THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE, LIFE & ENVIRONMENTAL SCIENCES
COLLEGE OF ENGINEERING
Biosystems Engineering

Graduate Manual for the Biosystems Engineering and Biosystems Analytics & Technology Programs

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Table of Contents

BIOSYSTEMS ENGINEERING (BE) MISSION, PURPOSE, VISION, VALUES 5
1. INTRODUCTION 6
2. DEGREE PROGRAM INFORMATION 6
2.1. BE Accelerated Master's Program (AMP) 6
2.2. Traditional Master of Science (2-year MS) 7
2.3. Doctor of Philosophy (PhD) 7
3. ADMISSION 7
3.1. General Admission Requirements 7
3.2. BE Admission Requirements 7
3.3. BAT Admission Requirements 7
3.4. Requirements for International Candidates 8
4. FINANCIAL SUPPORT IN THE BE DEPARTMENT 8
4.1. Graduate Research and Teaching Assistantships 8
4.1.1. Graduate Research Assistantships (GRAs) 8
4.1.2. Graduate Teaching Assistantships (GTAs) 8
4.2. Hourly Graders 8
4.3. Fellowships, Scholarships and Grant Funding 8
5. GENERAL ADMINISTRATION OF THE GRADUATE PROGRAM 9
5.1. Orientations and Required Training 9
5.1.1. Graduate School 9
5.1.2. Departmental 9
5.2. Registration 9
5.3. Deficiencies 9
5.4. Continuous Enrollment Policy for Domestic Students 9
5.4.1. Summer Enrollment 9
5.4.2. International Students 10
5.4.3. Graduate Assistantships 10
5.4.4. Graduate Scholarships 10
5.5. Graduate Committee Meetings 10
5.6. Leave of Absence Policy 10
5.7. Enrollment in Departmental Graduate Seminar (BE 596A/B) 10
5.7.1. BE 596A (Presenting Class) 11
5.7.2. BE 596B (Non-presenting Class) 11
5.7.3. Student Resources 11
5.7.4. Student Governance, Appeals and Grievances 11
5.8. UAccess GradPath 11
5.9. UAccess GradPath Forms 12
5.9.1. Responsible Conduct of Research Statement 12
5.9.2. Plan of Study (POS) Form 12
5.9.3. Committee Appointment Form 12
5.9.4. Degree (MS, AMP, PhD) Completion Form 12
5.10. Graduate Student Academic Progress Reports 12
5.11. Enrollment in Multiple Graduate Degree Programs 12
5.12. Thesis/Dissertation Publication Requirements 13
5.13. Archiving the Thesis/Dissertation 13
5.14. Commencement 13

5.14.1. University Commencement 13
5.14.2. College of Agriculture, Life & Environmental Sciences (CALES) 13
5.14.3. College of Engineering (COE) 13
5.14.4. Biosystems Engineering Department 13
5.15. International Student Resources 13
5.16. Graduate Student Learning Outcomes Assessment 14
5.16.1. Expected Learning Outcomes 14
5.16.2. Assessment Activities 14
6. MASTER OF SCIENCE (MS) DEGREE IN THE BIOSYSTEMS ENGINEERING DEPARTMENT 15
6.1. Credit Requirements 16
6.1.1. Traditional BAT MS 16
6.1.2. BE AMP 16
6.1.3. Traditional BE MS 17
6.2. Time Limitation 17
6.3. Transfer Credit 17
6.4. Master's Plan of Study (POS) Form 18
6.5. MS Major Professor 18
6.5.1. Faculty Eligible to Serve as MS Major Professor 19
6.6. MS Graduate Committee 19
6.6.1. Faculty Eligible to Serve on the MS Graduate Committee 19
6.7. MS Thesis/Graduate Report Requirements 19
6.7.1. Thesis Option 20
6.7.2. Graduate Report Option 20
6.8. Research Proposal 20
6.9. Final Oral Defense/Examination 20
6.9.1. Dates and Deadlines 20
6.9.2. MS Thesis/Report Defense Process 20
6.9.3. Reporting Final Oral Defense (Examination) Results 22
7. Doctor of Philosophy (PhD) Degree in Biosystems Engineering and Biosystems Analytics & Technology 23
7.1. Pursuing a PhD after an MS at the University of Arizona 23
7.2. Major Professor 23
7.2.1. Faculty Eligible to Serve as the PhD Major Professor 23
7.3. PhD Graduate Committee 24
7.3.1. Faculty Eligible to Serve on the PhD Graduate Committee 24
7.4. Credit Requirements for PhD 24
7.4.1. Minimum Course Requirements for BAT PhD 24
7.4.2. Minimum Course Requirements for BE PhD 25
7.5. Transfer Credit 26
7.6. PhD Minor Requirements for BAT and BE PhD Candidates 26
7.7. Requirements for Minoring in BAT or BE 26
7.8. Teaching Experience Requirement 27
7.9. Time Limitation 27
7.10. Plan of Study 28
7.11. Research Proposal (Prospectus) for the Dissertation 28
7.12. Comprehensive Examination 28
7.12.1. Comprehensive Examination Structure 28
7.12.2. Comprehensive Examination Committee and Form 29
7.12.3. Announcement of Comprehensive Examination 29

