



DEPARTMENT OF

*Chemical Engineering*

COLLEGE OF ENGINEERING | THE UNIVERSITY OF UTAH

# GRADUATE STUDENT HANDBOOK

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# INTRODUCTION

Welcome to the Department of Chemical Engineering! This handbook provides students with all necessary information to successfully navigate their graduate studies, including application procedures, coursework, research, publications, presentations, writing and defending a thesis or dissertation and day-to-day professional conduct. Current graduate students are responsible for understanding the information provided in this handbook as well as policies and procedures of both the department and the University of Utah Graduate School.

The Department of Chemical Engineering offers the following graduate degrees:

- Doctoral Degree (Ph.D.) in Chemical Engineering
- Master of Science (M.S.) in Chemical Engineering
- Dual degree of Master of Science (M.S.) in Chemical Engineering and Master of Business Administration (MBA), in coordination with the School of Business

Details of the requirements and procedures for these degrees are presented in the chapters that follow. If you have any questions regarding the content of this handbook or the Department of Chemical Engineering Graduate Program, please do not hesitate to contact any of the graduate program personnel listed on the following page.

## GRADUATE PROGRAM PERSONNEL

|  |   |
|--|---|
| <b>Dr. Kody M. Powell, Director of Grad Studies</b><br>INSCC 392<br>kody.powell@utah.edu | <b>Dr. Yachao Chen, Assoc. Director of Graduate Studies</b><br>MEB 4512<br>yachao.chen@utah.edu |
|--|---|

The Director of Graduate Studies oversees policies and procedures for all graduate degrees offered through the Department of Chemical Engineering and is chair of the department's Graduate Committee. The Director is available to answer general questions about the graduate program and to provide recommendations regarding coursework. The Director of Graduate Studies also serves as the default advisor for new students that have not yet established a research advisor.

### **Wanda Brown, Graduate Academic Advisor**

Merrill Engineering Building (MEB) Room 3290F  
(801) 585-1181 – wanda.brown@chemeng.utah.edu

The Graduate Academic Advisor assists students in all aspects relating to Chemical Engineering graduate degrees, including applications, admissions, policies and procedures, graduation, tuition benefit and student health insurance. All graduate students in the Department of Chemical Engineering are required to meet with Graduate Academic Advisor during their second semester of coursework (excluding summer) to review academic plans. In addition, students are expected to meet regularly with the Academic Advisor as they progress towards their degree to ensure that procedures and forms are properly completed and submitted.

### **Tracey Farnsworth, Administrative Officer**

Merrill Engineering Building (MEB) Room 3290B  
(801) 587-3610 – tracey.farnsworth@chemeng.utah.edu

# GRADUATE PROGRAM APPLICATION AND ADMISSIONS

The Department of Chemical Engineering welcomes applications for graduate studies from qualified individuals. Minimum requirements and application procedures are explained below.

## EXPECTED PROFICIENCY AND PREREQUISITE COURSES

### DOCTORAL AND MASTER'S DEGREES IN CHEMICAL ENGINEERING

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. CH EN course codes indicate the course number for the University of Utah's Department of Chemical Engineering.

- 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.

## APPLICATION PROCEDURE AND MINIMUM REQUIREMENTS

Applications for graduate study in the Department of Chemical Engineering are submitted online. Details regarding the application procedure and a link to the online application are available on the Chemical Engineering Graduate Program web site (<http://che.utah.edu/graduate>). The following information will be required for the application.

**GPA:** The University of Utah Graduate School requires that all applicants for graduate degrees have a minimum 3.0 GPA (of maximum 4.0) to be considered for admission. Applications of students with a GPA below 3.0 will not be evaluated. The minimum acceptable undergraduate GPA for the Chemical Engineering PhD program is 3.25. The minimum acceptable undergraduate GPA to be admitted into any Department of Chemical Engineering Master's program is 3.0. Meeting these minimum requirements does not guarantee admission into the graduate program.

**GRE Scores:** Students must have their official GRE scores sent to the University of Utah Testing Center by Educational Testing Service (ETS). The department code is 1001. GRE scores are required from all applicants, regardless of background or previous degrees. The minimum GRE score for consideration for graduate studies

in the Department of Chemical Engineering is 155 for master's applicants and 160 for PhD applicants, based on a test taken within the past 24 months; older GRE scores will not be taken into consideration.

**TOEFL or IELTS Language Test for International Students:** International applicants are required to take the TOEFL or IELTS test. The University of Utah requires a minimum TOEFL score of 80 iBT (550 pBT), or a minimum IELTS band score of 6.5, for an application to be evaluated. The Department of Chemical Engineering looks favorably upon applicants with a minimum TOEFL iBT score of 96 (590 pBT; 7 IELTS). International students that have received a bachelor's or master's degree from an accredited institution in the United States, Canada (except Quebec), the United Kingdom, Ireland, Australia, or New Zealand are not required to take the TOEFL exam. More information regarding language proficiency requirements is available at the University's Office of International Admissions (<http://admissions.utah.edu/apply/international/graduate.php>).

**Transcripts:** Transcripts from all universities attended must be sent directly to the University's Office of Admissions (<http://admissions.utah.edu/apply/graduate>). For the graduate school application, unofficial transcripts are acceptable. If a student is accepted into the graduate program, they will then be notified to send official transcripts.

**Letters of Recommendation:** As part of the application, students are required to submit at least three letters of recommendation. These letters are to be submitted electronically through the online graduate application. Paper copies (hardcopies) of recommendation letters sent to the department risk not being included with the application, which would result in an incomplete file which would not be evaluated.

# DOCTOR OF PHILOSOPHY IN CHEMICAL ENGINEERING

The degree of Doctor of Philosophy (Ph.D.) in Chemical Engineering represents scholarly achievement demonstrated by independent research. A Ph.D. candidate must be able to demonstrate competence in the subject matter of his or her field. Of major importance to the Ph.D. degree is the student's research, publication in peer-reviewed journals, and dissertation, which must provide new and significant contribution to knowledge in the student's field. The intellectual and creative matter presented in the dissertation must meet the standards of the department and university. Typically, successful completion of a PhD degree requires five years for students entering the program with a bachelor's degree. The maximum allowable time for completion of the PhD degree is seven years.

## TRACKS & COURSE REQUIREMENTS

Tracks and course requirements depend on the background of the student, as described below:

### Core Courses:

#### ***Track A (Students Entering with a BS in Chemical Engineering or Similar)***

Students whose bachelor's degree is in Engineering or similar must take the following four core courses and earn an average GPA of 3.3, with no grade below a C.

- CH EN 6400 – Foundations of Engineering Analysis (3 credits)
- CH EN 6553 – Chemical Reaction Engineering (3 credits) or CH EN 6555 Catalytic Engineering & Science (3 credits)
- CH EN 6853 – Thermodynamics (3 credits)
- CH EN 6603 – Advanced Transport Phenomena (3 credits)

**Electives:** Students must take 15 elective credit hours, of which at least 6 must be chemical engineering electives. 2 hours of Intro to Research and 2.0 hours of Grad Seminar will round out the total required 31 credit hours of coursework. Grades below C will not count for credit towards the student's graduate program.

#### **Track B (Students Entering with a Master's Degree in Chemical Engineering):**

**Core Courses:** Students who already have a Master's degree in Chemical Engineering must take the following two core courses and earn an average GPA of 3.3.

- CH EN 6400 – Foundations of Engineering Analysis (3 credits)
- CH EN 6553 – Chemical Reaction Engineering (3 credits) or CH EN 6555 Catalytic Engineering & Science (3 credits)
- CH EN 6853 – Thermodynamics (3 credits)
- CH EN 6603 – Advanced Transport Phenomena (3 credits)

**Electives:** Students must take 6 elective credit hours, of which at least 3 must be chemical engineering electives. 2 hours of Intro to Research and 2 hours of Grad Seminar will round out the total required 15 credit hours of coursework. Grades below C will not count for credit towards the student's graduate program.



**Track C (Students Entering with a Master's Degree in Chemical Engineering from the U of U):**

Students who already have a Master's degree in Chemical Engineering from the University of Utah are not required to take core courses. Students must take 2 hours of Intro to Research and 2 hours of Grad Seminar. Electives, if any, will be determined by the faculty advisor. Grades below C will not count for credit towards the student's graduate program.

