COLLEGE OF ENGINEERING

Chemical & Environmental Engineering

2024–2025 GRADUATE STUDENT HANDBOOK

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Photo by Grace Fuller

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1. Introduction

This Graduate Handbook is intended to help you on your path through the Department of Chemical and Environmental Engineering's (the Department's) advanced degree programs 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 recommend that you review the entire document now and ask questions about it. Please be aware that the handbook is likely to be updated each year and that those revisions may be important to you. You should also become familiar with the information provided on the University of Arizona (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/new-and-current-students.

2. General Program Information

The Department offers the following advanced degrees in both Chemical Engineering (ChE) and Environmental Engineering (EEN): Master of Science (MS) with and without a thesis (MS Thesis and MS Non-Thesis), and the Doctor of Philosophy (PhD). Both programs also offer an Accelerated Master's Program (AMP) leading to an MS Non-Thesis or MS Thesis degree. Students in the MS Non-Thesis degree program will broaden their knowledge in their chosen discipline, and by selecting the MS Thesis program, students will complete a research project working in close collaboration with a faculty member. Students choosing the PhD degree will be trained to do independent and original research. The Department also offers a Master of Engineering—Environmental Engineering (ME), a coursework-only one-year degree program.

Graduates of each of these degree programs will be trained to be leaders in industry, academia, national laboratories, or consulting. CHEE graduates are represented in many varied organizations, including Intel, Global Foundries, Micron, Pfizer, Inc., Cabot Microelectronics, NXP Semiconductors, Taiwan Semiconductor Manufacturing Company (TMSC), the National Renewable Energy Lab, Space X, NASA, the US Department of Defense, Arizona State University, Virginia Tech, universities in Brazil, Mexico, El Salvador, Saudi Arabia, South Africa, and more. Upon graduation, students will be well-prepared to assume positions in a variety of industries and academia due to the diversity of the knowledge gained in the two CHEE degree programs, with the environmental focus leading to more environmentally relevant positions.

3. Information for New Students and Continuing Students

3.1 Assignment of Research Projects and Faculty Advisors (new students)

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 process of determining your research topic and faculty advisor(s). Developing and maintaining an early working relationship with a faculty advisor, who is responsible for mentoring the student, is extremely important.

Students who have a research assistantship will typically have a faculty advisor before the first semester begins. Any student who does not have a faculty advisor before the first semester begins (this will likely include students who are self-supported or who have fellowship support), must meet with all faculty members whose research interests the student, and that have available research projects, during their first two weeks of classes. After completing meetings with faculty, and no later than the Friday of the third week of classes, a new student should indicate the student's first, second, and third choices for a faculty advisor on the Chemical and Environmental Engineering Advisor Selection Form (see appendix A10 of this handbook). This form must be submitted to the chair of the new student's respective Chemical Engineering or Environmental Engineering Graduate Studies Committee (GSC) with a copy to Lori Huggins (lhuggins@arizona.edu), the graduate program coordinator. Even if a student has a faculty advisor before the semester begins, the student must confirm the name of their faculty advisor either by submitting the completed Advisor Selection Form or by a confirmation email to Lori Huggins.

The GSCs for both Chemical Engineering and Environmental Engineering oversee the project requests by incoming students for the respective MS and PhD degree programs. For students who do not have a faculty advisor when they enter their program, final assignment of projects and research (faculty) advisor(s) is made for all these students by the respective GSCs and the department chair based on student preferences, availability of funding, and balance in accordance with the research objectives of the department.

The choice of a faculty advisor may be the most crucial decision made during graduate training. The following suggestions may be of assistance to graduate students in choosing their first, second and third choices for a faculty advisor. There are two broad areas that come into play when choosing a faculty advisor. The first area has a professional basis and the second a personal basis. When considering the professional aspects of your selection of an advisor, the following questions may prove helpful:

1. For PhD students, if you need funding to complete your degree, does your prospective faculty advisor have the funding available to support your research and stipend for several years and/or have a thorough plan to help you secure funding throughout your PhD? This area is probably the most problematic for graduate students. The money

needed to fund your research project will most likely come from your mentor's laboratory if funds are available. Note that requiring a student to TA each semester is not a solid plan for funding, but some TA-ing will likely be necessary and is encouraged for all PhD students.

2. For all graduate students:
    a. How does your prospective faculty advisor's lab operate? You should critically evaluate the day-to-day operations of the lab and understand the goals of the lab and where you will 'fit in.' You should also understand the role of your faculty advisor in those operations.
    b. Evaluating lab culture is also an important part of choosing a faculty advisor. Some principal investigators have lab managers or research assistants who run the laboratory. You should know almost as much about these individuals as about your prospective faculty advisor, as well as meet with other students in the lab. Your relationships with your lab team will be critically important, as you will be spending the majority of your day-to-day with these people.
    c. What are the professional requirements/expectations of the prospective faculty advisor on such issues as work habits, ethics, sharing of ideas, lab meetings, journal clubs, and authorship on papers?

On the personal side, the answers to the following questions may be extremely helpful:

1. Is the personality of the prospective faculty advisor compatible with your own?
2. Is this individual going to be responsive to your needs and, just as important, are you going to be responsive to their needs? When you join a lab, your faculty advisor will have certain expectations of you, and these should be identified when evaluating a prospective faculty advisor. By the same token, what are your expectations of a faculty advisor?

Be sure to place a great deal of importance and thought into your faculty advisor selection. Talk to other people (including the faculty advisor's current students) about your prospective faculty advisor and ask clarifying questions. Provide yourself with honest answers to both the professional and personal aspects of your decision.

Once you have identified a faculty advisor, complete the Chemical and Environmental Engineering Advisor Selection Form (see Appendix A10 of this handbook)**.** Students should see the department chair or their respective GSC chair if they have any questions during this process.

Students who do not complete these explicit processes for faculty advisor selection on time must meet with the GSC for their respective program to discuss the issue. This meeting will take place before the end of the fall semester of the first year of study and will be set up jointly with the GSC and the student. Without a compelling extension request (see Section 3.11 of this handbook), the GSC will ask the Graduate College to remove a student who has not obtained a faculty advisor by the end of the first semester.

Additional note: While the ME degree is a coursework only rather than research-based degree, ME students must still have a faculty advisor. Students who are part of the Engineering ME—Environmental Engineering program will work with the current Environmental Engineering Graduate Studies chair (currently Reyes Sierra-Alvarez) as their advisor. The Environmental Engineering GSC will guide the ME student about which course selections they might want to take to meet their individual career and educational goals. Because ME students have a designated Faculty Advisor, they do not need to complete the Advisor Selection Form.

3.2 Reassignment of Faculty Advisor

Although the situation is rare, the department realizes that it is sometimes in the best interest of the student to switch faculty advisors. In such cases, ethical behavior requires that both the student and the new faculty advisor consult with the first faculty advisor before making any such change. To change faculty advisors, the student must obtain approval of the primary faculty advisor, the Graduate Studies Chair for the relevant program (ChE or EEN), or the CHEE Department Chair. Once the approval is obtained, the student will do one of the following:

MS Student

1. If the student has already completed a Plan of Study in GradPath, then the student will submit a new Plan of Study with the new faculty advisor listed.
2. If the student has not already completed a Plan of Study, then the student will simply list the new faculty advisor on the Plan of Study at such time as it is submitted to the Graduate College.

PhD Student

1. If the student has completed a Plan of Study but has not completed the Comp Exam Committee Appointment form in GradPath, the student must submit a new Plan of Study with the new faculty advisor listed.
2. If the student has completed the Comp Exam Committee Appointment form in GradPath but has not completed the Oral Comprehensive Exam, then the student must submit a new Comp Exam Committee Appointment form listing the new faculty advisor as the Chair of the Comprehensive Exam Committee.
3. If the student has completed the Doctoral Comprehensive Exam, then the student will list the new faculty advisor as the Chair of the Doctoral Dissertation Committee on the dissertation committee appointment form in GradPath.

If a faculty advisor determines that it is in the best interest of a student to be reassigned from the advisor's research group, then that faculty advisor shall consult with the program's Graduate Studies Committee members to determine best steps for reassigning the student.

3.3 Laboratory Chemical Safety Training (new students)

All entering MS and PhD graduate students are required to take the General Laboratory Chemical Safety Training that is administered by the University of Arizona Research Laboratory & Safety Services through EDGE Learning. **THIS IS REQUIRED PRIOR TO WORKING ON ANY PROJECT**. Once in EDGE Learning, search for Course ID 0000003299: General Laboratory Chemical Safety Training. Students must submit an electronic copy of their completion certificate to their faculty advisor and to the graduate program coordinator, Lori Huggins (lhuggins@arizona.edu), upon completion of the course. Students can access their completion certificate through the RLSS User Dashboard (rlss.arizona.edu/services) and EDGE Learning after they complete the Final Quiz. Students must allow one hour for the certificate to be processed and available on that screen. Because the ME student does not work in a research lab, the ME student does not need to take the Safety Training.

3.4 Satisfactory Academic Progress

A high level of performance is expected of all students in the CHEE graduate degree programs. Students must maintain a minimum of a 3.0/4.0 cumulative GPA throughout the program and must consult with both their faculty advisor and the graduate program coordinator to discuss issues pertaining to unsatisfactory progress, which includes conditions resulting in academic probation (https://grad.arizona.edu/policies/academic-policies/academic-probation) such as a GPA below 3.0/4.0 at the end of a given semester. Students failing to meet GPA requirements will be placed on probation by the Graduate College for one semester. If the cumulative GPA is not raised to the required minimum in the following semester, the student's faculty advisor and the relevant graduate studies committee will decide whether to: (1) academically disqualify the student from the program; or (2) with Graduate College approval, allow the student to continue probation upon approval of a remediation plan. The student is expected to work with the student's faculty advisor and the graduate program coordinator to improve their academic standing.

See Sections 3.10 *Degree Requirements, Timelines and Deadlines* and 3.13 *Annual Evaluation* herein for additional information regarding timely and satisfactory degree progress. Moreover, students should refer to their individual program sections within this handbook for additional benchmarks required to maintain satisfactory academic progress, as well as making use of the degree benchmark checklists for each program available in the Appendix of this handbook.

3.5 Help with Academic and Other Issues

In most circumstances, graduate students should first pose questions on academic matters to their faculty advisor. Other members of their thesis or dissertation committees may also provide guidance and mentoring. The Graduate Studies Committees can help with advice, especially on curriculum questions and deadlines. Students may also contact the department chair at any time concerning issues related to their graduate studies. For non-academic questions and issues (e.g. navigating GradPath or required benchmarks), the best resource is Lori Huggins (lhuggins@arizona.edu), the

graduate program coordinator, or the Graduate College Degree Counselor for CHEE. See also Section 3.15 *Graduate Student Academic Grievance Procedures* of this handbook for additional information.

3.6 University Policies

Students are responsible for being aware of the policies described at the following websites pertaining to academic conduct, conduct of research, and general student conduct.

- CODE OF ACADEMIC INTEGRITY | Dean of Students Office (arizona.edu)
- Responsible Conduct of Research: Research Laboratory & Safety Services | UArizona Research, Innovation & Impact
- Student Conduct: https://public.azregents.edu/Policy%20Manual/5-308-Student%20Code%20of%20Conduct.pdf
- Graduate Policies and Procedures: https://grad.arizona.edu/policies

3.7 Departmental Seminar

All full-time MS and PhD graduate students enrolled in the chemical engineering or environmental engineering graduate programs are required to register for 1 seminar unit (CHEE 696A *Departmental Seminar*) and attend the departmental seminar or colloquium each semester **unless it conflicts with another required course.** (Enrollment will not be waived for conflicting elective courses.) In rare instances, a student may obtain permission to enroll in both CHEE 696A and a concurrent course (see Section 3.12 herein regarding waivers), but the student must log in to view the Zoom recording of the seminar each week and complete any assignments on time.

CHEE 696A is required even if the student has satisfied the seminar requirements for their degree. Enrollment in seminar may be waived in special circumstances for those students who have completed all requirements for their degrees and are enrolled in only one (1) unit of CHEE 909, 910 or 920, with no other course enrollment. Students requesting the waiver must submit a petition (see Section 3.12 herein) to the appropriate grad studies committee and the chair of the seminar committee. Committees will grant waivers on a case-by-case basis.

Students in the Engineering ME program for Environmental Engineering are exempt from enrolling in the Departmental Seminar, but they are encouraged to attend if their schedules allow.

3.8 Research and Teaching Assistantships and Other Funding Opportunities

Teaching and research assistantships, traineeships, and fellowships provide the most common forms of support for graduate students. Assistantships at 0.50 full time equivalent (FTE) or higher include a living stipend, health insurance,

and full tuition. Assistantships at less than 0.50 FTE include a stipend, health insurance, out-of-state tuition, and 50% of in-state tuition: https://grad.arizona.edu/funding/gaships.

Research assistantships (RAs) are awarded to graduate students by faculty advisors and funded by the faculty advisor's research program. Priority is given to PhD candidates. RA contracts may be for 0.25 FTE, 0.33 FTE, or 0.50 FTE. The faculty advisor is responsible for supervising RAs whom they employ.

Teaching assistantships (TAs) are awarded/assigned by the GSC each semester. Priority is given to 2nd–5th year PhD students. ***Note that it is strongly recommended that all PhD students TA at least one semester during pursuit of their degree.*** All students must have the appropriate background for the course for which they will TA (e.g., they have taken an equivalent course as an undergraduate). TA and grader position descriptions may be provided to graduate students and faculty during the semester preceding the semester where the TA or grader is needed. Students typically are nominated for the positions by their faculty advisors. Interested students who are not nominated by their faculty advisors may submit a resume to the graduate program coordinator and indicate which position interests them. 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 and holding office hours. TAs are supervised and reviewed by their assigned course instructors. The review process is mandatory and provides constructive feedback for the TAs.

Out-of-state tuition is waived with all RA and TA contracts.

RAs and TAs receive partial or full in-state tuition coverage as part of their employment benefit as follows:

- 0.25 FTE: 50% in-state tuition is covered.
- 0.33 FTE: 50% in-state tuition is covered.
- 0.50 FTE: 100% in-state tuition is covered.

Students awarded less than 0.50 FTE are responsible for payment of 50% of their in-state tuition. For specific information on tuition costs, students can refer to the online Tuition Calculator at https://tuitioncalculator.fso.arizona.edu.

Students who are awarded TA/RA positions will receive an offer letter outlining their specific funding, including tuition coverage at 50% or 100%, prior to the beginning of the semester in which they will serve as a TA/RA. While the Graduate College and international immigration rules require that students in TA positions must enroll in at least 6 units, the CHEE Department requires that all students working as paid TAs or RAs must maintain full-time student status (9 units). On rare occasions there may be an exception to this departmental requirement determined on a case-by-case basis.

Before serving as a TA, graduate students must successfully complete three important trainings, all available online. First, TAs must pass the Graduate College's Teaching Assistant Online Training and Orientation (TATO) test.

Additionally, FERPA training is required for all TA positions. Further information regarding FERPA requirements can be found at: https://registrar.arizona.edu/privacy-ferpa/ferpa. Finally, a last important requirement prior to serving as a TA/RA is to complete online training in Title IX (https://equity.arizona.edu/training/online-training).

ME students are not eligible to serve as either RAs or TAs in the Department of Chemical and Environmental Engineering.

Graders are hired as needed for core chemical engineering and environmental engineering courses. PhD, MS, and ME students with the appropriate background for the course are eligible to apply for grader positions. Graders are hired on an hourly basis for no more than 5 hours per week during the semester. There is no tuition coverage benefit with grader contracts.

Graduate students may seek additional funding opportunities announced by the UA Graduate College. A detailed listing is available at: https://grad.arizona.edu/funding/opportunities. Graduate students seeking funding for their studies or research can also find helpful information through the Graduate Center Office of Fellowships. Many other funding resources are available to UA students through Scholarship Universe. The Graduate and Professional Student Council (GPSC) also has funding opportunities at https://gpsc.arizona.edu/grantsawards.

One of the scholarships that may be given by the UA Graduate College is the Thesis & Dissertation Tuition Scholarship for non-resident students who are within two years of completing their MS or PhD degrees and are taking only CHEE 909, 910 or 920 graduate units. The scholarship can reduce tuition for these students to the in-state resident amount. If you are interested in taking advantage of this scholarship, please contact Lori Huggins (lhuggins@arizona.edu), the graduate program coordinator, as it requires a departmental nomination. Students who are awarded the scholarship are required to attend the CHEE 696A *Departmental Seminar* each week although they cannot enroll in the course. Scholarship recipients who do not attend the seminars will not be nominated for the scholarship for any additional semester and will be required to enroll in CHEE 696A.

3.9 Other Resources

The Graduate College offers students many resources for parents, for professional development, for health and wellness, and more. Information on the resources available can be found at https://grad.arizona.edu/new-and-current-students.

3.10 Degree Requirements, Timelines and Deadlines

There are five graduate degrees offered by the Department of Chemical and Environmental Engineering: PhD in Chemical Engineering, MS in Chemical Engineering, PhD in Environmental Engineering, MS in Environmental Engineering, and an ME in Environmental Engineering. Subsequent sections describe the specific requirements for each of these degree paths. The student's faculty advisor, other members of their thesis, comp exam or dissertation committees,

the members of the graduate studies committees, and the staff graduate program coordinator are all sources of additional information regarding the department's degree requirements and deadlines. The staff graduate program coordinator is probably the student's most reliable source. The graduate program coordinator helps the student navigate required forms, timelines, and deadlines so that the student can graduate on time. There are degree checklists in the Appendices (A3−A9) of this handbook that students should review and keep with them during their full period of study to make sure they are on track. Students can direct questions to the staff graduate program coordinator or the Graduate College Degree Counselor for CHEE.

Graduate studies milestones indicating the semesters in which certain administrative steps should take place in order to make satisfactory progress toward completion of degree requirements are highlighted in yellow on the many sample plans provided in the following sections of this handbook. They are also included in the seven degree benchmark checklists provided in the appendix to this handbook. These steps include comprehensive exams, submission of research proposals, and timely filing of required forms (e.g., plan of study, committee appointments, etc.). The graduate program coordinator reviews student progress regularly and will often provide reminders to students who have fallen behind on progress, but it is still the student's responsibility to be aware of and adhere to the degree requirements, timelines and deadlines required for their degree. Students who fail to make satisfactory academic or research progress will be notified in writing of their status. They will be asked to develop and submit a remediation plan signed by their faculty advisor. It is in the best interest of both the students and the Department of Chemical and Environmental Engineering for degrees to be earned in a timely manner. MS students who have not completed degree requirements within 4 years, or PhD students who have not completed degrees within 6 years may receive a letter strongly encouraging them to complete all degree requirements within 1 year (with a copy to the Graduate College). Students who fail to meet this deadline will be sent another letter (with a copy to the Graduate College) and will be required to submit a letter requesting and justifying a time extension to the relevant graduate studies committee (with a copy to the graduate program coordinator) no later than 1 month after receipt of the CHEE letter. A letter of endorsement from the faculty advisor and the student's defense committee (whether thesis or dissertation) must accompany the student's letter of request. This process can be repeated once more before the student is judged to be in noncompliance with timely progress. If extreme extenuating circumstances prevent a student in good standing (e.g., GPA $\geq$ 3.0) from completing the degree requirements within the year, a leave of absence may be requested. Students who fail to complete requirements and fail to submit a letter requesting a time extension will be judged to be in chronic non-compliance, and the Graduate College will be asked to dismiss the student from the CHEE program. Dismissed students are eligible to reapply to the program (reapplication does not guarantee readmission).

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. Students must follow the specific instructions provided on the following links:

- http://catalog.arizona.edu/
- https://grad.arizona.edu/gsas
- https://grad.arizona.edu/gsas/degree-requirements

All PhD, MS and ME students must submit GradPath forms to the Graduate College electronically. Students must review the Graduate College information carefully and be aware of deadlines. From the website listed in the third bullet above, students can navigate to find the following link that provides important information about dates and deadlines:

- http://grad.arizona.edu/gsas/degree-requirements/important-degree-dates-and-deadlines

3.11 Departmental Waivers and the Appeals Process

Any student who wishes to request a departmental waiver for any of the department's degree requirements, for any of the ME, MS or PhD degrees, must complete a Graduate Student Departmental Petition (see Appendix A13) and submit it to the appropriate Graduate Studies Committee Chair. The request will be reviewed by the program's Graduate Studies Committee. The request must be supported by a compelling case, or the petition will be denied. Additional pages can be attached and submitted with the petition, if necessary. NOTE: The petition must be submitted prior to or in the first weeks of the semester for which a change is being requested or it will be denied automatically. (Student's may not submit retroactive waiver requests.) A student who is denied a waiver may, at the discretion of the student and with the support of the student's faculty advisor, appeal to the Department Chair for additional review of the case. Weighing discussions with the student, the student's faculty advisor and the relevant Graduate Studies Committee members, the decision of the Department Chair will be considered final.

3.12 CHEE Incomplete Policy

Incomplete grades should be completed in a timely manner and are submitted at the discretion of the course instructor. According to the Graduate College (https://catalog.arizona.edu/policy/grades-and-grading-system#incomplete), any incomplete grade must be completed no later than one year from the last day of the term of the course for which the student received the incomplete unless a one-year extension has been approved by the student's instructor and the Graduate College dean prior to the one-year deadline. A student *must not* re-enroll in a course the following year to fulfill an Incomplete grade – doing so will result in a failing grade for the Incomplete.

3.13 Annual and Semester Evaluations

All CHEE graduate students will be evaluated each semester regarding satisfactory work as a research assistant in their faculty advisor's lab group. Approximately 6-8 weeks before the end of the semester, the Graduate program coordinator will forward "RA Conversation" forms to all faculty advisors and their graduate students, as well as forward "TA Conversation" forms to any instructors and their TAs who have used a TA during the semester. The RA and TA Conversation forms must be completed and turned in to the Graduate program coordinator before final grades post at the

end of the semester. All TAs and RAs will receive official performance reviews (RA and TA Conversations), copies of which will be filed with the department through the graduate program coordinator. Completing RA and TA reviews each semester is a requirement of the University of Arizona Graduate College.

Additionally, once each academic year, at the close of the spring semester, students will receive a written progress report from the CHEE Graduate program coordinator that will detail progress toward completing their degree requirements. The progress report will detail courses completed during the year, progress toward degree benchmarks (as outlined on the degree benchmarks lists in the Appendix of this handbook) and other details. The student will complete information about any teaching or research assistantships, publications, conference presentations, scholarships, fellowships, honors and awards, and completed professional development for that academic year, as well as plans for the next academic year. The student's faculty advisor will add comments and sign the completed review and then it will be signed by the appropriate Graduate Studies Chair before filing with the department. The TA and RA performance reviews (RA and TA Conversations) do not replace the required progress reports. RA reviews focus on performance within the context of the student's RA assignment and lab group. The annual progress report addresses the broader academic progress of the student over the course of the entire academic year.

ME students are not subject to the annual evaluation if they complete their degree within one year. However, if they do not complete their degree within one year, they will need the annual progress report.