7.12.4. Reporting the Results of the Comprehensive Examination 29
7.13. Dissertation Requirements 29
7.14. Final Oral Defense 30
7.14.1. Dates and Deadlines 30
7.14.2. Final Oral Defense Process 30
7.14.3. Reporting Results of the Final Oral Defense 31
7.15. Dissertation Submission 32
7.16. Dual Degrees 32
APPENDIX A 33
EXAMPLE OF PLAN OF STUDY FOR THE ACCELERATED MASTER'S PROGRAM (AMP) in BIOSYSTEMS ENGINEERING 33
APPENDIX B 34
THESIS/ GRADUATE REPORT/DISSERTATION REQUIREMENTS 34
APPENDIX C 38
TIMELINES/CHECKLISTS FOR COMPLETING THE STEPS IN THE BE AMP, BAT/BE TRADITIONAL MS, AND BAT/BE PhD DEGREES 38
APPENDIX D 42
Biosystems Analytics & Technology Graduate Faculty 42
Biosystems Engineering Graduate Faculty 42
APPENDIX E 45
FORMS 45
APPENDIX F 50
ASSESSMENT RUBRICS 50
Exit Survey for MS and PhD Students Near Graduation in the Department of Biosystems Engineering ... 55

The Biosystems Engineering Department is committed to fostering inclusive learning environments that embrace the diversity of experiences and interests represented in our communities and the broader world. Aligned with the University of Arizona's mission, we see diversity, equity, and inclusion as essential to excellence in teaching and scholarship. Our department comprises faculty, students, and staff from a wide range of racial and ethnic identities, gender expressions, sexual orientations, health statuses, abilities, ages, nationalities, immigration status, religions, and socio-economic backgrounds.

BIOSYSTEMS ENGINEERING (BE) MISSION, PURPOSE, VISION, VALUES

Mission

Our mission is to improve the quality of life through excellence in instruction, research, and extension. To achieve this, the Biosystems Engineering Department is dedicated to developing safe and reliable food, water, energy, and biological information systems that can meet the challenges of a changing world.

Purpose

The Biosystems Engineering Department develops and facilitates the use of innovative technologies for the generation of food, bioenergy, and bioproducts, while promoting the efficient use of water, natural resources, and information systems suitable for arid and semi-arid environments. Our faculty, staff, and students collaborate at the intersection of science and engineering.

Vision

The Biosystems Engineering Department aspires to be a world leader in creating technologies and systems that ensure the safe production of food, bioenergy, bioproducts, and biological information to support the sustainable use of arid and semi-arid environments. Our programs attract students, constituents, and professionals from around the world.

Shared Values

Innovation	We are innovative in our solutions and how we approach engineering, life science, and data science practices to solve grand challenges.
Inclusiveness	We bring together different people, ideas, backgrounds, and perspectives to produce lasting solutions for all. We encourage and help all to be successful.
Interdisciplinary	We embrace on-campus collaboration to develop better solutions that address the needs of all.
Cooperation	We forge off-campus partnerships to solve society's complex problems and improve the quality of life
Sustainability	We manage the use of natural resources to maintain healthy ecosystems throughout the production cycle of food, bioenergy, and bioproducts.
Connectedness	We work with industry and communities to understand tomorrow's needs and open up opportunities for our students and alums to help.
Ethics	High ethical standards and sound decision-making are at the heart of our research, discovery, business, and financial practices.

1. INTRODUCTION

This handbook provides students with information on the requirements and procedures for pursuing a graduate degree (AMP, MS, or PhD) in the Department of Biosystems Engineering (BE) at The University of Arizona. The Department has multiple general emphasis areas: Biometry and Biosystems Informatics; Controlled Environment Agriculture; Food, Bioproducts, Renewable Energy; and Water Resources. However, students will find that a graduate program in the BE department can be designed to fit almost any need in the general field of applying engineering principles to the solution of agricultural and biological engineering problems. The program's flexibility allows foreign and domestic students to develop programs specifically suited to their career goals and interests in consultation with their advisors and sponsors. The University of Arizona is a diverse institution that offers a wide range of courses to support both specialized and broad academic programs.

This manual is a compilation of current policies, practices, and procedures of the Graduate School and the Department of Biosystems Engineering. Information found in the Graduate Catalog [http://catalog.arizona.edu/policy-audience/graduate], which the student is expected to become familiar with. It serves as the foundation for addressing special problems, managing extraordinary situations, and providing details not covered in this manual.

This manual contains general program information, admission requirements, general administration of the graduate program, and deadlines for submission to the Graduate College of items such as study programs, reports on examinations, etc. The Graduate College publishes official specific deadline dates. A copy of the official deadline dates can be obtained from the BE Academic Advisor or the Graduate College website [http://grad.arizona.edu/].

2. DEGREE PROGRAM INFORMATION

The Department offers the following degrees:

- Biosystems Engineering:
    - Accelerated Master of Science (AMP)
    - Traditional Master of Science (2-year MS) (Main and Yuma Campus)
    - Doctor of Philosophy (PhD)
- Biosystems Analytics & Technology
    - Traditional Master of Science (2-year MS)
    - Doctor of Philosophy (PhD)

Students in either MS programs can elect to complete either a thesis or a report. The thesis option is intended for students who want to study in a specialized area and to work closely with a faculty member on a unique research topic. It will also prepare the student for the independent research needed for the PhD program. The report option is designed for students seeking a broad education and engineering experience. It includes coursework in several areas and an engineering report to be completed under the supervision of the student's major professor (advisor) and committee members.