**Track D (Students Entering with a Master's Degree NOT in Chemical Engineering):**

Students who already have a Master's degree but in a discipline other than Chemical Engineering are required to take the core courses according to their Bachelor's degree and 2 hours of Intro to Research and 2 hours of Grad Seminar.

Bachelors in Chemical Engineering:

- CH EN 6603 – Fluid Mechanics (3 credits)
- CH EN 6603 – Multicomponent Mass Transfer (3 credits)

Bachelors NOT in Chemical Engineering:

- CH EN 6603 – Fluid Mechanics (3 credits)
- CH EN 6553 – Chemical Reaction Engineering or CH EN 6555 Catalytic Engineering & Science (3 credits)
- CH EN 6603 – Multicomponent Mass Transfer (3 credits)
- CH EN 6853 – Thermodynamics (3 credits)

**Electives:** Total hours and course requirements are to be determined by the student's Faculty Advisor. Grades below C will not count for credit towards the student's graduate program.

**INTRODUCTION TO RESEARCH AND GRADUATE SEMINAR SEQUENCE:**

Introduction to Research (CH EN 7753 and 7755) must be taken the first four semesters (fall and spring) of a student's PhD program. Graduate Seminar (CH EN 7857 and 7859) is required every subsequent fall and spring semester until graduation, or student is no longer eligible for Tuition Benefit. The seminars expose graduate students to topics outside their normal area of research and provide an excellent opportunity to broaden their scientific awareness and understanding.

**CH EN 7973: THESIS RESEARCH – PHD:**

Once the student has selected a research topic and faculty advisor, they will be expected to register each semester for CH EN 7973 (research). A minimum of 14 credit hours of Thesis Research is required for the PhD degree. Students typically register for enough Thesis Research credits to bring their total number of credit hours to 9 hours for Fall and Spring semesters and 3 for Summer Term. The Thesis Research course is graded on a credit/no-credit basis. Students must request the class number and permission code from the Graduate Academic Advisor. If a student does not yet have a faculty advisor, the Director of Graduate Studies serves as the instructor for the Thesis Research course.



# DEGREE MILESTONES

## PRELIMINARY EVALUATION

A student's performance in the graduate core courses serves as the preliminary examination for the department. Doctoral students must attain a minimum average GPA of 3.3 in these courses to continue towards a graduate 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 Faculty Advisor, 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 (10 semesters for Bachelors-to-PhD students; 8 semesters for Masters-to-PhD students). Therefore, timely completion of all graduate coursework should be a priority.

## QUALIFYING EXAM

### OVERVIEW

The QE is generally taken one year after the date of enrollment in the PhD program. For most students, the QE will be taken at the end of the summer semester, with a second exam being offered at the end of the Fall Semester. This second exam is for student's joining the program off-cycle or as a second examination should the student not pass the first time. Failing to pass the QE after two attempts will result in dismissal from the PhD program.

The QE is an assessment of a student's:

- Comprehension of chemical engineering and scientific principles
- Ability to critically analyze the scientific literature to identify knowledge gaps
- Effectiveness of conducting independent scientific research
- Communication skills in both written documents and oral presentation

Passing the QE is a wholistic assessment of the target skills and a minimum attainment of each criterion is not necessarily sufficient. However, excellence in one or more areas can assist in deficiencies in other areas to pass the QE.

### **The exam consists of 3 components:**

- Coursework: Attaining a minimum of a 3.3 GPA in the required core chemical engineering courses as detailed in the Graduate Handbook based on your prior degree.
- Written Exam: A written document that provides a literature review, knowledge gaps, motivation for your work, a modest amount of independent research performed, and a discussion of the future steps to complete a short-term goal in the research project (i.e., not a comprehensive plan for your dissertation).
- Oral Exam: A 15-minute presentation that covers the same content as the written exam. The oral exam will be assessed by a sub-committee of faculty, followed by 30 minutes of discussion.

A sub-committee of at least four faculty will evaluate the written and oral exams. The final decision on a Pass/Fail on the QE is determined by a majority vote of the faculty participating in the QE assessment. The student's PhD advisor is not permitted to be on the sub-committee and should not provide direct assistance to the student to prepare the written and oral examination materials. However, the PhD advisor may attend the oral exam. The advisor may not assist the student during the exam but may answer clarifying questions from the sub-committee members. The Qualifying Exam Committee Chair will assign four faculty reviewers and will attempt to have at least one faculty sub-committee member who has expertise related to the research proposal.

### WRITTEN EXAM

The written exam is a maximum of 12 pages (double spaced, 12 Times or Times New Roman font, 1" margins). The page limit is inclusive of figures and tables, but exclusive of references. A one-page CV must be appended to the end of the written exam (not included in the page limit). The written report must be submitted in electronic form 1-week prior to the QE oral exam date to the Qualifying Exam Committee Chair.

### ORAL EXAM

The oral exam will consist of an uninterrupted 15-minute presentation (time strictly enforced). After the presentation, there will be 30 minutes allocated for discussion between the faculty sub-committee and exam participant. The objective of the discussion is to allow the faculty sub-committee to assess the student's exam materials and to provide constructive feedback on the scientific objectives or approach. The discussion will cover:

- Engineering and scientific principles from the core coursework that are related to your research project.
- Conclusions, approaches, and knowledge gaps from the prior literature.
- Motivation for the research project and potential impact of the work.
- The theory and approach of the techniques applied (simulation, analytical, and/or experimental).
- Strengths and limitations of the approaches and scientific conclusions.
- Short-term research plan.

### RECOMMENDATIONS FOR WRITTEN AND ORAL EXAM

The faculty sub-committee will not necessarily be familiar with the specific details of the student's research topic. Consequently, the student should prepare written and oral materials with a general audience of chemical engineers in mind, including the necessary theoretical framework for the research approaches and connect these approaches to greater engineering and scientific principles. The student must also clearly differentiate their specific research contributions that go beyond prior work from the literature, from the advisor, or within the research group. The student should ensure that their written and oral presentations are well-organized and adhere to accepted norms for references and presentation of figures/tables. **The written and oral exams are an assessment of the work reasonably performed over the time since joining a research group, not the plan for the entire dissertation.**

Suggested Format:

- Introduction (<1 page, 1-2 slides): Motivation, knowledge gaps, significance and "big-picture" objectives.
- Background and Literature Review (3-5 pages, 3-5 slides): Rigorous literature review of the state-of-the-art in your research topic that highlights motivates your project.
- Results/Analysis (3-5 pages, 3-5 slides): Overview of the specific contributions or analysis that you have performed since joining the PhD program.

- **Conclusions/Future Work (2-4 pages, 2-3 slides):** Summarize what you have learned in your work to date and design a plan (few months of work) of how you will continue in this research in the near future. Discuss specific research tasks that you anticipate completing to advance your project. Do not provide a detailed plan for your PhD dissertation.

### QE TIMELINE

Students must notify the Director of Graduate Studies and Graduate Advisor by July 1 if they plan to participate in the Summer QE or by Nov. 1 if they plan to participate in the Winter QE (if offered). The Summer QE evaluation will be conducted in August. The Fall QE will be offered if needed.

### REEXAMINATION

If a student does not pass the QE, they may petition the Graduate Committee to retake the exam by a written formal request submitted to the Director of Graduate Studies. If approved, the student must take the QE at the next available opportunity. Failure to pass the exam a second time will result in dismissal from the PhD program.

### EVALUATION

The sub-committee will evaluate the QE participant based on the QE form (below). A score of 15/20 is considered passing, a score of 12-15/20 will require a discussion of all faculty participating in the QE and the advisor. A score of 12 or below is considered a failing score.

### QE EVALUATION FORM

Student Name: \_\_\_\_\_

Faculty Advisor: \_\_\_\_\_

|                              |  |  |  |
|------------------------------|--|--|--|
| CH EN 6853 (Thermodynamics)  |  | CH EN 6553 (Reactions) or CH EN 6555 (Catalysis) |  |
| CH EN 6603 (Fluid Mechanics) |  | CH EN 6603 (Transport)                           |  |

Please provide your assessment of the student's performance using the following metrics:

- **1 = Insufficient:** Significantly below expected for an incoming PhD student, unlikely to graduate.
- **2 = Work Needed:** At a level below expectations but is likely to graduate.
- **3 = Satisfactory:** As expected for a 1<sup>st</sup> year student.
- **4 = Advanced:** At a level comparable to a 2<sup>nd</sup> or 3<sup>rd</sup> year student.