3.14 Transitioning from MS to PhD or adding an MS to a PhD program

On the advice of the student's faculty advisor, an MS student who is in good academic standing (GPA of 3.0 or higher) may apply to pursue a PhD. The student must apply and be accepted to the doctoral program through GradApp (and pay the application fee). It is strongly suggested that the faculty advisor be selected as a reference for the PhD application. The reference letters used for the MS application may also apply to the PhD, but the applicant will need to see Lori Huggins (lhuggins@arizona.edu), the graduate program coordinator, for information on how to navigate the application form to satisfy the references requirement.

Students who transition from the MS program to the PhD program are expected to take the Qualifying and Comprehensive Examinations on the same schedule as if their first day in the MS program was their first day in the PhD program. If the student transitioning to the PhD has a GPA of 3.75/4.0 or greater in their program's core courses, they will be exempt from taking the Qualifying Exam. If the student transitioning to the PhD has a GPA below 3.75/4.0 in their core courses, the student must take the exam on the next available exam date after having completed the core courses. See Sections 4.1.4 (Chemical Engineering) and 5.1.3 (Environmental Engineering) for additional details.

A student may also determine, upon the advice of the student's faculty advisor, to add an MS degree to the student's PhD program. To add the MS to the PhD program, the student must complete a Change of Program Form to be signed

by the student and the program's Graduate Studies Chair. The completed form must be submitted via email to the CHEE degree counselor at the Graduate College. The student does not need to apply for the MS or pay an application fee.

3.15 Graduate Student Academic Grievance Procedures

A student with any type of grievance should first communicate with their graduate faculty/research advisor or chair of the Graduate Studies Committee, based on which is more appropriate in the student's view depending on the matter at hand. In some instances, the student may decide that the issue cannot be addressed adequately by either of these faculty. Then the student may bring the matter to the attention of the graduate program coordinator and/or the department chair. This process aims to resolve grievances informally within the department. When issues cannot be resolved informally, the graduate student is encouraged to read the Grievance Policy of the University of Arizona on the Graduate College website. The Summary of Grievance Types and Responsible Parties website lists grievance types and links to offices where the student can report grievances and have them addressed more formally. Here the student will find information on where and how to report grievances related to academic policy/procedures, grades, research ethics and inappropriate behavior by students, faculty or staff. If a student would like support from outside of the department for bias they have experienced or witnessed, they can share their experience with the University of Arizona's Bias Education & Support Team (BEST). BEST is *not* an investigative or punitive campus unit, but rather provides education, support, and/or resources to any students, faculty, or staff who have been impacted by bias on campus. Sharing someone's experiences and ideas helps us all do better in creating a more equitable and inclusive environment in the department and at the university. Additionally, if a student believes that they have been the subject of discrimination or harassment based on race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity or genetic information, they can report this at the Office of Institutional Equity, University Services Building, Room 113, (520) 621-9449.

3.16 International Student Requirements and Resources

Information specific to international students can be found on the University of Arizona Graduate College website:

- https://grad.arizona.edu/international-students

International students can also find resources specific to their needs at the International Student Services Office:

- International Student Services | Arizona International

3.17 Keys and Desk Assignments

Most CHEE graduate students will need physical keys and/or keyless access to buildings and lab spaces where they work. These will include access to the Harshbarger and Old Engineering Buildings for all graduate students, as well as physical keys for certain spaces in Harshbarger, Old Engineering and Civil Engineering as needed. Students have certain

important responsibilities when they are issued physical keys to lab and office spaces. When they are done with the keys, they *must* return them to the University of Arizona Key Desk (currently housed on the second floor of the Facilities Management Building at 1405 North Ring Road) *before graduation.* Failure to do so may result in the withholding of final grades or a bill for the cost of re-keying the space(s). Students may not transfer keys to other students or faculty. If a student anticipates that they will not be able to return the keys to the Key Desk before graduation, they may return the keys to the graduate program coordinator in an envelope marked with their name and their Student ID number, and the graduate program coordinator will return them to the Key Desk on their behalf.

If a student believes that they need a key to a particular lab or storage space, they must obtain the okay from their faculty advisor. The faculty advisor will email Darla Strong (darla1120@arizona.edu) in the CHEE main office and request the key(s) on behalf of the student. Important information that Darla will need before ordering any key(s) or authorizing any keyless access to buildings is the student's 1) Cat Card number, 2) Student ID number, and 3) the student's US cell phone number.

4.0 Degree Requirements: Chemical Engineering

	PhD*	Thesis MS*	Non-Thesis MS*
Required Courses (CHEE 502, 505, 506, 530) **	12	12	12
Electives (excluding PhD minor)	6	9	9
Minor ***	9-12		
CHEE 696A (Departmental Seminar)	6 ****	4 ****	2 ****
CHEE 910 (MS Thesis)		5	
CHEE 909 or CHEE 594 *and* 1 unit of CHEE 909 (MS Non-thesis)			3
CHEE 900 (Research)	12		4
CHEE 920 (Dissertation)	18		
Total Units	63-66	30	30

* Students who enter the PhD program with an MS in Chemical Engineering or equivalent may transfer up to 30 units of coursework as part of the requirements for the PhD according to regulations stipulated by the Graduate College and approval by the Chemical Engineering GSC. Students entering an MS program may transfer up to 12 units of graduate courses.

** Required core courses are offered only once per academic year, either in the fall or the spring. Students must be aware of this when they are planning their studies.

*** Different departments have different minor unit requirements. If the PhD minor requires more than 9 units of minor coursework (e.g., 12 units), the student must still meet the 36 unit minimum in major coursework and will therefore complete their degree with more than the 63 Graduate College required minimum units. Students should work with the graduate program coordinator to make sure that they take the required number of major units. The Graduate College also requires that at least 22 units of the combined major and minor units must be graded (A/B) units.

**** Note that all CHEE MS and PhD graduate students must register and regularly attend CHEE 696A (CHEE Departmental Seminar) each semester that they are in their respective programs. However, their Plan of Study should include only the number of units listed in the table above to meet Graduate College requirements and allow the PhD student to advance to candidacy after completion of the Comprehensive Exam.

The Graduate College website summarizes all graduate degree requirements at: https://grad.arizona.edu/gsas/degree-requirements/. For more information about the Accelerated Master Program (AMP) leading to the Thesis or Non-Thesis MS degree, see Section 4.3 of this handbook. You may also refer to the CHEE website for graduate programs at https://chee.engineering.arizona.edu/grad-programs/degrees, and then select the link labeled "Accelerated MS-CHE" to access catalog information about the program.

Descriptions for the courses shown in subsequent pages can be found at https://chee.engineering.arizona.edu/grad-programs/courses

4.1 PhD Program (Chemical Engineering)

Thirty-six units of coursework are required for the major subject, exclusive of dissertation research and the minor. Six* (6) units of departmental seminar (CHEE 696A), six (6) units of electives (which may include additional units of CHEE 900), twelve (12) units of CHEE 900 and eighteen (18) units of dissertation (CHEE 920) will be used to satisfy Graduate College requirements for the PhD degree, as well as the core courses outlined below and nine to twelve (9-12) units of minor courses (depending on requirements of the minor department).

* Units listed are to allow students to meet Graduate College unit requirements and advance to candidacy after completion of their Comprehensive Exam, but the Department of Chemical and Environmental Engineering requires students to register for and regularly attend the Departmental Seminar each semester that they are in the CHEE program.

4.1.1 Course Requirements for *Chemical Engineering (ChE) PhD*

All Chemical Engineering PhD students are required to take the following core courses at the University of Arizona or an approved equivalent elsewhere:

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

Additionally, Chemical Engineering PhD students will take a minimum of six (6) units of electives (elective units do not include units for their minor courses), a minimum of six (6) units of CHEE 696A *Chemical Engineering Seminar** to meet Graduate College unit requirements, twelve (12) units of CHEE 900 *Research*, a minimum of eighteen (18) units of CHEE 920 *Dissertation* and nine to twelve (9-12) units of a minor. Students who enter the PhD program with an MS may transfer up to thirty (30) units of coursework after approval from the Graduate College and will be evaluated individually to devise a Plan of Study (see Section 4.1.6 herein). Note that minor unit requirements can vary by department. According to the Graduate College, if the student minors in a subject that requires more than nine (9) units of coursework, the student will still need to take a full thirty-six (36) units of major coursework outside of dissertation units that must be reflected on the submitted Plan of Study (see Section 4.1.6 herein).

* Units listed are to allow students to meet Graduate College unit requirements and advance to candidacy after completion of their Comprehensive Exam, but the Department of Chemical and Environmental Engineering requires all MS and PhD students to register for and regularly attend the Departmental Seminar each semester that they are in the CHEE graduate program.

4.1.2 Sample Course Plan—Chemical Engineering PhD

The following table is to be used as a ***general guide only***—please work with your faculty advisor and the graduate program coordinator to determine your own individualized Plan of Study (see Section 4.1.6). Specific course requirements are outlined in Section 4.1.1 herein.

	Fall	**Spring**
Year 1	CHEE 502—Advanced Engineering Analysis (3 units) CHEE 505—Advanced Chemical Engineering Transport Phenomena (3 units) CHEE 506—Advanced Chemical Engineering Thermodynamics (3 units) CHEE 696A—Departmental Seminar (1 unit) CHEE 900—Research (3 units) *Student must submit Responsible Conduct of Research form in GradPath before working in lab.* *Student must complete online General Lab Safety course and submit copy of completion certificate to graduate program coordinator before working in lab.* *Student must have an assigned faculty research advisor by end of this semester.*	CHEE 530—Advanced Chemical Reaction Engineering (3 units) Elective (may include additional units of CHEE 900) CHEE 696A—Departmental Seminar (1 unit) CHEE 900—Research (3 units) *Any student with a GPA <3.75/4.0 in the four core courses (502/505/506/530) must take the written qualification exam in August. The exam is waived for students with a GPA ≥ 3.75/4.0.*
Year 2	Minor (3 units) Minor (3 units) CHEE 696A—Departmental Seminar (1 unit) CHEE 900—Research (3 units) *The student's **Plan of Study** is due by the end of the third semester.* *Student works with their faculty advisor to determine their Graduate Comp Exam Committee by the end of their 3rd semester in the program. Submit Comp Exam Committee Appointment form in GradPath when the committee members are determined.*	Minor (3 units) Elective (may include additional units of CHEE 900) or minor (if minor requires 12 units) (3 units) CHEE 696A—Departmental Seminar (1 unit) CHEE 900—Research (3 units) *Determine Comp Exam date and file Announcement of Doctoral Comp Exam Form in GradPath before end of semester.* *All students must take the Comprehensive exam: (i) write their thesis proposal; and (ii) orally defend their thesis proposal no later than September of the next fall semester* *Student must file Dissertation Committee Appointment form immediately following successful completion of the Comp Exam.*
Year 3	Additional elective, if needed (may include additional units of CHEE 900) (3 units) CHEE 696A*—Departmental Seminar (1 unit) CHEE 920—Dissertation Research (5-8 units**) *Students who have passed the Comprehensive exam should plan to TA at least one semester.* *Students will advance to candidacy as soon as they have completed all major and minor coursework on their Plan of Study, as well as the Comprehensive Exam.*	CHEE 696A*—Departmental Seminar (1 unit) CHEE 920—Dissertation Research (8 units**) *Student must meet with Dissertation Committee and submit Dissertation Committee Review Form with Graduate program coordinator before end of semester.*

Year 4	CHEE 696A*—Departmental Seminar (1unit) CHEE 920—Dissertation Research (8 units**)	CHEE 696A*—Departmental Seminar (1unit) CHEE 920—Dissertation Research (8 units**) *Student must file Announcement of Final Oral Defense form in GradPath at least 10 business days before defense.* *Student must turn in publications form (See Appendix A12 herein) with copies of publications to graduate program coordinator.* *Student must provide defense information, including any Zoom link, to graduate program coordinator at least 10 business days before defense.*

* Candidates wishing to advance to candidacy immediately following their Comprehensive Exam cannot have any outstanding units other than CHEE 920 units listed on their Plan of Study, or they will not advance until they complete those units. Therefore, while required by the department, the Departmental Seminar (CHEE 696A) units to be taken after the Comprehensive Exam cannot be listed on the Plan of Study.

** Although 18 units of CHEE 920 are required for the PhD degree, more units are suggested if a student needs to maintain full-time status of 9 units per semester.

4.1.3 CHEE 900 Research Requirement

During the first and second year of the student's progress toward their PhD degree, the student will take CHEE 900 *Research*, 3 units each in their first and second semesters, and 3 units each in their third and fourth semesters, as they develop individual research that may lead to their dissertation thesis. Students may also opt to take additional CHEE 900 units for their required elective units for an additional 6 units (e.g., 6 units each in their third and fourth semesters instead of 3). Students who enter the PhD program after completing a Master's in Chemical Engineering at the University of Arizona may need fewer CHEE 900 units at the discretion of their faculty advisor. Nonetheless, students must take CHEE 900 until they complete their oral Comprehensive Exam and should take CHEE 920 after that. Note that this is not specific dissertation research but a time of exploration as the student hones planning, concepts and goals. Note that CHEE 900 should not be used directly for dissertation preparation. CHEE 920 is reserved for dissertation preparation. Beginning in the third year (or fifth semester), students should begin registering for CHEE 920.

4.1.4 Qualifying Examination

The PhD Qualifying Examination is a written exam, given in August of the 2nd year before the semester starts. The exam is given over two days and the subjects evaluated are Transport Phenomena, Thermodynamics, Reaction Engineering, and Applied Mathematics. The material evaluated will be taken from the core graduate Chemical Engineering courses. The written qualifying exam is waived for students with a GPA of 3.75/4.0 or greater in the core courses CHEE 502, 505, 506 and 530 (or equivalent transferred credits). Students taking the Qualifying Exam will take the sections of the exam that apply to subjects for which they did not receive a grade of "A." Students failing section(s) of the exam will retake the exam for that (those) section(s); the retake exam will be offered in December of the same year the exam is initially taken. If the student fails any part of the exam again, then the student will have failed the written qualification

exam, will be placed on the MS track and is ineligible to reapply for a PhD in Chemical Engineering at the University of Arizona.

For international transfer students and those students entering with a degree other than chemical engineering, the GSC will work with the student to develop a Plan of Study (see Section 4.1.6) that will prepare them for the Qualifying Exam at the beginning of their second year. Transfer students from United States universities and those entering with an MS degree in Chemical Engineering will be evaluated individually to devise plans for courses and the Qualifying Exam.

Students who transition from the UA Chemical Engineering MS program to the PhD program are expected to take the Qualifying and Comprehensive Examinations on the same schedule as if their first day in the MS program was their first day in the PhD program. Such students will take the Qualifying Exam on the first date that it is offered after entering the PhD program if they have already completed the four core Chemical Engineering courses. Students who transition to the PhD program with a GPA of 3.75/4.0 or above in the four core Chemical Engineering courses are exempt from the Qualifying Exam.

4.1.5 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 their faculty research advisor. Students may, at their discretion and upon the advice of their faculty advisor, minor in Chemical Engineering. Minors are administered and approved by the minor department. They typically consist of 9 to 12 units of course work. Because of Graduate College requirements, these units are not part of the 6 elective units mentioned in the Course Requirements Section of this Handbook (Section 4.1.1 herein).

Students may opt to construct a multidisciplinary minor when they want to take minor courses from multiple departments. The multidisciplinary minor typically requires nine (9) units of coursework, but the student's major advisor may require twelve (12) units of coursework. The multidisciplinary minor must be approved by the student's faculty advisor and the rest of the student's comprehensive exam committee. One instructor from the courses in the multidisciplinary minor must serve as a member of the student's comprehensive exam committee and direct that part of the comprehensive exam.

To select the multidisciplinary minor, the student must choose "Multidisciplinary" from the dropdown list for the minor on the GradPath Plan of Study.

4.1.6 Plan of Study

In conjunction with the student's faculty advisor, each PhD student is responsible for developing a Plan of Study to be filed with the Graduate College using GradPath https://grad.arizona.edu/gsas/gradpath during their third semester of study, sometime 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 that the student intends to apply toward the graduate degree; and (3) additional coursework to be completed to fulfill degree requirements.

Note, however, that students should not list more than 6 units of CHEE 696A CHEE Departmental Seminar on their Plans of Study even though the department requires that they register and attend the seminar each semester (see Section 3.6 herein). The Graduate College requires that only dissertation units (CHEE 920) be left to complete on the Plan of Study to allow the student to advance to candidacy following successful completion of the oral and written Comprehensive Exam (see Section 4.1.7 below). Therefore, the student must register for and attend the Departmental Seminar each semester following the Comprehensive Exam, but they cannot have any outstanding non-dissertation requirements listed on their Plan of Study or they will be prevented from advancing and cannot defend their dissertation until they complete those units.

Students are encouraged to meet with the graduate program coordinator to review the proposed Plan of Study before submitting it in GradPath to correct inadvertent errors that will prevent its Graduate College approval or prevent them from advancing to candidacy after they successfully complete their Comprehensive Exam. The Plan of Study will have the approval of the student's faculty advisor, their minor advisor, and chair of the GSC (all done electronically) before it is reviewed and approved by the Graduate College. Students are responsible to be aware of the deadline to submit the GradPath Plan of Study for review and approval.

4.1.7 Comprehensive Examination

Before admission to candidacy for the doctoral degree, the student must pass both a written and an oral doctoral comprehensive examination. This examination is intended to evaluate 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 (as described in Section 4.1.9 herein) and at least one University of Arizona faculty from the chosen minor. Committee members from other UA programs can be incorporated at the discretion of the student and faculty advisor. Additionally, committee members from other institutions can be incorporated, in addition to CHEE faculty and minor members, as special members. Special members must be pre-approved by the program and the Dean of the Graduate College for inclusion on the comprehensive exam committee (and dissertation committee, if desired). The student and the student's faculty advisor determine the comprehensive exam committee (and by extension the dissertation committee) in consultation (if needed) with the GSC. Before scheduling the exam, all students must file the Comprehensive Exam Committee Appointment Form in GradPath. Once a date has been determined for the oral comprehensive exam, the student must file an Announcement of Doctoral Comprehensive Exam Form in GradPath at least two weeks (10 business days) in advance of the exam date.

The written portion of the comprehensive examination must be completed during the spring semester following completion of the qualifying examination (i.e., fourth semester). It 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 US Federal Agency research article format and font, as recommended by the student's faculty advisor and the rest of the comprehensive exam committee).

The student may also choose to take CHEE 503 (a CHEE elective) to assist them with writing their written proposal, which is a course that focuses on oral and written communication. Students who opt to take CHEE 503 must take the course and complete the proposal by the end of their fourth semester in residency. If a student does not submit a thesis proposal by the end of this semester, they will receive a failing grade in CHEE 503. The student's entire comprehensive exam committee will evaluate the written proposal.

No later than immediately following completion of the written part of the comprehensive examination, the student must determine a comprehensive examination committee of at least four (4) members. The committee will consist of three (3) current CHEE faculty and one faculty member from the student's minor department. As described above, committee members from other programs and institutions can be incorporated, in addition to CHEE faculty and minor members. Special members must be pre-approved by the program and the Dean of the Graduate College for inclusion on the comprehensive exam committee (and dissertation committee, if desired). Once a committee has been determined, the student must submit the Comp Exam Committee Appointment form in GradPath.

The oral part of the comprehensive examination will be a defense of the dissertation thesis proposal (the student will provide this written proposal to all members of their committee at least 2 weeks before their oral exam) in which the student must demonstrate breadth of knowledge in chemical engineering and their minor field of study. The oral part of the examination **must** be completed before September 30 of the fall semester following completion of the written part of the exam (i.e., fall semester of third year). Students should be aware that they need to complete most of their graded coursework (i.e., the 22 graded units of core and elective courses) to be eligible to take the comprehensive examination. Recall that these graded units (A/B system) are composed of the core CHEE courses (502, 505, 506 and 530), the Graduate Seminar (CHEE 696A) and the 2 elective courses. The student must also have completed their courses for the minor. The oral comprehensive examination is conducted by the student's comprehensive examination committee. The student must display a broad knowledge of the chosen field of study and sufficient depth of understanding on the major and minor fields to pass this exam. 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. The Graduate College allows no more than one re-take of the oral exam.

When the student has passed the written and oral portions of the comprehensive examination, and the Graduate Student Academic Services Office (within the Graduate College) has confirmed completion of all non-dissertation units listed on the approved doctoral Plan of Study, the student will advance to doctoral candidacy.

4.1.8 Timeline for Comprehensive Examination and Requirements

According to the Graduate College, the written and oral portions of the comprehensive examination should take place at least six months prior to the final oral examination (defense of dissertation), and they must be completed no less than 3 months ahead of the oral defense of the dissertation. CHEE departmental requirements are stricter: the written and oral portions of the comprehensive exam **must** be completed by the end of the fall semester of the student's third year (assuming a re-take, by September 30 otherwise) ***and*** at least 12 months prior to the defense of the dissertation. The oral comprehensive examination is performed upon successful completion of the written portion of the comprehensive exam as outlined in Section 4.1.7 herein. The exact time and place of the oral comprehensive examination must be scheduled with the department and approved in GradPath using the Announcement of Doctoral Comprehensive Exam form before the exam can take place. The Announcement of Doctoral Comprehensive Exam form must be submitted and approved at least two weeks (10 business days) in advance of the scheduled exam date.

In summary, to satisfy the requirements of the comprehensive examination and advance to candidacy a student must:

- File a Plan of Study with the Graduate College through GradPath (as approved by the Graduate Studies Committee)
- Satisfy all requirements stipulated by the minor department or program
- Complete all required courses, and a minimum of 90% of *all* coursework
- Complete the written comprehensive examination as described above
- Complete the Comp Exam Committee Appointment form in GradPath
- Complete the Comp Exam Announcement form in GradPath at least two weeks (10 business days) in advance of the comprehensive exam date
- Take and successfully pass the oral comprehensive examination as described above

4.1.9 Dissertation Committee

When the student has an approved doctoral Plan of Study on file and approved in GradPath, has satisfied all graded course work on their Plan of Study with the possible exception of CHEE 696A, all requirements of their minor department, and passed the written and oral portions of the comprehensive examination, the student must select their doctoral dissertation committee iw2mmediately following passing the comprehensive examination and file the Doctoral Dissertation Committee Appointment Form in GradPath. The doctoral dissertation committee must include a minimum of three members, all of whom must be University of Arizona tenured, tenure-track, approved as tenure-eligible, or designated as Graduate Faculty by the Graduate College for the purposes of serving on graduate committees. It must include the student's dissertation director (faculty advisor) and two other members of the current Chemical and Environmental Engineering Department faculty. Committee members from other programs can be included with the

permission of the student's faculty advisor. Committee members from other institutions can be incorporated in addition to CHEE faculty and minor members as special members. Special members must be pre-approved by the program and the Dean of the Graduate College for inclusion on the dissertation exam committee.

Typically, the doctoral dissertation committee consists of the three CHEE faculty members who served on the student's comprehensive exam committee. As soon as the committee is determined, the student must submit the Doctoral Dissertation Committee Appointment Form in GradPath. The Committee Appointment form reports the student's planned dissertation committee, dissertation title (subject to change), and the expected graduation term. It requires approval from the student's dissertation director (faculty advisor) and the major and minor departments. The approval signature from the minor department on this form indicates both approval of the reported dissertation committee and confirmation that the student has satisfied all requirements for the minor.