2.1. BE Accelerated Master's Program (AMP)

The BE Accelerated MS program (AMP) allows advanced undergraduate students with a 3.30 Cum GPA (or higher) to leverage their coursework into a graduate degree. The AMP is designed for the top undergraduate students who plan to pursue a graduate degree in Biosystems Engineering. AMP students can complete their Bachelor of Science degree and the Master of Science degree (BEMS) in 5 years. AMP students may complete up to 12 units of graduate-level coursework during the fourth year of their BS program and receive credit toward their BS and MS after completing the course requirements with a 3.0 GPA or higher. The AMP students who chose the MS report option typically complete the remainder of the MS program requirements within one

year.

2.2. Traditional Master of Science (2-year MS)

A Master's degree involves advanced training to be gained through intensive study beyond the bachelor's degree in a specialized field, supplemented by study in supporting subjects. The MS in Biosystems Engineering is designed for graduate engineers and scientists aspiring to advance their careers or prepare themselves for advanced degrees or research opportunities.

2.3. Doctor of Philosophy (PhD)

A Doctor of Philosophy (PhD) in the Biosystems department is designed for students seeking an intense research focus and aspiring to make scholarly contributions to either biosystems engineering or biosystems analytics & technology disciplines. The doctoral program prepares engineers for senior responsibility in industry, research, or academia. The successful candidate must demonstrate the ability to devise and execute a program of study and research that makes a fundamentally new contribution to the chosen field. The dissertation and resulting peer reviewed publications are the central component of the doctoral program, serving as the primary evidence of the student's original contribution. The student should be prepared for a very demanding period of study beyond the master's degree. A minor field of specialization is also required for the doctoral programs.

3. ADMISSION

3.1. General Admission Requirements

All candidates must apply online through the Graduate College application site at [https://apply.grad.arizona.edu/users/login]. Graduate Admission Requirements are listed in the Graduate Catalog and Program Descriptions: [https://grad.arizona.edu/catalog/]. The application for admission includes official transcripts from all previous colleges and universities attended, a resume (CV), a minimum of three letters of recommendation, and the applicant's statement of purpose. NOTE: Applications for the Accelerated Master's Program are for Fall semester admittance only. Other graduate programs can be admitted in both the fall and spring semesters.

The GPA requirements differ depending on the graduate program:

- BE AMP: GPA = 3.3
- 2-year MS: GPA = 3.0
- PhD GPA = 3.3

Applicants are evaluated on the individual merits of their academic achievements and scholarly potential to complete graduate-level coursework and research requirements. The department Graduate Committee, with help from faculty from the student's area of interest, evaluates the candidate's application. Once a decision is made, the departmental recommendation will be transmitted to the Graduate College, and the candidate will be notified.

3.2. BE Admission Requirements

Candidates must hold a bachelor's degree in engineering or a BS in a STEM field to be considered for the BE MS program. Candidates must hold a BS and/or MS degree in engineering or a BS and/or MS in a STEM field to be considered for the BE PhD program. Candidates with non-engineering degrees may be assigned engineering deficiency courses in addition to the MS or PhD requirements. These requirements must be completed to earn the degree. For more details on the admission process, please visit [http://grad.arizona.edu/admissions/requirements].

3.3. BAT Admission Requirements

Candidates must hold a bachelor's degree to be considered for the BAT MS program and a BS and/or MS degree to be considered for the BAT PhD program. Candidates with non-STEM degrees may be assigned deficiency courses, in addition to the MS or PhD requirements. These requirements must be completed to earn the degree. For more details on the admission process, please visit [http://grad.arizona.edu/admissions/requirements].

3.4. Requirements for International Candidates

In addition to the academic requirements for all applicants, international students must satisfy English proficiency, financial guarantee, and health insurance requirements. To demonstrate proficiency in English, refer to the Graduate College policies: [https://grad.arizona.edu/international-students].

4. FINANCIAL SUPPORT IN THE BE DEPARTMENT

There are several funding opportunities available to graduate students. Subject to available funding, MS students will be supported for no more than four (4) semesters (2 years), and PhD students for no more than eight (8) semesters (4 years) per BE department policy.

4.1. Graduate Research and Teaching Assistantships

Graduate Assistants/Associates (GA) positions [https://grad.arizona.edu/funding/gaships] provide students with valuable work experiences and support the department's teaching, research, and outreach missions. Graduate Research Assistantships/Associateships (GRAs) and Graduate Teaching Assistantships/Associateships (GTAs) positions are appointed based on funding allocations. Graduate Assistants (GRA/GTA) receive tuition remission based on FTE (full-time equivalent). Students on 0.25FTE (10 hours a week) qualify for 50% tuition remission, and students on 0.50 FTE (20 hours a week) qualify for 100% tuition remission. GA Nonresident Tuition rates are recalculated to the resident rate, and students are responsible for paying other University fees. Students needing to delay payment for tuition and fees can enroll in the GA Deferment Plan [https://grad.arizona.edu/funding/gaships/benefits-appointment#tuition-deferment
]. All Graduate Teaching Assistants must be evaluated by the respective course instructor at the end of each semester to qualify for continued service and future GA positions in the department.