Please assess the student's performance in the QE by the following metrics:

1. Motivation, objectives and impact of research project (4): \_\_\_\_\_
2. Literature review and knowledge gaps (4): \_\_\_\_\_
3. Research product is appropriate for time committed (4): \_\_\_\_\_
4. Clarity of the of the written and oral exam (4): \_\_\_\_\_
5. Comprehension of research topic and engineering principles (4): \_\_\_\_\_

**Total:** \_\_\_\_ /20

**Overall Assessment**      **PASS**      **FAIL**

Additional comments, commendations, or areas for improvement:

## RESEARCH PROPOSAL

Students are not eligible to submit a Research Proposal until they have successfully passed the Qualifying Examination and established their Supervisory Committee. **Ph.D. students are strongly encouraged 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 a student's 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 the student is 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 format presented below. 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 all or part of 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.

The student should bring a copy of the **Research Proposal Form** (available in the Graduate section of the Chemical Engineering web site) to the oral presentation and obtain required signatures from the Supervisory Committee. The completed form, including indication of Pass, Pass with Qualification or Fail, should be submitted to the Graduate Academic Advisor of the Department of Chemical Engineering.

### 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 research cited in the literature survey
5. A Clear and Concise Statement of the Student's Original Contributions
6. Nomenclature
7. References

## MILESTONE MASTER'S DEGREE (OPTIONAL)

Upon completion of the Qualifying Examination, all coursework (with cumulative GPA above 3.3), submission of the Supervisory Committee and Program of Study forms, successful defense of the student's research proposal, and submission of at least one first-author manuscript based on the student's research to a peer-reviewed journal, a PhD candidate may submit an application for a Milestone Master's degree to the Graduate Academic Advisor. A Master of Science program will be added to the student's PhD program, and the two degrees will be conferred upon completion of the PhD.

## PHD DISSERTATION

All doctoral students are required to write an original dissertation based on their research. Details regarding content and format can be found in the [Handbook for Theses and Dissertations](#).

## DISSERTATION DEFENSE

PhD Candidates must defend their dissertation 8 weeks prior to the end of the semester of graduation in order to allow sufficient time for corrections to the dissertation before it is sent to the Thesis Office for Format Approval. (See the Thesis Office web page for deadlines for format approval.) A student must also have a time period of 6 months, at a minimum, between the proposal defense and dissertation defense. This defense will suffice as the final oral examination and will be administered by the student's Supervisory Committee. A defense can take up to 3 hours.

### RECOMMENDED OUTLINE FOR THESIS DEFENSE

- 35-40 minute presentation focusing on results and contributions to scientific understanding
- Question and Answer session with the public
- Excuse the public and continue with a Question and Answer session with your supervisory committee

### REQUIRED FORMS (ON HAND THE DAY OF THE DEFENSE):

- PhD Final Exam Form (found at [www.che.utah.edu/graduate/forms](http://www.che.utah.edu/graduate/forms))
- Doctoral Supervisory Committee Approval and Final Reading Approval ([Thesis Office](#))
- Doctoral Statement of Approval ([Thesis Office](#))

The supervisory committee may approve and sign the required forms, or they may conditionally approve in which the student will be required to make specific corrections before their committee will sign the required forms. A committee may also not approve at which point the supervisory committee will determine if corrections can be made and/or a new defense will be required, or if a student will be dismissed from the

program. Students are encouraged to maintain notice of Thesis Office submission deadlines to ensure their graduation date. Students are not officially graduated until their thesis has been published.

## RESEARCH PROJECT AND FACULTY ADVISOR

PhD students enter the graduate program either (a) already assigned a faculty advisor and research project, arranged through previous correspondence, or (b) under a Departmental Fellowship with no faculty advisor or research project yet established. Students entering the PhD program under a Departmental Fellowship will participate in a standardized assignment procedure facilitated by the department. This includes presentations by hiring faculty during the Intro to Research course. Students are then expected to meet with 6-8 faculty individually to learn additional details about their research and group culture. Students must meet with a minimum of three faculty. Students are also encouraged to attend research group meetings and/or to perform experiments on a short-term basis during this period. On a determined date students will list their top choices of faculty to work with for their PhD research. Faculty will have the final authority on whether to accept a student into their research group.

## REQUEST FOR SUPERVISORY COMMITTEE

The student's Supervisory Committee is responsible for approving the student's program of study, research proposal defense, and dissertation defense. PhD Supervisory Committees consist of five members: three Department of Chemical Engineering tenured or tenure-track faculty, one external member, and one member with optional affiliation. The student's research advisor is the chair of the Supervisory Committee, which fills one of the three Chemical Engineering faculty membership requirement. If a student requests to have a member that is a non-tenure-track professor or is not affiliated with the University, it must be approved by the department's Graduate Academic Advisor and the Graduate School. The **Supervisory Committee Form** can be found on the Chemical Engineering website, [che.utah.edu](http://che.utah.edu); the form must be signed by the committee members and submitted to the department's Graduate Academic Advisor. The Supervisory Committee is required to be formed no later than six months after a student successfully passes the Qualifying Exam.

## PROGRAM OF STUDY

PhD candidates are required to complete no fewer than three full years of approved graduate work and a dissertation; more time may be required. A student's Program of Study must follow the outline of their specific track in conjunction with recommendations from their advisor and approved by the Supervisory Committee. Students must complete the online **Program of Study Form** and submit to the department's Graduate Academic Advisor. This is due by the end of the student's second year of the program.

## PRESENTATIONS AND PUBLICATIONS

PhD candidates are expected to demonstrate intellectual contributions to their area of research as evidenced by the publication of *at least two*, and preferably three or more peer-reviewed papers in archival journals, transactions, or proceedings. They are also encouraged to give technical presentations at meetings, conferences and seminars.

## TEACHING ASSISTANT EXPERIENCE

PhD students are required to complete two TA experiences during their program. Students can serve as a TA at any time during their program. In general, graduate students will have successfully completed the core chemical engineering course work before requesting a TA assignment. Detailed information about the responsibilities and expectations of teaching assistants can be found on page 28 of this guide.

## TIME RESTRICTIONS

PhD students in the Department of Chemical Engineering must complete their PhD degrees, including final publication of their dissertation, within seven years. Students entering the program with a BS degree should strive to complete their PhD degree in no more than 5 years, in part because that corresponds to the duration of tuition benefit. Students entering the PhD program with Master's degrees should expect to complete their degree within 4 years, again corresponding to tuition benefit restrictions. Please see section on the Tuition Benefit Program on page 29 for more information.

## DISMISSAL FROM THE PHD PROGRAM

Below is a list of common conditions for dismissal from the Ph.D. program. If a student satisfies any of the conditions below, then the student is academically deficient unless there is a previous arrangement for deviation from the corresponding requirement.

- Failure to maintain a 3.0 grade point average (this is required by the Graduate School if the student wishes to continue to receive tuition benefit) or failure to meet the grade requirement for taking the qualifying exam. See Handbook Section on Coursework for details.
- Failing the qualifying exam twice. See Handbook Section on the Qualifying Exam.
- Failure to conduct research at a level needed to complete a Ph.D. See the Handbook Sections on the Student/Advisor Relationship and the Graduate Student Assistantship.
- Failure to have a faculty advisor for more than one year. See Handbook Section on Student/Advisor Relationship.
- Failure to graduate within 7 years. This time limit excludes leaves of absence. Extensions may be granted for students who are concurrently working at a full-time position outside of the University of Utah. Students may request an extension by following the [Graduate School's petition for an extension](#).
- Academic misconduct. See Office of the Dean of Students Policy on Academic Misconduct (<https://deanofstudents.utah.edu/accountability/academic.php>)

Students who fall behind in any of these categories, or who fail to meet other requirements specified for their program, must promptly file a written appeal to the Graduate Committee if they wish to continue in the program. Dismissal from the PhD program shall result in termination of graduate student funding.

