



**Department of Chemical and Environmental
Engineering**

**CHEMICAL AND ENVIRONMENTAL ENGINEERING
GRADUATE STUDENT HANDBOOK**

2015-2016

CHEMICAL & ENVIRONMENTAL ENGINEERING PERSONNEL

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WHOM TO SEE FOR HELP WITH ACADEMIC ISSUES?

In most circumstances, you should first pose questions on academic matters to your thesis or dissertation advisor. Other members of your committee should also provide guidance and mentoring. The Graduate Study Committees can help with advice especially on curriculum questions and deadlines. You may also contact the Department Chair at any time concerning issues related to your graduate studies.

Welcome!

This Graduate Handbook is intended to help you on your path through the Department's advanced degree program and on to future career success. Here you will find information and guidance from the time you arrive until you become one of our many outstanding graduates. We strongly suggest that you review the entire document now, ask questions, and also anticipate yearly revisions since we are continually updating this document. You should also become familiar with the information provided on the UA Graduate College website: <http://grad.arizona.edu/>. Specifically, general information about non-academic resources for graduate students can be found at <http://grad.arizona.edu/student-resources/student-services>.

INFORMATION FOR NEW STUDENTS

Assignment of Research Projects and Advisors

The MS and PhD degrees are primarily research degrees. Consequently, one of the most important objectives for entering graduate students is to participate in the processes for determining your research topic and advisor(s). Students must follow the guidelines described below for specific degree programs. Developing and maintaining an early working relationship with an advisor, who is responsible for mentoring, is extremely important. Students who for some reason do not complete these explicit processes for project and advisor selection on time cannot remain in the graduate programs.

The graduate study committees (GSC) oversee the project requests by incoming students for the respective degree programs. Final assignment of students to projects and research advisor(s) is made for all degree programs by the GSC and Department Chair based on student preferences, availability of funding, and balance in accordance with the research objectives of the department. Please see the Department Chair if you have any questions during these processes.

Safety Training

All entering graduate students are required to take safety training. This is available on-line through D2L. THIS IS REQUIRED PRIOR TO WORKING ON ANY PROJECT. Please bring a copy of your certificate to Debbie and a copy to your advisor.

Chemical Engineering

For the fall semester, graduate students will obtain an overview of the research being conducted in the department by attending the Chemical and Environmental Engineering Research Symposium (held every year around the beginning of classes of the fall semester). For students without an advisor, the GSC will make available a list of projects and the associated research advisors that can be considered by students. Students are strongly encouraged to interact with prospective major professors to find out more about specific projects immediately upon their arrival.

On a specific date, new chemical engineering students will indicate their preferences for a research project following guidelines established by the GSC, and they will be assigned to projects shortly thereafter.

Any requests for exceptions to the process described in this section must be made directly to the GSC.

Environmental Engineering:

Upon arrival on campus, new graduate students should contact the chair of the GSC to discuss getting started on the selection of projects and major professors. In general, new

students who are supported by departmental research assistantships meet only with faculty members who have research projects with supported student positions available. Self-supported students or students with fellowship support should meet with all faculty members that have available environmental research projects. All meetings with faculty regarding research should be completed within the first two weeks after arrival at the University of Arizona. In addition, the students must attend the Chemical and Environmental Engineering Research Symposium. This symposium will provide further introduction to the research activities in the department.

After completing these steps and no later than a specific date to be specified by the Graduate Studies Committee, new students should provide his/her first, second, and third choices on a special form available in the department office. This form must be returned to the GSC.

Departmental Graduate Seminar

All full-time graduate students enrolled in any chemical engineering or environmental engineering graduate program are required to register for 1 seminar unit (CHEE 696A) each semester **unless it conflicts with another course**. This is required even if they have satisfied the seminar requirements for their degree. All graduate students in residence are required to attend the departmental seminar.