4.1.1. Graduate Research Assistantships (GRAs)

Based on the funding and annual budget, the department may provide a limited number of GRA positions typically offered to incoming first-year PhD students. Additional Graduate Research Assistantships may be provided by an individual faculty member's research grant(s) or funding mechanisms. Faculty members identify and make selections from active students in the department to work on their respective funded projects.

4.1.2. Graduate Teaching Assistantships (GTAs)

A limited number of departmental 0.25 & 0.50 FTE GTA positions are available each semester. Students hired as GTAs must review policies and complete training and orientations required by the Graduate College [https://grad.arizona.edu/funding/ga].

4.2. Hourly Graders

The BE Department often offers hourly grader positions on a class-by-class basis. Contact either the course instructor or Department Head about possible opportunities.

4.3. Fellowships, Scholarships and Grant Funding

Graduate students are encouraged to apply for fellowships, scholarships, and grants to support their academic journey.

Fellowships and Scholarships Graduate students seeking funding for their studies or research can also find helpful information through the Graduate Center Office of Fellowships [http://gradcenter.arizona.edu/gcof]. Many other scholarship funding resources are available through Scholarship Universe [http://scholarshipuniverse.arizona.edu/].

ProQuest-Pivot-RP: The ProQuest database [https://proquest.libguides.com/pivot] system helps students and faculty identify funding to support research.

Thesis/Dissertation Scholarship: International and Non-Resident students who have completed their PhD degree coursework within two years or two semesters of completing their MS degree may qualify for this Graduate College Scholarship. This award excludes the mandatory registration fees. Students hired as GRAs or GTAs do not qualify for this waiver. For more information on this scholarship, visit https://grad.arizona.edu/funding/opportunities/thesis-dissertation-tuition-scholarships.

5. GENERAL ADMINISTRATION OF THE GRADUATE PROGRAM

5.1. Orientations and Required Training

5.1.1. Graduate School

New students (international and domestic) need to attend the New Student Orientations offered by the Department, Colleges, International Student Office, and University Graduate Professional Student Council (GPSC).

Graduate Teaching Assistants must attend CALES GAT orientation and complete the required TA Training sessions.

5.1.2. Departmental

The BE department organizes an annual Orientation workshop for New Graduate Students hosted by the Director of Graduate Studies, the Academic Program Manager, and Department head.

5.2. Registration

Students can register for courses through UAccess [http://www.uaccess.arizona.edu/]. Graduate students are responsible for enrolling in their coursework (including BE 909/910/920 units) during the open enrollment period. Registration for the first semester in residence should be completed with the Academic Program Manager. Graduate students be enrolled to be considered for funding.

5.3. Deficiencies

Candidates identified with course deficiencies must complete the required coursework satisfactorily before completing their graduate degree program. Although waiving deficiencies is generally difficult, students who disagree with the list of deficiencies provided at admission may contact the Academic Program Manager to submit a petition for review.

5.4. Continuous Enrollment Policy for Domestic Students

To be considered full-time, domestic graduate students must enroll in 6 units per semester. Students who cannot enroll in the fall or spring semester must submit a Leave of Absence form. If you fail to meet the continuous enrollment policy and do not register, you must reapply to the Graduate College and be approved for readmission by the Associate Dean of Academic Programs.

5.4.1. Summer Enrollment

MS and PhD students who plan to defend their Report/Thesis/Dissertation and have completed their required coursework are not required to enroll in a Summer Session.

5.4.2. International Students

International students need to follow their visa enrollment requirements and their sponsor's guidelines. For more information regarding the University of Arizona's international graduate student enrollment policies, see [https://global.arizona.edu/international-students].

5.4.3. Graduate Assistantships

Students who are supported by or through The University of Arizona via assistantships as a Graduate Teaching Assistant (GTA) or Graduate Research Assistant (GRA) are expected to enroll in at least six to nine units per semester, depending on the funding source (refer to the notice of appointment). Individual Colleges may set their own GTA/GRA enrollment requirements.

College of Agriculture, Life & Environmental Sciences (CALES) and College of Engineering (COE) require that all Graduate Assistants/Associates (GA) hired as GTA/GRA must enroll in at least nine units during the first semester of their GA contract. GAs may enroll in 6 units after their first time serving as a GA. For more information on Graduate College GA enrollment requirements, see [.https://grad.arizona.edu/funding/gaships/qualifications-appointment]

5.4.4. Graduate Scholarships

Students awarded Graduate Registration Scholarships or Graduate Tuition Scholarships are required to enroll as full-time students per Graduate College policies [http://grad.arizona.edu/funding/opportunities].

5.5. Graduate Committee Meetings

In addition to meeting with their advisor, students are expected to meet with their committee members at least once per semester to review and discuss their academic/research progress.