### ACADEMIC ACCOMMODATIONS:

Students are expected to timely fulfill all academic requirements of the Program. Students who believe that they have a disability, which requires special consideration and academic accommodations, must seek those accommodations directly from the University's Center for Disability and Access, (801) 581-5020. Accommodations must be sought in advance and may not be awarded retroactively to coursework.

### STUDENTS WISHING TO LEAVE THE GRADUATE PROGRAM:

If a student plans to leave the PhD program mid-semester, it is their responsibility to work with their advisor as soon as possible so that they can meet the requirements associated with their graduate assistantship. It is also their responsibility to leave their work in a state that it can be transitioned to another individual.

Students wishing to leave the program must also contact the Director of Graduate Studies as early as possible if they are considering leaving the graduate program. The timing of a student's departure from the program impacts whether tuition must be reimbursed and eligibility for a degree. Reimbursement for tuition is delineated on the description of the Tuition Benefit Plan on the Graduate School website:



**“IMPORTANT: Students adding and/or dropping courses after the semester’s published add/drop deadlines are responsible for any and all charges incurred, including withdrawals.** Tuition benefit will not pay for withdrawn credit hours, and if registration falls below nine credit hours at any time during the semester, a student becomes ineligible for TBP participation and will be billed the full tuition for that semester.”

Students will not earn and receive a Master’s or PhD degree if the Graduate School and Department requirements have not been met when they leave the graduate program. As such, students are advised to discuss degree requirements with the Graduate Advisor or the Director of Graduate Studies by requesting a special interview before they consider leaving the graduate program. The student should recognize that they would be required to re-apply should they wish to continue in the program and work on another advanced degree.

#### TERMINATION OF STUDENT-FACULTY RESEARCH RELATIONSHIP:

Either the graduate student or the faculty advisor may terminate a student/advisor research relationship because of dissatisfaction. It is important that both parties respect the needs of the other. The following guidelines are designed to help accomplish this.

If a faculty advisor is dissatisfied with the research effort of a student, the advisor should make every effort at an early stage of the dissatisfaction to communicate to the student the concerns they may have about the quality of research performance and document this communication. If the deficiencies persist, the faculty advisor should identify, in writing to the student, the unsatisfactory aspects of their research performance, and allow the student a reasonable time (at least 30 days from when a probationary letter is received by both the Director of Graduate Studies and student) to correct the deficiencies. If the deficiencies are corrected in the probationary period, the faculty advisor should notify the student in writing that they are no longer on probation (and a copy of the letter should be sent to the Director of Graduate Studies).

If the deficiencies persist at the end of the formal probationary period, it is the prerogative of the research advisor to terminate the student-advisor research relationship. The procedure should be:

- a. To notify the student (as well as the supervisory committee), in writing, giving reasons for the termination of the student-advisor relationship, indicating a formal termination date at least 15 days after the date of the letter. A copy of the letter should be sent to the Director of Graduate Studies and Department Chair.
- b. If the student is being paid as a Graduate Research Assistant, the student should be kept on the payroll for 15 days after the date of the notification letter to allow time to obtain a new research director, unless a new research director puts the student on a payroll before the end of the 15 days.
- c. In the unlikely situation that the student is being paid as a Teaching Assistant, the department will continue the current T.A. support until the end of the termination semester, contingent, of course, on the T.A. duties being carried out conscientiously.

A student who wants to leave a research group should give the faculty advisor, the Graduate Advisor, and the Director of Graduate Studies 30 days written notice outlining the reasons for leaving the group. During the 30 days, the experimental work should be brought to a point where it could be easily passed on to a new person. All notebooks, data, university-owned equipment (i.e., computers), and key should be returned to the research advisor before the student is put on another faculty member's payroll or within the 30-day notice period, whichever comes first. Students should be aware that it is impossible to make T.A. appointments in mid-semester and should plan accordingly.

When changing a thesis lab, the student must contact the Graduate Advisor and the Director of Graduate Studies as early as possible before they make arrangements to leave a thesis lab. This is to ensure the student understands the potential liabilities of the transition, including issues obtaining a degree, tuition support, stipends, health insurance and potentially visa status. Faculty must provide their student up to 4 weeks of financial support to facilitate their active search/transition to another lab. The faculty must submit to the Director of Graduate Studies and the Graduate Advisor an email detailing the length of support the parties

have agreed upon. However, as soon as the new lab/PI has agreed to take the student, the student and PI must contact the Department office, and financial responsibility for student support transfers to the new PI/advisor. The student is ultimately responsible for ensuring all Graduate School and departmental requirements are met and forms are submitted for the transition. As a matter of policy, the Department does not provide stipend support for students as they rotate to find a new thesis lab. Under rare circumstances, the Department may consider such support, but this must involve discussions in advance with the Department Chair.

After termination of a student/advisor relationship, it is the student's responsibility to identify a faculty advisor willing to advise and mentor the student during the pursuit of their PhD. If, after the termination of a student-faculty research relationship, the student is unable to identify a new faculty member willing to undertake this role within one year, the student will be dismissed from the program. Upon dismissal, any remaining program funding to the student will cease.

See the Section on Termination of Graduate Student Assistantship for details regarding the graduate assistantship and any associated financial support.

## REQUIRED FORMS AND FILING PROCEDURES

Several forms must be completed and submitted throughout the progress of the degree. It is a student's responsibility to ensure that all forms are submitted by the due date. Please see page 34 of this handbook for a summary of required forms and deadlines.

Students are encouraged to read the Thesis Office's "Handbook for Theses and Dissertations," and note submission deadlines to avoid any complications with their anticipated graduation.

# MASTER OF SCIENCE IN CHEMICAL ENGINEERING

## (THESIS/NON-THESIS)

The Master of Science degree allows students an opportunity to earn an advanced degree in chemical engineering in less time and with lower research intensity than the PhD degree. Students will develop a deeper understanding of core principles of chemical engineering and will learn the art of independent research. The Master of Science in Chemical Engineering degree can be a good springboard for a PhD, since the course requirements for the two degrees are similar.

The University of Utah Department of Chemical Engineering offers several options for students to earn a Master of Science in Chemical Engineering degree:

- **Coursework-Based track\*:** This option provides an opportunity for students to deepen their knowledge of chemical engineering subjects through coursework. Students must complete 30 credit hours of core and elective engineering courses with an average GPA of 3.3 to receive their degree. This track can usually be completed in 16 to 24 months. Students on this track are responsible for covering all costs for the degree.
- **Project-Based track\*:** Under this track, students perform an independent, self-directed project chosen either through consultation with their supervisory committee or through their employer. The project is worth six credit hours and students take 24 additional core and elective credit hours. Completing the degree involves an oral defense of the project before the supervisory committee. This track can usually be completed in 16 to 24 months. Students on this track are responsible for covering all costs for the degree.
- **Thesis-Based track:** For the thesis-based Master of Science degree, students must complete 30 credit hours of core and elective courses and perform independent research under the direction of a faculty advisor. It is expected that at least one peer-reviewed article related to the research project will be published. Students must write and successfully orally defend a Master's thesis in order to receive the degree. This track typically takes 24 to 36 months to complete and is coordinated under special circumstances through special arrangement with a supporting faculty member.
- **Dual MBA and Master of Science in Chemical Engineering Program:** This program, which is coordinated in conjunction with the David Eccles School of Business, offers students an opportunity to earn two impressive Master's degrees in less than three years. Details about this option are provided on page 24 of this handbook.
- **Chemical Engineering BS/MS Program:** This program allows current chemical engineering Bachelor's students to acquire an MS with just one more year of study. Interested students should contact the undergraduate academic advisor.

\* Students can switch between the coursework- and project-based non-thesis tracks at any time during their degree.

Details regarding coursework and degree procedures for the first three options are provided on the following pages.

## MS DEGREE – COURSEWORK-BASED TRACK

### COURSEWORK

A total of 30 credit hours of coursework is required for a Master's degree.

**Core Courses.** Students pursuing a coursework-only degree must take the following four core courses and earn an average GPA of 3.0 between the four, with no grade below a C+.

