.

The following forms are available on the Chemical Engineering web page at http://www.che.utah.edu/graduate/forms.php. Completed forms (including the research proposal form) are to be submitted to the Academic Advisor.
- Request for Supervisory Committee: Due by the second year of graduate work. Signature required.
- Program of Study: Due one semester prior to graduation and no earlier than one year prior to graduation.
MBA/MS Engineering

The MBA/MS Engineering combines an MBA with a Master of Science in Engineering. The U of U is a worldwide hub of innovation and technology commercialization, and our MBA/MS Engineering graduate students bridge the gap between techno-types and entrepreneurs.

MBA/ MS Program Description

The College of Engineering and the David Eccles School of Business offer a dual degree program in which the students can earn both an MBA and MS Engineering degree in just two years. The MBA/MS Engineering dual-degree program combines students' applied interests and training in Engineering with the comprehensive business skills developed in a full-time MBA program. Graduates develop the skills needed to move between complex technical issues and the commercial issues of leading and managing businesses. Our graduates are valuable assets to companies who rely on technological innovation to stay competitive in the business world. Graduates of the MBA/MS program earn two distinct degrees in one integrated educational experience. Two degrees are awarded. Two degrees - one exceptional experience.

MBA/ Engineering Options:

Currently, the dual degree program is offered through five engineering programs.
Master of Science (MS) Bioengineering : MS Chemical Engineering MS Computer Science : MS Electrical and Computer Engineering MS Mechanical Engineering

Program Details

Length of Program:
A student enrolled in the joint degree program earns both degrees in 21-24 months of full-time study. In general, students take 21 credit hours in the College of Engineering, 47 hours in the College of Business. This is in addition to a 6 hour capstone project taught across both colleges.

*If the MBA degree is dropped the student must meet with the Graduate Director to determine the course of study to receive the MS degree in Chemical Engineering

Core and Electives in ChemE

CH EN 6353 Fluid Mechanics
CH EN 6603 Mass Transfer
CH EN 6553 Chemical Reaction Engineering
CH EN 6853 Thermodynamics
= 3.0 GPA required in the four Core Courses
Typical MS/MBA Program

Orientation Week - MGT 6050 Teams Foundations (1.5)

Fall Semester 17 credits (including orientation)

- ACCTG 6000 Financial Accounting (3.0)
- OIS 6040 Data Analysis I (1.5)
- OIS 6060 Operations MGT I (1.5)
- MKTG 6090 Marketing (3.0)
- FINAN 6025 Managerial Economics (3.0)
- Engineering Course (3.0) Fluid Mechanics
- MBA 6000 Career Strategies (0.5)

Spring Semester 16.5 credits

- ACCTG 6001 Managerial Accounting (1.5)
- IS 6010 Information Systems (1.5)
- OIS 6061 Operations Management II (1.5)
- OIS 6041 Data Analysis II (1.5)
- FINAN 6020 Finance (3.0)
- MGT 6053 Adv. Writing for Business (1.5)
- Engineering Course (3.0) Mass Transfer
- Engineering Course (3.0) Kinetics

Summer Semester 6 credits

- Business Elective (3.0)
- Business Elective (3.0)

Fall Semester 16.5 credits

- Capstone I (3.0)
- MGT 6070 Business Strategy (1.5)
- MGT 6071 Corporate Strategy (1.5)
- MGT 6051 Managing & Leading (3.0)
- Engineering Course (3.0) Thermodynamics
- Engineering Course (3.0) Elective

Spring Semester 12 credits

- Capstone II (3.0)
- Engineering Course (3.0) Elective
- Engineering Course (3.0) Elective
- Business Elective (3.0)

Summer Semester 6 credits

- Business Elective (3.0)
- Business Elective (3.0)
Master of Science (thesis)

The minimum average GPAs are 3.0 for students pursuing master’s degrees, and the Master of Science requires an approved course of study consisting of at least 30 combined credit hours. There are no minor or language requirements, but a thesis is required. In addition, a satisfactory score must be achieved on the preliminary examination. With adequate undergraduate preparation, requirements for the MS degree can be completed in one to two years, depending upon how early the student initiates a research program. All work for the degree should be completed within four years.