Any changes to the committee should be reported to the Graduate Student Academic Services office. Under normal circumstances, submission is expected at least one year before the final oral examination (i.e., defense of dissertation). If a change in committee composition is required within the 12-month window, please report it to your program's Graduate Studies Committee as soon as possible so that a suitable replacement can be appointed.

4.1.10 Annual Interaction with Dissertation Committee

The overall goal is for students to complete their PhD degrees in four years. Hence, in the years after completion of the comprehensive examination (years 3 and 4*), all PhD candidates must, as part of their CHEE 920 *Dissertation* credits, meet with their doctoral dissertation committee as described in Section 4.1.9 herein, each spring semester in years 3 and following. The dissertation committee will evaluate the intellectual content of the student's proposed project and progress. The meeting will consist of an oral presentation given to the committee. The presentation should review progress to date and should include a discussion of the publications that will be submitted or are in progress (see Section 4.1.12 herein). The committee members will be required to sign the Annual Dissertation Committee Review form (Appendix A11) and the student must return the signed copy to the CHEE graduate program coordinator. In the student's final semester, the semester in which they will defend their dissertation, the final oral defense shall take the place of the annual interaction with the dissertation committee. However, if the student will complete in the summer term, they must meet with their dissertation committee during the spring semester before a summer defense and have the form completed and signed by committee members.

* Meeting with dissertation committee is needed in the spring of each year that the student has not scheduled the final oral defense in GradPath.

4.1.11 Final Oral Defense 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 must be

submitted to the graduate program coordinator for archiving with the department. The examination focuses on the dissertation itself, but it can also include general questioning related to the field(s) of study within the scope of the dissertation. The examining committee will be the same as the dissertation committee previously described in Section 4.1.9 herein. Committee members representing the minor program must be invited to the defense, but their participation is optional. There will be a public facing presentation as part of the candidate's defense, but the questioning of the candidate by the dissertation committee is closed to the public. The candidate must submit an announcement of their final oral defense via GradPath at least two weeks (10 business days) before their defense. If the defense will be conducted by Zoom or other online platform, the candidate must also provide the link to the online defense to the graduate program coordinator (lhuggins@arizona.edu) so that the public portion of the defense can be announced to the Department of Chemical and Environmental Engineering. Additional information on the dissertation defense may be found at https://grad.arizona.edu/gsas/degree-requirements/doctor-philosophy#final-oral-defense. Dissertation approval pages can be completed electronically through AdobeSign. We recommend that students work with the graduate program coordinator to get the approval page drafted and set up for signature.

4.1.12 Publications

Having multiple publications successfully submitted or published while still in graduate school greatly enhances the student's potential for landing either a faculty position at an accredited university or a research position at a major corporation. Therefore, prior to graduating, PhD students are strongly encouraged to have two first-author publications either accepted, in press or published in peer-reviewed, indexed journals. These publications should form a major part of the student's dissertation. Copies of any publications must be submitted to the graduate program coordinator for delivery to the chair of the Graduate Studies Committee and the department chair, along with the Publications Form (see Appendix A9 herein, but also available by request from the Graduate program coordinator) before the final oral examination is scheduled. A successful submission of a manuscript to a peer-reviewed journal can be counted as a publication on the publications form. When a publication has been accepted by a peer-reviewed, indexed journal, email the citation to the graduate program coordinator for departmental records.

4.2 MS Program (Chemical Engineering)

All Chemical Engineering MS students are required to take the following courses at the University of Arizona or an approved equivalent elsewhere:

- 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:

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 to meet Graduate College unit requirements:

- CHEE 910—Thesis (5 units)
- CHEE 696A—Departmental Seminar (4 units) *
- Approved electives (9 units)

In this option, the student will develop a research project leading to the MS thesis. Upon the completion and successful approval of the MS thesis research by the student's thesis committee, the candidate is to submit to a final oral defense examination (see Section 4.2.5 herein). A copy of the signed approval page of the research document must be submitted to the graduate program coordinator for archiving with the department. The examination focuses on the student's research. The examining committee will consist of the MS thesis committee (see Section 4.2.5 herein). All members of the committee must be present during the examination while the presence of additional committee members is optional. Note that the MS thesis must be archived.

Non-thesis MS Students

The non-thesis MS track requires 30 units of graduate level coursework. In addition to the required courses listed above, all students undertaking the master's non-thesis track must complete the following courses to meet Graduate College unit requirements:

- CHEE 909—Master's Report (3 units) *or*
- CHEE 594 (units) *and* 1 unit of CHEE 909—One semester industrial internship w/ written report
- CHEE 696A—Departmental Seminar (2 units) *
- Approved electives (9 units)
- CHEE 900—Research (4 units)

In this option, the student will participate either in a one-semester research project or in a one-semester industrial internship. The non-thesis MS can be completed in one year by taking one elective in the fall semester, along with the required core courses, and two electives in the spring semester along with other required courses.

* Units listed allow students to meet Graduate College unit requirements, but the Department of Chemical and Environmental Engineering requires students to register for and regularly attend the Departmental Seminar each semester that they are in the CHEE program.

4.2.1 Sample Course Plan—Thesis ChE MS

The following table is to be used as a ***general guide only***—please work with your faculty advisor and the graduate program coordinator to determine your own individualized Plan of Study (see Section 4.2.4 herein).

	Fall	**Spring**
Year 1	CHEE 502—Advanced Engineering Analysis (3 units) CHEE 505—Advanced Chemical Engineering Transport Phenomena (3 units) CHEE 506—Advanced Chemical Engineering Thermodynamics (3 units) CHEE 696A*—Departmental Seminar (1 unit) *Student must submit Responsible Conduct of Research form in GradPath before working in lab.* *Student must complete online General Lab Safety course and submit copy of completion certificate to graduate program coordinator before working in lab.* *Student must have a faculty advisor by the end of the first semester.*	CHEE 530—Advanced Chemical Reaction Engineering (3 units) Elective (3 units) Elective (3 units) CHEE 696A*—Departmental Seminar (1 unit) *Student must file Plan of Study no later than the end of the second semester.*
Year 2	Elective (3 units) CHEE 696A*—Departmental Seminar (1 unit) CHEE 910—MS Thesis Research (5 units) **	CHEE 696A*—Departmental Seminar (1 unit) CHEE 910—MS Thesis Research (8 units) ** *Student must file MS Thesis Committee Appointment Form in GradPath early in semester.* *Student writes thesis and orally defends it by end of the semester.*

* Although only 4 units of CHEE 696A Department Seminar are required to meet Graduate College requirements, students must take CHEE 696A Departmental Seminar each semester they are enrolled in the program, even if they take more than 4 semesters to complete. It is a departmental requirement.

** Although only 5 units of CHEE 910 are required for the MS Thesis degree, more units are suggested if a student needs to maintain full-time status of 9 units per semester.

4.2.2 Sample Course Plan—Non-thesis ChE MS

The following table is to be used as a ***general guide only***—please work with your faculty advisor and the graduate program coordinator to determine your own individualized Plan of Study (see Section 4.2.4 herein).

	Fall	**Spring**
Year 1	CHEE 502—Advanced Engineering Analysis (3 units) CHEE 505—Advanced Chemical Engineering Transport Phenomena (3 units) CHEE 506—Advanced Chemical Engineering Thermodynamics (3 units) CHEE 696A*—Departmental Seminar (1 unit) *Student must submit Responsible Conduct of Research form in GradPath before working in lab.* *Student must complete online General Lab Safety course and submit copy of completion certificate to Graduate program coordinator before working in lab.* *Student must have a research advisor by the end of the first semester.*	CHEE 530—Advanced Chemical Reaction Engineering (3 units) Elective (3 units) CHEE 900 (2 units) CHEE 696A*—Departmental Seminar (1unit) *Student must file Plan of Study no later than the end of the second semester.*
Year 2	Elective (3 units) Elective (3 units) CHEE 900 (2 units) CHEE 696A*—Departmental Seminar (1 unit)	CHEE 696A*—Departmental Seminar (1 unit) CHEE 909—MS Research Report (3 units) *or* CHEE 594—Practicum (2 units) and 1 unit of CHEE 909 ** *Student must file MS Thesis Committee Appointment Form in GradPath early in semester.* *Student completes a non-thesis research project and report by the end of the semester.*

* Although only two units of CHEE 696A Departmental Seminar are required to meet Graduate College requirements, students must take CHEE 696A Departmental Seminar each semester they are enrolled in the program. It is a departmental requirement.

** Although only three units of CHEE 909 are required for the MS Non-Thesis degree, more units are suggested if a student needs to maintain full-time status of 9 units per semester.

4.2.3 Sample Course Plan—Non-thesis ChE MS in 1 year

The following table is to be used as a ***general guide only***—please work with your faculty advisor and the graduate program coordinator to determine your own individualized Plan of Study (see Section 4.2.4 herein).

	Fall	**Spring**
Year 1	CHEE 502—Advanced Engineering Analysis (3 units) CHEE 505—Advanced Chemical Engineering Transport Phenomena (3 units) CHEE 506—Advanced Chemical Engineering Thermodynamics (3 units) CHEE 900—Research (2 units) Elective (3 units) CHEE 696A—Departmental Seminar (1unit) *Student must submit Responsible Conduct of Research form in GradPath before working in lab.* *Student must complete online General Lab Safety course and submit copy of completion certificate to Graduate program coordinator before working in lab.* *Student must have a research advisor by the end of the first semester.* *Student must file Plan of Study no later than the end of the first semester.*	CHEE 530—Advanced Chemical Reaction Engineering (3 units) Elective (3 units) Elective (3 units) CHEE 900—Research (2 units) CHEE 909—MS Report (3 units) CHEE 696A—Departmental Seminar (1 unit) *Student must file MS Thesis Committee Appointment Form in GradPath early in semester.* *Student completes a non-thesis research project and report by the end of the semester.*

4.2.4 Plan of Study (MS Degree)

In conjunction with the student's faculty advisor, each MS student is responsible for developing a Plan of Study to be filed with the Graduate College using GradPath https://grad.arizona.edu/gsas/gradpath during their second semester of study. Students following the one-year non-thesis plan must submit their Plan of Study before the end of their first semester. The Plan of Study identifies (1) courses the student intends to transfer from other institutions; (2) courses already completed at The University of Arizona that the student intends to apply toward the graduate degree; and (3) additional course work to be completed to fulfill degree requirements. Students are encouraged to meet with the graduate program coordinator to review the proposed Plan of Study before submitting it to correct inadvertent errors that will prevent its Graduate College approval. The Plan of Study will have the approval of the student's faculty advisor and chair of the GSC (all done electronically) before it is submitted to the Graduate College. The student is responsible to be aware of the deadline to submit the GradPath Plan of Study for review and electronic approvals.

4.2.5 Final Oral Presentation and Oral Defense Examination

MS Thesis: All MS Thesis students must report a thesis committee in GradPath, using the Master's/Specialist Committee Appointment Form. The master's thesis committee must include a minimum of three members, all of whom must be

University of Arizona tenured, tenure-track, approved as tenure-eligible, or designated as Graduate Faculty by the Graduate College for the purposes of serving on graduate committees. It must include the student's thesis director (faculty advisor) and two other members of the current Chemical and Environmental Engineering Department faculty. Committee members from other programs can be added with the approval of the student's faculty advisor. Committee members from other institutions can be incorporated in addition to the CHEE faculty as special members with the approval of the department and the Dean of the Graduate College. Upon 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 must be present during the examination. The presence of additional committee members is optional. Thesis approval pages may be completed electronically through AdobeSign. Students are strongly encouraged to work with the graduate program coordinator to get the approval page drafted and set up for signature to prevent errors that may delay completion of their degree.

MS Non-thesis: Non-thesis MS students do not need to have a thesis committee. In this option, the student will (1) participate in a one-semester research project and write a research report that will be approved by the student's faculty advisor overseeing the research, or (2) participate in a one-semester industrial internship and write a technical report about their experience. Prior to completion of the degree, however, the student will still need to log into GradPath and complete the Master's/Specialist Committee Appointment Form. The non-thesis student will open the form and click on the "No" button next to the question "Do you have a Master's Committee?" and then submit the form.

4.3 Accelerated MS Program (AMP Chemical Engineering)

4.3.1 Overview

The Accelerated Master's Program in Chemical Engineering (AMP ChE) is a program designed to enable advanced University of Arizona undergraduate students to complete both the Bachelor of Science degree and the Master of Science degree in ChE in a total of 5 years. This program is available only for University of Arizona undergraduate students in the Department of Chemical and Environmental Engineering.

4.3.2 Eligibility Criteria

To be considered eligible to apply for the AMP ChE, the student must:

- Be a continuing University of Arizona undergraduate.
- Have a minimum cumulative GPA of 3.30/4.0.
- At the time of application, have completed a minimum of seventy-five (75) units of undergraduate coursework; a minimum of twelve (12) undergraduate units must have been completed in the student's major at the University of Arizona's main campus.
- At the completion of the semester in which the student applies for the AMP, the student must have completed a minimum of ninety (90) units of undergraduate coursework and maintained a minimum cumulative GPA of 3.30/4.0 for full admission to the program.

Research experience as an undergraduate is not a requirement, but it is desirable.

4.3.3 How to Apply

Students who have completed a minimum of seventy-five (75) units are eligible to apply, usually early in the second semester of the student's junior year (typically January). The student must create an account in GradApp (https://apply.grad.arizona.edu) and submit an online application to the Chemical Engineering AMP. (See https://grad.arizona.edu/catalog/programinfo/CHEMSCHEAMP for more details). Once students have completed ninety (90) units (usually at the end of their junior year's second semester) and have a 3.30/4.0 or higher cumulative GPA, they will be conditionally admitted into the AMP. After conditional acceptance to the AMP program, students may register during their senior (fourth) year to take a combination of undergraduate and graduate courses but are still classified as undergraduate students. The graduate courses can double-count, serving both the BS degree and as elective or core courses for the MS degree.

One exception is CHEE 420/520 Chemical Reaction Engineering. CHEE 520 may not be taken to fulfill the required CHEE 420 undergraduate course. Graduate degrees are intended to take your education from basic undergraduate knowledge to a deeper or more specialized knowledge. If you are an engineer, you expect your graduate-level education not to be repetitive of content that you already know, but to have new content that will help you get a better understanding

of processes and that will impart new knowledge on more specialized subjects. In view of this, core courses are not common to both undergraduate and graduate degrees except for CHEE 420/520. Because CHEE 420 is a core (required) course for all Chemical Engineering undergraduate students, it may not be taken as a graduate-level course while in undergraduate status.

Additionally, graduate courses may not be taken to fulfill both undergraduate elective requirements and graduate electives. AMP students must consult with their undergraduate advisor and/or the graduate program coordinator to make sure that they are not in violation of this policy when selecting their graduate level courses.

To be fully admitted into the MS Graduate Program, early in the second semester of their senior year (usually January), the AMP student must submit a new application for the MS in Chemical Engineering to be fully accepted into the CHEE MS program. The student will not be charged an application fee for this simplified application. An automatic application fee waiver will be granted.

Note, however, that the abbreviated application to the full MS Graduate Program does not guarantee admission. During their senior year, AMP students must have maintained at least a 3.0/4.0 GPA in their graduate courses, obtained a faculty advisor early in the first semester of their senior year (see Section 3.1 herein), and shown acceptable progress in their research with the faculty advisor. The student's faculty advisor will submit a letter to the Chemical Engineering Graduate Studies Committee supporting the AMP student's admission to the full graduate program before the student will be recommended for full admission to the Graduate MS program. After completing the BS, students are then eligible to be fully accepted as MS degree students and matriculate into the graduate program.

In the fifth and final year, AMP students focus on graduate course work and their thesis or project.

4.3.4 Program requirements and guidelines

After admission into the AMP ChE program and during the student's final undergraduate (senior) year, the student must select a faculty advisor who will guide the student's research or development work toward the completion of a master's thesis or master's report. (See Section 3.1 of this handbook for helpful tips on selecting a faculty advisor.) Once the faculty advisor has been determined, the AMP student must complete the Chemical and Environmental Engineering Advisor Selection Form (see appendix A10 of this handbook). This form must be submitted to Lori Huggins (lhuggins@arizona.edu), the graduate program coordinator, for department records. The graduate program coordinator will provide the name of the student's faculty advisor to the chair of the Chemical Engineering Graduate Studies Committee (GSC) when the student has completed their BS and enrolled in their graduate year courses as a full MS student.

AMP seniors will submit an Undergraduate Enrollment in Graduate Courses form in both the fall and spring semesters in order to enroll in graduate courses. The form must be signed by the instructor for any course requested, and then signed by the student, the graduate program coordinator, and the department head. The graduate program coordinator will submit the completed form to the Registrar after reviewing and approving for accuracy.

Writing either a thesis or a project report is required. CHEE 400-level courses that are convened with 500-level courses can be taken for both the BS and the AMP programs except for CHEE 420/520 or courses being taken to fulfill undergraduate elective requirements as explained in Section 4.3.3 herein, but the 500-level version of the course must be taken if it is to be used toward the AMP. Note that except for one core course, only graduate elective courses should be taken as an undergraduate. The AMP ChE can be either thesis or non-thesis and will follow the same requirements of the traditional MS program with the following exceptions:

- AMP students who choose to follow the MS-Thesis track in their graduate year will take only 2 units of CHEE 696A instead of the usual 4, leaving them with an additional two (2) units to fill. They complete the extra two units in one of two ways:
    - Take an additional two (2) units of CHEE 910 Thesis
    - Take an additional elective with two (2) or more units

4.3.5 University of Arizona Graduate College policies on AMPs

Students will be considered undergraduates until they complete their undergraduate requirements, which should be no later than the end of their fourth year. Students must take at least twelve (12) of their graduate credits while in graduate status.

Once admitted to the AMP, during the senior (or transition) year, students may take up to twelve (12) units of graduate coursework, which may apply toward both the BS and the MS degrees. While an undergraduate, students are required to keep their graduate coursework cumulative GPA at 3.0/4.0 or higher to be fully admitted to the master's program upon completion of their BS degree.

During the senior (transition) year, students will be charged at the undergraduate rate and retain eligibility for undergraduate scholarships. After completion of all BS requirements, students will be granted graduate status, be charged at the graduate rate, and be eligible for graduate assistantships. Should a student have completed twelve (12) graduate credits, but not yet completed the undergraduate degree, they will be considered a graduate for financial aid and tuition purposes. They will no longer be eligible for undergraduate scholarships, nor will they be eligible for graduate assistantships. Once all requirements for the undergraduate degree have been completed, at least twelve (12) additional graduate units must be taken while in graduate status (with no pending undergraduate requirements to be completed). A total of thirty (30) graduate credits (500-level courses or higher) must be taken.

AMP students should complete their undergraduate requirements no later than one semester before receiving their MS. Neither degree will be awarded until all undergraduate degree requirements have been completed.

4.3.6 Sample course plans for Thesis and Non-thesis AMP ChE (beginning with Senior year)

All Chemical Engineering MS AMP students are required to take the following core courses at the University of Arizona:

- 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 AMP degree options:

Thesis MS AMP Students

The AMP thesis MS track requires thirty (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 to meet Graduate College unit requirements:

- CHEE 910—Thesis (5 units)
- CHEE 696A—Departmental Seminar (2 units) *
- Approved electives (9 units)
- Additional two (2) units may be made up by adding another elective or adding two (2) more units of CHEE 910 Thesis.

In this option, the student will develop a research project leading to the MS thesis. Upon the completion and successful approval of the MS thesis research by the student's thesis committee, the candidate is to submit to a final oral defense examination (see Section 4.2.5 herein). A copy of the signed approval page of the research document must be submitted to the graduate program coordinator for archiving with the department. The examination focuses on the student's research. The examining committee will consist of the MS Thesis Committee (see Section 4.2.5 herein). All members of the committee must be present during the examination while the presence of additional committee members is optional. Note that the MS thesis must be archived.

Non-thesis MS AMP Students

The AMP non-thesis MS track requires thirty (30) units of graduate level coursework. In addition to the required courses listed above, all students undertaking the master's non-thesis track must complete the following courses to meet Graduate College unit requirements:

- CHEE 909—Master's Report (3 units)
- CHEE 696A—Departmental Seminar (2 units) *
- Approved electives (9 units)
- CHEE 900— (4 units)

Sample Plan 1: BS in ChE and AMP in ChE (MS Thesis)

The following tables assume a student who is majoring in Chemical Engineering as an undergraduate, and they are to be used as a ***general guide only***—please work with your faculty advisor, the undergraduate advisor (while in undergraduate status) and the graduate program coordinator to determine your own individualized Plan of Study (see Section 4.3.7 herein).

Semester 7 (Fall – Senior Year)	**Semester 8 (Spring – Senior Year)**
CHEE 401A—Chemical and Environmental Engineering Lab I (1 unit) CHEE 442—Chemical Engineering Design Principles (3 units) CHEE 420—Chemical Reaction Engineering (3 units) CHEE 506—Advanced Chemical Engineering Thermodynamics (3 units) CHEE Graduate elective* (3 units) *Student must have a faculty advisor by the end of their first semester in the AMP program.*	CHEE 401B—Process Dynamics and Control Lab (1 unit) CHEE 413—Process Control and Simulation (3 units) CHEE 443—Chemical Engineering Plant Design (3 units) CHEE Graduate elective* (3 units) CHEE Graduate elective* (3 units) *Student applies to graduate MS program by the end of the spring semester.*
Semester 9 (Fall—Grad Year)	**Semester 10 (Spring—Grad Year)**
CHEE 502**—Advanced Engineering Analysis (3 units) CHEE 505**—Advanced Chemical Engineering Transport Phenomena (3 units) CHEE 910—Thesis (2 units) CHEE 696A***—Departmental Seminar (1 unit) *Student must submit Responsible Conduct of Research form in GradPath before working in lab.* *Student must complete online General Lab Safety course and submit copy of completion certificate to graduate program coordinator before working in lab.* *Student must file Plan of Study no later than the end of the first semester in the graduate program.*	CHEE 530—Advanced Chemical Reaction Engineering (3 units) CHEE 696A***—Departmental Seminar (1 unit) CHEE 910—MS Thesis Research (5 units) *Student must file MS Thesis Committee Appointment Form in GradPath early in semester.* *Student writes thesis and orally defends it by the end of the semester.*

* Student should take a 500-level elective course, although taking one core course as an undergrad is acceptable. Up to two electives can be from Math or Science graduate programs. At least one elective must be from an Engineering graduate program; 400/500 level courses are acceptable for the AMP only if the 500-level version of the course is taken.

** Student may have taken one of these core courses as an undergraduate AMP student. In that instance, the student may take an additional 2 or more-unit elective or an additional 2 units of CHEE 910 Thesis to meet requirements.

*** Although 4 units of CHEE 696A Department Seminar are required to meet CHEE MS Thesis requirements, 2 units of the CHEE 696A Departmental Seminar requirement are waived for AMP MS-Thesis students if they complete their degree within 2 graduate semesters.