5.6. Leave of Absence Policy

Graduate students may apply for a Leave of Absence for a semester or academic year using the Graduate Petition for a Leave of Absence [https://grad.arizona.edu/gsas/gradpath/graduate-petition-and-graduate-petition-user-guides]. Graduate students should review the Graduate College requirements [https://grad.arizona.edu/policies/enrollment-policies/leave-absence] and meet with the Academic Program Manager before filing a LOA petition. International students must also meet with the International Students Programs and Services Advisor before filing for a Leave of Absence. An LOA may affect the status of a graduate student's financial aid. Only academic services or facilities available to the general public can be used during the LOA. Students are responsible for determining the requirements of their funding agency and/or academic unit before applying for a Leave of Absence. Students who fail to enroll/register and do not have an approved Leave of Absence on file will be discontinued from their program. A new graduate application will be necessary for the student to return and continue their program. Readmission is not guaranteed. See Continuous Enrollment [https://grad.arizona.edu/policies/enrollment-policies/continuous-enrollment] and Re-admission Policies [https://grad.arizona.edu/admissions/types/readmission-requirements] for more information.

5.7. Enrollment in Departmental Graduate Seminar (BE 596A/B)

BE 596A and 596B are combined for a single departmental graduate seminar course. The course is designed to support graduate student development by facilitating the exchange of scholarly information through a combination of graduate-student research presentations, guest presentations, discussions, reports, and/or papers. All graduate students are expected to participate in either BE 596A or 596B continuously

throughout their program.

5.7.1. BE 596A (Presenting Class)

MS students must enroll in two (2) units, and PhD students must enroll in four (4) units during their graduate program. These units will be included in the students' plan of study. Students enrolled in the BE 596A class must give a presentation about their research/project to the class and complete the course assignments to receive credit. PhD students who have proof that they have made a graduate presentation in another institution or UA graduate program may petition and receive a waiver and permission to apply the UA/Transfer course towards the PhD unit requirements in the student's Plan of Study (POS). Grades available are A, B, C, D, E, I, W.

5.7.2. BE 596B (Non-presenting Class)

MS students must enroll in two (2) units of 596B, and PhD students must enroll in four (4) units of 596B. These units will be included in the students' plan of study. Students enrolled in the 596B section must coordinate and preside over the seminar presentations and the course assignments to receive a passing grade. Grades available are S, P, F, I, W.

Students who have completed their 596A/B credit requirements must enroll in 596B as a guest in the D2L system for the remainder of their tenure in the program. To remain in good standing in the program, these students must complete the graduate program assignments posted in D2L and are encouraged to attend the weekly seminar. Non-residents receiving a Thesis or Dissertation Scholarship Award are exempt from the BE 596B enrollment requirement; however, they must still attend the course as a guest and fulfill all other requirements.

The department may consider relaxing this requirement on a case-by-case basis if the student submits a petition with appropriate justification. Situations such as sponsor requirements, scheduling conflicts with critical courses, or research-related fieldwork may qualify for a waiver.

5.7.3. Student Resources

There are a variety of student resources, such as the Graduate and Professional Student Council, Think Tank, Writing Center, CALES Learning Lab, UA Libraries, and ProQuest, designed to assist students through their academic journey. The department recommends that students utilize these resources. Graduate Student resources are available on the Department Graduate D2L site and the Biosystems Engineering, Graduate College, and College of Agriculture, Life & Environmental Sciences, College of Engineering and UA websites.

5.7.4. Student Governance, Appeals and Grievances

Resources are available to assist students resolve issues. Graduate students who feel mistreated should first attempt to resolve difficulties by bringing those concerns directly to the person responsible for the action. Students may also choose to meet with their BE major professor, the director of graduate studies, the department head, the academic program manager, or the immediate supervisor of the person responsible for the action. The student may file a formal grievance if the problem cannot be resolved. Issues related to discrimination or harassment based on race, religion, color, sex, age, national origin, disability, veteran status, sexual orientation, gender identity or genetic information should be brought to the Office of Institutional Equity: https://equity.arizona.edu/. Please refer to the Graduate College policies and procedures.

5.8. UAccess GradPath

Students must complete their Graduate College degree "GradPath" forms through their UAccess Student

accounts[http://uaccess.arizona.edu/]. Once a student completes the required GradPath form, the form automatically routes to everyone who needs to see or approve them. The BE Academic Program Manager can assist with this process. If a student feels their GradPath form(s) is not progressing timely, contacting the faculty member or individual responsible for approval can help expedite the process.

5.9. UAccess GradPath Forms

Each of the following steps requires completion and should be taken at the appropriate time during the student's tenure in the department. To keep on schedule for graduation, please refer to the dates and deadlines posted on http://grad.arizona.edu/gsas/degree-requirements/important-degree-dates-and-deadlines. The appropriate forms are accessible through UAccess [http://uaccess.arizona.edu/].

5.9.1. Responsible Conduct of Research Statement

Students must complete the UAccess GradPath Responsible Conduct training to gain access to their required forms.

5.9.2. Plan of Study (POS) Form

In conjunction with their major professor, each student is responsible for developing and submitting a Plan of Study (POS). Two-year MS and PhD students must submit the POS forms before the last day of the second semester. BEAMP students must submit the POS during the first semester of the BEMS. Before creating the POS, students should read the Graduate College's requirements [http://grad.arizona.edu/gsas/degree-requirements]. Courses listed in the POS must match the actual course enrollment/course completion posted in UAccess. After receiving approval for their POS, students who make changes to their UAccess course enrollments must modify and submit the POS for reapproval. Students must enter their Committee Chair (Major Professor), expected graduation term, and their Thesis/Dissertation title on the POS form. For further information on the POS, MS students should see section 6.4, and PhD students should see section 7.8.