Teaching Assistantships

Teaching assistantships are awarded/assigned by the GSC each semester. All chemical engineering PhD students will TA for one semester in their 3rd or 4th year. If additional TA positions are available in a given semester, priority is given to 2nd – 4th year PhD students. All students must have the appropriate background for the course for which they will TA (i.e. taken the equivalent course as an undergraduate). Faculty mentors nominate graduate students for TA positions. The TA positions consist of academic training intended to provide the student with the opportunity to participate in the education of undergraduate students. Duties may include conducting laboratory and discussion sessions, holding office hours, and participating in the elaboration of course materials.

Degree Requirements, Timelines and Deadlines

There are four graduate degrees offered by the Department of Chemical and Environmental Engineering: PhD in Chemical Engineering, MS in Chemical Engineering, PhD in Environmental Engineering, and MS in Environmental Engineering. Subsequent sections describe the particular requirements for each of these degree paths. Your advisor, other members of your committee, the members of the graduate study committees, and the staff graduate program coordinator are all sources of additional information regarding the department's degree requirements and deadlines.

Specific information about steps to the degree can be obtained from the Graduate College website, which includes a list of official requirements, deadlines and procedures. Make sure that you follow the specific instructions provided on the following pages:

<http://grad.arizona.edu/academics/degree-certification/gradpath>
http://grad.arizona.edu/system/files/Deadlines4terms.2013_14.pdf

DEGREE REQUIREMENTS

PhD PROGRAM IN CHEMICAL ENGINEERING

Course Requirements

Thirty-six units of coursework are required for the major subject, exclusive of dissertation research. Courses required for all chemical engineering PhD students are:

CHEE 502, Advanced Engineering Analysis
CHEE 505, Advanced Chemical Engineering Transport Phenomena
CHEE 506, Advanced Chemical Engineering Thermodynamics
CHEE 530, Chemical Reaction Engineering
CHEE 6XX, Chemical Engineering Research Proposition course

In addition to these core courses, students who enter the PhD program without an MS in chemical engineering must take 15 units of electives (which includes the minor), and 4 units of departmental seminar (CHEE 696A), and 1 unit of ChEE 900 in the spring of Years 3 and 4 to complete the 36-units. All core and elective courses must be in courses in which regular grades (A, B or C) have been earned. Students who enter the PhD program with an MS may transfer up to 12 units of coursework after approval from the Graduate College, and will be evaluated individually to devise a plan of study.

Qualifying Examination

The PhD Qualifying Examination is a written exam, given in August of the 2nd year before the semester starts. The exam is over 2 days and the subjects evaluated are Transport Phenomena, Thermodynamics, Reaction Engineering and Applied Mathematics. The material evaluated will be a mixture of graduate and undergraduate material. The written qualifying exam is waived for students with a GPA of 3.75 and above in the core courses ChEE 502, 505 506, and 530. Students entering with a BS in Chemical Engineering must take the exam the first time it is offered. If a student enters with a degree other than chemical engineering, the GSC will work with the student to develop a plan of study. A student failing two or more parts of the exam fails the exam and cannot retake it. The student will be put on a MS track. A student failing only one part can retake that one part in December. If the student fails this part again, then the student will have failed the written qualification exam and be put on the MS track.

Choice of Minor

All PhD students must fulfill the requirements for a minor in a program of their choice. Selection of the minor should be compatible with the student's research interests and discussed with the research advisor. Minors are administered and approved by the minor department. They typically consist of 9 to 12 units of course work. These units are part of the 15 elective units mentioned in the Course Requirements Section.

Plan of Study

In conjunction with his/her advisor, each student is responsible for developing a Plan of Study, to be filed with the Graduate College during the semester after passing the qualifying examination. The Plan of Study identifies (1) courses the student intends to transfer from other institutions; (2) courses already completed at The University of Arizona, which the student intends to apply toward the graduate degree; and (3) additional course work to be completed in order to fulfill degree requirements. The Plan of Study must have the approval of the student's advisor and chair of the GSC before it is submitted to the Graduate College.

Comprehensive Examination

Before admission to candidacy for the doctoral degree, the student must pass both a Written and an Oral PhD Comprehensive Examination. These examinations are intended to test the student's comprehensive knowledge of the major and minor subjects of study, both in breadth across the general field of study, and in depth within the area of specialization. The Comprehensive Examination is considered a single examination, although it consists of written and oral parts. The committee that will evaluate the comprehensive examination will consist of the dissertation committee and at least one University of Arizona faculty from the chosen minor. Committee members from other programs and institutions can be incorporated in addition to the chemical engineering faculty and minor members as a courtesy and/or as adjunct appointments. The GSC forms the thesis committee in consultation with the faculty.