- CH EN 6400 – Foundations of Engineering Analysis (3 credits)
- CH EN 6553 – Chemical Reaction Engineering (3 credits) or CH EN 6555 Catalytic Engineering & Science (3 credits)
- CH EN 6853 – Thermodynamics (3 credits)
- CH EN 6603 – Advanced Transport Phenomena (3 credits)

**Elective Courses.** Students must take 18 elective credit hours, at least 9 of which must be chemical engineering electives. A minimum C+ is required for credit towards the student's graduate program.

## REQUIREMENTS, PROCEDURES AND ASSOCIATED FORMS

### ADVISORS

The Director of Graduate Studies and Graduate Academic Advisor oversee students pursuing a non-thesis, coursework-based degree. A supervisory committee is not required for these students.

### PRELIMINARY EVALUATION

A student's performance in the four graduate core courses serves as the preliminary examination for the department. Masters students on the non-thesis, coursework-based track must attain a minimum GPA of 3.3 in these courses, with no grade below a C+, to continue towards a graduate degree. (Courses for the degree cannot be taken using a CR/NC option.) Students who do not meet these minimum requirements must arrange a meeting with the Director of Graduate Studies. The Department of Chemical Engineering may dismiss students that do not meet these minimum standards.

### PROGRAM OF STUDY

For students pursuing a non-thesis, coursework-based Master of Science degree, the Program of Study is constructed with course recommendations from the Director of Graduate Studies. Students must complete the online **Program of Study Form** and submit it to the department's Graduate Academic Advisor. It is recommended that the Program of Study be established during the second year of studies. It is due no later than one semester before the anticipated semester of graduation.

### FINAL EXAMINATION

The final exam (required by the University Graduate School) for the non-thesis, coursework-based Masters is simply the GPA based on the graduate-level courses taken for the degree. Students achieving a minimum 3.3 GPA pass the final exam. In addition, students must have at least a C+ in all courses.

### CHANGE TO PROJECT-BASED MASTER'S DEGREE

Students in the non-thesis, coursework-based Master's degree may change to a non-thesis, project-based degree at any time by informing the Graduate Academic Advisor. Note that the student must establish a Supervisory Committee for a project-based degree if one does not already exist.

### TIME RESTRICTIONS

Typically, a student in the non-thesis, coursework-based Master's program can complete the degree in two years. The University requires that all M.S. students complete their degree within 4 years.

### REQUIRED FORMS

Several forms must be completed and submitted throughout the progress of the degree. It is a student's responsibility to ensure that all forms are submitted by the due date. Please see page 34 of this handbook for a summary of required forms and deadlines.

## MS DEGREE – PROJECT-BASED TRACK

### COURSEWORK

A total of 30 credit hours of coursework is required for a Master's degree.

**Core Courses:** Students must take the following four core courses and earn an average GPA of 3.0 between the four, with no grade below a C.

- CH EN 6400 – Foundations of Engineering Analysis (3 credits)
- CH EN 6553 – Chemical Reaction Engineering (3 credits) or CH EN 6555 Catalytic Engineering & Science (3 credits)
- CH EN 6853 – Thermodynamics (3 credits)
- CH EN 6603 – Advanced Transport Phenomena (3 credits)

**Elective Courses:** Students must take 12 elective credit hours, at least 6 of which must be chemical engineering electives. At least a C grade is required for credit towards the student's graduate degree.

**CH EN 6253 – Advanced Design Project (6 credit hours):** This course is required for students pursuing the project-based MS degree. This is a capstone project with a topic approved by student's Supervisory Committee. Students register for this course in the semester they anticipate graduation. Work on this project may and should be spread over a student's entire program. The grade is based on the written and oral reports and is administered by the student's Supervisory Committee.

## REQUIREMENTS, PROCEDURES AND ASSOCIATED FORMS

### PRELIMINARY EVALUATION

A student's performance in the four graduate core courses serves as the preliminary examination for the department. Masters students on the non-thesis, project-based track must attain a minimum GPA of 3.0 in these courses, with no grade below a C, to continue towards a graduate degree. (Courses for the degree cannot be taken using a CR/NC option.) Students who do not meet these minimum requirements must arrange a meeting with the Director of Graduate Studies. The Department of Chemical Engineering may dismiss students that do not meet these minimum standards.

### SUPERVISORY COMMITTEE

Students pursuing a non-thesis, project-based Masters must establish a Supervisory Committee by the end of the second semester of the student's program. The student's Supervisory Committee is responsible for approving the student's Program of Study and project defense. The student, in consultation with his/her Program Advisor or the Director of Graduate Studies, selects potential members of the Supervisory Committee.

**The M.S. Supervisory Committees consist of three members:** a chair (the student's program advisor) and two additional members. Committee members are typically tenured or tenure track faculty in Department of Chemical Engineering, although one member external to the department may be allowed. If a student requests to have a member that is a non-tenure-track professor or is not affiliated with the University, it must be approved by the department's Graduate Academic Advisor and the Graduate School. The **Supervisory Committee Form**, which is available on the Chemical Engineering graduate program website must be signed by the committee members and submitted to the department's Graduate Academic Advisor.

### PROGRAM OF STUDY

For students pursuing a non-thesis, project-based Master of Science degree, the Program of Study is constructed with course recommendations from the student's Program Advisor and Supervisory Committee. Students must complete the online **Program of Study Form** and submit it to the department's Graduate Academic Advisor. It is recommended that the Program of Study be established during the second year of studies. It is due no later than one semester before the anticipated semester of graduation.

### FINAL EXAMINATION (PROJECT DEFENSE)

An oral defense of the Special Project, administered by the Supervisory Committee, serves as the final examination for the candidate's program. The final exam must be scheduled following the completion and approval of the Special Project by their committee chair. Request for Supervisory Committee and Program of Study forms must be filed and approved by the Graduate School before the defense. Student must be registered in the semester the oral defense takes place.

### CHANGE TO COURSEWORK-BASED MASTER'S DEGREE

Students in the non-thesis, project-based Master's program may change to a non-thesis, coursework-based Master's degree by informing the Graduate Academic Advisor. If a Supervisory Committee has already been established for the student, the student should also inform the committee of the change in track. Students changing to a coursework-based degree will retain the Supervisory Committee.

### TIME RESTRICTIONS

Typically, a student in the non-thesis, project-based Master's program can complete the degree in two years. The University requires that all M.S. students complete their degree within 4 years.

### REQUIRED FORMS

Several forms must be completed and submitted throughout the progress of the degree. It is a student's responsibility to ensure that all forms are submitted by the due date. Please see page 34 of this handbook for a summary of required forms and deadlines.



## MS DEGREE – THESIS-BASED TRACK

### COURSEWORK

A total of 30 credit hours of coursework is required for a Master's degree. Course requirements for this track depend on whether the student has a Bachelor's degree in Chemical Engineering.

#### Students with a BS/BA Degree in Chemical Engineering

**Core Courses:** Students with a Bachelor's degree in Chemical Engineering must take the following two core courses and earn an average GPA of 3.0 in the core courses.

- CH EN 6400 – Foundations of Engineering Analysis (3 credits)
- CH EN 6553 – Chemical Reaction Engineering (3 credits) or CH EN 6555 Catalytic Engineering & Science (3 credits)
- CH EN 6853 – Thermodynamics (3 credits)
- CH EN 6603 – Advanced Transport Phenomena (3 credits)

**Elective Courses:** Students must take 9 elective credit hours, at least 9 of which must be chemical engineering electives. Grades below C will not count for credit towards the student's graduate program.

**Introduction to Research and Graduate Seminar Sequence:** All students on the thesis-based track must take Introduction to Research (CH EN 7753 and 7755) the first four semesters (fall and spring) of the program. Graduate Seminar (CH EN 7857 and 7859) is required every subsequent fall and spring semester until graduation, or until student is no longer eligible for Tuition Benefit. The seminars expose graduate students to topics outside their normal area of research and provide an excellent opportunity to broaden their scientific awareness and understanding.

**CH EN 6973: Thesis Research – Masters:** Once the student has selected a research topic and faculty advisor, she/he will be expected to register each semester for CH EN 6973 (research). A minimum of 9 credit hours of Thesis Research is required for the thesis-based Master's degree. Students typically register for enough Thesis Research credits to bring their total number of credit hours to 11 hours for Fall and Spring semesters and 3 for Summer Term. The Thesis Research course is graded on a credit/no-credit basis. Students must request the class number and permission code from the Graduate Academic Advisor. If a student does not yet have a faculty advisor, the Director of Graduate Studies serves as the instructor for the Thesis Research course.