Core and Electives

The general requirements for the MS (thesis) degree are outlined in Figure 2 and summarized below

**Previous Degree in ChemE:**
CH EN 6353 Fluid Mechanics
CH EN 6603 Mass Transfer
= 3.0 GPA in the two Core Courses
15 Additional Elective Credit Hours – at least 9 must be from ChemE Electives

**Previous Degree NOT in ChemE:**
CH EN 6353 Fluid Mechanics
CH EN 6603 Mass Transfer
CH EN 6553 Chemical Reaction Engineering
CH EN 6853 Thermodynamics
= 3.0 GPA in the four Core Courses
9 Additional Elective Credit Hours – at least 3 must be from ChemE Electives

CH EN 6973 Thesis Research – Masters (minimum of 7 semester hours).
* Research hours are graded on a credit/no-credit basis.

Graduate Seminar Sequence

Taken the first two semesters of the graduate program

Preliminary Exam

A student’s performance in the graduate core courses serves as the preliminary examination for the department. Students must attain a minimum GPA in these courses to be allowed to continue on towards a graduate degree. The minimum average GPA is 3.0 for students pursuing a master degree. Note that Chemical Engineering graduate students cannot take these courses using a CR/NC option. In addition, any grade less than a C will be unacceptable for credit in a Chemical Engineering course. Students who do not meet these minimum requirements must develop a plan, in consultation with their Supervisory Committee, and then petition the Graduate Committee for the required action. The Department of Chemical Engineering may dismiss students that do not meet these minimum standards.

Although a specific timeframe requirement for completion of the core courses is not mandated, it is in the best interest of the student to complete the core courses as soon as possible. Note that there is a limit on the number of tuition benefits a student may receive in the Tuition Benefit Program (as described in Section III -1); therefore, timely completion of all graduate coursework should be a significant priority.

Students who have previously taken equivalent core graduate courses from other institutions may petition the Graduate Committee for an exemption from those courses. No more than two core courses may be waived. The same GPA minimum requirements as described above would apply to the equivalent core graduate courses.
Teaching Assistant Experience
- Successfully complete one teaching assistant assignment (unpaid).

Final Examination
- Candidates must defend their thesis at least six weeks prior to the semester of graduation. This defense will suffice as the final oral examination and will be administered by the student’s Supervisory Committee. The Request for Supervisory Committee and Application for Admission to Candidacy forms must be filed and approved by the Graduate School before the thesis defense.

Forms and Filing Procedure
Forms are submitted to the academic advisor by the appointed deadline. The information is entered electronically. You can track your forms through the audit link located through your campus information system.

The following forms are available on the Chemical Engineering web page at [http://www.che.utah.edu/graduate/forms.php](http://www.che.utah.edu/graduate/forms.php).

Completed forms (including the research proposal form) are to be submitted to the Academic Advisor.
- Request for Supervisory Committee: Due by the second year of graduate work.
- Program of Study: Due one semester prior to graduation and no earlier than one year prior to graduation.
- Graduation Application: Due to the graduation office one semester prior to graduation (deadlines posted
- Final Examination: Due six weeks before the last day of examinations during the semester of graduation.
- Dissertation Release: Due by the last day of examinations during the semester of graduation. Delivered by the thesis editor to Graduate Records, then to the Graduation Department.
- Final Exit Form: Due to the Chair of the Department after the final defense has been approved.

Doctor of Philosophy
The degree of Doctor of Philosophy (Ph.D.) in Chemical Engineering represents scholarly achievement demonstrated by independent research. To be considered for the Ph.D. degree, students must achieve a satisfactory score on the preliminary examination. In addition, a Ph.D. candidate must demonstrate general competence in the subject matter of the student's chosen field. Of major importance to the Ph.D. degree is the student's research and dissertation. The dissertation must embody the result of independent research and constitute a significant contribution to knowledge in the student's field. The intellectual and creative matter presented in the dissertation must meet the standards of the college, the department, and the student's Supervisory Committee.