The Comprehensive Examination must be completed in the Spring semester following completion of the Qualifying Examination (i.e. 4th semester at the UA). This will be done as part of a new required course ChEE 6XX. Students will register for this course that will focus on oral and written communication. The written part of the comprehensive examination will be a research proposal that will be prepared as part of the CHEE 6XX course requirements. Students must take this course and complete the proposal by the end of their fourth semester in residency.

The oral part of the comprehensive examination will be a defense of the thesis proposal in which the student must demonstrate breadth in chemical engineering. The oral part of the examination must be completed before the beginning of their 5th semester in residency (i.e. Fall semester of 3rd year). Students should be aware that they need to complete most of their coursework (that is at least 27 of the 30 units of core course and electives) to be eligible to take the comprehensive examination.

Annual Interaction with Thesis Committee

The overall goal is for students to complete their PhD degrees in 4 years. Hence, in the years after Completion of the Comprehensive Examination (Years 3, 4) all PhD candidate will register for one unit of ChEE 900 in the spring semester. To complete the course, the candidate must have a meeting with his/her committee and discuss progress towards

degree completion. The meeting will consist of an oral presentation given to the committee. The presentation should review progress to date and in particular should include a discussion of the publications that will be submitted or are in progress.

Publications Requirement

PhD students must have two publications either accepted, in press or published in peer-reviewed, indexed journals. Copies of the publications must be submitted to the department chair, along with the Publication Compliance Form, available in the department's office, before the final oral examination is scheduled. In exceptional circumstances, a successful submission of a manuscript to a peer-reviewed journal can be counted as one of the required publications.

Final Oral Examination

Upon the completion and successful approval of the dissertation research by the dissertation committee, the candidate is to submit to a Final Oral Defense Examination. A copy of the signed cover page of the Dissertation document should be submitted to the GSC. The examination focuses on the dissertation itself but can include general questioning related to the field(s) of study within the scope of the dissertation. The examining committee will be the same dissertation committee. Committee members representing the minor program must be invited to the defense, but their participation is optional.

Typical Coursework Schedule – PhD in Chemical Engineering

Fall Semester - Year 1

CHEE 502 (3)
CHEE 505 (3)
CHEE 506 (3)
CHEE 696A (1)
CHEE 920 (1)

Spring Semester - Year 1

CHEE 530 (3)
Elective or Minor (6)
CHEE 696A (1)
CHEE 900 (1)
CHEE 920 (1)

Fall Semester - Year 2

Electives and/or Minor (6)
CHEE 920 (5)
CHEE 696A (1)

Spring Semester - Year 2

Electives and/or Minor (3)
CHEE 6XX (3)
CHEE 920 (5)
CHEE 696A (1)

Fall Semester - Year 3

CHEE 920 (3- 11)
CHEE 696A (1)

Spring Semester - Year 3

CHEE 900 (1)
CHEE 920 (2-10)
CHEE 696A (1)

Fall Semester - Year 4

CHEE 920 (3-11)
CHEE 696A (1)

Spring Semester - Year 4

CHEE 900 (1)
CHEE 920 (1 - 10)
CHEE 696A (1)

Note: Only 4 units of seminar (CHEE 696A) and 22 units of dissertation (CHEE 920) will be used as requirements for the PhD degree.

Requirements for PhD Degree in Chemical Engineering

Year 1

Fall	Spring
Transport – ChEE 505 Thermodynamics – ChEE 506 Mathematics – ChEE 502 ChEE 696A and ChEE 920 A student will be assigned to a research group before matriculating. Desire to have students interview with faculty and research groups then make assignments.	Kinetics – ChEE 530 Elective Elective ChEE 696A, ChEE 900 and ChEE 920 A student with a GPA below 3.75 in the four core ChemE courses must take the written qualification exam in August. The exam is waived for a student with a GPA of 3.75 and above.