## REQUIREMENTS, PROCEDURES AND ASSOCIATED FORMS

### PRELIMINARY EVALUATION

A student's performance in the graduate core courses serves as the preliminary examination for the department. Masters students on the thesis-based track must attain a minimum GPA of 3.0 in these courses, with no grade below a C, to continue towards a graduate degree. (Courses for the degree cannot be taken using a CR/NC option.) Students who do not meet these minimum requirements must develop a plan in consultation with their research advisor or Supervisory Committee and 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 (four semesters for MS Thesis students). Therefore, timely completion of all graduate coursework should be a priority.

### SUPERVISORY COMMITTEE

Students pursuing a thesis-based masters must establish a Supervisory Committee by the end of the second semester of the student's program. The student's Supervisory Committee is responsible for approving the student's Program of Study and thesis defense. The student, in consultation with his/her Program Advisor or the Director of Graduate Studies, selects potential members of the Supervisory Committee. The M.S. Supervisory Committees consist of three members: a chair (the student's program advisor) and two additional members. Committee members are typically tenured or tenure track faculty in Department of Chemical Engineering, although one member external to the department may be allowed. If a student requests to have a member that is a non-tenure-track professor or is not affiliated with the University, it must be approved by the department's Graduate Academic Advisor and the Graduate School. The **Supervisory Committee Form**, which is available on the Chemical Engineering graduate program website must be signed by the committee members and submitted to the department's Graduate Academic Advisor.

### PROGRAM OF STUDY

A student's program of study is constructed with course recommendations from their advisor and approved by the Supervisory Committee. Students must complete the online form and submit to the department's Graduate Academic Advisor. This is due no later than one semester before the anticipated semester of graduation, and before the student's thesis defense.

### PUBLICATIONS AND PRESENTATIONS

Thesis-based master's candidates are expected to demonstrate intellectual contributions to the selected area of research as evidenced by the publication of at least one peer-reviewed paper in an archival journal, transaction, or proceeding. They are also encouraged to give technical presentations at meetings, conferences, and seminars.

### TEACHING ASSISTANT EXPERIENCE

Thesis-based Master's candidates are required to complete one TA experience during their program. Students can serve as a TA at any time during their program. In general, graduate students will have successfully completed the core chemical engineering course work before requesting a TA assignment. Detailed information about the responsibilities and expectations of teaching assistants can be found on page 28 of this guide.

### MS THESIS

All Master's students are required to write an original thesis based on their research. Details regarding content and format can be found in the [Handbook for Theses and Dissertations](#).

### THESIS DEFENSE

Master's Thesis Candidates must defend their thesis 8 weeks prior to the end of the semester of graduation in order to allow sufficient time for corrections to the thesis before it is sent to the Thesis Office for Format Approval. (See the Thesis Office web page for deadlines for format approval.) This defense will suffice as the

final oral examination and will be administered by the student's Supervisory Committee. A defense can take up to 3 hours.

**Recommended Outline for Thesis Defense**

- 35-40 minute presentation focusing on results and contributions to scientific understanding
- Question and Answer session with the public
- Excuse the public and continue with a Question and Answer session with your supervisory committee

**Required Forms (on hand the day of the defense):**

- MS Final Exam Form (found at [www.che.utah.edu/graduate/forms](http://www.che.utah.edu/graduate/forms))
- Masters Supervisory Committee Approval and Final Reading Approval ([Thesis Office](#))
- Masters Statement of Approval ([Thesis Office](#))

The supervisory committee may approve and sign the required forms, or they may conditionally approve in which the student will be required to make specific corrections before their committee will sign the required forms. A committee may also not approve at which point the supervisory committee will determine if corrections can be made and/or a new defense will be required, or if a student will be dismissed from the program. Students are encouraged to maintain notice of Thesis Office submission deadlines to ensure their graduation date. Students are not officially graduated until their thesis has been published.

**TIME RESTRICTIONS**

The length of time required for the M.S. program depends primarily on the diligence with which the student pursues his or her research/project. Students should strive to complete their M.S. degree in no more than 2 years, in part because that corresponds to the duration of tuition benefit for MS thesis students. The University requires that all M.S. students complete their degree within 4 years.

**REQUIRED FORMS**

Several forms must be completed and submitted throughout the progress of the degree. It is a student's responsibility to ensure that all forms are submitted by the due date. Please see page 34 of this handbook for a summary of required forms and deadlines.

# DUAL MASTER OF BUSINESS ADMINISTRATION (MBA) AND MASTER OF SCIENCE IN CHEMICAL ENGINEERING

The dual MBA and MS Chemical Engineering program offers students an opportunity to earn both degrees in as little as two years. The University of Utah a worldwide hub of innovation and technology commercialization, and our MBA/MS Engineering graduate students bridge the gap between techno-types and entrepreneurs. 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. More information is available through the School of Business Full Time MBA program website <http://mba.business.utah.edu/page/mbams-engineering-program>.

## COURSE REQUIREMENTS

A student enrolled in the joint degree program earns both degrees in 24 to 30 months of full-time study. In general, students take 21 credit hours in the College of Engineering and 47 hours in the College of Business. In addition, students perform a 6-credit hour capstone project taught across both colleges. For the chemical engineering MS component of the program, students must take the following four core courses and earn an average GPA of 3.0, with no grade below a C.

- CH EN 6400 – Foundations of Engineering Analysis (3 credits)
- CH EN 6553 – Chemical Reaction Engineering (3 credits) or CH EN 6555 Catalytic Engineering & Science (3 credits)
- CH EN 6853 – Thermodynamics (3 credits)
- CH EN 6603 – Advanced Transport Phenomena (3 credits)
- CH EN 6960 – MS/MBA Capstone (3 credits)

To round out the 21 required credits, students must take 6 elective credit hours, of which at least 3 must be chemical engineering electives. Grades below C will not count for credit towards the student's graduate program.

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

## REQUIREMENTS, PROCEDURES AND ASSOCIATED FORMS

### ADVISORS

The Director of Graduate Studies and Graduate Academic Advisor supervise students in the MBA/MS program. A default supervisory committee is assigned.

### PRELIMINARY EVALUATION

A student's performance in the four graduate core courses serves as the preliminary examination for the department. Students must attain a minimum GPA of 3.3 in these courses, with no grade below a C+, to continue towards a graduate degree. (Courses for the degree cannot be taken using a CR/NC option.) Students who do not meet these minimum requirements must arrange a meeting with the Director of Graduate Studies. The Department of Chemical Engineering may dismiss students that do not meet these minimum standards.

### PROGRAM OF STUDY

The Program of Study for the Master of Science in Chemical Engineering degree of the dual MBA/MS program is constructed with course recommendations from the Director of Graduate Studies. Students must complete the online **Program of Study Form** and submit it to the department's Graduate Academic Advisor. It is recommended that the Program of Study be established during the second year of studies. It is due no later than one semester before the anticipated semester of graduation.

### CAPSTONE PROJECT

The Chemical Engineering Capstone project is under the supervision of the Director of Graduate Studies. It is offered all semesters.

### FINAL EXAMINATION

The final exam (required by the University Graduate School) for the non-thesis, coursework-based master's is simply the GPA based on the graduate-level courses taken for the degree. Students achieving a minimum 3.3 GPA pass the final exam. In addition, students must have at least a C+ in all courses.

### TIME RESTRICTIONS

In general, completing the two degrees under the MBS / MS ChE program takes 24 to 36 months. The University requires that all M.S. students complete their degree within 4 calendar years.

### REQUIRED FORMS

Several forms must be completed and submitted throughout the progress of the degree. It is a student's responsibility to ensure that all forms are submitted by the due date. Please see page 34 of this handbook for a summary of required forms and deadlines.

# UNIVERSITY GRADUATE SCHOOL POLICIES

## TRANSFER CREDIT AND COURSE WAIVERS

Students may petition to have transfer credit substituted for electives. However, the core courses will not be waived, and transfer credit will not be accepted in place of them. A maximum of 6 semester hours of credit from another institution, if not already applied towards a previous degree, may be applied toward U of U graduate degree requirements. Up to 9 credit hours of (6000 level and above) non-matriculated student course work may be applied to a graduate program. Requests for course waivers must be approved by the Graduate Committee. The student must submit a formal written petition of no more than 1 page expressing why he/she feels the waiver is appropriate to the Graduate Advisor. The petition will be discussed at the following Graduate Committee meeting.

## RESIDENCY REQUIREMENT

For PhD students, the University of Utah Graduate School requires that at least one year (i.e., two consecutive semesters) of the doctoral program be spent in full-time academic work in order to fulfill the residency enrollment requirement. For Master's students, the Graduate School requires at least 24 credit hours of resident study at the University of Utah to fulfill the residency enrollment requirement for the MS degree.

A full-time academic load is defined as 9 or more coursework credit hours per semester, including research credits. Once a student has met the residency requirement, 3 credit hours of thesis research are considered full-time. As noted in the Financial Assistance section, students who receive a tuition waiver through the Tuition Benefit program are requested to sign up for 11 credits (courses + research) each spring and fall.

## CONTINUOUS REGISTRATION POLICY

All graduate students must be registered for at least one course from the time of formal admission through completion of all requirements for the degree they are seeking, unless granted an official leave of absence. Students not on campus and not using University facilities are not expected to register for summer term. Students must, however, be registered during summer term if they are taking examinations or defending theses/dissertations during that semester. If students do not comply with this continuous registration policy and do not obtain an official leave of absence, they will be automatically discontinued from graduate study. In this case, students will be required to reapply for admission to the University through Graduate Admissions upon approval of the home department. Students should be registered for graduate level courses (5000-6000 level for masters; 6000-7000 level for doctoral) until they have completed all requirements for the degree including the defense of the project, thesis, or dissertation.

## GPA REQUIREMENTS / ACADEMIC PROBATION

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 6000-, and 7000-level courses, which are used to satisfy degree requirements. Grades below C are not acceptable for credit in any graduate level course. Students who do not meet these minimum requirements will be placed on Academic Probation at which point a plan must be developed. The course of action and consequences will be at the discretion of the Faculty Advisor and Supervisory Committee (if applicable). Tuition Benefit will be suspended, and the student will be required to pay for subsequent semesters until the GPA is restored. The Department of Chemical Engineering may dismiss students who do not meet these minimum standards.

## LEAVES OF ABSENCE

Students who wish to discontinue their studies for one or more semesters (other than summer term) must complete a Leave of Absence Form, available through the university's Office of the Registrar. The form must be approved and signed by the supervisory committee chair and department chair or Director of Graduate Studies and then forwarded to the dean of The Graduate School for approval.

Requests for leaves of absence may be granted for up to one year for circumstances related to:

- A serious health condition of the student or family member,
- Parental leave to care for a newborn or newly adopted child,
- A call to serve in military service, or
- Other compelling reasons that the student's department believes is in the best interests of both the student and the University.

The form requesting a leave of absence for a current semester must be completed and received in The Office of the Registrar by the last day of classes of that semester. Leaves of absence are not granted retroactively. Students must officially withdraw from classes in any semester for which a leave is granted; failure to formally withdraw results in the reporting of E or EU grades for all classes.

The period during which a leave of absence is granted does not count toward the period allowed to complete the degree. Leaves are granted for a maximum of one year at a time and may be renewed by submitting a new form to The Office of the Registrar. The leave of absence is void if a student registers for classes in a semester for which a leave was granted.

## MAXIMUM HOURS PER SEMESTER

No candidate for a graduate degree is permitted to register for more than 16 credit hours in any single semester. A schedule of nine hours is considered a full load for masters and doctoral degree candidates. Requests for exceptions to this policy should be submitted in writing to the dean of The Graduate School by the student's supervisory committee chair. Students in the Tuition Benefit Program (TBP) are advised to refer to the TBP information website to review policies related to maximum hours.

## INTERNATIONAL STUDENTS

The Department of Chemical Engineering is proud to accept international students into its graduate program. International students must attend an international student orientation soon after their arrival in the United States and should report to the International Student & Scholar Services Center (Union Building, 4<sup>th</sup> floor; 801-581-8876) as soon as they arrive in Salt Lake City. The International Student & Scholar Services Center is responsible for approving international students' leave of absence requests and must be notified of all vacation semesters. International students are responsible for keeping their visas in status.

## ENGLISH LANGUAGE PROFICIENCY

All graduate students are expected to have, or to develop, proficiency in both written and oral English. Students whose first language is not English may be required to take one or more English as a Second Language classes; more advanced students may be excused.



# GRADUATE RESEARCH ASSISTANT EMPLOYMENT

## GRADUATE RESEARCH ASSISTANT APPOINTMENTS

Graduate students holding appointments as Graduate Research Assistants fill the dual roles of employee and student. Each is a part-time employee of the University. Faculty advisors set compensation for “effort,” with consideration of department guidelines and internal equity. The “effort” designated through the payroll system reflects part-time employment status; it does not reflect the associated personal effort required for a student to complete research and degree requirements. The graduate student is expected to treat his or her responsibilities as student and employee synergistically, one complementing the other without division. It will be a rare situation when a successful graduate student invests less personal effort than compensated effort.

Employment as a Graduate Research Assistant provides compensation and other key resources that meet sponsored project and degree requirements simultaneously. Funding for experimental and computational costs of research are provided in association with this appointment. Additionally, the appointments often provide opportunities to participate in professional conferences (national and international). The professional work experience adds academic and practical depth to students’ educational experiences.

## EXPECTATIONS OF GRADUATE RESEARCH ASSISTANTS

In return for the university degree and for monetary compensation, it is expected that the Graduate Research Assistant will provide a work effort equivalent to a full-time professional engineer. As a professional, this usually means more than 40 hours per week through both the school year and the summer. As a professional, some flexibility in scheduling work time and place is granted to the Graduate Research Assistant. However, as a professional, it is expected that the Graduate Research Assistant will be at his or her assigned workspace at the university for much of the normal work week (8am-5pm), that he or she will make every possible effort to attend all relevant research meetings, and to contribute to the efforts of the research group even if not directly applicable to his or her thesis.

## POLICY FOR TERMINATING A GRADUATE STUDENT’S

If a faculty advisor is dissatisfied with the research effort of a student, the advisor should make every effort at an early stage of the dissatisfaction to communicate to the student the concerns they may have about the quality of research performance and document this communication. If the deficiencies persist, the faculty advisor should identify, in writing to the student, the unsatisfactory aspects of their research performance, and allow the student a reasonable time (at least 30 days from when a probationary letter is received by both the Director of Graduate Studies and student) to correct the deficiencies.

If the deficiencies are corrected in the probationary period, the faculty advisor should notify the student in writing that they are no longer on probation (and a copy of the letter should be sent to the Director of Graduate Studies).

If the deficiencies persist at the end of the formal probationary period, it is the prerogative of the research advisor to terminate the student-advisor research relationship. The advisor should follow the following procedure:

- a. To notify the student, in writing, of the formal termination date at least 15 days after the date of the letter. A copy of the letter should be sent to the Director of Graduate Studies and Department Chair. This letter may be combined with a termination of the graduate advisor relationship.
- b. If the student is being paid as a Graduate Research Assistant, the student should be kept on the payroll for 15 days after the date of the notification letter to allow time to obtain financial support, unless a new financial supporter puts the student on a payroll before the end of the 15 days.

Students whose Graduate Research Assistantship has been terminated are not discharged from the graduate program. They may seek another faculty advisor and research project, or they may continue their studies personally funded. Students not supported under a fellowship or research project may not be eligible for tuition benefit.

## FINANCIAL ASSISTANCE

Financial assistance is available to PhD students and some thesis master's 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 Graduate 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 administers separate funds for small short-term loans. Student loans are approved based on merit and need. Application is made through the college.

## TUITION BENEFIT PROGRAM

Graduate students having assignments as Graduate Research Assistants, Graduate Fellows or Teaching Assistants may qualify for Tuition Benefit. Full-time, matriculated graduate students whose salary or fellowship meets minimum support requirements may have 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 or differential tuition.

Students that qualify for the Tuition Benefit are required to adhere to the policy outlined by the Graduate School, which can be found at <http://gradschool.utah.edu/tbp>. 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 in a PhD program who entered with a Bachelor's degree are limited to 5 years (10 semesters) of tuition benefit support.
- Students in a PhD 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 PhD program with a Master's degree from another university are eligible for four years (8 semesters) of tuition benefit support.
- Students adding or dropping courses after the published university deadline are responsible for paying all fees incurred.

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 his or her 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, or one credit hour if no longer eligible for tuition benefit, for the semester in which the thesis/dissertation defense takes place.

Students should consult with the Graduate Academic Advisor 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 Graduate Research Assistants. More information about the HIBP can be found at <http://gradschool.utah.edu/>. Students should consult with the Graduate Academic Advisor about these benefits.

## OTHER IMPORTANT INFORMATION

### SAFETY AND WELLNESS

Your safety is our top priority. In an emergency, dial 911 or seek a nearby emergency phone (throughout campus). Report any crimes or suspicious people to 801-585-COPS; this number will get you to a dispatch officer at the University of Utah Department of Public Safety (DPS; [dps.utah.edu](https://dps.utah.edu)). If at any time, you would like to be escorted by a security officer to or from areas on campus, DPS will help — just give a call.

The University of Utah seeks to provide a safe and healthy experience for students, employees, and others who make use of campus facilities. In support of this goal, the University has established confidential resources and support services to assist students who may have been affected by harassment, abusive relationships, or sexual misconduct. A detailed listing of University Resources for campus safety can be found at <https://registrar.utah.edu/handbook/campussafety.php>

Your well-being is key to your personal safety. If you are in crisis, call 801-587-3000; help is close. The university has additional excellent resources to promote emotional and physical wellness, including the Counseling Center (<https://counselingcenter.utah.edu>), the Wellness Center (<https://wellness.utah.edu>), and the Women's Resource Center (<https://womenscenter.utah.edu>). Counselors and advocates in these centers can help guide you to other resources to address a range of issues, including substance abuse and addiction.

### TEACHING ASSISTANTSHIPS

As part of their educational experience, PhD students are required to perform two (2) unpaid teaching assistantships. Thesis-based master's students funded through a research program are required to perform one (1) unpaid research assistantship. Opportunities to perform additional, paid teaching assistantships may be available.

### RESPONSIBILITIES AND EXPECTATIONS

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

## PROCESS:

- Students will be notified each semester of TA opportunities.
- The department's Graduate 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.
- 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. Compensation rates are adjusted yearly and are a set amount regardless of credit hours or number of students in the course.
- 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.

## OFFICE SPACE, COMPUTERS, E-MAIL, PRINTERS

**Office space:** Office space and a desk will be provided for all PhD students. Students should speak with their advisor or the Graduate Academic Advisor regarding location of the desk. Students are responsible for keeping their desks and work areas clean. Students must clean their desk and office, move out and return office and/or laboratory keys, within 30 days of defending their dissertation.

**Computers:** In general, the Department of Chemical Engineering does not provide computers for students. In exceptional cases, a computer may be provided in association with a research project. Students are welcome to use their own computers, which can be connected to the University's network system.

**Telephones:** The Department of Chemical Engineering does not provide telephones for graduate students. If a long distance or overseas call needs to be made, students should consult with their research advisor.

**Email:** All students are assigned a University of Utah email address upon enrollment with the University. The default email address is e.g., u1234567@utah.edu. Students can make an alias email address, for example firstname.lastname@utah.edu by visiting the Office of Information Technology University Network ID web site at <http://unid.utah.edu>.

**Printing and Copying:** Availability of printers and copy machines varies by location. In general, printers and copy machines are to be used for research purposes only. Students are expected to use their own printers for coursework and personal matters.

## GRADUATE STUDENT ADVISORY COMMITTEE (GSAC)

The Graduate Student Advisory Committee (GSAC) 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 GSAC 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 GSAC 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 GSAC will provide recommendations on any faculty members being considered for retention, tenure, or promotion (RPT).
- The GSAC 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 Chemical Engineering GSAC 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 GSAC please refer to the GSAC website at <https://chegsac.utahclubs.org/>.

## REQUIRED FORMS

Required forms for the various graduate degrees are summarized in the table below. Forms must be completed and submitted to the Graduate Academic Advisor by the specified deadline. Information from the forms is entered electronically into the university's graduate student tracking system. Students can check the status of their forms through the audit link located in the Campus Information System. Forms are available under the Graduate section of the Chemical Engineering web pages.

All required forms are available for download from the Department of Chemical Engineering web pages at <http://che.utah.edu/graduate/forms/>.

| Form   | Due  | PhD Chem Eng | MS Chem Eng (coursework) | MS Chem Eng (project) | MS Chem Eng (thesis) |
|--|--|--------------|--------------------------|-----------------------|----------------------|
| Request for MS Supervisory Committee                     | End of second semester                                 |              |                          | ★                     | ★                    |
| Request for PhD Supervisory Committee                    | Within 6 months of passing qualifying exam             | ★            |                          |                       |                      |
| Program of Study   | End of second year                                     | ★            | ★                        | ★                     | ★                    |
| Research Proposal  | End of second year                                     | ★            |                          |                       |                      |
| Milestone Masters Application (optional)                 | When milestones met, latest semester before graduation | ★            |                          |                       |                      |
| Application for Graduate Degree                          | Semester before graduation                             | ★            | ★                        | ★                     | ★                    |
| Final Exam   | After approval of thesis or dissertation               | ★            | ★                        | ★                     | ★                    |
| Student Exit   | With Final Reading Approval form                       | ★            |                          |                       | ★                    |
| Supervisory Committee Approval of Thesis or Dissertation | After approval of thesis or dissertation               | ★            |                          |                       |                      |
| Final Thesis or Dissertation Reading Approval            | After approval of thesis or dissertation               | ★            |                          |                       |                      |

The purpose of each form is briefly explained on the following page.



## DESCRIPTION OF FORMS

- **Supervisory Committee Form:** This is a department form that is required to formally establish a student's Supervisory Committee. For Master's students, this form is due by the end of the second semester of study. For PhD students, the form needs to be submitted within six months of successful passing of the qualifying exam.
- **Program of Study Form:** This is a department form that is required to set up a student's Program of Study (courses the student will take to meet the requirements of the degree). This form should be completed in consultation with the student's faculty advisor or the Director of Graduate Studies. This form should be submitted by the end of the second year of study.
- **Research Proposal Form:** This department form, which is for PhD students only, is submitted after a PhD candidate has successfully passed his or her research proposal. The form needs to be signed by every member of the candidate's Supervisory Committee. The research proposal and associated form should be completed by the end of the second year of study.
- **Milestone Masters Application Form:** This department form is submitted after a PhD candidate has fulfilled all requirements for a milestone master's degree (see page 11) and must be submitted no later than one semester before the student graduates.
- **Application for Graduate Degree:** This university form is due to the graduation office one semester prior to graduation. Students must confer with their advisor regarding graduation date before submitting this form. Visit <http://gradschool.utah.edu/> for graduation application deadlines.
- **Final Exam Form:** This is a Graduate School form that is submitted to the Graduate Academic Advisor after the final examination has been approved. The form of the final examination depends on the degree. For PhD students the final examination is the dissertation defense. For a coursework-based Masters, the final examination is successful completion of all coursework with a minimum average GPA of 3.3. For project and thesis-based master's degrees the final examination is the defense of the project or thesis.
- **Student Exit Form:** This department form is required for students who have been performing research and/or had an office or desk at the university. This form is due to the Graduate Academic Advisor upon completion of the final exam, and after a student has fulfilled housekeeping obligations as evidenced by signature of the advisor and Chemical Engineering staff. Failure to submit this form will stop the graduation process.
- **Supervisory Committee Approval of Thesis or Dissertation:** This university form is signed by all members of a student's Supervisory Committee after the student successfully defends his/her thesis or dissertation and makes all edits and changes required by the committee.
- **Final Reading Approval Form:** This university form is submitted after successful completion of the final exam (thesis defense) and approval of the supervisory committee as evidenced by the Supervisory Committee Approval Form. This form requires the signature of the Chemical Engineering Department Chair. NOTE: The department Chair will not sign this form unless it is accompanied by the completed Student Exit Form. The Final Reading Approval form is submitted to the Thesis Office of the University Graduate School prior to submitting a thesis for Thesis Office approval.