Course of Study for the Doctor of Philosophy
*Students with a master's degree from the University of Utah or another University should see their advisor for course of study requirements.

Core and Electives
The general requirements for the PhD degree are outlined in Figure 3 and summarized below

Previous Degree in ChemE:
CH EN 6353 Fluid Mechanics
CH EN 6603 Mass Transfer
= 3.3 GPA in the two Core Courses
24 Additional Elective Credit Hours – at least 9 must be from ChemE Electives
Previous Degree NOT in ChemE:
CH EN 6353 Fluid Mechanics
CH EN 6603 Mass Transfer
CH EN 6553 Chemical Reaction Engineering
CH EN 6853 Thermodynamics
= 3.3 GPA in the four Core Courses
18 Additional Elective Credit Hours – at least 3 must be from ChemE Electives

** Graduate students may petition the Graduate Committee to waive up to two of the four core courses required by the University of Utah Chemical Engineering Doctor of Philosophy degree if they have taken a similar class at the graduate level another institution. Students who have taken these classes outside of the United States or from a department other than a chemical engineering department must provide sufficient documentation to support their petition. The petition to waive these classes must be signed by both the student and their research advisor. The Graduate Committee will review the student’s performance in the class, as well as the class content.

Students with an MS degree will work with their supervisory committee to plan additional coursework as seems appropriate. Generally, approximately one year of additional coursework is required. As stated in the Bulletin of the University of Utah Graduate School, at least one year (i.e., two consecutive semesters) must be spent in full-time academic work. At the University of Utah a full-time academic load is defined as a 9 or more credit hours per semester, including research credits.

The length of time required for this program depends primarily on the diligence with which the student pursues his or her research project. Those who are most diligent should expect to complete their degree within approximately 3 years.

**Graduate Seminar Sequence**
Intro to Research (CH EN 7753 and 7755) must be taken the first two semesters (Fall and Spring)
Graduate Seminar (Continuous enrollment in CH EN 7857 and 7859 is required every subsequent Fall and Spring semester until graduation.

**Preliminary Exam**
As outlined in Figure 3 a student’s performance in the 2-4 graduate core courses serves as the preliminary examination for the department. Students must attain a minimum GPA in these courses to be allowed to continue on towards a graduate degree. The minimum average GPA is 3.3 for students pursuing a doctoral degree. Note that Chemical Engineering graduate students cannot take these courses using a CR/NC option. In addition, any grade less than a C will be unacceptable for credit in a Chemical Engineering course. Students who do not meet these minimum requirements must develop a plan, in consultation with their Supervisory Committee, and then petition the Graduate Committee for the required action. The Department of Chemical Engineering may dismiss students that do not meet these minimum standards.

Although a specific timeframe for completion of the core courses is not mandated, it is in the best interest of the student to complete the core courses as soon as possible. Note that there is a limit on the number of tuition benefits a student may receive in the Tuition Benefit Program; therefore, timely completion of all graduate coursework should be a priority.

Students who have previously taken equivalent core graduate courses from other institutions may petition the Graduate Committee for an exemption from those courses. No more than two core courses may be waived. The same GPA minimum requirements as described above would apply to the equivalent core graduate courses.

**CH EN 7973 Thesis Research – Ph.D. (minimum of 14 semester hours)**
- Once the student has selected a research topic, he/she will be expected to register each semester for CH EN 7973 (research) for a number of credit hours agreed to by the thesis advisor.
- Research hours are graded on a credit/no-credit basis.
Teaching Assistant Experience

- Successfully complete two teaching assistant assignments (unpaid). See page 12

Qualifying Exam

Only graduate students interested in pursuing a PhD are required to take this examination, and students are not eligible to take the Qualifying Examination until the core coursework has been completed with a minimum average GPA of 3.3.

The Qualifying Examination will consist of a critical review of a scientific paper, presented in both written and oral form. This examination provides an opportunity for the faculty to assess a student’s creativity, critical thinking skills; grasp of fundamental chemical engineering principles, and is used as a means for determining potential for doctoral-level graduate research.