Sample Plan 2: BS in ChE and AMP in ChE (non-thesis)

Semester 7 (Fall—Senior Year)	**Semester 8 (Spring—Senior Year)**
CHEE 401A—Chemical and Environmental Engineering Lab I (1 unit) CHEE 442—Chemical Engineering Design Principles (3 units) CHEE 420—Chemical Reaction Engineering (3 units) CHEE 506—Advanced Chemical Engineering Thermodynamics (3 units) CHEE Graduate elective* (3 units) *Student must have a faculty advisor by the end of their first semester in the AMP program.*	CHEE 401B—Process Dynamics and Control Lab (1 unit) CHEE 413—Process Control and Simulation (3 units) CHEE 443—Chemical Engr Plant Design (3 units) CHEE Graduate elective* (3 units) CHEE Graduate elective* (3 units) *Student applies to graduate MS program by the end of the spring semester.*
Semester 9 (Fall—Grad Year)	**Semester 10 (Spring—Grad Year)**
CHEE 502—Advanced Engineering Analysis (3 units) CHEE 505—Advanced Chemical Engineering Transport Phenomena (3 units) CHEE 696A**—Departmental Seminar (1 unit) CHEE 900—Research (2 units) *Student must submit Responsible Conduct of Research form in GradPath before working in lab.* *Student must complete online General Lab Safety course and submit copy of completion certificate to graduate program coordinator before working in lab.* *Student must file Plan of Study no later than the end of first semester in the graduate program.*	CHEE 530—Advanced Chemical Reaction Engineering (3 units) CHEE 696A**—Departmental Seminar (1 unit) CHEE 900—Research (2 units) CHEE 909—MS Research Report (3 units) *Student must file MS Thesis Committee Appointment Form in GradPath early in semester.* *Student completes a non-thesis research project and report by the end of the semester.*

* Student must take a 500-level course.

** Although 2 units of CHEE 696A Departmental Seminar is required to meet Graduate College requirements, students must take CHEE 696A Departmental Seminar each semester they are enrolled in the program if they take more than 2 graduate semesters to complete their degree. It is a departmental requirement.

Sample Plan 3: BS in EEN and AMP in ChE (MS Thesis)

The following tables assume a student who is majoring in Environmental Engineering as an undergraduate, and they are to be used as a ***general guide only***—please work with your faculty advisor, the undergraduate advisor (while in undergraduate status) and the graduate program coordinator to determine your own individualized Plan of Study (see Section 4.3.7 herein).

Semester 7 (Fall – Senior Year)	**Semester 8 (Spring – Senior Year)**
CHEE 442—Chemical Engineering Design Principles (3 units) CHEE 475—Water Treatment System Design (3 units) CHEE 400A—Environmental Engineering Laboratory I (1 unit) EHS 418—Intro to Human Health Risk Assessment, **OR** ATMO 469A—Atmospheric Pollution I: Gases, **OR** ENVS 464—Environmental Organic Chemistry (3 units) General Education: Building Connections (3 units) CHEE 506—Advanced Chemical Engineering Thermodynamics (3 units) CHEE 520 Chemical Reaction Engineering* (3 units) *Student must have a research advisor by the end of their first semester in the AMP program.*	CHEE 443—Chemical Engineering Plant Design (3 units) CHEE 469B—Air Pollution II: Aerosols (3 units) CHEE 400B—Environmental Engineering Laboratory II (1 unit) CHEE 478—Introduction to Hazardous Waste Management (3 units) UNIV 301 General Education Portfolio (1 unit) CHEE Graduate elective (engineering)* (3 units) CHEE Graduate elective (technical)* (3 units) *Student applies to graduate MS program by the end of the Spring semester.*
Semester 9 (Fall—Grad Year)	**Semester 10 (Spring—Grad Year)**
CHEE 502—**Advanced Engineering Analysis (3 units) CHEE 505**—Advanced Chemical Engineering Transport Phenomena (3 units) CHEE 696A***—Department Seminar (1 unit) CHEE 910****—MS Thesis Research (2 units) *Student must submit Responsible Conduct of Research form in GradPath before working in lab.* *Student must complete online General Lab Safety course and submit copy of completion certificate to Graduate program coordinator begin working in lab.* *Student must file Plan of Study no later than the end of the first semester in the grad program.*	CHEE 530—Advanced Chemical Reaction Engineering (3 units) CHEE 696A***—Department Seminar (1 unit) CHEE 910****—MS Thesis Research (5 units) *Student must file MS Thesis Committee Appointment Form in GradPath early in semester.* *Student writes thesis and orally defends it by the end of the semester.*

* Student must take a 500-level elective course for it to count for both the graduate and undergraduate degrees. Up to two electives can be from Math or Science graduate programs. At least one elective must be from an Engineering graduate program; 400/500 level courses are acceptable for the AMP only if the 500-level version of the course is taken. CHEE 520 Chemical Reaction Engineering is recommended for EEN students to help prepare them for CHEE 530 Advanced Chemical Reaction Engineering during their graduate year.

** Student may have taken one of these core courses as an undergraduate AMP student. In that instance, the student may take an additional two (2) or more-unit elective or add two (2) units of thesis to meet requirements.

*** Although 4 units of CHEE 696A Department Seminar is required to meet CHEE MS Thesis requirements, 2 units of the CHEE 696A Departmental Seminar requirement are waived for AMP MS-Thesis students if the student completes their degree within 2 graduate semesters.

**** Although only 5 units of CHEE 910 are required for the AMP MS Thesis degree, more units are suggested if a student needs to maintain full-time status of 9 units per semester.

Sample Plan 4: BS in EEN and AMP in ChE (MS non-thesis)

Semester 7 (Fall—Senior Year)	**Semester 8 (Spring—Senior Year)**
CHEE 442—Chemical Engineering Design Principles (3 units) CHEE 475—Water Treatment System Design (3 units) CHEE 400A—Environmental Engineering Laboratory I (1 unit) EHS 418—Intro to Human Health Risk Assessment, **OR** ATMO 469A—Atmospheric Pollution I: Gases, **OR** ENVS 464—Environmental Organic Chemistry (3 units) General Education: Building Connections (3 units) CHEE 506—Advanced Chemical Engineering Thermodynamics (3 units) CHEE 520 Chemical Reaction Engineering* (3 units) *Student must have a research advisor by the end of their first semester in the AMP program.*	CHEE 443—Chemical Engineering Plant Design (3 units) CHEE 474—Fate and Transport Processes in Environmental Engineering (3 units) CHEE 400B—Environmental Engineering Laboratory II (1 unit) CHEE 478—Introduction to Hazardous Waste Management (3 units) UNIV 301 General Education Portfolio (1 unit) CHEE Graduate elective (engineering)* (3 units) CHEE Graduate elective (technical)* (3 units) *Student applies to graduate MS program by the end of the Spring semester.*
Semester 9 (Fall—Grad Year)	**Semester 10 (Spring—Grad Year)**
CHEE 502—Advanced Engineering Analysis (3 units) CHEE 505—Advanced Chemical Engineering Transport Phenomena (3 units) CHEE 696A—Department Seminar (1 unit) CHEE 900—Research (2 units) *Student must submit Responsible Conduct of Research form in GradPath before working in lab.* *Student must complete online General Lab Safety course and submit copy of completion certificate to Graduate program coordinator begin working in lab.* *Student must file Plan of Study no later than the end of first semester in the grad program.*	CHEE 530—Advanced Chemical Reaction Engineering (3 units) CHEE 900—Research (2 units) CHEE 696A—Department Seminar (1 unit) CHEE 909—MS Research Report (3 units) *Student must file MS Thesis Committee Appointment Form in GradPath early in semester.* *Student completes a non-thesis research project and report by the end of the semester.*

* Student must take a 500-level elective course for it to count for both the graduate and undergraduate degrees. Up to two electives can be from Math or Science graduate programs. At least one elective must be from an Engineering graduate program; 400/500 level courses are acceptable for the AMP only if the 500-level version of the course is taken. CHEE 520 Chemical Reaction Engineering is recommended for EEN students to help prepare them for CHEE 530 Advanced Chemical Reaction Engineering during their graduate year.

4.3.7 Plan of Study (ChE AMP Degree)

In conjunction with the student's faculty advisor, each AMP student is responsible for developing a Plan of Study to be filed with the Graduate College using GradPath https://grad.arizona.edu/gsas/gradpath during their first semester of study as a graduate student. The Plan of Study identifies (1) courses the student intends to transfer from other institutions; (2) courses already completed at The University of Arizona that the student intends to apply toward the graduate degree, including those completed as an undergraduate; and (3) additional course work to be completed to fulfill degree requirements. Students are encouraged to meet with the Graduate program coordinator to review the proposed Plan of Study before submitting it to correct inadvertent errors that will prevent its Graduate College approval. The Plan of Study must have the approval of the student's advisor and chair of the Chemical Engineering GSC before it is submitted to the Graduate College. The student is responsible to be aware of the deadline to submit the GradPath Plan of Study for review.

4.3.8 Final Oral Presentation and Oral Defense Examination

MS Thesis: All MS Thesis students must report a thesis committee in GradPath, using the Master's/Specialist Committee Appointment Form. The Master's Thesis Committee must include a minimum of three members, all of whom must be University of Arizona tenured, tenure-track, approved as tenure-eligible, or designated as Graduate Faculty by the Graduate College for the purposes of serving on graduate committees. It must include the student's thesis director (faculty advisor) and two other members of the current Chemical and Environmental Engineering Department faculty. Committee members from other institutions can be incorporated in addition to the CHEE faculty as a courtesy and/or adjunct appointment as special members with the approval of the department and Graduate College. Upon 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 must be present during the examination. The presence of additional committee members is optional. Thesis approval pages may be completed through AdobeSign. Students may work with the Graduate program coordinator to get the approval page drafted and set up for electronic signatures.

MS Non-thesis: Non-thesis MS students do not need to have a thesis committee. In this option, the student will (1) participate in a one-semester research project and write a research report that will be approved by the student's faculty advisor overseeing the research, or (2) participate in a one-semester industrial internship and write a technical report about their experience. Prior to completion of the degree, however, the student will still need to go into GradPath and complete the Master's/Specialist Committee Appointment Form. The non-thesis student will open the form and click on the "No" button next to the question "Do you have a Master's Committee?" and then submit the form.

4.4 Minor in Chemical Engineering

Nine units of courses are required. Except for students who are also majoring in Chemical Engineering, at least six units must come from the following core courses of the Chemical Engineering graduate program:

- CHEE 502—Advanced Engineering Analysis (3 units)
- CHEE 505—Advanced Chemical Engineering Transport Phenomena (3 units)
- CHEE 506—Advanced Chemical Engineering Thermodynamics (3 units)
- CHEE 530—Advanced Chemical Reaction Engineering (3 units)

The other three units must come from courses in the previous or the following list:

- CHEE 500R*—Water Chemistry for Engineers (3 units)
- CHEE 512—Electrochemical Engineering (3 units)
- CHEE 514—Sustainable Water Supplies for Remote Communities (3 units)
- CHEE 520—Chemical Reaction Engineering (3 units)
- CHEE 535—Corrosion and Degradation (3 units)
- CHEE 538—Intermolecular and Surface Forces (3 units)
- CHEE/ATMO 569A—Air Pollution I: Gases (3 units)
- CHEE/ATMO 569B—Air Pollution II: Aerosols (3 units)
- CHEE 572—Interfacial Chemistry of Biomolecules in Environmental Systems (3 units)
- CHEE 574*—Fate and Transport Processes in Environmental Engineering (3 units)
- CHEE 575*—Water Treatment System Design (3 units)
- CHEE 576*—Wastewater Treatment System Design (3 units)
- CHEE 578—Introduction to Hazardous Waste Management (3 units)
- CHEE 581A—Engineering of Biological Processes (3 units)
- CHEE 581B—Cell and Tissue Engineering (3 units)
- CHEE 582—Analysis of Emerging Environmental Contaminants (3 units)
- CHEE 583—Intro to Polymeric Materials (3 units)
- CHEE 585—Water Reuse (3 units)
- CHEE 589—Trends in Nanomedicine Engineering: Fundamentals of Therapeutics and Drug Delivery Systems

* If the student minoring in Chemical Engineering is majoring in Environmental Engineering, this elective cannot be used for the minor because it is a required course for the major in Environmental Engineering.

Chemical Engineering PhD students who also minor in Chemical Engineering will take nine (9) units of elective Chemical Engineering courses that are not part of the Chemical Engineering core requirements to complete the minor.

A member from the Chemical Engineering graduate faculty will serve as the student's minor advisor and will serve as a member of the student's doctoral comprehensive exam committee.

Chemical Engineering Split Minor

If a PhD student chooses two minor subjects (called a split minor) and Chemical Engineering is one of them, then the student must complete a minimum of six (6) units in Chemical Engineering courses. The six (6) units must be taken from the CHEE course lists above. Students may take either core or elective CHEE courses, depending on the needs of their

major research. Students taking courses in Chemical Engineering as part of a split minor must work with their faculty minor advisor to determine which courses are most appropriate.

5.0 Degree Requirements: PhD and MS in Environmental Engineering

	PhD*	Thesis MS	Non-Thesis MS
Required Courses (CHEE 500R, 574, 575, 576) **	12	12	12
Electives (excluding minor) – six (6) units must be from approved electives list in Section 5.1.1	21	12	12
Minor***	9-12		
CHEE 696A (Department Seminar)	3****	2****	2****
CHEE 910 (MS Thesis)		4	
CHEE 909 (MS Non-thesis)			4
CHEE 920 (Dissertation)	18		
Total Units	63-66	30	30

* Students 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.

** Core courses are offered only once per academic year, either in the fall or the spring. Students must be aware of this when they are planning their studies. Additionally, students who have taken CHEE 474, 475 and/or 476 or their equivalent undergraduate courses at another institution will take CHEE 505 Advanced Chemical Engineering Transport Phenomena (3 units) in lieu of CHEE 474, and CHEE 514 Sustainable Water Supplies for Remote Communities (3 units) and CHEE 676 Advanced Water and Wastewater Treatment (3 units) in lieu of CHEE 475 and 476.

*** Note that the Graduate College requires 36 units of major coursework exclusive of the minor for the PhD. Therefore, if the PhD minor requires more than 9 units of minor coursework (e.g., 12 units), the student will still need to take 36 units of coursework in the major. Students should work with the graduate program coordinator to make sure that they take the required number of major units. The Graduate College also requires that at least 22 units of the required major and minor units must be graded (A/B) units.

**** Note that all CHEE graduate students must register and regularly attend CHEE 696A (Departmental Seminar) each semester that they are in their respective programs. However, their Plan of Study should include only the numbers listed in the table above to meet Graduate College requirements and allow the student to advance to candidacy after completion of the Comprehensive Exam.

The Graduate College website summarizes this information at: https://grad.arizona.edu/gsas/degree-requirements/doctor-philosophy. For more information about the Accelerated Master Program (AMP) leading to the Thesis or Non-Thesis MS degree, see Section 5.3 of this handbook. You may also refer to the CHEE website for graduate programs at https://chee.engineering.arizona.edu/grad-programs/degrees, and then select the link under the tab labeled "Accelerated MS-EE" to find more information about the program.

Descriptions for the courses shown in subsequent pages can be found at this website: https://chee.engineering.arizona.edu/grad-programs/courses.

5.1 PhD Program (Environmental Engineering)

Thirty-six units of coursework are required for the major subject, exclusive of dissertation research and the minor. Three (3)* units of seminar (CHEE 696A), twenty-one (21) units of electives as described in more detail in Section 5.1.1 following, and eighteen (18) units of dissertation (CHEE 920) will be used to satisfy Graduate College requirements for the PhD degree, as well as the twelve (12) units of core courses outlined below and 9-12 units of minor courses (depending on requirements of the minor department).

* Units listed will allow students to meet Graduate College unit requirements and advance to candidacy after completion of their comprehensive exam, but the Department of Chemical and Environmental Engineering requires students to register for and regularly attend the Departmental Seminar each semester that they are in the CHEE program.

5.1.1 Course Requirements Environmental Engineering (EEN) PhD

All Environmental Engineering PhD students are required to take the following core courses at the University of Arizona or an approved equivalent elsewhere:

- CHEE 500R—Water Chemistry for Engineers (3 units)
- CHEE 574—Environmental Transport Processes* (3 units)
- CHEE 575—Water Treatment System Design* (3 units)
- CHEE 576—Wastewater Treatment System Design* (3 units)

* Students who enter the PhD program having taken CHEE 474 Environmental Transport Processes or an equivalent course will take CHEE 505
Advanced Chemical Engineering Transport Phenomena instead. Students who enter the PhD program having taken CHEE 475 Water Treatment
System Design (3 units) and CHEE 476 Wastewater Treatment System Design (3 units) or equivalent courses will take CHEE 514 Sustainable Water Supplies for Remote Communities (3 units) and CHEE 676 Advanced Water and Wastewater Treatment (3 units) instead.

To meet Graduate College unit requirements, Environmental Engineering PhD students will take a minimum of twenty-one (21) units of electives, six (6) units of which must be from the list below:

- CHEE 514—Sustainable Water Supplies for Remote Communities** (3 units)
- CHEE 525—Emerging Issues in Water Quality (3 units)
- CHEE 542—Bioremediation on Inorganic Contaminants (2 units)
- CHEE 569A—Air Pollution I: Gases (3 units)
- CHEE 569B—Air Pollution II: Aerosols (3 units)
- CHEE 572—Interfacial Chemistry of Biomolecules in Environmental Systems (3 units)
- CHEE 578—Introduction to Hazardous Waste Management (3 units)
- CHEE 582—Analysis of Emerging Environmental Contaminants (3 units)
- CHEE 585—Water Reuse (3 units)
- CHEE 676—Advanced Water and Wastewater Treatment** (3 units)

The additional fifteen (15) units of electives may be taken from a combination of electives, research and independent study courses at the discretion of the student and their faculty advisor.

** Students who have taken CHEE 514 and CHEE 676 in lieu of other required courses will choose different elective courses.

Students will also take the following:

- Three (3) units of CHEE 696A *Departmental Seminar****
- Nine (9) to twelve (12) units of minor courses (depending on requirements of the minor department),

- Eighteen (18) units of Dissertation Research (CHEE 920).

According to the Graduate College, at least twenty-two (22) units of the combined major and minor course work must be in courses in which regular grades (A/B) have been earned. Students who enter the PhD program with an MS in environmental engineering or a related discipline may transfer up to thirty (30) units of coursework after approval from the Graduate College and the Environmental Engineering Graduate Studies Committee (GSC) and will be evaluated individually to devise a Plan of Study (see Section 5.1.5 following).

Note also that minor unit requirements can vary by department. According to the Graduate College, if the student minors in a subject that requires more than nine (9) units of coursework, the student will still need to take a full thirty-six (36) units of major coursework, exclusive of dissertation units, which must be reflected on the submitted Plan of Study (see Section 5.1.5 following). This may affect the total number of units that the student will take to meet completion requirements.

*** Units listed are to allow students to meet Graduate College unit requirements and advance to candidacy after completion of their Comprehensive Exam, but the Department of Chemical and Environmental Engineering requires students to register for and regularly attend the Departmental Seminar each semester that they are in the CHEE program.

5.1.2 Sample Course Plan—Environmental Engineering PhD

The following table is to be used as a ***general guide only***—please work with your faculty advisor and the graduate program coordinator to determine your own individualized Plan of Study (see Section 5.1.5 following). Specific course requirements are discussed in Section 5.1.1 herein.

	Fall	**Spring**
Year 1	CHEE 500R—Water Chemistry for Engineers (3 units) CHEE 575*—Water Treatment System Design (3 units) Elective** (or minor) (3 units) CHEE 696A***—Departmental Seminar (1 unit) *Student must submit Responsible Conduct of Research form in GradPath before working in lab.* *Student must complete online General Lab Safety course and submit copy of completion certificate to graduate program coordinator before working in lab.* *Student must have a research advisor by end of this semester.*	CHEE 574*—Environmental Transport Processes (3 units) CHEE 576*—Wastewater Treatment System Design (3 units) Elective** (or minor) (3 units) CHEE 696A***—Departmental Seminar (1 unit) *Any student with a GPA <3.75 in the core courses 500R, 574, 575, and 576 must take the written qualification exam the next time it is offered, usually the week before classes start in August for the fall semester. The exam is waived for GPA ≥ 3.75.*
Year 2	Elective** (or minor) Elective** (or minor) (3 units) Elective** (or minor) (3 units) CHEE 696A***—Dept Seminar (1 unit)	Elective** (or minor) (3 units) Elective** (or minor) (3 units) Elective* (or minor) (3 units) CHEE 696A***—Dept Seminar (1 unit)

	*The student's **Plan of Study** is due early in the 3rd semester, after the Qualifying Exam.*	
Year 3	Elective** (3 units) Elective** (3 units) CHEE 696A***—Departmental Seminar (1 unit) CHEE 920—Dissertation Research (2 units****) *Student works with their faculty advisor to determine their Graduate Committee by the end of their 5th semester in the program.*	Elective** (3 units) CHEE 696A***—Departmental Seminar (1 unit) CHEE 920—Dissertation Research (5 units****) *Student must file Comp Exam Committee Appointment Form before end of semester.* *File Announcement of Doctoral Comp Exam Form in GradPath before end of semester.* *All students should take the Comprehensive exam: (i) write their thesis proposal; and (ii) orally defend their thesis proposal by the beginning of the next fall semester.* *Student must file Dissertation Committee Appointment Form in GradPath immediately following successful completion of comprehensive exam.* *Students who have passed the comprehensive exam should plan to TA at least one semester.*
Year 4	CHEE 696A***—Departmental Seminar (1 unit) CHEE 920—Dissertation Research (8 units****)	CHEE 696A***—Departmental Seminar (1) CHEE 920—Dissertation Research (8 units****) *Student must file Announcement of Final Oral Defense form in GradPath at least 10 business days before defense.* *Student must turn in Publications form with copies of publications to graduate program coordinator.* *Student must provide defense information, including any Zoom link, to graduate program coordinator at least 10 business days before defense.*

* Students who have taken CHEE 474, 475 and/or 476 or their equivalent undergraduate courses at another institution will take CHEE 505 Advanced Chemical Engineering Transport Phenomena (3 units) in lieu of CHEE 574, and CHEE 514 Sustainable Water Supplies for Remote Communities (3 units) and CHEE 676 Advanced Water and Wastewater Treatment (3 units) in lieu of CHEE 575 and 576.

** Six (6) units of elective courses are required. The additional 15 units of electives may be CHEE 900 Research, CHEE 599 Independent Study or additional elective courses (at the discretion of the student and their faculty advisor).

*** Candidates wishing to advance to candidacy immediately following their comprehensive exam cannot have any outstanding non-CHEE 920 units listed on their Plan of Study, or they will not advance until they complete those units. Therefore, while required by the department, CHEE 696A courses cannot be listed on the Plan of Study if they are to be taken after the comprehensive exam.

**** Although 18 units of CHEE 920 are required for the PhD degree, more units are suggested if a student needs to maintain full-time status of 9 units per semester.