Written qualification exam. Offered in August before fall semester starts. Consists of four parts on transport, mathematics, thermodynamics, and kinetics, and can contain both undergraduate and graduate material. A student failing two or more parts fails the exam and cannot retake it. The student will be put on the MS track. A student failing only one part can retake that one part in December. If the student fails this part again then the student will have failed the written qualification exam and be put on the MS track

Year 2

Fall	Spring
Elective Elective ChEE 696A and ChEE 920 File Plan of Study	Elective New ChEE course on oral and written communication. – ChEE 6XX ChEE 696A and ChEE 920 Comprehensive exam: 1) write thesis proposal and 2) orally defend thesis proposal and demonstrate breadth in chemical engineering. A student must submit a thesis proposal and defend it by the end of their fourth semester or receive a failing grade in the thesis course.

30 graded course units required for the PhD (Graduate College requires $(36+9)/2=22$ units to come from courses in which a grade is given on the A/B/C/D/E system).

4 core chemical engineering courses + thesis proposal course.

5 elective courses. These courses include those for the minor.

Transfer students from US universities will be evaluated individually to devise plans for courses and the written qualification exam.

After thesis proposal is approved, TA for one semester.

Graduate committee forms thesis committee in consultation with faculty.
Yearly thesis committee meetings in years 3-4. Take 1 unit 900 level course in spring.

MS PROGRAM IN CHEMICAL ENGINEERING

Course Requirements

Courses required for all Chemical Engineering MS students are:

CHEE 502, Advanced Engineering Analysis
CHEE 505, Advanced Chemical Engineering Transport Phenomena
CHEE 506, Advanced Chemical Engineering Thermodynamics
CHEE 530, Advanced Chemical Reaction Engineering

There are two MS degree options:

1. Thesis MS

In this option, the student will develop a research project leading to the MS thesis, which must be defended successfully before a thesis committee. Requirements in addition to the core courses are

12 units of elective courses in chemical engineering or related fields
1 unit of seminar (CHEE 696A)
5 units of MS Thesis (CHEE 910).

2. Non-thesis MS

In this option, the student will participate either in a one-semester research project or in a one-semester industrial internship. Requirements in addition to the core courses are:

15 units of elective courses in chemical engineering or related fields
3 units of CHEE 909 (Masters report - research) or 3 units of CHEE 594 (Practicum - internship)

Plan of Study

In conjunction with the advisor, each student must file a Plan of Study with the Graduate College during the second semester in residence. The Plan of Study identifies (1) courses the student intends to transfer from other institutions; (2) courses already completed at The University of Arizona which the student intends to apply toward the graduate degree; and (3) additional course work to be completed in order to fulfill degree requirements. The Plan of Study must have the approval of the student's advisor and chair of the GSC before it is submitted to the Graduate College.

Final Oral Defense Examination (Thesis MS only)

Upon the completion and successful approval of the MS thesis research by the thesis committee, the candidate is to submit to a Final Oral Defense Examination. A copy of the signed cover page of the research document should be submitted to the GSC. The examination focuses on the research. The examining committee will consist of the MS Thesis Committee. All members of the committee should be present during the examination while the presence of additional committee members is optional.

Typical Coursework Schedule – Thesis MS in Chemical Engineering

Fall Semester - Year 1

CHEE 502 (3)
CHEE 505 (3)
CHEE 506 (3)
CHEE 696A (1)
CHEE 910 (2)

Spring Semester - Year 1

CHEE 530 (3)
CHEE 696A (1)
Electives (6)
CHEE 910 (variable)

Fall Semester - Year 2

CHEE 910 (variable)
CHEE 696A (1)
Electives (6)

Typical Coursework Schedule – Non-thesis MS in Chemical Engineering

Fall Semester - Year 1

CHEE 502 (3)

CHEE 505 (3)

CHEE 506 (3)

Elective (3)

Spring Semester - Year 1

CHEE 530 (3)

Electives (9)

Fall Semester - Year 2

Elective (3)

CHEE 909 or CHEE 594 (3)

Note: the non-thesis MS can be completed in one year by taking an additional elective in either fall or spring semesters, and completing CHEE 909 or CHEE 594 in the summer.

Summary of Requirements for Graduate Degrees in Chemical Engineering

	PhD ¹	Thesis MS	Non-thesis MS
Required Courses (502, 505, 506, 530)	12	12	12
Electives (Graduate lecture courses)	20	12	15
Seminar 696A	4	1	
CHEE 909 or CHEE 594			3
MS Thesis		5	
Subtotal	36	30	30
Dissertation + ChEE 900	25		
Minor Department or Program ²	9-12		

¹Students who enter the PhD program with an MS in Chemical Engineering will be allowed to transfer course work as part of the requirements for the PhD according to regulations stipulated by the Graduate College

²Requirements dictated by Minor Department

PHD PROGRAM IN ENVIRONMENTAL ENGINEERING

Course Requirements

With Prior MS If an approved MS degree is completed (either at the UA or elsewhere) prior to entering the doctoral program, a minimum of 15 units of coursework must be completed beyond the MS degree requirements. An approved minor must be completed. The required coursework in the minor may be included in the 15 unit requirement. In addition, 18 units of dissertation and 2 units of seminar must be completed.

Without Prior MS A minimum of 36 units of approved coursework in the major area must be completed. An approved minor must be completed, but the required coursework in the minor may not be included in the 36 unit major requirement. In addition, 18 units of dissertation and 2 units of seminar experience must be completed.

All Environmental Engineering PhD students are required to take the following courses at the UA or an approved equivalent elsewhere:

CHEE 500R, Water Chemistry for Engineers
CHEE 500L, Environmental Engineering Laboratory
CHEE 574, Environmental Transport Processes
CHEE 576A, Water Treatment System Design
CHEE 576B, Wastewater Treatment System Design
CHEE 577R, Microbiology for Engineers
CHEE 676, Advanced Water and Wastewater Treatment

Qualifying Examination

The Qualifying Examination is a written exam, given once per year, if needed. The subjects evaluated are Environmental Transport, Water Chemistry, Environmental Microbiology, and Water Treatment and Wastewater Treatment System Design. The Qualifying Examination may be waived at the discretion of the Environmental Engineering Graduate Study Committee (EEGSC) for students who have completed a master's degree in Environmental Engineering at the UA, but is required of all other doctoral students. It is the responsibility of the doctoral candidate and their advisor to determine when the Qualifying Examination should be taken, but it must be taken no less than 3 months before the University Comprehensive Examination.

Dissertation Committee

The Dissertation Committee must include a minimum of three members, all of whom must be University of Arizona tenured, tenure-track, or approved as equivalent. It must include the Dissertation Director and one other member of the Chemical and Environmental Engineering Department faculty. Additional committee members (a

minimum of one and maximum of three) may be drawn from ChEE department, the candidate's minor department, or another UA department faculty or be a specially approved member from outside the UA faculty.

Choice of Minor

All PhD students must fulfill the requirements for a minor in a program approved by the candidate and their dissertation advisor. Minor requirements are administered and approved by the minor department. They typically consist of 9 to 12 units of course work.

Plan of Study

In conjunction with his/her advisor, each student is responsible for developing and filing a Plan of Study as described in the Graduate College requirements. The Plan of Study identifies (1) courses the student intends to transfer from other institutions; (2) courses already completed at The University of Arizona which the student intends to apply toward the graduate degree; and (3) additional course work to be completed in order to fulfill degree requirements. The Plan of Study must have the approval of the student's Dissertation Advisor, minor advisor, and the ChEE Department Chair before it is submitted to the Graduate College. The Graduate College recommends that students submit their Plan of Study in the second semester (MS students) and third semester (PhD students) in residence at University of Arizona.

Comprehensive Examination

Before admission to candidacy for the doctoral degree, the student must pass both a Written and an Oral Doctoral Comprehensive Examination. These examinations are intended to test the student's comprehensive knowledge of the major and minor subjects of study, both in breadth across the general field of study, and in depth within the area of specialization. The Comprehensive Examination is considered a single examination, although it consists of written and oral parts. The examining committee must consist of a minimum of four members, three of whom represent the Environmental Engineering major and one of whom represents the candidate's minor. All must be University of Arizona tenured, tenure-track, or approved as equivalent.

Written Comprehensive Examination The Written part of the Comprehensive Examination consists of a written comprehensive research proposal. This document should contain a thorough literature analysis of the subject of the dissertation research (*i.e.* the state of the art), and a detailed research plan on which subsequent dissertation-related work will be premised. The entire document, not including appendices and references, must be a minimum of 10 and not more than 20 pages (single-spaced in a normal research article format and font). The written document, after approval by the Dissertation Advisor, must be

submitted to the other members of the examining committee not less than four weeks prior to the oral comprehensive exam and must be approved by all committee members prior to the oral comprehensive exam.

Some minor departments require a written comprehensive exam. It is the student's responsibility to complete this requirement, if required, prior to undertaking the oral comprehensive exam.

Oral Comprehensive Examination. The Oral Comprehensive Examination is conducted by the student's full Comprehensive Examination Committee. This is the occasion when faculty committee members have both the opportunity and obligation to see that the student can display a broad knowledge of the chosen field of study and sufficient depth of understanding in areas of specialization. The Oral Comprehensive Examination is mainly based on coursework to ensure that the candidate has a thorough grasp of his/her major and minor subject areas. The student should be able to display a broad knowledge of the chosen field of study and sufficient depth of understanding in areas of specialization. Discussion of proposed dissertation research may be included. The examining committee must attest that the student has demonstrated the professional level of knowledge expected of a junior academic colleague.

Timeline for Comprehensive Examination and Requirements

The written and oral portions of the comprehensive examination must take place at least three months prior to the Final Oral Examination (defense of dissertation). The Oral Comprehensive Examination is performed upon successful completion of the written examinations in the major and minor(s). The exact time and place of this examination must be scheduled with the Graduate Degree Certification Office at least 7 working days in advance.

To satisfy the requirements of the comprehensive examination a student must:

- File a Program of Study with the Graduate Study Committee
- Satisfy all requirements stipulated by the minor department or program
- Complete all required courses, and a minimum of 90% of *all* course work
- Complete the Written Comprehensive Examination as described above
- Take and successfully pass the Oral Comprehensive Examination.

Final Oral Defense Examination

Upon the completion and successful approval of the dissertation research by the dissertation committee, the candidate must successfully complete a Final Oral Defense Examination. The examination focuses on the dissertation itself but can include general questioning related to the field(s) of study within the scope of the dissertation. The examining committee will be the Dissertation Committee previously described. Committee members representing the Minor Program must be invited to the Defense, but their participation is optional.

**Summary of Requirements for Graduate Degrees in
Environmental Engineering**

	PhD ¹	MS Thesis	MS Non-Thesis ²
Required Courses (500R, 500L, 574, 576A&B, 577R, 676)	19	19	19
Electives ³	15	6	6 ²
Seminar (CHEE 696A)	2	1	1
MS Thesis (CHEE 910)		4	
MS Report (CHEE 909)		4	4
Subtotal	36	30	30
Dissertation (CHEE 920)	18		
Minor Department or Program ⁴	9-12		
Total	63-66	30	30

¹Students who enter the PhD program with an MS in Environmental Engineering or equivalent may transfer course work as part of the requirements for the PhD according to regulations stipulated by the Graduate College and approval by the Environmental Engineering GSC

² A prerequisite for students who enter the Master of Science (non-thesis) is 10 units of undergraduate courses with environmental engineering emphasis or other approved undergraduate classes.

³Some examples of possible electives: ChEE 525 “*Emerging Issues in Water Quality*”, ChEE 573 “*Biodegradation of Organic Compounds*”, ChEE 574 “*Bioremediation of Inorganic Compounds*”; Chee 578 “*Hazardous Waste Management*”, ChEE 482/582 – *Analysis of Emerging Environmental Contaminants*, ChEE 510 - *Logistics of Writing a Manuscript for the Chemical and Environmental Engineering*, ChEE 569A “*Air Pollution*”; ChEE 696c “*Topics in Mine Reclamation and Environmental Management Seminar-based Course*”.