Students will be assigned a journal article. They will be given one week in which to perform their critical review and to submit a written synopsis of no more than five, double-spaced pages. The written critiques will be based on guidelines provided below.

All faculty members are encouraged to evaluate the students taking the Qualifying Examination. Each faculty member will be given a profile of each student that is taking the exam; the profile will contain a summary of their Preliminary Examination (core courses and grades) and any other relevant information. Each faculty member will also be given a copy of the student’s written critique and should read and evaluate the written critique before the oral component of the exam.

Small groups of faculty, three or four, will be scheduled for 1 hour per student to evaluate the student’s performance. The students will present, uninterrupted, for 10 – 15 minutes to the small faculty group. Faculty will have approximately 25 - 30 minutes to question the student. The students may question the student on the written critique, the oral presentation, the article, or basic Chemical Engineering principles as defined by the core curriculum. The last 15 minutes will be spent evaluating the student’s performance, without the student present. Students will rotate through all of these small groups; they will have a 15 minute break between presentations while the faculty evaluates student performances. A minimum of 9 faculty members must evaluate the student.

At the end of the 45 minute session, each faculty member will write an evaluation of the student on a standardized evaluation form, that will provided to the faculty before the exams begin. Students will be able to see a blank copy of the form to help prepare for the qualifying exam. The evaluation must contain constructive feedback to aid the student if they have not passed the Qualifying Examination. The feedback will be collected and given to the graduate committee. Every faculty member will have one vote of a pass or fail on a student’s performance. The vote will be confidential and anonymous; the faculty will vote on their evaluation sheets. The vote will be counted at the end of the Qualifying Examination. Students who have been voted ‘pass’ by 75% or more of the faculty will pass the Qualifying Examination without discussion. Students who are voted ‘fail’ by 50% or more of the faculty will fail the Qualifying Examination without discussion. Students who fail to get these percentages of votes will be discussed by the Graduate Committee as soon as possible after the exam period. The student’s research advisor will attend the discussion, and all faculty will be invited to attend. All students will be notified by letter of the outcome of their examination. Students who did not pass will be given feedback on how to improve their performance.

Students who fail the Qualifying Examination may petition the Graduate Committee to retake the examination at a later date. University guidelines specify that the Qualifying Examination can only be repeated once (Graduate Handbook, the Graduate School of the University of Utah).

The Qualifying Examination will be offered twice yearly. Students are encouraged to take this examination as soon as possible, but are not required to take it at a specific time. Students must complete their required graduate core courses prior to requesting a Qualifying Examination.

The Chemical Engineering Qualifying Examination has two objectives:
- To evaluate the student’s critical thinking ability and creativity through their independent evaluation of someone else’s work.
To evaluate the student’s understanding of basic chemical engineering principles as covered by the Chemical Engineering graduate core courses.

**Students are not allowed to seek help from other students or faculty members once they have selected the journal article.**

**Written Critique Guidelines**

Write a five-page, double-spaced critical review of the paper you have selected from the list of journal articles provided to you (note that you receive approval for your selection prior to initiating your review). This paper should be more than a summary of the work and should address the following points.

- The originality of the work
- The quality of the technical approach
- The clarity of the presentation
- The importance of the work to the field

The specific details of this review will depend on the nature of the paper you have selected. Examples of the types of questions that a review should address follow: are the assumptions made in the theory or models sufficiently general to allow broad application? Is the experimental design adequate to address the questions? Are the conclusions adequately supported by the data presented? Are there alternative explanations of the results which the authors did not consider? Are the literature references appropriate and correct? How does this work compare and contrast to other published works in this area?

**Oral Examination Guidelines**

In the first half of this oral exam, the student will present an uninterrupted oral summary of the technical paper. The length of this oral summary must not exceed 15 minutes, with no more than 7 minutes spent discussing the background of the research topic. A question and answer period will follow the oral summary, in which the student will answer questions about the technical paper, the written critique, and any concepts in the core Chemical Engineering graduate courses. The student should be prepared to answer questions about the following.

- The technical assumptions of all the models and equations appearing in the technical paper, and the validity of these assumptions.
- The basic Chemical Engineering principles involved in this paper and how they are applied.
- Comparison between the technical paper and other important published papers on the same or similar research topic.
- The validity of the conclusions of the technical paper.
- Suggestions for future work on the same research topic covered by the technical paper.

Basic Chemical Engineering principles from all of the core courses, whether or not they are involved in the paper.

**Research Proposal**

Only graduate students interested in pursuing a Ph.D. are required to complete a Research Proposal, and students are not eligible to submit a Research Proposal until they have successfully passed the Qualifying Examination. Ph.D. students are strongly urged to complete their Research Proposal within one year of passing the Qualifying Examination.

The Research Proposal involves the creation of a written proposal and an oral defense of that proposal to their Supervisory Committee. The proposal should be completed once a student has made significant progress towards a doctoral degree, typically after completion of their second year of graduate work. The Research Proposal provides an opportunity for the student to formulate a plan for completion of his/her degree, when they are now at a stage where they are intimately familiar with their research area and will have completed a significant fraction of their research. The proposal presentation provides a forum where the student and the Supervisory Committee can determine what will be required of the student to complete his/her dissertation. It is recommended that the student meet informally with individual members of the Supervisory Committee during preparation of the proposal.

The written proposal should not be longer than 20 double-spaced, typewritten pages of text, excluding nomenclature, references tables, figures, and appendices. It is recommended that the document be organized in the form shown in Appendix D. This written document must be reviewed by the student’s faculty advisor before submitting it to the
Supervisory Committee. Final approval of the proposal will come after review by the entire Supervisory Committee and the oral presentation.

The oral presentation should closely reflect the contents of the written proposal and should be no longer than 30 minutes, assuming that there are no interruptions. The student is encouraged to limit discussion of background information to 5 minutes and dedicate the remainder of the presentation to a detailed description of the proposed research program. The originality and potential significance of the proposed research should be emphasized.

The outcome of this proposal will be Pass, Pass with Qualification, or Fail. The Pass with Qualification may require that the student rewrite the research proposal and/or make a second oral presentation. The rewritten proposal must be resubmitted to the Supervisory Committee for approval.

The student should not write the research proposal assuming that the readers will be experts in the area of research of the proposal. The proposal should be written at a level that is understandable to a reader with only a general knowledge of chemical engineering.

Please have committee members sign the Research Proposal Form and submit to the Academic Advisor.

**Recommended Outline for Research Proposal**

1. Cover page
2. Summary (one page)
   - a. Research objectives
   - b. Significance of the proposed research
3. Literature Review (~5 pages)
   - a. The general literature in the field
   - b. Previous and current work conducted in the research advisor’s lab
4. Proposed Research Program (~8 pages, not including figures)
   - a. Research objectives
   - b. Expected significance
   - c. Broad description of experiments and/or modeling to be undertaken
   - d. Adequate description of proposed experimental and/or numerical methods
   - e. Relation of the proposed program to the goals of the research cited in the literature survey
5. A Clear and Concise Statement of the Student’s Original Contributions
6. Nomenclature
7. References
8. Appendices
   - a. A copy of the references most pertinent to the proposed research program.

**Final Examination**

- Candidates must defend their thesis at least six weeks prior to the semester of graduation. This defense will suffice as the final oral examination and will be administered by the student’s Supervisory Committee. The Request for Supervisory Committee, Report of the Qualifying Exam and Application for Admission to Candidacy, and the Program of Study forms must be filed and approved by the Graduate School before the thesis defense.

**Graduate Presentations and Technical Papers**

- It is required that all graduate students give technical presentations and publish technical papers during their academic career. This includes a technical presentation at a meeting, conference, or seminar. It is suggested that Ph.D. students are suggested to give three presentations and publish three papers.
Miscellaneous

- While the Chemical Engineering Department does not require any foreign-language examination, the candidate's Supervisory Committee may require proficiency in a foreign language if, for example, important literature pertaining to the research topic exists in another language.

- In approving a proposed program of study, the Supervisory Committee will take into account acceptable graduate-level courses taken at other institutions or the University of Utah. Students may petition to have transfer credit substituted for any of these requirements. Note that a maximum of 6 semester hours of credit from another institution may be applied toward graduate degree requirements.

Forms and Filing Procedure

Forms are submitted to the academic advisor by the appointed deadline. The information is entered electronically. You can track your forms through the audit link located through your campus information system.

The following forms are available on the Chemical Engineering web page at http://www.che.utah.edu/graduate/forms.php. Completed forms (including the research proposal form) are to be submitted to the Academic Advisor.

- Request for Supervisory Committee: Due by the second year of graduate work. Signatures required.
- Research Proposal
- Program of Study: Due one semester prior to graduation and no earlier than one year prior to graduation.
- Graduation Application: Due to the graduation office one semester prior to graduation (deadlines posted
- Final Examination: Due six weeks before the last day of examinations during the semester of graduation.
- Dissertation Release: Due by the last day of examinations during the semester of graduation. Delivered by the thesis editor to Graduate Records, then to the Graduation Department.
- Final Exit Form: Due to the Department Chair after the final exam has been approved.

Teaching Assistant Experience

All graduate students are expected to serve as a teaching assistant. Master's students must successfully complete one teaching assistant assignment; doctoral students must successfully complete two. A teaching assistant (TA) is expected to establish rapport with the course instructor(s) and identify the instructor(s) specific expectations for the course. TAs are expected to establish office hours and provide weekly help sessions to students. TAs will provide grading for assignments, as directed by the instructor. The instructor is encouraged to provide the TA with an opportunity to teach one or two classes in order to provide a classroom teaching experience.

Students can serve as a TA at any time during their program; however, in general, graduate students will have successfully completed at least one year of course work in the graduate program of chemical engineering before requesting a TA assignment.

Responsibilities
1. Teaching Assistants are expected to establish rapport with the course instructor(s) and identify the instructor(s) specific expectations for the course.
2. Teaching Assistants are expected to establish office hours and provide weekly help sessions to students.
3. Teaching Assistants will provide grading for assignments, as directed by the instructor.
4. The instructor is encouraged to provide the TA with solutions for assignments to be graded in order to equalize grading results.
5. The instructor is encouraged to grade major exams personally.
6. The instructor is encouraged to provide the TA with an opportunity to teach one or two classes in order to provide a classroom teaching experience.

Process
1. Students will be notified each semester of TA opportunities.

2. The department’s academic advisor will match course needs with student’s and make initial assignments. Instructors will review and accept or reject the proposed assignments. The academic advisor will seek to arrange for an alternative assignment for students that are unacceptable in a course or to an instructor.

3. The academic advisor will establish a contract for services with the TA that outlines the expectations of the department and course instructor. If the assignment is to fulfill a graduation requirement, the agreement will so state. If the assignment is a paid position, the compensation amount and expected effort (FTE) will be included in the agreement. (Current compensation is at the rate of $1,370 per course, regardless of credit hours or number of students in the course.)

4. The course instructor will complete an evaluation of the TA’s performance at the end of the semester and submit the evaluation to the department chair. Input from the students of the course should be solicited. TAs will be provided with a job performance summary from input from instructor and students. Unsatisfactory performance by the TA may result in (1) the nullification of the assignment as satisfactory completion of a graduate program requirement or (2) restriction on future participation in paid TA assignments. The evaluation will become part of the students’ departmental academic files.

Policy for Terminating a Student’s Assistantship

The faculty advisor should inform the student in writing if there is a serious problem with the quality or quantity of the student’s work. The letter should include suggestions for corrective actions and desired improvements. A copy of the letter should be placed in the student’s file. At least four weeks should be allowed for the student to improve their performance. During this period the student should meet with their advisor at least once. The outcome of this meeting should be documented. If at the end of this time, if the faculty member does not perceive an improvement, the faculty member should inform the student in writing of the decision to terminate the student’s assistantship. The final outcome of the process should be documented.