5.1.3 Qualifying Examination

The PhD qualifying examination is a written exam offered once per year. The subjects evaluated are Environmental Transport, Water Chemistry, and Water Treatment and Wastewater Treatment System Design. The written qualifying exam is waived for students with a GPA of 3.75/4.0 or greater in the core courses CHEE 500R, 574, 575, and 576 (or 505, 514 and 676 if applicable). Students taking the qualifying exam will take the sections of the exam that apply to core subjects for which they did not receive a grade of "A." Additionally, if a student transfers units from an MS degree from another institution to replace a core course, they will take the qualifying exam in that subject. Students must take the exam the first time it is offered after they have completed the core courses. A student failing the qualifying examination can retake it once, provided that their faculty advisor agrees. If consent is obtained, students failing section(s) of the exam will retake the exam for that (those) section(s). The retake will be offered three months after the student is informed of the grade obtained in the initial exam. If the student fails any part of the exam again, then the student will have failed the written qualification exam and will be placed on the MS track. The qualifying examination is given in August before classes start for the fall semester, and it should be taken no later than the start of the third academic year.

For international transfer students and those students entering with a degree other than environmental engineering, the GSC will work with the student to develop a Plan of Study (see Section 5.1.5) that will prepare them for the qualifying exam. Transfer students from United States universities and those entering with an MS in Environmental Engineering will be evaluated individually to devise plans for courses and the qualifying exam.

5.1.4 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 their research advisor. Minors are administered and approved by the minor department. They typically consist of 9 to 12 units of course work. Note that if the student selects a minor that requires more than nine (9) units of minor coursework [e.g., twelve (12) units], the student will still need to take thirty-six (36) required units of major coursework, exclusive of dissertation units, as required by the Graduate College. The student should work with the graduate program coordinator to make sure the correct number of units are included in the Plan of Study (see Section 5.1.5 following) to meet the Graduate College requirement.

Students may opt to construct a multidisciplinary minor when they want to take minor courses from multiple departments. The multidisciplinary minor typically requires nine (9) units of coursework, but the student's major advisor may require twelve (12) units of coursework. The multidisciplinary minor must be approved by the student's faculty advisor and the rest of the student's comprehensive exam committee. One instructor from the courses in the

multidisciplinary minor must serve as a member of the student's comprehensive exam committee and direct that part of the comprehensive exam.

To select the multidisciplinary minor, the student must choose "Multidisciplinary" from the dropdown list for the minor on the GradPath Plan of Study.

5.1.5 Plan of Study

In conjunction with their faculty 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 that the student intends to apply toward the graduate degree; and (3) additional course work to be completed to fulfill degree requirements.

Note, however, that students should not list more than three (3) or four (4) units of CHEE 696A on their Plans of Study even though the department requires that they register and attend the departmental seminar each semester (see Section 3.6 herein). The Graduate College requires that only dissertation units be left to complete on the Plan of Study for the student to advance to candidacy following successful completion of the oral and written comprehensive exam (see Section 5.1.6 following). Therefore, the student must register for and attend 696A Departmental Seminar each semester following the comprehensive exam, but the student cannot have any outstanding non-dissertation requirements listed on the Plan of Study.

Students are encouraged to meet with the graduate program coordinator to review the proposed Plan of Study before submitting it in GradPath to correct inadvertent errors that will prevent its Graduate College approval or prevent the student from advancing to candidacy after they successfully complete their comprehensive exam. The Plan of Study must have the approval of the student's faculty advisor, minor advisor, and the chair of the Environmental Engineering GSC before it is reviewed and approved by the Graduate College. The Graduate College states that PhD students must submit their Plan of Study no later than the fourth semester in residence at The University of Arizona, soon after passing the qualifying exam.

5.1.6 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 evaluate 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 minor department controls the minor portion of the written examination and may waive it at their discretion. The Doctoral Comp Exam Committee must include a minimum of four members, all of whom must be University of Arizona tenured, tenure-track, approved as tenure-eligible, or designated as Graduate Faculty

by the Graduate College for the purposes of serving on graduate committees. It must include the student's dissertation director (faculty advisor) and two other members of the current Chemical and Environmental Engineering Department faculty, as well as a representative from the student's minor department. Committee members from other programs can be incorporated (in addition to the CHEE faculty and the minor representative) with the approval of the student's faculty advisor. Additionally, committee members from other institutions can be incorporated in addition to CHEE faculty and minor members as special members. Special members must be pre-approved by the program and the Dean of the Graduate College for inclusion on the comprehensive and dissertation exam committees. Before scheduling the exam, all students must file the Comprehensive Exam Committee Appointment Form in GradPath at least two weeks (10 business days) in advance of the exam date.

Written Comprehensive Examination. The written part of the comprehensive examination consists of a written 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 traditional research article format and font). The written document, after approval by the student's faculty advisor, must be submitted to the other members of the examining committee not less than two weeks (10 business days) prior to the oral comprehensive exam and must be approved by all committee members prior to the oral comprehensive exam.

The written comprehensive exam must be completed and approved successfully prior to undertaking the oral part of the comprehensive exam.

Oral Comprehensive Examination. The oral comprehensive examination is conducted by the student's comprehensive examination committee. The student must display a broad knowledge of the chosen field of study and sufficient depth of understanding on the major and minor fields to pass this exam. 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. The Graduate College allows no more than one re-take of the oral exam.

When the student has passed the written and oral portions of the comprehensive examination, and the Graduate Student Academic Services Office (within the Graduate College) has confirmed completion of the required courses on the approved doctoral Plan of Study, the student will advance to doctoral candidacy.

5.1.7 Timeline for Comprehensive Examination and Requirements

According to the Graduate College, the written and oral portions of the comprehensive examination should take place **at least six (6) months** prior to the final oral examination (defense of dissertation), and they *must* be completed

no less than three (3) months ahead of the oral defense of the dissertation. The oral comprehensive examination is performed upon successful completion of the written portion of the exam as described in Section 5.1.6 herein. The exact time and place of the oral comprehensive examination must be scheduled with the department and approved in GradPath using the Announcement of Doctoral Comprehensive Exam form at least two weeks (10 business days) in advance of the oral exam.

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

- File a Plan of Study with the Graduate College through GradPath (as approved by the Graduate Studies Committee)
- Satisfy all requirements stipulated by the minor department or program
- Complete all required courses, and a minimum of 90% of *all* coursework
- Complete the written comprehensive examination as described herein
- Complete the required forms in GradPath (appointment form and announcement form)
- Take and successfully pass the oral comprehensive examination as described herein

5.1.8 Dissertation Committee

When the student has an approved doctoral Plan of Study on file and approved in GradPath, has satisfied all course work, and passed the written and oral portions of the comprehensive examination, the student must file the Doctoral Dissertation Committee Appointment form in GradPath. The doctoral dissertation committee must include a minimum of three (3) members, all of whom must be University of Arizona tenured, tenure-track, approved as tenure-eligible, or designated as Graduate Faculty by the Graduate College for the purposes of serving on graduate committees. It must include the student's dissertation director (faculty advisor) and two other members of the current Chemical and Environmental Engineering Department faculty. Additional committee members may include eligible members of the CHEE department or the candidate's minor department, other UA department faculty, or a specially approved member from outside the UA faculty. Students must submit the names of their doctoral committee through GradPath.

Any changes to the committee should be reported to the Graduate Student Academic Services office. Under normal circumstances, submission is expected at least six (6) months before the final oral examination (i.e., defense). The Committee Appointment form reports the student's planned dissertation committee, dissertation title (subject to change) and the expected graduation term. It requires approval from the student's dissertation director (faculty advisor) and the major and minor departments. The approval signature from the minor department on this form indicates both approval of the reported dissertation committee and confirmation that the student has satisfied all requirements for the minor.

5.1.9 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. A copy of the signed approval page of the dissertation document must be submitted to the graduate program coordinator for archiving in the department. 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 described in Section 5.1.8 herein. Committee members representing the minor program must be invited to the defense, but their participation is optional. The candidate must submit an announcement of their final oral defense via GradPath at least two weeks (10 business days) before their defense. Additional information on the dissertation defense may be found at https://grad.arizona.edu/gsas/degree-requirements/doctor-philosophy#final-oral-defense. If the defense will be conducted by Zoom or other online platform, the candidate must also provide the link to the online defense to the graduate program coordinator (lhuggins@arizona.edu) so that the public portion of the defense can be announced to the Department of Chemical and Environmental Engineering. Dissertation approval pages can be completed electronically through AdobeSign. Students may work with the graduate program coordinator to get the approval page drafted and set up for signature.

5.1.10 Publications

Having multiple publications successfully submitted while still in graduate school greatly enhances the student's potential for landing either a faculty position at an accredited university or a research position at a major corporation. Therefore, prior to graduating, PhD students are strongly encouraged to have two first-author publications either accepted, in press or published in peer-reviewed, indexed journals. These publications should form a major part of the student's dissertation. Copies of any publications must be submitted to the graduate program coordinator for delivery to the chair of the Graduate Studies Committee and the department chair, along with the Publications Form (see Appendix A12, but also available from the graduate program coordinator) before the final oral examination is scheduled. A successful submission of a manuscript to a peer-reviewed journal can be counted as a publication on the publications form. When a publication has been accepted by a peer-reviewed, indexed journal, email the citation to the graduate program coordinator for departmental records.

5.2 MS Program (Environmental Engineering)

All Environmental Engineering MS students are required to take the following core courses at the University of Arizona or an approved equivalent elsewhere:

- CHEE 500R—Water Chemistry for Engineers (3 units)
- CHEE 574—Environmental Transport Processes* (3 units)
- CHEE 575—Water Treatment System Design* (3 units)
- CHEE 576—Wastewater Treatment System Design* (3 units)

* Students who enter the MS program having taken CHEE 474-Environmental Transport Processes or an equivalent course will take CHEE 505 -Advanced Chemical Engineering Transport Phenomena instead. Students who enter the MS program having taken CHEE 475-Water Treatment System Design (3 units) and CHEE 476-Wastewater Treatment System Design (3 units) or equivalent courses will take CHEE 514-Sustainable Water Supplies for Remote Communities (3 units) and CHEE 676-Advanced Water and Wastewater Treatment (3 units) instead.

To meet Graduate College unit requirements, Environmental Engineering MS students will take a minimum of twelve (12) units of electives, six (6) units of which must be from the list below:

- CHEE 514—Sustainable Water Supplies for Remote Communities** (3 units)
- CHEE 525—Emerging Issues in Water Quality (3 units)
- CHEE 542—Bioremediation on Inorganic Contaminants (2 units)
- CHEE 569A—Air Pollution I: Gases (3 units)
- CHEE 569B—Air Pollution II: Aerosols (3 units)
- CHEE 572—Interfacial Chemistry of Biomolecules in Environmental Systems (3 units)
- CHEE 578—Introduction to Hazardous Waste Management (3 units)
- CHEE 582—Analysis of Emerging Environmental Contaminants (3 units)
- CHEE 585—Water Reuse (3 units)
- CHEE 676—Advanced Water and Wastewater Treatment** (3 units)

The additional six (6) units of electives may be taken from a combination of electives, research and independent study courses at the discretion of the student.

** Students who have taken CHEE 514 and CHEE 676 in lieu of other required courses will choose different elective courses.

Students will also take CHEE 696A *Departmental Seminar* each semester that they are in the program. However, only two (2) units of CHEE 696A will be used on their Plan of Study (see Section 5.2.2 following). Note that while listing the two (2) units of CHEE 696A on the Plan of Study will satisfy Graduate College requirements, the Department of Chemical and Environmental Engineering requires students to register for and regularly attend CHEE 696A *Departmental Seminar* each semester that they are in the CHEE program.

Thesis MS students

The thesis MS track requires thirty (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)

In this option, the student will develop a research project leading to the MS thesis. 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 approval page of the research document must be submitted to the graduate program coordinator for archiving in the department. The examination focuses on the research. The examining committee will consist of the MS Thesis Committee (see Section 5.2.3 herein). All CHEE members of the committee must be present during the examination while the presence of additional committee members is optional. Note that the MS thesis must be archived with the Graduate College.

Non-thesis MS students

The non-thesis MS track requires thirty (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:

- CHEE 909—Master's Report (4 units)

In this option, the student will develop a non-thesis research project leading to an MS written report. Upon the completion and successful approval of the student's research project by an appointed non-thesis committee, the candidate will present the report before the non-thesis committee (see Section 5.2.3 herein).

5.2.1 Sample Course Plan for Thesis or Non-thesis EEN MS

The following table is to be used as a ***general guide only***—please work with your faculty advisor and the graduate program coordinator to determine your own individualized Plan of Study (see Section 5.2.2).

	Fall	**Spring**
Year 1	CHEE 500R—Water Chem for Engineers (3 units) CHEE 575*—Water Treatment System Design (3 units) Elective** (3 units) CHEE 696A***—Departmental Seminar (1 unit) *Student must submit Responsible Conduct of Research form in GradPath before working in lab.* *Student must complete online General Lab Safety course and submit copy of completion certificate to graduate program coordinator begin working in lab.* *Student must have a research advisor by the end of the first semester.*	CHEE 574*—Environmental Transport Processes (3 units) CHEE 576*—Wastewater Treatment System Design (3 units) Elective** (3 units) CHEE 696A***—Departmental Seminar (1) *Student must file Plan of Study no later than the end of the second semester.*
Year 2	Elective** (3 units) Elective** (3 units) CHEE 696A***—Departmental Seminar (1 unit) CHEE 910—MS Thesis Research *or* CHEE 909—MS Research Report (2 units) ****	CHEE 696A***—Departmental Seminar (1 unit) CHEE 910—MS Thesis Research *or* CHEE 909—MS Research Report (2-8 units) **** ***Thesis**: Student must file MS Thesis Committee Appointment Form in GradPath early in semester.* *Student writes thesis and orally defends it by end of the semester. or* ***Non-Thesis**: Student conducts a non-thesis research project and presents it in front of a non-thesis committee.*

* Students who have taken CHEE 474, 475 and/or 476 or their equivalent undergraduate courses at another institution will take CHEE 505 Advanced Chemical Engineering Transport Phenomena (3 units) in lieu of CHEE 574, and CHEE 514 Sustainable Water Supplies for Remote Communities (3 units) and CHEE 676 Advanced Water and Wastewater Treatment (3 units) in lieu of CHEE 575 and 576.

**Six (6) units of elective courses are required. The additional six (6) units of electives may be CHEE 900 Research, CHEE 599 Independent Study or additional elective courses (at the discretion of the student).

*** Although only two (2) units of CHEE 696A Departmental Seminar are required to meet Graduate College requirements, students must take CHEE 696A Departmental Seminar each semester they are enrolled in the program. It is a departmental requirement.

**** Although only four (4) units of CHEE 910 or CHEE 909 are required for the MS degree, more units are suggested if a student needs to maintain full-time status of 9 units per semester.

5.2.2 Plan of Study (MS Degree)

In conjunction with the student's faculty advisor, each MS student is responsible for developing a Plan of Study to be filed with the Graduate College using GradPath https://grad.arizona.edu/gsas/gradpath during their second semester of study. The Plan of Study identifies (1) courses the student intends to transfer from other institutions, (2) courses already completed at The University of Arizona that the student intends to apply toward the graduate degree, and (3) additional course work to be completed to fulfill degree requirements. Students are encouraged to meet with the graduate program coordinator to review the proposed Plan of Study before submitting it to correct inadvertent errors that will prevent its Graduate College approval. The Plan of Study must have the approval of the student's faculty advisor and chair of the GSC before it is reviewed and approved by the Graduate College. The student is responsible to be aware of the deadline to submit the GradPath Plan of Study for review.

5.2.3 Selection of Thesis or Non-Thesis Committee and Final Oral Presentation

After completion of the Plan of Study, it is the responsibility of the student and their faculty advisor to select a thesis or non-thesis committee (depending on whether the student is pursuing a thesis or non-thesis degree). The Master's Committee (thesis or non-thesis) must include a minimum of three members, all of whom must be University of Arizona tenured, tenure-track, approved as tenure-eligible, or designated as Graduate Faculty by the Graduate College for the purposes of serving on graduate committees. It must include the student's dissertation director (faculty advisor) and two other members of the current Chemical and Environmental Engineering Department faculty. Committee members from other institutions can be incorporated in addition to the CHEE Faculty as a courtesy and/or adjunct appointment as special members. Special members to a thesis committee require the approval of the department and Graduate College. Non-thesis committees do not require department or Graduate College approvals.

MS Thesis: All MS Thesis students must report a thesis committee in GradPath, using the Master's/Specialist Committee Appointment Form. Upon 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 must be present during the examination. The presence of additional committee members is optional. Note that all thesis approval pages may be completed through AdobeSign. Students must work with the graduate program coordinator to get the approval page drafted and set up for signature.

MS Non-thesis: Upon completion and approval of the written MS research report by the MS Non-thesis Committee, the candidate must give a final oral presentation and answer questions from the committee and the audience. The examining committee is not a formal committee for Graduate College purposes. All CHEE members of the committee should be present during the presentation.

All MS students, whether thesis or non-thesis, must complete a Master's Committee Appointment Form in GradPath. MS Thesis students in Environmental Engineering will check the "Yes" button next to the question "Do you have a Master's committee?" Thesis students will submit their final approved thesis to the Graduate College.

The non-thesis student will still need to go into GradPath and complete the Master's/Specialist Committee Appointment Form. The non-thesis student will open the form and click on the "No" button next to the question "Do you have a Master's Committee?" and then submit the form. They must submit the names of their non-thesis committee members to the graduate program coordinator before they defend their report. The non-thesis student will ***not*** submit their report to the Graduate College. The non-thesis report remains internal to the CHEE department.

5.3 Accelerated MS Program (AMP Environmental Engineering)

5.3.1 Overview

The Accelerated Master's Program in Environmental Engineering (AMP EEN) is a program designed to enable advanced University of Arizona undergraduate students to complete both the Bachelor of Science degree and the Master of Science degree in Environmental Engineering in a total of five (5) years. This program is available only for University of Arizona undergraduate students in 1) Environmental Engineering, 2) Chemical Engineering, 3) Civil Engineering, and 4) Environmental Science. Students from other related disciplines, such as Biosystems Engineering, may be admitted with the recommendation of an Environmental Engineering faculty advisor.

5.3.2 How to apply

Students who have completed a minimum of seventy-five (75) units are eligible to apply, usually early in the second semester of the student's junior year (usually January). The student must create an account in GradApp (https://apply.grad.arizona.edu) and submit an online application to the Environmental Engineering AMP. (See https://grad.arizona.edu/catalog/programinfo/CHEMSCHEAMP) for more details. Once students have completed ninety (90) units (usually at the end of their junior year's second semester) and have a 3.30/4.0 or higher cumulative GPA, they will be conditionally admitted into the AMP. After conditional acceptance to the AMP program, students may register during their senior (fourth) year to take a combination of undergraduate and graduate courses, but they are still classified as undergraduate students. The graduate (500-level) courses can double-count, serving both as core or elective courses for the BS degree and as core or elective courses for the MS.

To be fully admitted into the MS Graduate Program, early in the second semester of their senior year (usually January), the AMP student must submit a new application for the MS in Environmental Engineering to be fully accepted into the CHEE MS program. The student will not be charged an application fee for this simplified application. An automatic application fee waiver will be granted.

Note, however, that the abbreviated application to the full MS Graduate Program does not guarantee admission. During their senior year, AMP students must have maintained at least a 3.0/4.0 GPA in their graduate courses, obtained a faculty advisor early in the first semester of their senior year (see Section 3.1 herein), and shown acceptable progress in their research with the faculty advisor. The student's faculty advisor will submit a letter to the Environmental Engineering Graduate Studies Committee supporting the AMP student's admission to the full graduate program before the student will be recommended for full admission to the Graduate MS program. After completing the BS, students are then eligible to be fully accepted as MS degree students and matriculate into the graduate program. Once admitted, in the fifth and final year, students focus on graduate course work and their thesis or project.

5.3.3 Eligibility criteria

To be considered eligible to apply for the AMP Environmental Engineering, a student must:

- Be a continuing University of Arizona undergraduate.
- Have a minimum cumulative GPA of 3.30/4.0.
- At the time of application, have completed a minimum of seventy-five (75) units of undergraduate course work; a minimum of twelve (12) undergraduate units must have been completed in the student's major at the University of Arizona's main campus.
- At the completion of the semester in which the student applies for the AMP, the student must have completed a minimum of ninety (90) units of undergraduate coursework and maintained a minimum cumulative GPA of 3.30/4.0 for full admission to the program.

Research experience as an undergraduate is not a requirement, but it is desirable.

5.3.4 University of Arizona Graduate College policies on AMPs

Students will be considered undergraduates until they complete their undergraduate requirements, which should be no later than the end of their fourth year. Students must take at least twelve (12) of their graduate credits while in graduate status. In other words, during years 1–3 (or approximately 0–90 credits) students will be taking undergraduate coursework and charged at the undergraduate rate.

Once admitted to the AMP, during the senior (or transition) year, students may take up to twelve (12) units of graduate coursework, which may apply toward both the BS and the MS degrees. Students will be charged at the undergraduate rate and retain eligibility for undergraduate scholarships. After completion of all BS requirements and applying for the MS in Environmental Engineering in the second semester of their senior year, students will be granted graduate status, be charged at the graduate rate, and be eligible for graduate assistantships. Should a student have completed twelve (12) graduate credits, but not yet completed the undergraduate degree, they will be considered graduate for financial aid and tuition purposes. They will no longer be eligible for undergraduate scholarships. Nor will they be eligible for graduate assistantships. Once all requirements for the undergraduate degree have been completed, at least twelve (12) additional graduate units must be taken while in graduate status (with no pending undergraduate requirements to be completed). A total of thirty (30) graduate credits (500-level courses or higher) must be taken.

AMP students should complete their undergraduate requirements no later than one semester before receiving their MS. Students who finish their undergraduate requirements later than one semester before earning their master's will no longer be eligible for undergraduate scholarships or for graduate assistantships. Neither degree will be awarded until all undergraduate degree requirements have been completed.

5.3.5 Program requirements and guidelines

After admission into the AMP Environmental Engineering program and during the student's final undergraduate year, the student must select a faculty advisor who will guide the student's research or development work toward the completion of a thesis or master's report (see Section 3.1 herein). (Writing a thesis or a project report is required.) Once the faculty advisor has been determined, the AMP student must complete the Chemical and Environmental Engineering Advisor Selection Form (see appendix A10 of this handbook). This form must be submitted to Lori Huggins (lhuggins@arizona.edu), the graduate program coordinator, for department records. The graduate program coordinator will provide the name of the AMP student's faculty advisor to the chair of the Environmental Engineering Graduate Studies Committee (GSC) when the student has completed their BS and enrolled in their graduate year courses as a full MS student.

AMP seniors will submit an Undergraduate Enrollment in Graduate Courses form in both the fall and spring semesters in order to enroll in graduate courses. The form must be signed by the instructor for any course requested, and then signed by the student, the graduate program coordinator, and the department head. The graduate program coordinator will submit the completed form to the Registrar after reviewing and approving for accuracy.

5.3.6 Sample course plans for Thesis and Non-thesis AMP EEN (beginning with Senior year)

All AMP Environmental Engineering MS students are required to take the following courses at the University of Arizona:

- CHEE 500R—Water Chemistry for Engineers (3 units)
- CHEE 574—Environmental Transport Processes* (3 units)
- CHEE 575—Water Treatment System Design* (3 units)
- CHEE 576—Wastewater Treatment System Design* (3 units)

* Students who enter the AMP program having taken CHEE 474 Environmental Transport Processes or an equivalent course will take CHEE 505
Advanced Chemical Engineering Transport Phenomena instead. Students who enter the MS program having taken CHEE 475 Water Treatment
System Design (3 units) and CHEE 476 Wastewater Treatment System Design (3 units) or equivalent courses will take CHEE 514 Sustainable
Water Supplies for Remote Communities (3 units) and CHEE 676 Advanced Water and Wastewater Treatment (3 units) instead.

To meet Graduate College unit requirements, Environmental Engineering AMP students will take a minimum of twelve (12) units of electives, six (6) units of which must be from the list below:

- CHEE 514—Sustainable Water Supplies for Remote Communities** (3 units)
- CHEE 525—Emerging Issues in Water Quality (3 units)
- CHEE 542—Bioremediation on Inorganic Contaminants (2 units)
- CHEE 569A—Air Pollution I: Gases (3 units)
- CHEE 569B—Air Pollution II: Aerosols (3 units)
- CHEE 572—Interfacial Chemistry of Biomolecules in Environmental Systems (3 units)
- CHEE 578—Introduction to Hazardous Waste Management (3 units)
- CHEE 582—Analysis of Emerging Environmental Contaminants (3 units)
- CHEE 585—Water Reuse (3 units)

- CHEE 676—Advanced Water and Wastewater Treatment** (3 units)

The additional six (6) units of electives may be taken from a combination of electives, research and independent study courses at the discretion of the student and their faculty advisor.

Students will also take CHEE 696A *Departmental Seminar* each semester that they are in their graduate year(s) of the program. However, only two (2) units of CHEE 696A will be used on their Plan of Study (see Section 5.2.2 following). Note that while listing the two (2) units of CHEE 696A on the Plan of Study will satisfy Graduate College requirements, the Department of Chemical and Environmental Engineering requires students to register for and regularly attend CHEE 696A *Departmental Seminar* each semester that they are in the CHEE program.

Thesis MS students

The AMP thesis MS track requires thirty (30) units of graduate level coursework. In addition to the required courses and electives listed above, all students undertaking the master's thesis track must complete the following:

- CHEE 910—Thesis (4 units)

In this option, the student will develop a research project leading to the MS thesis. 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 approval page of the research document must be submitted to the graduate program coordinator for archiving in the department. The examination focuses on the research. The examining committee will consist of the MS Thesis Committee (see Section 5.3.8 herein). All CHEE members of the committee must be present during the examination while the presence of additional committee members is optional. Note that the MS thesis must be archived with the Graduate College.

Non-thesis MS students

The AMP non-thesis MS track requires thirty (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:

- CHEE 909—Master's Report (4 units)

In this option, the student will develop a non-thesis research project leading to an MS written report. Upon the completion and successful approval of the student's research project by an appointed non-thesis committee, the candidate will present the report before the non-thesis committee (see Section 5.3.8 herein).

Sample plans for AMP students majoring in both Environmental Engineering and other majors as undergraduate students (thesis or non-thesis) follow, beginning with the 7th semester (senior year) of undergraduate work:

Sample Plan 1: BS in EEN and AMP in EEN

The following table assumes a student who is majoring in Environmental Engineering as an undergraduate, and it is to be used as a ***general guide only***—please work with your faculty advisor, the undergraduate advisor (while in undergraduate status) and the graduate program coordinator to determine your own individualized Plan of Study (see Section 5.3.7 herein).

Semester 7 (Fall – Senior Year)	**Semester 8 (Spring – Senior Year)**
CHEE 442—Chemical Engineering Design Principles (Fall only, must take CHEE 443 in spring semester) (3 units) EHS 418—Intro to Human Health Risk Assessment, **OR** ATMO 469A—Atmospheric Pollution I: Gases, **OR** ENVS 464—Environmental Organic Chemistry (3 units) CHEE 400A—Environmental Engineering Laboratory (1 unit) CHEE 575—Water Treatment System Design* (3 units) CHEE Graduate Elective* (3 units) General Ed: Building Connections (3 units) *Student must have a research advisor by the end of the first semester in the AMP program.*	CHEE 443—Chemical Engineering Plant Design (3 units) CHEE 400B—Environmental Engineering Laboratory II (1 unit) CHEE 478—Intro to Hazardous Waste Management (3 units) Undergraduate technical elective (3 units) UNIV 301—General Education Portfolio (1 unit) CHEE 569B—Air Pollution II: Aerosols* (3 units) CHEE Graduate Elective* (3 units) *Student applies to graduate MS program by the end of the Spring semester.*
Semester 9 (Fall—Grad Year)	**Semester 10 (Spring—Grad Year)**
CHEE 500R—Water Chemistry for Engineers (3 units) CHEE Graduate Elective, Research or Independent Study (3 units) CHEE 696A**—Department Seminar (1 unit) CHEE 910—MS Thesis Research (2 units) *or* CHEE 909—MS Research Report (2 units) *Student must file Plan of Study no later than the end of the first semester of graduate work.*	CHEE 676**—Advanced Water and Wastewater Treatment System Design (3 units) or CHEE 514**—Sustainable Water Supplies for Remote Communities (3 units) CHEE Graduate Elective, Research or Independent Study (3 units) CHEE 696A**—Department Seminar (1 unit) CHEE 910—MS Thesis Research (2 units) *Student must file MS Thesis Committee Appointment Form in GradPath early in semester.* *Student writes thesis proposal and orally defends it by the end of the semester. or* CHEE 909—MS Research Report (2 units) *Student conducts a non-thesis research project and presents it in front of a non-thesis committee.*

* Student must take a 500-level graduate course for it to count for both undergraduate and graduate credit. (See Section 5.3.5 herein)

** CHEE 474/574, 475/575 and 476/576 are all required for both the undergraduate and graduate Environmental Engineering degrees. Students may use CHEE 575 and CHEE 574 to apply toward undergraduate requirements and graduate requirements. However, since CHEE 476 Wastewater Treatment System Design is a required Environmental Engineering course in the student's junior year, the student will take CHEE 676 Advanced Water and Wastewater Treatment Design or CHEE 514 Sustainable Water Supplies for Remote Communities as their graduate core course. CHEE 514 and 676 are taught in alternating years.

*** Although only two (2) units of CHEE 696A Department Seminar are required to meet Graduate College requirements, students must take CHEE 696A Department Seminar each semester they are enrolled in the program. It is a department requirement.

Sample Plan 2: BS in ChE and AMP in EEN

The following table assumes a student who is majoring in Chemical Engineering as an undergraduate, and it is to be used as a ***general guide only***—please work in tandem with the CHEE undergraduate advisor (while in undergraduate status) and the graduate program coordinator to determine your own individualized Plan of Study (see Section 5.3.7 herein).

Semester 7 (Fall – Senior Year)	**Semester 8 (Spring – Senior Year)**
CHEE 401A—Chemical & Environmental Engineering Lab I (1 unit) CHEE 420—Chemical Reaction Engineering (3 units) CHEE 442—Chemical Engineering Design Principles (3 units) Technical Elective (1-3 units) General Education: Building Connections (3 units) CHEE 575*—Water Treatment System Design (3 units) CHEE Graduate Elective* (3 units) *Student must have a research advisor by the end of the first semester in the AMP program.*	CHEE 401B—Chemical & Environmental Engineering Lab II (1 unit) CHEE 413—Intermediate Engr Analysis (3 units) CHEE 443—Chemical Engr Plant Design (3 units) Technical Elective (3 units) General Education: Building Connections (3 units) UNIV 301—General Education Portfolio (1 unit) CHEE 574*—Environmental Transport Processes (3 units) CHEE Graduate elective* (3 units) *Student applies to graduate MS program by the end of the Spring semester.*
Semester 9 (Fall—Grad Year)	**Semester 10 (Spring—Grad Year)**
CHEE 500R—Water Chem for Engineers (3 units) CHEE Graduate Elective, Research or Independent Study (3 units) CHEE 696A**—Department Seminar (1 unit) CHEE 910—MS Thesis Research (2 units) *or* CHEE 909—MS Research Report (2 units) *Student must file Plan of Study no later than the end of the first semester of graduate work.*	CHEE 576—Wastewater Treatment Design (3 units) CHEE Graduate Elective, Research or Independent Study (3 units) CHEE 696A**—Department Seminar (1 unit) CHEE 910—MS Thesis Research (2 units) *Student must file MS Thesis Committee Appointment Form in GradPath early in semester.* *Student writes thesis proposal and orally defends it by end of the semester. or* CHEE 909—MS Research Report (2 units) *Student conducts a non-thesis research project and presents it in front of a non-thesis committee.*

* Student must take a 500-level graduate course for it to count for both undergraduate and graduate credit. (See Section 5.3.5 herein)

** Although only two (2) units of CHEE 696A Department Seminar are required to meet Graduate College requirements, students must take CHEE 696A Department Seminar each semester they are enrolled in the program. It is a department requirement.

Sample Plan 3: BS in other undergraduate major and AMP in EEN

The following table assumes a student who is majoring in an area other than Environmental Engineering (e.g., Civil Engineering or Environmental Science) as an undergraduate, and it is to be used as a ***general guide only***—please work in tandem with your department's undergraduate advisor while in undergraduate status and the CHEE graduate program coordinator to determine your own individualized Plan of Study (see Section 5.3.7 herein).

Semester 7 (Fall – Senior Year)	**Semester 8 (Spring – Senior Year)**
Undergraduate requirement or elective (3 units) Undergraduate requirement or elective (3 units) Undergraduate requirement or elective (3 units) Undergraduate requirement or elective (3 units) CHEE 575*—Water Treatment System Design (3 units) CHEE Graduate Elective* (3 units) *Student must have a CHEE research advisor by the end of the first semester in the AMP program.*	Undergraduate requirement or elective (3 units) Undergraduate requirement or elective (3 units) Undergraduate requirement or elective (3 units) Undergraduate requirement or elective (3 units) CHEE 574*—Environmental Transport Processes (3 units) CHEE Graduate Elective* (3 units) *Student applies to graduate MS program by the end of the Spring semester.*
Semester 9 (Fall—Grad Year)	**Semester 10 (Spring—Grad Year)**
CHEE 500R—Water Chemistry for Engineers (3 units) CHEE Graduate Elective, Research or Independent Study (3 units) CHEE 696A**—Departmental Seminar (1 unit) CHEE 910—MS Thesis Research (2 units) *or* CHEE 909—MS Research Report (2 units) *Student must file Plan of Study no later than the end of the first semester of graduate work.*	CHEE 576—Wastewater Treatment System Design (3 units) CHEE Graduate Elective, Research or Independent Study (3 units) CHEE 696A**—Departmental Seminar (1 unit) CHEE 910—MS Thesis Research (2 units) *Student must file MS Thesis Committee Appointment Form in GradPath early in semester.* *Student writes thesis proposal and orally defends it by end of the semester. or* CHEE 909—MS Research Report (2 units) *Student conducts a non-thesis research project and presents it in front of a non-thesis committee.*

* Student must take a 500-level graduate course for it to count for both undergraduate and graduate credit. (See Section 5.3.5 herein)

** Although only two (2) units of CHEE 696A Department Seminar are required to meet Graduate College requirements, students must take CHEE 696A Department Seminar each semester they are enrolled in the program. It is a department requirement.

5.3.7 Plan of Study (EEN AMP Degree)

In conjunction with the student's faculty advisor, each AMP student is responsible for developing a Plan of Study to be filed with the Graduate College using GradPath https://grad.arizona.edu/gsas/gradpath during their first semester of study as a graduate student. The Plan of Study identifies (1) courses the student intends to transfer from other institutions; (2) courses already completed at The University of Arizona that the student intends to apply toward the graduate degree, including those 500-level courses completed as an undergraduate; and (3) additional course work to be completed to fulfill degree requirements. Students are encouraged to meet with the graduate program

coordinator to review the proposed Plan of Study before submitting it to correct inadvertent errors that will prevent its Graduate College approval. The Plan of Study must have the approval of the student's faculty advisor and chair of the Environmental Engineering GSC before the Graduate College will review and approve it. The student is responsible to be aware of the deadline to submit the GradPath Plan of Study for review.

5.3.8 Selection of Thesis or Non-Thesis Committee and Final Oral Presentation

After completion of the Plan of Study, the student and their faculty advisor must select a Thesis or Non-thesis Committee (depending on whether the student is pursuing a thesis or non-thesis degree). The Master's Committee (Thesis or Non-thesis) must include a minimum of three members, all of whom must be University of Arizona tenured, tenure-track, approved as tenure-eligible, or designated as Graduate Faculty by the Graduate College for the purposes of serving on graduate committees. It must include the student's faculty advisor and two other members of the current CHEE faculty. Committee members from other institutions can be incorporated in addition to the CHEE faculty as a courtesy and/or adjunct appointment as special members. Special members to a thesis committee require the approval of the department and Graduate College. Non-thesis committees do not require department or Graduate College approvals.

MS Thesis: All MS Thesis students must report a thesis committee in GradPath, using the Master's/Specialist Committee Appointment Form. Upon 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 must be present during the examination. The presence of additional committee members is optional. Note that all thesis approval pages may be completed through AdobeSign. Students must work with the graduate program coordinator to get the approval page drafted and set up for signature.

MS Non-thesis: Upon the completion and approval of the written MS research report by the MS Non-thesis Committee, the candidate must give a final oral presentation and answer questions from the committee and the audience. The examining committee will consist of the MS non-thesis committee (not a formal committee for Graduate College purposes). All CHEE members of the committee should be present during the presentation. The presence of additional committee members is optional.

All MS students, whether thesis or non-thesis, must complete a Master's Committee Appointment Form in GradPath. MS Thesis students in Environmental Engineering will check the "Yes" button next to the question "Do you have a Master's committee?" Thesis students will submit their final approved thesis to the Graduate College.

The non-thesis student will still need to go into GradPath and complete the Master's/Specialist Committee Appointment Form. The non-thesis student will open the form and click on the "No" button next to the question "Do

you have a Master's Committee?" and then submit the form. They must submit the names of their non-thesis committee members to the graduate program coordinator before they defend their report. The non-thesis student will ***not*** submit their report to the Graduate College. The non-thesis report remains internal to the CHEE department.

5.4 ME Program (Master of Engineering – Environmental Engineering)

The Master of Engineering in Environmental Engineering is a multidisciplinary professional graduate degree for recent graduates as well as working professionals. It is a coursework-only degree that can be completed in one year (30 total units) and is designed for students with an engineering background who want to solve today's many contemporary environmental challenges with an emphasis on water, air, soil, and energy.

Students must complete **12 units** consisting of the following:

a. 12 units of required courses:
    1. CHEE 500R—Water Chemistry for Engineers (3 units)
    2. CHEE 574—Environmental Transport Processes (3 units)
    3. CHEE 575—Water Treatment System Design (3 units)
    4. CHEE 576—Wastewater Treatment System Design (3 units)

b. 6 units of electives approved by department advisor from the following focus areas (up to 3 units may be CHEE 599 Independent Study):

Air Quality/ Pollution

- ATMO 569A—Air Pollution I: Gases (3 units)
- ATMO 569B—Air Pollution II: Aerosols (3 units)

Hazardous Waste

- CHEE 578—Introduction to Hazardous Waste Management (3 units)
- CHEE 582—Analysis of Emerging Environmental Contaminants (3 units)

Water Resources

- CE 529—Special Topics in Hydraulics & Water Resources Engineering (3 units)
- CE/HWRS 521—Water Resources Systems Planning and Management (3 units)

Hydrology

- CE/HWRS 523—Hydrology (3 units)
- HWRS 518—Fundamentals of Subsurface Hydrology (3 units)
- HWRS 519—Fundamentals in Surface Hydrology (3 units)
- HWRS 528—Fundamentals: Systems Approach to Hydrologic Modeling (3 units)

Energy

- CHEE 514—Sustainable Water Supplies for Remote Communities (3 units)
  (Note that CHEE 514 cannot be used to fulfill the **Entrepreneurship/Innovation/Design** requirement if being used as an elective)
- ECE 514A—Photovoltaic Solar Energy Systems (3 units)

Other requirements specific to this ME degree

Students must complete **12 units** consisting of one course (3 units) in each of the following categories:

1. Engineering Management/Business

Take one of the following courses:

- BNAD 523—Business law (2 units) *and* BNAD 520E: Project management (1 unit)
- HWRS 576—Natural Resources Law and Economics (3 units)
- SIE/ENGR 514—Law for engineers/Scientists (3 units)
- SIE 515—Technical Sales and Marketing (3 units)
- SIE/ENTR 557—Project management (3 units)
- SIE 564—Cost Estimation (3 units)
- SIE/ENGR 567—Financial Modeling for Innovation (3 units)

Other courses may be approved by Department faculty advisor.

2. Applied Engineering/Mathematics

Take one of the following courses:

- BE 513—Applied Biostatistics (3 units)
- CE 502—Introduction to Finite Element Methods (3 units)
- CE 503—Subsurface Fluid Dynamics (3 units)
- CE 504—Numerical Methods in Subsurface Hydrology (3 units)
- CE 510—Probability in Civil Engineering (3 units)
- CE 523—Hydrology (3 units)
- CHEE 502—Advanced Engineering Analysis (3 units)
- CHEE 505—Advanced Chemical Engineering Transport Phenomena (3 units)
- CHEE 506—Advanced Chemical Engineering Thermodynamics (3 units)
- CHEE 530—Advanced Chemical Reaction Engineering (3 units)
- CHEE 571—Rheology: Principles and Applications (3 units)
- ECE 501B—Advanced Linear Systems Theory (3 units)
- ECE 503—Probability and Random Processes for Engineering Applications (3 units)
- ECE 511—Numeric Modeling of Physics & Biological Systems (3 units)
- HWRS 506—Modeling of Mass and Energy Flow in Soils (3 units)
- HWRS 527—Computer Applications in Hydraulics (3 units)
- HWRS 543A—Risk Assessment for Environmental Systems (3 units)
- HWRS 582—Applied Groundwater Modeling (3 units)
- SIE 500A—Introduction to SIE Methods: Probability and Statistics (1 unit)
- SIE 506—Quality Engineering (3 units)
- SIE 508—Reliability Engineering (3 units)
- SIE 520—Stochastic Modeling I (3 units)
- SIE 522—Engineering Decision-Making Under Uncertainty (3 units)
- SIE 530—Engineering Statistics (3 units)
- SIE 531—Simulation Modeling and Analysis (3 units)
- SIE 533—Fundamentals of Data Science for Engineers (3 units)
- SIE 540—Survey of Optimization Methods (3 units)
- SIE 554A—Systems Engineering Process (3 units)
- SIE 574—Information Analytics and Decision-Making in Engineering (3 units)

Other courses may be approved by Department faculty advisor.

3. Entrepreneurship/Innovation/Design

Take one of the following courses:

- CHEE 514—Sustainable Water Supplies for Remote Communities (3 units)
- ChEE 676—Advanced Water and Wastewater Treatment (3 units)

4. Advanced Engineering Science

Take one of the following courses:

- AME 542A—HVAC System Design (3 units)
- ATMO 536A—Fundamentals of the Atmospheric Sciences (3 units)
- ATMO 555—Introduction to Atmospheric and Hydrology Remote Sensing (3 units)
- ATMO 569A—Air Pollution I: Gases (3 units)
- ATMO 569B—Air Pollution II: Aerosols (3 units)
- ATMO 656B—Atmospheric Radiation and Remote Sensing (3 units)
- BE/CE 526—Watershed Engineering (3 units)
- CE 522—Open channel flow (3 units)
- CE 545—Geoenvironmental Engineering (3 units)
- CHEE 578—Hazardous Waste Management (3 units)
- ECE 514A—Photovoltaic Solar Energy Systems (3 units)
- ENVS 562—Environmental Soil and Water Chemistry (3 units)
- SIE 540—Survey of Optimization Methods (3 units)

Other courses may be approved by the student's faculty advisor.

5.4.1 Sample Course Plan for EEN ME

The following table is to be used as a ***general guide only***—please work with your faculty advisor and the graduate program coordinator to determine your own individualized Plan of Study (see Section 5.4.2).

	Fall	**Spring**
Year 1	CHEE 500R—Water Chemistry for Engineers. (3 units) CHEE 575—Water Treatment System Design (3 units) Subject Course Category 1, 2, 3 or 4 (3 units) Subject Course Category 1, 2, 3 or 4 (3 units) CHEE 599—Independent Study (3 units) *OR* Elective* course of 1 focus (3 units) *Student must file Plan of Study no later than the end of the first semester.*	CHEE 574—Environmental Transport Processes (3 units) CHEE 576—Wastewater Treatment System Design (3 units) Subject Course Category 1, 2, 3 or 4 (3 units) Subject Course Category 1, 2, 3 or 4 (3 units) Elective* course of 1 focus* (3 units) *Student must file MS Thesis Committee Appointment Form in GradPath early in semester.*

* Note that the ME student may take either up to 3 units of CHEE 599 Independent Study *and* an elective course of 1 focus for another 3 units OR they may take 6 units of elective courses in one (1) or more focus areas.

5.4.2 Plan of Study (EEN ME Degree)

In conjunction with the student's faculty advisor (the Chair of the Environmental Engineering Graduate Studies Committee), each ME student is responsible for developing a Plan of Study to be filed with the Graduate College

using GradPath https://grad.arizona.edu/gsas/gradpath during their first semester of study as a graduate student. The Plan of Study identifies (1) courses the student intends to transfer from other institutions, (2) courses already completed at The University of Arizona that the student intends to apply toward the graduate degree, and (3) additional course work to be completed to fulfill degree requirements. Students are encouraged to meet with the graduate program coordinator to review the proposed Plan of Study before submitting it to correct inadvertent errors that will prevent its Graduate College approval. The Plan of Study must have the approval of the student's faculty advisor and chair of the Environmental Engineering GSC before the Graduate College can review and approve it. The student is responsible to be aware of the deadline to submit the GradPath Plan of Study for review.

5.4.3 Master's Committee Appointment form

All Master's students, including the Engineering ME students, ***must complete a Master's Committee Appointment Form in GradPath***. Engineering ME students will check the "No" button next to the question "Do you have a Master's committee?" and then submit the form.

5.5 Minor in Environmental Engineering

The minor in Environmental Engineering consists of nine (9) units of environmental engineering coursework. At least six (6) units must be selected from the following courses:

- CHEE 500R—Water Chemistry for Engineers (3 units)
- CHEE 574—Environmental Transport Processes (3 units)
- CHEE 575—Water Treatment System Design (3 units)
- CHEE 576—Wastewater Treatment System Design (3 units)

The additional 3 units may correspond to an additional course in the previous list or another graduate environmental engineering course from the following:

- CHEE 505—Advanced Chemical Engineering Transport Phenomena (3 units)
- CHEE 514—Sustainable Water Supplies for Remote Communities (3 units)
- CHEE 520—Chemical Reaction Engineering (3 units)
- CHEE 525—Emerging Issues in Water Quality (3 units)
- CHEE 542—Bioremediation on Inorganic Contaminants (2 units)
- CHEE/ATMO 569A—Air Pollution I: Gases (3 units)
- CHEE/ATMO 569B—Air Pollution II: Aerosols (3 units)
- CHEE 572—Interfacial Chemistry of Biomolecules in Environmental Systems (3 units)
- CHEE 578—Introduction to Hazardous Waste Management (3 units)
- CHEE 581A—Engineering of Biological Processes (3 units)
- CHEE 582—Analysis of Emerging Environmental Contaminants (3 units)
- CHEE 676—Advanced Water and Wastewater Treatment (3 units)
- ENGR 522—Engineering Sustainable Development (3 units)
- ENGR 552—Globalization, Sustainability and Innovation (3 units)

The additional 3 units may also be taken from other related graduate engineering courses upon approval of the minor advisor.

Environmental Engineering PhD students who also minor in Environmental Engineering will take nine (9) units of elective Environmental Engineering courses from the above list that are not part of the Environmental Engineering core requirements to complete the minor.

Depending on the student's background, the minor advisor might recommend preparatory undergraduate courses to be taken to cover prerequisite deficiencies.

A member from the Environmental Engineering graduate faculty will serve as the student's minor advisor and will serve as a member of the student's Doctoral Comprehensive Exam Committee.

Environmental Engineering Split Minor

If a PhD student chooses two minor subjects (called a split minor) and Environmental Engineering is one of them, then the student must complete a minimum of six (6) units in Environmental Engineering core courses as described in the first list above. Students taking courses in Environmental Engineering as part of a split minor must work with their faculty minor advisor to determine which of the core courses are most appropriate. A member from the Environmental Engineering graduate faculty will serve as a minor committee member.

APPENDIX

A1. Chemical & Environmental Engineering Faculty and Staff

Faculty

Name	Title	Phone	Office	Email
Achilli, Andrea	Assistant Professor	520-621-6586	CE 306C	achilli@arizona.edu
Arnold, Robert G.	Professor Emeritus	520-621-2410	CE 306A	rga@arizona.edu
Baygents, James C.	Associate Dean, Academic Affairs	520-621-6032	JWH 146A	baygents@arizona.edu
Blowers, Paul	Distinguished Professor	520-626-5319	JWH 128	blowers@arizona.edu
Brush, Adrianna	Assistant Professor of Practice	520-626-5259	JWH 134B	adriannabrush@arizona.edu
DeVore, Cherie	Assistant Professor	520-621-2573	CE 306G	cdevore@arizona.edu
Farrell, James	Professor Emeritus			farrellj@arizona.edu
Field, James A.	Professor Emeritus	--		jimfield@arizona.edu
Flouda, Paraskevi (Evi)	Assistant Professor	520-621-3876	JWH 108C	flouda@arizona.edu
Guzmán, Roberto	Professor	520-621-6041	JWH 134D	guzmanr@arizona.edu
Hempel, Byron	Assistant Professor of Practice	520-621-6055	JWH 105D	byronhempel@arizona.edu
Hickenbottom, Kerri	Assistant Professor	520-626-9323	CE 306E	klh15@arizona.edu
Karanikola, Vicky	Assistant Professor	520-621-5881	CE 306F	vkaranik@arizona.edu
Ogden, Greg	Associate Professor of Practice	520-621-4422	JWH 105E	gogden@arizona.edu
Ogden, Kimberly L.	Professor / Department Chair	520-621-9484	JWH 120	ogden@arizona.edu
Philipossian, Ara	Professor Emeritus			ara@arizona.edu
Printz, Adam	Assistant Professor	520-626-6769	JWH 146C	aprintz@arizona.edu
Robinson, Ellis	Assistant Professor	pending		esrobinson@arizona.edu
Sáez, Eduardo	Distinguished Professor	520-621-5369	JWH 142C	esaez@arizona.edu
Savagatrup, Suchol	Assistant Professor	520-621-1266	JWH 132	suchol@arizona.edu
Shadman, Farhang	Regents Professor	--		shadman@erc.arizona.edu
Sierra-Alvarez, Reyes	Professor	520-626-2896	JWH 130	rsierra@arizona.edu
Sorooshian, Armin	Professor	520-626-5858	JWH 108E	armin@arizona.edu
Sullivan, Sylvia	Assistant Professor	520-621-9195	JWH 130	sylvia@email.arizona.edu

STAFF

Name	Title	Phone	Office	Email
Altman, Holly	Program Manager	520-621-2591	JWH 108	haltman@arizona.edu
Chessmore, Darla	Administrative Support	520-621-6044	JWH 108	darla1120@arizona.edu
Durazo, Armando	R&D Scientist / Engineer IV	520-626-6748	CE 314C	armandodurazo@arizona.edu
Huggins, Lori	Graduate Program Coordinator	520-621-1897	JWH 120A	lhuggins@arizona.edu
James, Lauren	Undergraduate Advisor	520-621-3110	JWH 118D	laurenjames@arizona.edu
HMBC (Business Office)	(for all inquiries)	520-626-2991	MM 141	HMBC@arizona.edu

GRADUATE COLLEGE REPRESENTATIVE FOR CHEE (not part of CHEE department)

Name	Title	Phone	Office	Email
Tammy Tran	Graduate Degree Counselor	520-626-9962		tammytran@arizona.edu

A2. Graduate Studies Committees

CHEMICAL ENGINEERING

Adam Prince, Chair and Director of Graduate Studies

Sylvia Sullivan

Lori Huggins

ENVIRONMENTAL ENGINEERING

Reyes Sierra-Alvarez, Chair and Director of Graduate Studies

Ellis Robinson

Lori Huggins

A3. ME Degree Benchmarks (Environmental Engineering only)

Department of Chemical and Environmental Engineering

Use the following checklist as a general guide only – please work with the ME Faculty advisor to determine your own individualized path forward, but keep in mind that these benchmarks are recommended (and some are required by the Graduate College) to keep you moving forward on a 2-semester timeline.

SEMESTER 1		
Deadline	***Benchmark / Task***	***Done***
Week 1	Submit Responsible Conduct of Research form in GradPath.	☐
	Review Graduate College policies.	☐
	Review CHEE Graduate Student Handbook.	☐
	Email Darla Strong (darla1120@arizona.edu) with Cat Card number to get keyless access to Harshbarger Building.	☐
Before end of Semester 1	Meet w/ Dr. Reyes Sierra (rsierra@arizona.edu) to determine courses best suited to your career interests (see Graduate Handbook Sec. 5.4).	☐
	Submit Plan of Study by semester's end in GradPath (See Graduate Handbook Sec. 5.4.2). See Lori Huggins (lhuggins@arizona.edu) with any questions or if in need of assistance.	☐
SEMESTER 2		
Deadline	***Benchmark / Task***	***Done***
Early in Semester	Submit Master's Committee Appointment Form in GradPath (see Graduate Handbook Sec. 5.4.3). Check the "No" radio button next to the question "Do you have a Master's committee?" and submit.	☐
Week of graduation	Complete exit survey. Contact Darla Strong (darla1120@arizona.edu) for link to survey.	☐
	Complete exit interview. Contact Darla Strong (darla1120@arizona.edu) to schedule interview.	☐
	Turn in keys (if any) to Key Desk or to Darla Chessmore in envelope with your name and Student ID number written on outside.	☐
	Clean out desk (if any) and notify Darla Strong (darla1120@arizona.edu) that desk is cleared.	☐

When you can check off every box above, then CONGRATULATIONS!
You've done it!

A4. AMP MS Degree Benchmarks (Non-Thesis)

Department of Chemical and Environmental Engineering

Use the following checklist as a general guide only – please work with your faculty advisor to determine your own individualized path forward, but keep in mind that these benchmarks are recommended (and some are required by the Graduate College) to keep you moving forward on a 4-semester timeline, 2 semesters as an undergraduate taking graduate courses, and 2 semesters as a full-time graduate student.

SEMESTER 6 (Undergraduate Junior Year, usually Spring)		
Deadline	***Benchmark / Task***	***Done***
January	Apply for AMP in GradApp.	☐
Mid-semester	Meet with Lori Huggins (lhuggins@arizona.edu) and Lauren James (laurenjames@arizona.edu) if ChE student, to determine graduate level courses for next semester.	☐
By end of semester	Complete Undergraduate Enrollment in Graduate Courses form for 500-level courses for next semester (1st semester with Senior status); ***SUBMIT FORM TO LORI HUGGINS, and she will submit it to the Registrar***.	☐
SEMESTER 7 (Undergraduate Senior Year)		
Deadline	***Benchmark / Task***	***Done***
Weeks 1-2	Review CHEE Graduate Student Handbook.	☐
	Meet w/ CHEE faculty to determine research project and advisor (see Graduate Handbook Sec. 4.3.4 and Sec. 5.3.5).	☐
Week 3	Submit CHEE Advisor Selection Form no later than Friday of Week 3 (see Graduate Handbook Sec. 3.1, Sec. 4.3.4 and Sec. 5.3.5, and Appendix A6) to Lori Huggins (lhuggins@arizona.edu).	☐
Mid-semester	Meet with faculty advisor, Lori Huggins (lhuggins@arizona.edu), and Lauren James (laurenjames@arizona.edu) if ChE student, to determine graduate level courses for next semester.	☐
By end of semester	Complete Undergraduate Enrollment in Graduate Courses form for 500-level courses for next semester (which will be the final semester with Senior status) and ***SUBMIT FORM TO LORI HUGGINS, who will forward it to the Registrar.***	☐
SEMESTER 8 (Undergraduate Senior Year)		
Deadline	***Benchmark / Task***	***Done***
Weeks 1-5	Apply for **MS degree** in GradApp. (***DO NOT RE-APPLY FOR THE AMP!***) The GradApp system will recognize AMP student status and will generate an abbreviated application with no application fee.	☐
By end of semester or early summer	Register for first semester graduate courses.	☐
SEMESTER 1 (Graduate Year)		
Week 1	Submit Responsible Conduct of Research form in GradPath.	☐
	Review Graduate College policies.	☐
	Review CHEE Graduate Student Handbook again.	☐

	Email Darla Strong (darla1120@arizona.edu) with Cat Card number to get keyless access to Harshbarger Building if access was not granted as an undergraduate senior.	☐
	Email Darla Strong (darla1120@arizona.edu) with preferred lab coat size so that new lab coat can be ordered.	☐
	Take online lab safety course in EDGE Learning (See Graduate Handbook Sec. 3.5). Log in with NetID and password. Search for "General Laboratory Chemical Safety Training" (Course ID #0000003299). Submit Lab Training Cert to Lori Huggins (lhuggins@arizona.edu).	☐
Due by semester end	Submit Plan of Study by semester's end in GradPath (See Graduate Handbook Sec. 4.2.4 and 5.2.2).	☐
SEMESTER 2 (Graduate Year)		
Deadline	***Benchmark / Task***	***Done***
Weeks 1-5	Complete Master's Committee Appointment Form in GradPath. Simply check the radio button "No" next to the question "Do you have a Master's Committee?" and submit. Environmental Engineering students follow additional instructions in Section 5.3.8 herein.	☐
	For Environmental Engineering students only: Review defense procedures with faculty advisor.	☐
	For Environmental Engineering students only: Determine report defense date with faculty advisor.	☐
2-4 weeks before defense (Environmental Engineering) or graduation (Chemical Engineering)	Report drafts and finals submitted electronically to your faculty advisor for review.	☐
	Complete any report revisions required by your faculty advisor BEFORE graduation.	☐
	For Environmental Engineering students only: Provide evaluation rubric (see Graduate Handbook, Appendix A11) to each member of Report Defense Committee.	☐
Day of defense	For Environmental Engineering students only: Make sure all members of report committee have the evaluation rubric before beginning defense.	☐
	For Environmental Engineering students only: Complete defense – Celebrate!	☐
End of semester before graduation	Make sure faculty advisor informs Lori Huggins (lhuggins@arizona.edu) that MS requirements have been successfully completed so she can request completion in GradPath.	☐
	Complete exit survey. Contact Darla Strong (darla1120@arizona.edu) for link to survey.	☐
	Complete exit interview. Contact Darla Strong (darla1120@arizona.edu) to schedule interview.	☐
	Turn in any (ALL) keys to Key Desk or Darla Strong in envelope with your name and Student ID number written on the outside (if not remaining to complete a PhD).	☐
	Clean out desk and notify Darla Strong (darla1120@arizona.edu) that desk is clear (if not remaining to complete a PhD).	☐

When you can check off every box above, then CONGRATULATIONS!
You've done it!

A5 AMP MS Degree Benchmarks (Thesis)

Department of Chemical and Environmental Engineering

Use the following checklist as a general guide only – please work with your faculty advisor to determine your own individualized path forward, but keep in mind that these benchmarks are recommended (and some are required by the Graduate College) to keep you moving forward on a 4-semester timeline, 2 semesters as an undergraduate taking graduate courses, and 2 semesters as a full-time graduate student.

SEMESTER 6 (Undergraduate Junior Year, usually Spring)		
Deadline	***Benchmark / Task***	***Done***
January	Apply for AMP in GradApp.	☐
Mid-semester	Meet with Lori Huggins (lhuggins@arizona.edu) and Lauren James (laurenjames@arizona.edu), if ChE student, to determine graduate level courses for next semester.	☐
By end of semester	Complete Undergraduate Enrollment in Graduate Courses form for 500-level courses for next semester (1st semester with Senior status) and ***SUBMIT FORM TO LORI HUGGINS, and she will forward to Registrar***.	☐
SEMESTER 7 (Undergraduate Senior Year)		
Deadline	***Benchmark / Task***	***Done***
Weeks 1-2	Review CHEE Graduate Student Handbook.	☐
	Meet w/ CHEE faculty to determine research project and advisor (see Graduate Handbook Sec. 4.3.4 and Sec. 5.3.5).	☐
Week 3	Submit CHEE Advisor Selection Form no later than Friday of Week 3 (see Graduate Handbook Sec. 3.1, Sec. 4.3.4 and Sec. 5.3.5, and Appendix A6) to Lori Huggins (lhuggins@arizona.edu).	☐
Mid-semester	Meet with faculty advisor, Lori Huggins (lhuggins@arizona.edu) and Lauren James (laurenjames@arizona.edu), if ChE student, to determine graduate level courses for next semester.	☐
By end of semester	Complete Undergraduate Enrollment in Graduate Courses form for 500-level courses for next semester (which will be the final semester with Senior status) and ***SUBMIT FORM TO REGISTRAR***.	☐
SEMESTER 8 (Undergraduate Senior Year)		
Deadline	***Benchmark / Task***	***Done***
Weeks 1-5	Apply for MS degree in GradApp. (***DO NOT RE-APPLY FOR THE AMP!***) The GradApp system will recognize AMP student status and will generate an abbreviated application with no application fee.	☐
By end of semester or early summer	Review CHEE Graduate Student Handbook.	☐
	Register for first semester graduate courses.	☐
SEMESTER 1 (Graduate Year)		
Week 1	Submit Responsible Conduct of Research form in GradPath.	☐
	Review Graduate College policies.	☐
	Review CHEE Graduate Student Handbook again.	☐

	Email Darla Strong (darla1120@arizona.edu) with Cat Card number to get keyless access to Harshbarger Building if access not granted as an undergraduate senior.	☐
	Email Darla Strong (darla1120@arizona.edu) with preferred lab coat size so that new lab coat can be ordered.	☐
	Take online lab safety course in EDGE Learning (See Graduate Handbook Sec. 3.5). Log in with NetID and password. Search for "General Laboratory Chemical Safety Training" (Course ID #0000003299). Submit Lab Training Cert to Lori Huggins (lhuggins@arizona.edu).	☐
Due by semester end	Submit Plan of Study by semester's end in GradPath (See Graduate Handbook Sec. 4.2.4 and 5.2.2).	☐
SEMESTER 2 (Graduate Year)		
Deadline	***Benchmark / Task***	***Done***
Weeks 1-5	Submit Master's Committee Appointment Form in GradPath (see Graduate Handbook Sec. 4.2.5 and 5.2.3).	☐
	Review defense procedures from Grad College with Faculty advisor.	☐
2-4 weeks before defense	Determine thesis defense date with Master's thesis committee and submit the date to Lori Huggins (lhuggins@arizona.edu) for departmental announcement, and to Darla Strong (darla1120@arizona.edu) for reserving room. Student may also provide Lori with the approval signature page from thesis (see Graduate College Thesis Sample pages for correct template – must be in Word, not PDF), completed except for the signatures and dates. Lori will set up the signature page in Adobe Sign and forward it to the Thesis Committee Chair one day prior to the thesis defense. When the form has been signed by all committee members, Lori will return it to student for insertion in the approved thesis. If the student's approval form is signed in some other manner than having it routed by the Graduate program coordinator through Adobe Sign, then the student must provide a copy of the signed approval page to the Graduate program coordinator for department archiving after the defense is completed.	☐
	Thesis drafts and finals submitted electronically to defense committee chair/faculty advisor for review.	☐
	If defense will have a Zoom component, set up Zoom meeting and provide link to defense committee members and Lori Huggins (lhuggins@arizona.edu).	☐
	Provide evaluation rubric (see Graduate Handbook, Appendix A14 herein) to each member of Thesis Defense Committee. The committee chair will return all the completed rubrics to Lori Huggins for filing with the department after student has successfully defended thesis.	☐
Day of defense	Make sure all members of thesis committee have the evaluation rubric before beginning defense	☐
	Complete defense – Celebrate!	☐
Prior to final Graduate College approved submission date for term completion	Complete and acquire approval of any requested committee revisions to thesis. Note that pursuant to Graduate College rules, students have 1 year from their defense date to complete any required changes and submit to the Graduate College. However, students must register for at least 1 unit of CHEE 910 each fall and spring semester during that time.	☐
	Submit completed thesis electronically to Graduate College. Formatting and other instructions are here. *If a student misses the deadline for submitting the thesis to*	☐

	the Graduate College, they must register for at least 1 unit of CHEE 910 for the following semester and they must update their completion term. ***So do not miss the deadline!***	
	Complete and submit Distribution Rights Form to Graduate College representative for CHEE. Check the Graduate Handbook (Appendix A1) for current representative and email address.	☐
After thesis submission but before graduation	Complete any revisions requested by Graduate College (usually only minor formatting corrections)	☐
	Make sure faculty advisor informs Lori Huggins (lhuggins@arizona.edu) that MS requirements have been successfully completed so she can request completion in GradPath.	☐
	Complete exit survey. Contact Darla Strong (darla1120@arizona.edu) for link to survey.	☐
	Complete exit interview. Contact Darla Strong (darla1120@arizona.edu) to schedule interview.	☐
	Turn in any (ALL) keys to Key Desk or to Darla Strong in envelope with your name and Student ID number written on the outside (if not remaining to complete a PhD).	☐
	Clean out desk and notify Darla Strong (darla1120@arizona.edu) that desk is clear (if not remaining to complete a PhD).	☐

When you can check off every box above, then CONGRATULATIONS!
You've done it!

A6. MS Degree Benchmarks (Non-Thesis)

Department of Chemical and Environmental Engineering

Use the following checklist as a general guide only – please work with your faculty advisor to determine your own individualized path forward, but keep in mind that these benchmarks are recommended (and some are required by the Graduate College) to keep you moving forward on a 4-semester timeline.

SEMESTER 1		
Deadline	***Benchmark / Task***	***Done***
Week 1	Submit Responsible Conduct of Research form in GradPath.	☐
	Review Graduate College policies.	☐
	Review CHEE Graduate Student Handbook.	☐
Weeks 1-2	Meet w/ CHEE faculty to determine research project and advisor (see Graduate Handbook Sec. 3.1).	☐
	Email Darla Strong (darla1120@arizona.edu) with Cat Card number to get keyless access to Harshbarger Building.	☐
	Email Darla Strong (darla1120@arizona.edu) with preferred lab coat size so that new lab coat can be ordered.	☐
	Take online lab safety course (See Grad Handbook Sec. 3.5). Log in with NetID and password. Search for "General Laboratory Chemical Safety Training" (Course ID #0000003299). Submit Lab Training Cert to Lori Huggins (lhuggins@arizona.edu).	☐
Week 3	Submit CHEE Advisor Selection Form no later than Friday of Week 3 (see Graduate Handbook Sec. 3.1 and Appendix A6).	☐
SEMESTER 2		
Deadline	***Benchmark / Task***	***Done***
Due by semester end	Submit Plan of Study by semester's end in GradPath (See Graduate Handbook Sec. 4.2.4 and 5.2.2).	☐
SEMESTER 3 – no benchmarks in semester 3 unless you have missed some in earlier semesters!		
SEMESTER 4		
Deadline	***Benchmark / Task***	***Done***
Weeks 1-5	Submit Master's Committee Appointment Form in GradPath (see Graduate Handbook Sec. 4.2.5 and 5.2.3). Check the "No" radio button next to the question "Do you have a Master's committee" if you are a non-thesis MS student and submit. Environmental Engineering students follow additional instructions in Section 5.3.8 in the CHEE Graduate Handbook.	☐
	For Environmental Engineering students only: Review defense procedures with Faculty advisor.	☐
	For Environmental Engineering students only: Determine report defense date with Faculty advisor.	☐
2-4 weeks before (Environmental Engineering) report defense or (Chemical Engineering) graduation	Submit report drafts and finals electronically to faculty advisor for review.	☐
	Complete any report revisions required by faculty advisor BEFORE graduation.	☐
	Once report has been successfully approved/defended, make sure faculty advisor informs Lori Huggins (lhuggins@arizona.edu) that all requirements for MS Non-thesis have been completed so she can request completion in GradPath.	☐

Week of graduation	Complete exit survey. Contact Darla Strong (darla1120@arizona.edu) for link to survey.	☐
	Complete exit interview. Contact Darla Chessmore (darla1120@arizona.edu) to schedule interview.	☐
	Turn in any (ALL) keys to Key Desk or to Darla Strong in an envelope with your name and Student ID # written on it (if not remaining to complete a PhD).	☐
	Clean out desk and notify Darla Strong (darla1120@arizona.edu) that desk is available (if not remaining to complete a PhD).	☐

When you can check off every box above, then CONGRATULATIONS!
You've done it!

A7. MS Degree Benchmarks (Thesis)

Department of Chemical and Environmental Engineering

Use the following checklist as a general guide only – please work with your faculty advisor to determine your own individualized path forward, but keep in mind that these benchmarks are recommended (and some are required by the Graduate College) to keep you moving forward on a 4-semester timeline.

SEMESTER 1		
Deadline	***Benchmark / Task***	***Done***
Week 1	Submit Responsible Conduct of Research form in GradPath.	☐
	Review Graduate College policies.	☐
	Review CHEE Graduate Student Handbook.	☐
Weeks 1-2	If you do not already have an assigned advisor, meet w/ CHEE faculty to determine research project and advisor (see Graduate Handbook Sec. 3.1).	☐
	Email Darla Strong (darla1120@arizona.edu) with Cat Card number to get keyless access to Harshbarger Building.	☐
	Email Darla Strong (darla1120@arizona.edu) with preferred lab coat size so that new lab coat can be ordered.	☐
	Take online lab safety course in EDGE Learning. (See Graduate Handbook Sec. 3.5). Log in with NetID and password. Search for "General Laboratory Chemical Safety Training" (Course ID #0000003299). Submit Lab Training Certificate to Lori Huggins (lhuggins@arizona.edu).	☐
Week 3	Submit CHEE Advisor Selection Form no later than Friday of Week 3 (see Graduate Handbook Sec. 3.1 and Appendix A6).	☐
SEMESTER 2		
Deadline	***Benchmark / Task***	***Done***
Due by semester end	Submit Plan of Study by semester's end in GradPath (See Graduate Handbook Sec. 4.2.4 and 5.2.2).	☐
SEMESTER 3 – no benchmarks in semester 3 unless you have missed some in earlier semesters!		
SEMESTER 4		
Deadline	***Benchmark / Task***	***Done***
Weeks 1-5	Submit Master's Committee Appointment Form in GradPath (see Graduate Handbook Sec. 4.2.5 and 5.2.3).	☐
	Review defense procedures from Grad College with faculty advisor.	☐

2-4 weeks before defense	Determine thesis defense date with Master's thesis committee, and submit the date to both Darla Strong (darla1120@arizona.edu) for room reservation, and to Lori Huggins (lhuggins@arizona.edu) for departmental announcement. Student may also provide Lori with the approval signature page from thesis (see Graduate College Thesis Sample pages for correct template – must be in Word, not PDF), completed except for the signatures and dates. (Lori will set up the signature page in Adobe Sign and forward it to the Thesis Committee Chair one day prior to the thesis defense. When the form has been signed by all committee members, Lori will return it to student for insertion in the approved thesis.) If the student's approval form is signed in some other manner than having it routed by the Graduate program coordinator through Adobe Sign, then the student must provide a copy of the signed approval page to the Graduate program coordinator for departmental archiving after the defense is completed.	☐
	Submit thesis drafts and finals electronically to defense Committee Chair/faculty advisor for review.	☐
	If defense will have a Zoom component, set up Zoom meeting and provide link to defense committee members and Lori Huggins (lhuggins@arizona.edu).	☐
	Provide evaluation rubric (see Graduate Handbook, Appendix A11) to each member of Master's Defense Committee. Committee chair will return all completed rubrics to Lori Huggins for filing with the department after thesis has been successfully defended.	☐
Day of defense	Make sure all members of Master's defense committee have the evaluation rubric before beginning defense.	☐
	Complete defense – Celebrate!	☐
Prior to final Graduate College approved submission date for term completion	Complete and acquire approval of any requested committee revisions to thesis. Note that pursuant to Graduate College rules, students have 1 year from defense date to complete any required changes and submit to the Graduate College. However, students must register for at least 1 unit of CHEE 910 each fall and spring semester during that time.	☐
	Submit completed thesis electronically to Graduate College. Formatting and other instructions are here. *Students who miss the deadline for submitting the thesis to the Graduate College must register for at least 1 unit of CHEE 910 for the following semester and update their completion term.* ***So do not miss the deadline!***	☐
	Complete and submit Distribution Rights Form to Graduate College representative for CHEE. Check the Graduate Handbook (Appendix A1) for current representative and email address.	☐
After thesis submission but	Complete any revisions requested by Graduate College (usually minor formatting corrections).	☐

before graduation	Make sure faculty advisor informs Lori Huggins (lhuggins@arizona.edu) that all requirements for MS Thesis have been met so she can request completion in GradPath.	☐
	Complete exit survey. Contact Darla Strong (darla1120@arizona.edu) for link to survey.	☐
	Complete exit interview. Contact Darla Strong (darla1120@arizona.edu) to schedule interview.	☐
	Turn in any (ALL) keys to Key Desk or to Darla Strong in an envelope with your name and Student ID # written on the outside (if not remaining to complete a PhD).	☐
	Clean out desk and notify Darla Strong (darla1120@arizona.edu) that the desk is available (if not remaining to complete a PhD).	☐

When you can check off every box above, then CONGRATULATIONS! You've done it!

A8. PhD Degree Benchmarks (Chemical Engineering)

Department of Chemical and Environmental Engineering

Use the following checklist as a general guide only – please work with your faculty advisor to determine your own individualized path forward, but keep in mind that these benchmarks are recommended (and some are required by the Graduate College) to keep you moving forward on an 8-semester timeline.

SEMESTER 1		
Deadline	***Benchmark / Task***	***Done***
Week 1	Submit Responsible Conduct of Research form in GradPath.	☐
	Review Graduate College policies.	☐
	Review CHEE Graduate Student Handbook.	☐
Weeks 1-2	If faculty advisor and research group not determined before start of the semester, meet w/ CHEE faculty to determine research project and advisor (see Graduate Handbook Sec. 3.1).	☐
	Email Darla Strong (darla1120@arizona.edu) with Cat Card number to get keyless access to Harshbarger Building.	☐
	Email Darla Strong (darla1120@arizona.edu) with preferred lab coat size so that new lab coat can be ordered.	☐
	Take online lab safety course in EDGE Learning (See Graduate Handbook Sec. 3.5). Log in with NetID and password. Search for "General Laboratory Chemical Safety Training" (Course #0000003299). Submit Lab Training Certificate to Lori Huggins (lhuggins@arizona.edu).	☐
Week 3	Submit CHEE Advisor Selection Form no later than Friday of Week 3 (see Graduate Handbook Sec. 3.1 and Appendix A6).	☐
SEMESTER 2 (for Chemical Engineering PhD students only)		
Deadline	***Benchmark / Task***	***Done***
August immediately following Semester 2	If GPA is < 3.75/4.0 in the four core Chemical Engineering courses (CHEE 502, 505, 506 and 530), take the Chemical Engineering Qualifying Exam in August (see Graduate Handbook Sec. 4.1.4). The Qualifying Exam is waived for any GPA ≥ 3.75/4.0.	☐
SEMESTER 3		
Due by semester end	Choose a minor based on research interests and in discussion with faculty advisor (see Graduate Handbook Sec. 4.1.5).	☐
	Submit Plan of Study by semester's end in GradPath (see Graduate Handbook Sec. 4.1.6).	☐
	Meet with faculty advisor to determine members of Comp Exam Committee (see Graduate Handbook Sec. 4.1.7).	☐
SEMESTER 4		
Deadline	***Benchmark / Task***	***Done***
By end of semester (see Graduate Handbook Sec. 4.1.7 and 4.1.8)	Submit Comp Exam Committee Appointment form in GradPath.	☐
	Submit Written Comprehensive Exam (research proposal) to faculty advisor and obtain advisor's approval of document.	☐
	Complete all core (CHEE 502, 505, 506 and 530) and minor courses for PhD.	☐
	Schedule Oral Comprehensive Exam for no later than early Fall (5th semester).	☐

2 weeks prior to Oral Comprehensive Exam date	Submit Announcement of Doctoral Comprehensive Exam in GradPath.	☐
	Submit research proposal (Written Oral Exam) to all members of Doctoral Comprehensive Exam committee.	☐
Summer or Early Fall (5th semester)	Take Oral Comprehensive Exam.	☐
SEMESTER 5		
Deadline	***Benchmark / Task***	***Done***
Immediately after Comp Exam	Submit Doctoral Dissertation Committee Appointment Form in GradPath (see Graduate Handbook Sec. 4.1.9) immediately after passing Comp Exam.	☐
SEMESTERS 5, 6 and 7		
Following Comp Exam	Recommended: TA at least one semester (see Graduate Handbook Sec. 3.8).	☐
By end of each spring semester	Meet with Dissertation Defense Committee to review proposed project and progress on dissertation (see Graduate Handbook Sec. 4.1.10). Complete and submit Dissertation Committee Review Form (Graduate Handbook Appendix A11).	☐
SEMESTER 8 (Final Semester)		
Deadline	***Benchmark / Task***	***Done***
Weeks 1-5	Review defense procedures from Grad College with faculty advisor.	☐
2-4 weeks before defense	Determine dissertation defense date with Dissertation committee, and submit the date to both Lori Huggins (lhuggins@arizona.edu) for departmental announcement, and Darla Strong (darla1120@arizona.edu) for room reservation. Student may also provide Lori with the approval signature page from dissertation (see Graduate College Dissertation Sample pages for correct template – must be in Word, not PDF), completed except for the signatures and dates. (Lori will set up the signature page in Adobe Sign and forward it to the Dissertation Committee Chair one day prior to the dissertation defense. When the form has been signed by all committee members, Lori will return it to student for insertion in the approved dissertation.) If the student's approval form is signed in some other manner than having it routed by the graduate program coordinator through Adobe Sign, then the student must provide a copy of the signed approval page to the graduate program coordinator for departmental archiving after the defense is completed.	☐
	Turn in Publications form to Lori Huggins (lhuggins@arizona.edu), with electronic copies of publications, if applicable (see Graduate Handbook Sec. 4.1.12).	
	Submit Announcement of Final Oral Defense in GradPath (see Graduate Handbook Sec. 4.1.11).	
	Submit dissertation drafts and finals electronically to Dissertation Defense Committee Chair/faculty advisor and all committee members for review.	☐
	If applicable, set up Zoom meeting for Final Oral Defense and provide link to defense Committee members and Grace Fuller (see Graduate Handbook Sec. 4.1.11).	☐
	Provide evaluation rubric (see Graduate Handbook, Appendix A12) to each member of Dissertation Defense Committee. Committee chair will return all completed rubrics to Grace Fuller for filing with the department after successful dissertation defense.	☐

Day of defense	Make sure all members of defense committee have the evaluation rubric before beginning defense.	☐
	Complete defense – Celebrate!	☐
Prior to final Graduate College approved submission date for term completion	Complete and acquire approval of any requested committee revisions to dissertation. Note that pursuant to Graduate College rules, students have 1 year from their defense date to complete any required changes and submit to the Graduate College. However, these students will need to register for at least 1 unit of CHEE 920 each fall and spring semester during that time.	☐
	Submit completed dissertation electronically to Graduate College. Formatting and other instructions are here. *If a student misses the deadline for submitting the dissertation to the Graduate College, the student must register for at least 1 unit of CHEE 920 for the following semester and update their completion term.* ***So do not miss the deadline!***	☐
	Complete and submit Distribution Rights Form to Graduate College representative for CHEE. Check the Graduate Handbook (Appendix A1) for current representative and email address.	☐
After dissertation submission but before graduation	Complete any revisions requested by Graduate College (usually minor formatting corrections)	☐
	Complete exit survey. Contact Darla Strong (darla1120@arizona.edu) for link to survey.	☐
	Complete exit interview. Contact Darla Strong (darla1120@arizona.edu) to schedule interview.	☐
	Turn in any (ALL) keys to Key Desk or to Darla Strong in an envelope with your name and Student ID # written on the outside of the envelope.	☐
	Turn in computer/laptop (if applicable).	☐
	Clean out desk and notify Darla Strong (darla1120@arizona.edu) that it is cleared.	☐

When you can check off every box above, then CONGRATULATIONS!
You've done it!

A9 PhD Degree Benchmarks (Environmental Engineering)

Department of Chemical and Environmental Engineering

Use the following checklist as a general guide only – please work with your faculty advisor to determine your own individualized path forward, but keep in mind that these benchmarks are recommended (and some are required by the Graduate College) to keep you moving forward on an 8-semester timeline.

SEMESTER 1		
Deadline	***Benchmark / Task***	***Done***
Week 1	Submit Responsible Conduct of Research form in GradPath.	☐
	Review Graduate College policies.	☐
	Review CHEE Graduate Student Handbook.	☐
Weeks 1-2	If faculty advisor and research group not determined before start of the semester, meet w/ CHEE faculty to determine research project and advisor (see Graduate Handbook Sec. 3.1).	☐
	Email Darla Strong (darla1120@arizona.edu) with Cat Card number to get keyless access to Harshbarger Building.	☐
	Email Darla Strong (darla1120@arizona.edu) with preferred lab coat size so that new personal lab coat can be ordered.	☐
	Take online lab safety course in EDGE Learning (See Graduate Handbook Sec. 3.5). Log in with NetID and password. Search for "General Laboratory Chemical Safety Training" (Course ID #0000003299). Submit Lab Training Certificate to Lori Huggins (lhuggins@arizona.edu).	☐
Week 3	Submit CHEE Advisor Selection Form no later than Friday of Week 3 (see Graduate Handbook Sec. 3.1 and Appendix A6).	☐
SEMESTER 2 (No benchmark/deadlines for Semester 2 for Environmental Engineering)		
SEMESTER 3		
January immediately following Semester 3	If GPA is < 3.75/4.0 in the four core Environmental Engineering courses (CHEE 500R, 574, 575 and 576), take the Environmental Engineering Qualifying Exam, usually given in early January (see Graduate Handbook Sec. 5.1.3). The Qualifying Exam is waived for any GPA ≥ 3.75/4.0.	☐
SEMESTER 4		
Deadline	***Benchmark / Task***	***Done***
Weeks 1-2	Immediately following passage/waiver of the Qualifying Exam, choose a minor based on research interests and in discussion with faculty advisor (see Graduate Handbook Sec. 5.1.5).	☐
	Immediately following passage/waiver of the Qualifying Exam, submit Plan of Study in GradPath (See Graduate Handbook Sec. 5.1.5).	☐
SEMESTERS 5, 6 and 7		
Following Comp Exam	Recommended: TA at least one semester (see Graduate Handbook Sec. 3.8).	☐
Semester 6		
Weeks 1-5	Meet with faculty advisor to determine members of Comp Exam Committee (see Graduate Handbook Sec. 5.1.6).	☐
	Submit Comp Exam Committee Appointment Form in GradPath.	☐
By end of semester (see	Submit Written Comprehensive Exam (research proposal) to faculty advisor and obtain advisor's approval of document.	☐

Graduate Handbook Sec. 5.1.6 and 5.1.7)	Schedule Oral Comprehensive Exam for no later than early Fall (7th semester).	☐
	Complete all core (CHEE 500R, 574, 575 and 576), elective and minor courses for PhD.	☐
2 weeks prior to Oral Comprehensive Exam date	Submit Announcement of Doctoral Comprehensive Exam in GradPath.	☐
	Submit research proposal (Written Oral Exam) to all members of Doctoral Comprehensive Exam committee.	☐
Summer or Early Fall (7th semester)	Take Oral Comprehensive Exam.	☐
Immediately after Comp Exam	Submit Doctoral Dissertation Committee Appointment Form in GradPath (see Graduate Handbook Sec. 5.1.8) immediately after passing Comp Exam.	☐
SEMESTER 8 (Final Semester)		
Deadline	***Benchmark / Task***	***Done***
Weeks 1-5	Review defense procedures from Grad College with faculty advisor.	☐
2-4 weeks before defense	Determine dissertation defense date with Dissertation Committee and submit the date to both Lori Huggins (lhuggins@arizona.edu) for departmental announcement, and to Darla Strong (darla1120@arizona.edu) for room reservation. Student may also provide Lori with the approval signature page from dissertation (see Graduate College Dissertation Sample pages for correct template – must be in Word, not PDF), completed except for the signatures and dates. Lori will set up the signature page in Adobe Sign and forward it to the Dissertation Committee Chair one day prior to the dissertation defense. When the form has been signed by all committee members, Lori will return it to student for insertion in the approved dissertation. If the student's approval form is signed in some other manner than having it routed by the graduate program coordinator through Adobe Sign, then the student must provide a copy of the signed approval page to the graduate program coordinator for departmental archiving after the defense is completed.	☐
	Turn in Publications form to Lori Huggins (lorihuggins@arizona.edu), with electronic copies of publications, if applicable (see Graduate Handbook Sec. 5.1.10).	☐
	Submit Announcement of Final Oral Defense in GradPath (see Graduate Handbook Sec. 5.1.9).	☐
	Submit dissertation drafts and finals electronically to Dissertation Defense Committee Chair/faculty advisor and all committee members for review.	☐
	If applicable, set up Zoom meeting for Final Oral Defense and provide link to defense committee members and Grace Fuller (see Graduate Handbook Sec. 5.1.9).	☐
	Provide evaluation rubric (see Graduate Handbook, Appendix A12) to each member of Dissertation Defense Committee. Committee chair will return all completed rubrics to Lori Huggins for filing with the department after successful defense of dissertation.	☐
Day of defense	Make sure all members of dissertation committee have the evaluation rubric before commencing defense.	☐

	Complete defense – Celebrate!	☐
Prior to final Graduate College approved submission date for term completion	Complete and acquire approval of any requested committee revisions to dissertation. Note that pursuant to Graduate College rules, students have 1 year from defense date to complete any required changes and submit to the Graduate College. However, these students will need to register for at least 1 unit of CHEE 920 each fall and spring semester during that time.	☐
	Submit completed dissertation electronically to Graduate College. Formatting and other instructions are here. *If a student misses the deadline for submitting the dissertation to the Graduate College, the student must register for at least 1 unit of CHEE 920 for the following semester and update their completion term.* ***So do not miss the deadline!***	☐
	Complete and submit Distribution Rights Form to Graduate College representative for CHEE. Check the Graduate Handbook (Appendix A1) for current representative and email address.	☐
After dissertation submission but before graduation	Complete any revisions requested by Graduate College (usually minor formatting corrections).	☐
	Complete exit survey. Contact Darla Strong (darla1120@arizona.edu) for link to survey.	☐
	Complete exit interview. Contact Darla Strong (darla1120@arizona.edu) to schedule interview.	☐
	Turn in any (ALL) keys to Key Desk or to Darla Strong in an envelope with your name and Student ID # written on the outside.	☐
	Turn in computer/laptop (if applicable).	☐
	Clean out desk and notify Darla Strong (darla1120@arizona.edu) that it is cleared.	☐

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You've done it!

A10. Chemical and Environmental Engineering Advisor Selection Form

New graduate students who do not already have an assigned faculty advisor and senior undergraduate students in the AMP program should spend the first three weeks after beginning their respective programs meeting with potential faculty research advisors. After these meetings, students should fill out this form, scan and email it to the appropriate chair of the Graduate Studies Committee (Chemical Engineering: aprintz@arizona.edu or Environmental Engineering: rsierra@arizona.edu) no later than Friday of the third week of classes. Also provide a copy of the completed form to the Graduate Program Coordinator, Lori Huggins (lhuggins@arizona.edu).

Additionally, undergraduate seniors who are new AMP students should use this form to indicate their choice for a faculty advisor when one has been secured. All new students, including those who already have a faculty advisor, must complete this form for departmental records.

Student Full Name: Click or tap here to enter text.

First Choice: Click or tap here to enter text.

Second Choice: Click or tap here to enter text.

Third Choice: Click or tap here to enter text.

If you already have an advisor before the semester begins, please note the advisor's name below:
Advisor Name: Click or tap here to enter text.

Date: Click or tap here to enter text.

A11. Dissertation Committee Review Form (ChE only)

Date of Meeting: Click or tap here to enter text.

Name of PhD Candidate: Click or tap here to enter text.

Dissertation Committee members: Click or tap here to enter text.

Following successful completion of the Comprehensive Exam, each Chemical Engineering PhD Candidate must meet annually with their Dissertation Committee to discuss progress to date and, in particular, any publications that will be submitted or are in progress.

On the above-named date, we, the undersigned, met with the above-named student and are satisfied that the student has made acceptable progress toward completion of their degree, including any first-author publications submitted or in progress. Recommended next steps include: Click or tap here to enter text.

_____	Click or tap here to enter text.
(Name), Committee Chair	Date
_____	Click or tap here to enter text.
(Name), Member	Date
_____	Click or tap here to enter text.
(Name), Member	Date
_____	Click or tap here to enter text.
(Name), Member	Date
_____	Click or tap here to enter text.
Student Signature	Date

A12. PhD Publications Form

Date: Click or tap here to enter text.

Name PhD Candidate: Click or tap here to enter text.

Name(s) PhD Faculty Advisor(s): Click or tap here to enter text.

PhD students are strongly encouraged to have two first-author, peer reviewed journal publications either accepted, in press or published in peer reviewed indexed journals in order to make them more competitive employment candidates after graduation. A successful submission of a manuscript to a Journal can count toward these publications.

Publication 1
Authors: Click or tap here to enter text.
Year: Click or tap here to enter text.
Title: Click or tap here to enter text.
Journal: Click or tap here to enter text.
Volume, issue and pages: Click or tap here to enter text.
Journal's One Year Impact Factor: Click or tap here to enter text.

Publication 2
Authors: Click or tap here to enter text.
Year: Click or tap here to enter text.
Title: Click or tap here to enter text.
Journal: Click or tap here to enter text.
Volume, issue and pages: Click or tap here to enter text.
Journal's One Year Impact Factor: Click or tap here to enter text.

Attachments:
For each article, please attach reprint(s). If manuscript is in accepted or in press status, please attach correspondence with editor indicating the status or the page proofs. If you have a submission in lieu of an accepted publication, please attach evidence that article has been received by the journal and that your submission conforms with journal submission requirements

Comments (optional): Click or tap here to enter text.

Approval Signatures

PhD Faculty Advisor: Type name here Signature: _____ Date: Date here

A13. Graduate Student Departmental Petition

Date: Click or tap here to enter text.

Student Name: Click or tap here to enter text.

Student ID Number: Click or tap here to enter text.

Mailing Address: Click or tap here to enter text.

Phone: Click or tap here to enter text.Email: Click or tap here to enter text.

Degree Program: ☐ Chemical Engineering ☐ Environmental Engineering

Degree Sought: ☐ ME ☐ MS ☐ PhD

Subject of Petition: Click or tap here to enter text.

Request:Click or tap here to enter text.

Reason for Request: Click or tap here to enter text.

APPROVED: ☐

DENIED: ☐

Approval Signature (Grad Studies or Department Chair): _____

Grad Studies or Department Chair comments: Click or tap here to enter text.

A14. Chemical and Environmental Engineering Defense Evaluation Rubric (MS)

Assessment Activity: MS Thesis or Master's Report

Student Name: Click or tap here to enter text. Date: Click or tap here to enter text.

Committee Member: Click or tap here to enter text.

Directions: *Evaluate this student's written and verbal presentation of their research with a score between 1 and 5 for each of the criteria described below. Below each score and statement, briefly comment on the rationale if your score is less than 4. Turn in your completed rubric to the committee chair before leaving the defense.*

Score: 5–Exceptional 4–Very Good 3–Acceptable 2–Needs Improvement 1–Unacceptable

Quality of thesis/master's report writing Rationale if score below 4	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Problem description and analysis of the related research literature Rationale if score below 4	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Research design Rationale if score below 4	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Data analysis Rationale if score below 4	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Soundness of conclusions and quality of responses to challenges to candidate's interpretations and conclusions Rationale if score below 4	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Understanding of the broader implications of candidate's research Rationale if score below 4	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Ability to anticipate the logical next level of inquiry Rationale if score below 4	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1

A15. Chemical and Environmental Engineering Defense Evaluation Rubric (PhD)

Assessment Activity: PhD Dissertation & Defense

Student Name: Click or tap here to enter text. Date: Click or tap here to enter text.

Dissertation Committee Member: Click or tap here to enter text.

Directions: *Evaluate this student's written and verbal presentation of their research with a score between 1 and 5 for each of the criteria described below. Below each score and statement, briefly comment on the rationale if your score is less than 4. Turn in your completed rubric to the committee chair before leaving the defense.*

Score: 5–Exceptional 4–Very Good 3–Acceptable 2–Needs Improvement 1–Unacceptable

Quality of dissertation writing Rationale if score below 4	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Problem description and analysis of the related research literature Rationale if score below 4	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Research design Rationale if score below 4	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Data analysis Rationale if score below 4	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Soundness of conclusions and quality of responses to challenges to candidate's interpretations and conclusions Rationale if score below 4	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Understanding of the broader implications of candidate's research Rationale if score below 4	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Ability to anticipate the logical next level of inquiry Rationale if score below 4	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1