⁴Requirements dictated by Minor Department.

Typical PhD Environmental Engineering Coursework Schedule

Fall Semester - Year 1

CHEE 500R (3)
CHEE 500L (1)
CHEE 577R (3)
CHEE 576A (3)

CHEE 696A (1)
CHEE 920 (1)

Spring Semester - Year 1

CHEE 574 (3)
CHEE 576B (3)
Elective or Minor (3)

CHEE 696A (1)
CHEE 920 (2)

Fall Semester - Year 2

Electives and/or Minor (variable)

CHEE 920 (variable)
CHEE 696A (1)

Spring Semester - Year 2

CHEE 676 (3)
Electives and/or Minor (variable)

CHEE 920 (variable)
CHEE 696A (1)

Fall & Spring Semesters - Year 3 until completion

Electives and/or Minor (variable)

CHEE 920 (variable)
CHEE 696A (1)

MS PROGRAM IN ENVIRONMENTAL ENGINEERING

Course Requirements

All MS Students

All Environmental Engineering PhD students are required to take the following courses at the UA or an approved equivalent elsewhere:

CHEE 500R, Water Chemistry for Engineers
CHEE 500L Environmental Engineering Laboratory
CHEE 574, Environmental Transport Processes
CHEE 576A, Water Treatment System Design
CHEE 576B, Wastewater Treatment System Design
CHEE 577R, Microbiology for Engineers
CHEE 676, Advanced Water and Wastewater Treatment

Thesis MS Students

The thesis MS track requires 30 units of graduate level coursework. In addition to the required courses listed above, all students undertaking the Master's thesis track must complete the following:

CHEE 910, Thesis (4 units)
CHEE 696A, Seminar (1 unit)
Approved Electives (6 units)

Non-Thesis Students

A prerequisite for students who enter the Master of Science (non-thesis) is 10 units of undergraduate courses with environmental engineering emphasis or other approved undergraduate classes. Students considering this track should consult with a faculty advisor as to which courses taken as an undergraduate may satisfy unit requirements under this track.

The non-thesis MS track requires 30 units of coursework. In addition to the required courses listed above, all students undertaking the Master's non-thesis track must complete the following courses:

CHEE 909, Masters Report (4 units)
CHEE 696A, Seminar (1 unit)
Approved Electives (6 units)

Plan of Study

In conjunction with the advisor, each student must file a Plan of Study with the Graduate College during the second semester of residence. The Plan of Study identifies (1) courses the student intends to transfer from other institutions; (2) courses already completed at The University of Arizona which the student intends to apply toward the graduate degree;

and (3) additional course work to be completed in order to fulfill degree requirements. The Plan of Study must have the approval of the student's advisor and Department Chair before it is submitted to the Graduate College.

Selection of Thesis Committee

After completion of the plan of study, it is the responsibility of the student and their thesis advisor to select a Thesis Committee. The Thesis Committee will consist of the Thesis Director and two other members of the ChEE Faculty. Committee members from other Institutions can be incorporated in addition to the ChEE Faculty as a courtesy and/or adjunct appointment.

Final Oral Defense Examination

Upon the completion and approval of the written MS research thesis by the Thesis Committee, the candidate must pass a Final Oral Defense Examination. The examining committee will consist of the MS Thesis Committee. All ChEE members of the committee should be present during the examination. The presence of additional committee members is optional.

Typical MS Environmental Engineering Coursework Schedule

Fall Semester - Year 1

CHEE 500R (3)
CHEE 500L (1)
CHEE 577R (3)
CHEE 576A (3)
CHEE 696A (1)
Report or Thesis (1)

Spring Semester - Year 1

CHEE 574 (3)
CHEE 576B (3)
Elective (3)
CHEE 696A (1)
Report or Thesis (2)

Fall Semester - Year 2

Electives (variable)
Report or Thesis (variable)
CHEE 696A (1)

Spring Semester - Year 2

CHEE 676 (3)
Electives (variable)
Report or Thesis (variable)
CHEE 696A (1)