Office Space and Mailboxes

Office space should be obtained from the student’s research advisor. The Chemical Engineering Department will assign each graduate student a mailbox in the department library (MEB 3289). Graduate students should check their mailboxes frequently. Students are responsible for notifying the department if their mail needs to be forwarded. Once a student has completed their graduate degree, they must vacate their mailbox and have all mail forwarded.

Computer Programming

Some of the core courses require the writing of computer programs. It is necessary, therefore, for all graduate students to have a proficiency in at least one programming language. Students entering without this skill should consult the Director of Graduate Studies. The software program MATLAB is used extensively in some courses.

Contact Brian Gregory for information on accessing software remotely.
Key Policy

Keys to assigned lab space may be obtained through the department office. KEYS SHOULD NOT BE LOANED. University policy prohibits duplication. All keys must be returned upon leaving the University of Utah.

Safety

Students are responsible for their own personal safety. Each faculty advisor is responsible for safety on the project. Report unsafe conditions or practices to your advisor. The Department Chair is responsible for the general safety of all projects, courses or activities in the department. The Department Safety Coordinator, Dr. Keith Roper, may be consulted on all aspects of safety. All students are required to attend the OSHA Safety Course offered by the College of Engineering each fall. Work areas should be kept clean and free from obstructions. At the completion of any operation or at the close of day, clean up and deposit wastes in proper receptacles. Clean up spilled chemicals immediately. For hazardous chemical spills see the Department Safety Coordinator. Chemicals and solvents must be stored and discarded in an approved manner. Label all containers. Hallways and stairways should not be used as storage areas. Keep access to exits free from supplies and equipment.

Follow proper procedures for operation of various specific pieces of equipment. Examples are: drill presses, grinding wheels, high-pressure presses, autoclaves, hand drills, etc. Know how to handle high-pressure gas cylinders -- storage, transportation and application. Follow safe procedures in working with glassware. The most common lab injuries are cuts, punctures, and burns. In addition, prudent safety practice dictates that students do not work alone when operating laboratory equipment.

Use the safety devices and equipment at your disposal including safety barriers or shields, if needed. Provide a written emergency shutdown procedure near your experimental setup. KNOW the toxicity, flammability, etc. of the chemical that you use. MSDS’s (Material Safety Data Sheets) should be available for all chemicals that you use. Contact your faculty research advisor and Safety Services if there are fumes, odor, chemical spills, etc. and if there are problems with fume hoods.

All "lost time" accidents or injuries must be reported to the Utah State Department of Public Safety within 24 hours of their occurrence. This must be done through the Department Office and the Department of Public Safety. The University Administration carries a Liability Insurance Policy, which in effect covers expenses where the University or any of its employees are liable. The individual must cover personal injuries that may occur where the University or one or more of its employees are not liable. Accident or injury insurance is available and can be obtained by individual students. Non-University employees and students should not be in the laboratories at any time.

Student Advisory Committee (SAC)

The Graduate Student Advisory Committee (SAC) of the Department of Chemical Engineering is dedicated to the development of graduate student relations and to facilitating meaningful communication among the students, faculty and staff. These goals are accomplished through student representation with faculty, addressing student concerns and planning social activities.

The primary objective of the SAC is to promote meaningful communication between the student body and the faculty on a professional and technical as well as a social level. The following duties are illustrative of the ways in which this can be accomplished:

- The SAC Chair will attend faculty meetings at the invitation of the Department Chair and provide student input for matters considered by the faculty.
As required by University policy, the SAC will provide recommendations on any faculty members being considered for retention, tenure, or promotion (RPT).

The SAC is responsible for submitting a yearly request for funds to ASUU and is responsible and accountable for expenditure of any funds appropriated by ASUU.

The Graduate SAC of the Department of Chemical Engineering represents all graduate students of the Department of Chemical Engineering and all graduate students engaged in research within one of the departmental research groups. Any student previously described has the right to participate in planned events and request representation by the Graduate SAC.

For additional information and to view the SAC charter please refer to http://www.che.utah.edu/community_and_outreach/graduate_SAC.php