5.9.3. Committee Appointment Form

Students should complete their Committee Appointment Form in GradPath no later than the last day of class during their second semester. Students must enter their Committee Members on the form. Students should review the Graduate Faculty section to confirm eligibility to serve on MS and PHD committees.

5.9.4. Degree (MS, AMP, PhD) Completion Form

The Academic Program Manager records the MS student's final oral defense results via the MS GradPath Completion form. The PhD student's Major Professor/Committee Chair is responsible for completing the Final Oral Defense result form. For more information, see [https://grad.arizona.edu/degree-services/degree-requirements].

5.10. Graduate Student Academic Progress Reports

Graduate students must submit a Graduate Student Academic Progress Report annually per Graduate College Requirements. The Major Professor and student must discuss, review, and approve the progress report. The Director of Graduate Studies will also review the Progress Reports for completion and to identify problems. The department suggests a Progress Checklist to help students keep track of and identify key milestones and deadlines. These forms are located on the Graduate Programs D2L support site.

5.11. Enrollment in Multiple Graduate Degree Programs

University of Arizona students may pursue multiple graduate degrees simultaneously, and students must go through the UA Graduate College application process and meet all admission requirements for each degree separately. Please refer to the Graduate College Program Description Guide

[https://grad.arizona.edu/futurestudents/]

5.12. Thesis/Dissertation Publication Requirements

All MS thesis options, and PhD candidates must submit papers for publication or receive committee approval to indicate their work meets the standard for publication in a refereed scientific or engineering journal by the time of their Final Oral Defense. Details about the Thesis and Dissertation paper submission requirements and forms can be found in Appendix B.

5.13. Archiving the Thesis/Dissertation

Students completing an MS thesis (BE 910) or PhD dissertation (BE 920) must archive their final thesis/dissertation document. The final thesis/dissertation documents must be submitted to the University of Arizona Campus Repository, maintained by ProQuest/UM, in accordance with the Graduate College published Dates and Deadlines for graduation [https://grad.arizona.edu/gsas/degree-requirements/important-degree-dates-and-deadlines] during the student's expected graduation term. All degree requirements, including passing the Final oral defense and obtaining approval from the Major Professor/Committee Chair's to archive and publish the final thesis/dissertation (with no remaining edits or revisions), must be fulfilled prior to the Graduate College deadlines. Students unable to meet these deadlines and requirements must change their expected graduation term and notify the Academic Program Manager of their progress at least one month before the end of the semester.

5.14. Commencement

The University of Arizona, the College of Agriculture, Life & Environmental Sciences, the College of Engineering, and the Department of Biosystems Engineering all celebrate graduate degree completion.

5.14.1. University Commencement

The University of Arizona holds its commencement in May. UA Commencement information can be found at [http://grad.arizona.edu/gsas/commencement]. Students should ensure the address listed in their UAccess Student Center is current; diplomas are mailed to the 'permanent' address listed.

5.14.2. College of Agriculture, Life & Environmental Sciences (CALES)

The College of Agriculture, Life & Environmental Sciences has hooding ceremonies twice a year at the end of each academic semester. BAT and BE Graduate students who plan to attend the ceremony should select a Faculty Member, usually their advisor, to perform the Hooding ceremony.

5.14.3. College of Engineering (COE)

The College of Engineering holds a commencement/hooding ceremony at the end of the fall semester only. BE Graduate students can attend both (CALES and COE) ceremonies if they wish. BAT and BE Graduate students who plan to attend the ceremony should select a Faculty Member, usually their advisor, to perform the Hooding ceremony

5.14.4. Biosystems Engineering Department

The BE department holds a pre-commencement celebration twice a year -- at the end of each academic semester. Students completing degree requirements in August can attend either the May or December events.

5.15. International Student Resources

International students must familiarize themselves with the Office of Global Initiatives for International Students [http://global.arizona.edu/] and review the Student Resource Manual at [http://global.arizona.edu/international-students/student-resource-manual].

International students should check with the Office of International Student Programs to confirm compliance with their visa status requirements, as they may need to enroll in additional units to maintain full-time student status. Students should also check their I-20 expiration date and, if necessary, begin the renewal process. Students need to give themselves plenty of time to maintain their status. The process may take up to 6 months or more.

5.16. Graduate Student Learning Outcomes Assessment

5.16.1. Expected Learning Outcomes

5.16.1.1. Masters of Science

By the completion of the Graduate program, master's students in the Biosystems Engineering Department will:

1. Demonstrate knowledge of their focus area.
2. Critically analyze published research results in their focus area.
3. Conduct research in their focus area.
4. Demonstrate effective communication skills and defend the results of research to peers and broader scientific audiences.

5.16.1.2. Doctor of Philosophy

By the completion of the Graduate program, Doctoral students in the Biosystems Engineering Department will:

1. Demonstrate a broad knowledge of their focus area.
2. Critically evaluate published research results in their focus area.
3. Produce and conduct original research in their focus area.
4. Add to the body of knowledge of their discipline.
5. Effectively communicate and defend the results of research to peers and broader scientific audiences.

5.16.2. Assessment Activities

Assessments will be conducted throughout the graduate student's tenure in the BE Department following Tables 1 and 2. Common to all graduate programs in the BE department are the requirements of graduate seminar presentations, the oral defense of the research or creative activity, and the written exit survey. In addition to these common elements, the BE and BAT PhD programs require students to complete a comprehensive exam based on coursework and knowledge of their focus area. These already existing assessment activities are also used to gather program-level assessment data. Appendix F has the rubrics for the assessments in Tables 1 and 2.

Table 1. Graduate program assessments for master's students.

Assessment Activities	Outcome 1: Knowledge of the Focus Area	Outcome 2: Critical Analysis of Research In the Focus Area	Outcome 3: Conduct Research	Outcome 4: Communicate and/or Defend Research
BE 501, Research Methods in Biosystems Engineering	X			X
Graduate Seminar Presentations (BE 596A)		X		X

Oral Defense of the Report/Thesis[1]	X	X	X	X
Written Exit Survey	X	X	X	X
[1]For an example of the rubric, see Appendix F				

Table 2. Graduate program assessments for Doctoral students.

Assessment Activities	*Outcome 1: Broad Knowledge of the Focus Area*	*Outcome 2: Critical Evaluation of Research in the Focus Area*	*Outcome 3: Conduct Original Research*	*Outcome 4: Add to Body of Knowledge*	*Outcome 5: Communicate and/or Defend Research*
BE 501, Research Methods in Biosystems Engineering	*X*				*X*
Graduate Seminar Presentations (BE 596A)		*X*		*X*	*X*
Oral Comprehensive Exam[1]	*X*				
Oral Defense of the Dissertation[1]	X	*X*	*X*		X
Submit Manuscript to a Peer-reviewed Journal or Conference Proceedings				X	
Written Exit Survey	*X*	*X*	*X*	X	X
[1]For an example of the rubric, see Appendix F					

6. MASTER OF SCIENCE (MS) DEGREE IN THE BIOSYSTEMS ENGINEERING DEPARTMENT

The Biosystems Engineering Department offers three Master of Science degree programs: Accelerated Masters (AMP) in Biosystems Engineering and two Traditional Masters (2-year MS) in Biosystems Engineering and Biosystems Analytics & Technology. This section summarizes the requirements and steps for completing the AMP or the 2-year MS program. Students in both the AMP and the 2-year MS programs are responsible for meeting the departmental program and Graduate College requirements. Students must also review the Graduate College Policies and Procedures [http://grad.arizona.edu/policies] and the degree requirements for Master's degrees at [https://grad.arizona.edu/catalog/]. The requirements for Master's Degrees on the Graduate College website [http://grad.arizona.edu/gsas/degree-requirements] provide additional details. Students in the BEAMP and 2-year BEMS programs may choose either the thesis or graduate report option to complete their degree requirements.

AMP Students may complete up to 12 units of graduate-level courses in the final two semesters of their BS program, which may be applied to the BS and BEMS requirements. All required units of credit must be graduate-level coursework (500 level or above) completed at The University of Arizona or approved equivalent transfer units.

NOTE: Students must apply to the BEMS at the beginning of their second semester in the AMP graduate

program. Once the BS degree is awarded and the BEMS application is processed, the student will be considered a BE MS graduate student. Graduate Units taken in the AMP will be transferred into the BE MS program. The checklist for completing the degree steps is in Appendix C.

6.1. Credit Requirements

6.1.1. Traditional BAT MS

For an MS in Biosystems Analytics & Technology, students must complete a minimum of 30 units consisting of the following:

- 1 unit BE 597A
- 2 units of BE 501
- 2 units of BE 596A (presenting)
- 2 units of 596B (non-presenting)
  - Continuous enrollment in either BE 596A or 596B is expected.
  - Students must receive approval from the Department to be excused from this requirement.
- 3 units BE 513
- 3 units BE 534
- 3 units ENVS 508
- 9 units of elective courses (per Major Professor's approval)
  - Electives may include a 1-unit lab rotation experience (BE 593)
- 5 units of either BE 910 Thesis (thesis option) or BE 909 Graduate Report (non-thesis option) under their Major Professor's section number

All courses in the Plan of Study must be taken for a grade (A, B, C) except for BE 596B (S, P, F) and the optional 1-unit lab rotation (BE 593). To satisfy degree requirements, students must maintain a cumulative GPA of 3.0 or higher in graduate-level courses. A student whose GPA falls below 3.0 will not be permitted to register for additional courses. See Graduate College Policies online at https://grad.arizona.edu/admissions/requirements.

According to the Graduate College policy, units completed beyond the degree requirements should not be listed in the student's GradPath Plan of Study.

6.1.2. BE AMP

BEBSAMP students must complete a minimum of 30 units consisting of the following:

- 1 unit BE 597A
  - BE 597A will count toward the BEBS technical elective requirements
- 2 units of BE 596B (non-presenting).
  - BE 596B counts towards the BEBS technical elective requirements
    - Students must receive approval from the BE Graduate Committee to be excused from this requirement.
- 2 units of BE 596A (presenting)
  - Completed in the second-to-last and last semester of the MS program (third year in the AMP)
  - Continuous enrollment in either BE 596A or 596B is expected. As per the Graduate College policies, units in excess of the 2 required will not be listed on the student's GradPath Plan of Study
- 2 units of BE 501
  - BE 501 counts toward the BEBS technical elective requirements
- 3 units BE 513

- 3 units ENVS 508 – ENVS508 satisfy the BEBS technical writing requirement.
    - Students who completed the ENVS 408 course prior to AMP admissions may complete an elective course instead.
- 9 units of BE courses (limit of 3 units of house-numbered courses, i.e., 592, 593, 599)
- 3 units of an Elective course (per Major Professor's approval)
- 5 units of either BE 910 Thesis (thesis option) or BE 909 Graduate Report (non-thesis option) under their Major Professor's section number

All coursework must be in courses graded A, B, or C except for house-numbered courses, i.e., 592, 593, 599. AMP students may not take more than 12 units of graduate coursework while in their senior year of the AMP.
Students enrolled in the BEAMP must maintain a 3.0 GPA in the program to register for courses.
A student whose GPA falls below 3.0 will not be permitted to register for additional courses [https://grad.arizona.edu/admissions/requirements] AMP students must complete the Undergraduate Enrollment form [https://grad.arizona.edu/policies/enrollment-policies] during the final year of their BS program to receive permission to enroll in their 500-level coursework.

6.1.3. Traditional BE MS

For an MS in Biosystems Engineering, students must complete a minimum of 30 units consisting of the following:

- 1 unit BE 597A
- 2 units of BE 501
- 2 units of BE 596A (presenting)
- 2 units of 596B (non-presenting)
    - Students must receive approval from the BE Graduate Committee to be excused from this requirement.
    - Continuous enrollment in either BE 596A or 596B is expected. As per the Graduate College policies, any units in excess of the 2 required will not be listed on the student's GradPath Plan of Study
- 3 units BE 513
- 3 units ENVS 508
- 9 units of BE courses (limit of 3 units of house-numbered courses, i.e., 592, 593, 599)
- 3 units of elective courses (per Major Professor's approval)
- 5 units of either BE 910 Thesis (thesis option) or BE 909 Graduate Report (non-thesis option) under their Major Professor's section number

All courses in the Plan of Study must be taken for a grade (A, B, C) except for BE 596B (S, P, F) and the optional 1-unit lab rotation (BE 593). The cumulative GPA in graduate-level courses must be 3.0 or higher to complete degree requirements. A student whose GPA falls below 3.0 will not be permitted to register for additional courses [https://grad.arizona.edu/admissions/requirements]

6.2. Time Limitation

All requirements for the master's degree must be completed within six (6) years. Time-to-degree begins with the earliest course to be applied toward the degree, including credits transferred from other institutions. Coursework over six (6) years old is not accepted [http://grad.arizona.edu/gsas/degree-requirements/masters-degrees#time-limitation].

6.3. Transfer Credit

Graduate Course Transfer credits may apply toward the MS degree. Up to six (6) units for a master's degree may be transferred from other accredited institutions. The minimum grade for transferred graduate-level credits must be an A or B or the equivalent at the institution where the course was taken. The transfer grades are not included in the student's UA GPA.

Students who wish to apply Transfer units toward their MS degree should consult with the Academic Program Manager about the desired substitutions and may be asked to provide course descriptions and/or syllabi. The Graduate Program Committee will review the requested substitutions and determine if the transfer course(s) are equivalent. The course may be listed on the Plan of Study (POS) after approval is granted by the BE Department. Refer to the Graduate College Transfer Credit policies [http://grad.arizona.edu/academics/program-requirements/masters-degrees] and contact the BE Academic Program Manager.

6.4. Master's Plan of Study (POS) Form

In collaboration with their Major Professor, each student is responsible for developing a Plan of Study (POS) by the end of their first semester. The two-year MS Plans of Study must be filed in GradPath no later than the end of the first semester in residence. Students enrolled in the AMP program must file their Plan of Study in GradPath at the beginning of their first year in the BEMS (3rd semester in the AMP). The Plan of Study identifies:

1. Courses already completed and planned at The University of Arizona, which the student intends to apply toward the graduate degree, and
2. Approved Transfer courses.

The student should receive approval from the Major Professor before submitting their Plan of Study to the GradPath. The Plan of Study must have the approval of the Academic Program Manager, the Major Professor, the Minor Advisor (if applicable), the BE Director of Graduate Studies, and the Graduate College.

Courses listed in the POS must match the actual course enrollment/course completion posted in UAccess. Students who make changes to their UAccess course enrollments, after receiving approval for their POS, must submit a new POS for reapproval [http://grad.arizona.edu/gsas/degree-requirements/masters-degrees#plan-of-study].

6.5. MS Major Professor

Unless an earlier arrangement was made with a specific faculty to serve as the student's advisor, in the first few weeks after joining the program, students must meet with the BE Director of Graduate Studies to discuss options and procedures for choosing a Major Professor. A permanent Major Professor must be selected by the *end of the first semester of study*. The candidate's Major Professor specialization should match the student's main field of interest. The primary role of the Major Professor is to guide the students in coursework and to keep the students informed on whether they are making satisfactory progress. The Major Professor will serve as the student's mentor and Graduate Committee Chair. They are responsible for *helping* the student select their MS Graduate Committee members and developing a Plan of Study. The Major Professor is responsible for meeting with the student at least once a semester to review the student's progress.

The primary responsibilities of a Major Professor include the following:

1. Serves as a resource for academic information for their graduate student(s).
2. