

CHEMICAL ENGINEERING GRADUATE STUDENT HANDBOOK 2019/2020

This handbook provides a brief overview of the requirements and typical course of study for graduate students in the Chemical Engineering department. Additional information regarding policies, procedures, and requirements is available on the UND Graduate School webpage (<https://und.edu/programs/chemical-engineering-bs-ms-meng/index.html>)

Initial Milestones

To help students progress quickly towards completion of their degree we have identified the following important milestones for the first year of graduate study. Your research advisor and the Graduate Director are available to help you with each of these tasks, but the responsibility is yours to see that they are completed within the expected timeframe. Note: the 1st year consists of three terms. If you start in the fall term, the order is: fall, spring, and summer. If you start in the spring term, the order is: spring, summer, fall.

1st Term

- Select courses (with help of Graduate Director)
- Review Initial Program of Study (with Graduate Director)
- Complete Safety Training (report to Graduate Director)
- Complete Harassment Training (report to Graduate Director)
- Select Research Advisor (submit form to Graduate School)

2nd Term

- Select Committee (submit form to Graduate School)
- Finalize Program of Study (submit form to Graduate School)
- Present research plan to seminar
- Prepare Topic Proposal (submit form to Graduate School)

3rd Term

- Progress Review Meeting (with your Graduate Committee)

See the *Graduate Student Handbook* on the Grad School webpage for additional information on completing forms and graduation requirements and procedures.

M.S. ChE Program (with thesis)

Graduation Requirements

- 30 credits, including:
 - 20 from ChE
 - 15 from >500 level
 - 21 formal coursework (7 courses)
 - Chemical Engineering core courses:
 - ChE 501 Advanced Transport
 - ChE 509 Advanced Thermodynamics
 - ChE 511 Advanced ChE Kinetics
 - ChE 515 Design of Experiments
 - Other ChE graduate courses:
 - ChE 504 Air Pollution Control
 - ChE 505 Biochemical Engineering
 - ChE 525 Polymer Engineering
 - ChE 530 Combustion Theory and Modeling
 - ChE 531 Rocket Propulsion
 - ChE 532 Explosives: Theory and Modeling
 - ChE 535 Metallic Corrosion and Polymer Degradation
 - Can get a minor (9 credits of graduate coursework in e.g., EnvEng, MechEng, Chemistry, Math)
 - Can get a cognate (6 credits of 300+ level coursework taken for graduate credit in e.g., Business, Biochem, Biology)
 - 2 seminar credits
 - 4 thesis credits
 - 3 research credits
- Thesis
- Defense

Typical Course Schedule (shown for fall start)

1st Term (fall)

9 credits coursework (3 courses)

1 seminar

2nd Term (spring)

6 coursework (2 courses)

1 seminar

3rd Term (summer)

3 research

4th Term (fall)

6 coursework (2 courses)

5th Term (spring)

4 thesis

2 continuing enrollment

6th Term

3 continuing enrollment (if needed)

MS Non-thesis

Graduation Requirements

- 30 credits, including:
 - 24 formal coursework (8 courses)
 - Chemical Engineering
 - ChE 501 Advanced Transport
 - ChE 509 Advanced Thermodynamics
 - ChE 511 Advanced ChE Kinetics
 - ChE 515 Design of Experiments
 - Other ChE graduate courses:
 - ChE 504 Air Pollution Control
 - ChE 505 Biochemical Engineering
 - ChE 525 Polymer Engineering
 - ChE 530 Combustion Theory and Modeling
 - ChE 531 Rocket Propulsion
 - ChE 532 Explosives: Theory and Modeling
 - ChE 535 Metallic Corrosion and Polymer Degradation
 - Can get a minor (9 credits of graduate coursework in e.g., EnvEng, MechEng, Chemistry, Math)
 - Can get a cognate (6 credits of 300+ level coursework taken for graduate credit in e.g., Business, Biochem, Biology)
 - 2 seminar credits
 - 4 project credits
- Project report
- Defense in front of your advisor and your committee.

M. Eng. ChE Program

- 30 credits, including:
 - 30 formal coursework (10 courses)
 - Chemical Engineering
 - ChE 501 Advanced Transport
 - ChE 509 Advanced Thermodynamics
 - ChE 511 Advanced ChE Kinetics
 - ChE 515 Design of Experiments
 - Other ChE graduate courses:
 - ChE 504 Air Pollution Control
 - ChE 505 Biochemical Engineering
 - ChE 525 Polymer Engineering
 - ChE 530 Combustion Theory and Modeling
 - ChE 531 Rocket Propulsion
 - ChE 532 Explosives: Theory and Modeling
 - ChE 535 Metallic Corrosion and Polymer Degradation
 - Can get a minor (9 credits of graduate coursework in e.g., EnvEng, MechEng, Chemistry, Math)
 - Can get a cognate (6 credits of 300+ level coursework taken for graduate credit in e.g., Business, Biochem, Biology)

Combined BS/MS Program

Students can double count 6 credits for their BS and MS degrees.

- 30 credits (the same with MS requirements)

Accelerated BS/MS 4+1 Program

Students can double count 12 credits for their BS and MS degrees.

- 30 credits (the same with MS requirements)
- Students must first obtain a BS degree before MS enrollment.
- Students must complete MS requirement in 1 year.

ChE Ph.D. Program (Campus and online)

Graduation Requirements

- 90 credits, including:
 - 30 coursework
 - 12 ChE core (≥ 3.3 GPA)
 - Transport
 - Thermo
 - Kinetics
 - Design of Experiments
 - 9 outside ChE
 - 6 other coursework
 - 3 seminar
 - 12 dissertation
 - 36 research
 - 9 research or coursework
- Oral comprehensive exam
- Annual oral progress reports
- Dissertation
- Defense
- Continuing enrollment until completion of degree

Typical Course Schedule (shown for fall start)

1st Term (fall)

9 credits coursework (3 courses)

1 seminar

2nd Term (spring)

9 coursework (3 courses)

1 seminar

3rd Term (summer)

4 research

4th Term (fall)

6 coursework (2 courses)

1 seminar
3 research
5th Term (spring)
6 coursework (2 courses)
4 research
6th Term (summer)
4 research
7th Term (fall)
6 coursework (2 courses)
4 research
8th Term (spring)
3 coursework (1 course)
7 research
9th Term (summer)
4 research
10th Term (fall)
6 research
4 dissertation
11th Term (spring)
8 dissertation

Department Policies

Annual Progress Review Meetings

At the end of each year of study all graduate students are required to meet with their dissertation or thesis committee to review their progress over the previous year. Before the meeting students will prepare a written document describing their research accomplishments during the past year. This document should follow the format of a journal article or chapter(s) in a thesis or dissertation. A copy of this draft article or chapter(s) should be given to each committee member at least one week prior to the progress review meeting.

The student will also prepare a short (20-30 min) oral presentation of research accomplishments for the Committee. The main task for the Committee will be to evaluate the student's progress toward submission of a publication (and thesis or dissertation if in the final year) during the next year. Other tasks for the Committee will be to recommend the level of graduate assistantship support for the next year.

Assistantship Responsibilities

Students are expected to meet the goals and expectations set forth by the department.

Students supported by a ¼-time GRA/GTA are expected to spend 10 hours per week on work as directed by their advisor or grading policy by the instructor. Students shall also spend an additional 10 hours of independent work focused on meeting the goals of their thesis/dissertation research.

Students supported by a ½-time GRA/GTA are expected to spend 20 hours per week on work as directed by their advisor. Students shall also spend an additional 20 hours of independent work focused on meeting the goals of their thesis/dissertation research.

Students supported by a ½ time GRA/GTA are expected to be presented during the working hours e.g. 9:00 a.m-5:00 p.m. unless they have approval from their advisor to work different hours. ¼ time GRA/GTA schedules should be mutually agreed between student and advisor/supervising instructor.

Funding is typically provided for two calendar years for MS students (5 calendar years for PhD students), contingent upon satisfactory performance. Any delay in graduation does not guarantee funding.

Supplemental employment is only allowed with approval from the student's research advisor.

Computer Usage

In addition to other campus computing labs, all graduate student offices are equipped with computers for your research and course work. These machines are department property and should not be modified without prior approval. Please contact Dr. Bowman if you need additional software or encounter any problems with the operation of the office computers. ITSS can and does track downloads. Illegal downloading of software, music, videos, etc. can result in dismissal from UND and legal actions including fines and/or jail time.

Requirement

PhD students are required to complete the four core chemical engineering courses (ChE 501 Transport, ChE 509 Thermodynamics, ChE 511 Kinetics, and ChE 515 Design of Experiments) with an average GPA in these courses of at least 3.3. Students not meeting the required GPA will need to retake one or more these courses and achieve a 3.3 average to continue in the program. This core course requirement takes the place of a qualifying exam. Graduate students are expected to publish their research results in peer-reviewed journals. The number of the publications will be set by the students and their advisors. The typical numbers are 1-3 for MS students and 3-7 for Ph.D. students.

Graduation Procedures

In addition to Graduate School requirements, the Department of Chemical Engineering has several tasks that must be completed before a student can graduate: lab and office space must be thoroughly cleaned; chemical samples and other materials that need to be saved must be properly labeled and stored; all other chemicals, equipment, books, papers, supplies, etc. must be returned or removed; electronic copies of all data, data analysis files, thesis/dissertation, and other research products must be delivered to the research advisor. Final thesis/dissertation forms will not be signed until all of these items have been satisfactorily completed.

Oral Comprehensive Exam (for ChE PhD students only)

The oral comprehensive exam should be taken after a PhD student has completed at least 45 post baccalaureate credits. For students entering with a bachelor's degree this will typically occur at the start of their 3rd year in residence. For students entering with a master's degree this will typically occur at the start of their 2nd year in residence. (Note that an application to take the doctoral comprehensive examination must be submitted to the Graduate School at least 21 days prior to the date of the exam). The exam will be administered by at least three faculty members from the Department of Chemical Engineering and can take the place of the annual progress review meeting for that year.

The student will prepare a written draft of a journal article (or technical report with advisor consent) based on their research accomplishments and submit it to the exam committee members at least a week before the exam. For the oral exam the student will prepare a 20-30 min oral presentation summarizing their research proposal, results and analysis to date, and future plans. Faculty members will question the student on their research proposal, the four core chemical engineering courses, and application of these principles to the student's research.

The outcome of the exam will be Pass, Provisional Pass, or Fail. Students receiving a "Pass" will have demonstrated the potential to: (a) plan and conduct independent research, (b) apply chemical engineering principles to their research topic, and (c) effectively communicate research results in written and oral formats. Students obtaining a "Provisional Pass" will be required to meet additional conditions specified by the exam committee and approved by the Graduate Director. Students who fail the exam will be allowed one opportunity to repeat the exam. The reexamination must take place no later than 13 months after the initial exam attempt.

Lab Safety and Housekeeping

All graduate students are required to take a safety training course before they can begin work in any of the laboratories. For safety reasons, experimental work in the labs must be performed during normal working hours (8 am to 6 pm) unless permission is received from your advisor and there are at least two people working in or near the lab.

An essential element of safety is observing proper housekeeping practices in laboratory and office spaces. This includes returning unused equipment and supplies to storage areas, proper labeling, storage and disposal of all chemicals, and regular cleaning of glassware, equipment, countertops and floors. Properly stored food items are acceptable in office areas only, but are never permitted in laboratory areas. Failure to maintain a clean, safe laboratory and office area may result in disciplinary action, including loss of assistantship and tuition waiver funding.

Research Advisor and Project Selection

As soon as possible after arriving on campus all new graduate students are expected to meet with each of the faculty members in the department to introduce themselves and discuss research project opportunities. Upon completing these meetings students will submit a form to the Graduate Director listing their top choices for a research project and advisor. The department faculty will then make research advisor assignments so that students can start getting involved in research activities during their first semester.

Seminar

Graduate seminars are held each Friday at noon. **All graduate students are required to attend the department weekly seminars no matter you are registered or not.** At the end of each speaker's presentation there will be time for questions from the audience. You are expected to listen to each presentation carefully and ask relevant technical questions. You are also expected to make a 20-40 minute presentation on your research each year. Typically the first year's presentation will focus on your research plan and background information, while in the following year(s) you will present research results and analysis.

Tuition Waivers & Residency Status

Students receiving tuition waivers need to take care when registering for courses and research/thesis/dissertation credits. Tuition waivers are only valid for credits listed on the student's program of study. If you take coursework outside of the program of study, or do not have an approved program study after your first year of residence, or register for more credits than your awarded tuition waiver you will be responsible for tuition charges.

To allow the department to most efficiently use limited tuition waiver funds and provide full waivers to all, we ask that, where possible, graduate students establish residency in North Dakota. Most U.S. students can do this by obtaining a ND driver's license and living within the state for 1 year. After a year of residence a student can then apply for the North Dakota resident tuition rate, which is much less than the nonresident rate.

Vacations

Graduate students supported by a GRA/GTA are allowed two weeks of vacation per year plus University holidays. Time off must be approved in advance by the student's Advisor and the Graduate Director. Additional time off may be allowed under extraordinary circumstances; however, the student will not receive a stipend for this additional time away from UND. A "*Graduate Student Vacation Approval Form*" (available from the Graduate Director) should be completed to request and schedule vacation time.

Annual Progress Review Meeting Report for Chemical Engineering Graduate Students

Committee Chair should submit completed report to the ChE Graduate Director

Name of student: _____

Date of Annual Progress Review Meeting: _____

The student's progress towards the graduate degree was rated as follows by the dissertation/thesis committee:

Satisfactory

Not satisfactory

The committee recommends the following level of assistantship support during the next year:

½-time GTA/GRA

¼-time GTA/GRA

no GTA/GRA

other

The degree is expected to be completed at the end of _____ semester, 20____.

Comments (Use additional sheets if necessary):

Name _____ Signature _____
(Chairperson)

Name _____ Signature _____

Name _____ Signature _____

Name _____ Signature _____

Name _____ Signature _____

Oral Comprehensive Examination Report for Chemical Engineering PhD Students

*Committee Chair should submit completed report to the ChE Graduate Director
(together with Graduate School "Doctoral Comprehensive Examination" form)*

Name of student: _____

Date of Oral Comprehensive Exam: _____

The Student's performance on the oral comprehensive exam was voted as follows by the examination committee:

Pass

Provisional Pass

Fail

The degree is expected to be completed at the end of _____ semester, 20____.

Conditions Associated With Provisional Pass

Comments on how well student demonstrated potential to:

a) *Plan and conduct independent research*

b) Apply core chemical engineering principles (transport, thermo, kinetics, design of experiments) to research topic

c) Effectively communicate research results in written and oral formats

Other Comments (Use additional sheets if necessary):

Name _____ Signature _____
(Chairperson)

Name _____ Signature _____

Name _____ Signature _____

Name _____ Signature _____

Name _____ Signature _____

Graduate Student Vacation Approval Form

Graduate students supported by a GRA/GTA are allowed two weeks of vacation per year plus University holidays. Time off must be approved in advance by the student's Advisor and the Graduate Director. Additional time off may be allowed under extraordinary circumstances; however, the student will not receive a stipend for this additional time away from UND.

Please complete the form below to request and schedule vacation time.

Student Name _____

Requested Vacation Dates _____

Number of Days Requested _____

Number of Days Taken Year to Date _____

Number of Days

_____ Approved

_____ Approved without stipend

_____ Not Approved

Advisor signature

Date

Graduate Director signature

Date

Research Project & Advisor Selection

Selecting a research project and research advisor is one of the most important decisions you will make as a graduate student. In the next few days please meet with each of the faculty in the department to introduce yourself and to discuss the research projects that they have available.

	<u>Date of Meeting</u>
Dr. Alshami	_____
Dr. Bowman	_____
Dr. Ji	_____
Dr. Klemetsrud	_____
Dr. Kolodka	_____
Dr. Krishnamoorthy	_____
Dr. Mann	_____
Dr. Seames	_____

After meeting with each of the faculty, please list your 1st and 2nd choice research projects and return this form to Dr. Ji.

Name _____

	<u>Project</u>	<u>Advisor</u>
1 st Choice	_____	_____
2 nd Choice	_____	_____

Incoming graduate student questionnaire that is intended to evaluate the alignment of the Program of Study to the Student's Goals:

This is handed out to the student after a thesis advisor has been assigned and a preliminary discussion of the thesis project has taken place. Each question is evaluated by the advisor as "Satisfactory/Unsatisfactory" with the student repeating the exercise until all questions are answered satisfactorily.

1. List your immediate goals following graduate study.
2. List the specific topics and skill-sets in Chemical Engineering that you intend to master during your graduate study that will help you attain those goals.
3. List the specific courses that you intend to take that will provide you with the breadth and depth of knowledge on these topics.
4. List the goals and possible outcomes of your thesis work.
5. How do you envision synthesizing and integrating the knowledge that you have gained through your coursework towards addressing the goals/problems in your thesis?
6. What are the avenues through which you intend to effectively communicate (by writing and/or speaking) your knowledge on these topics to your peers, the public and other professionals in your discipline? (Please provide approximate timelines also).
7. List the professional, ethical standards and best practices that you will adhere to for ensuring that the research and your graduate study is being conducted in a responsible manner?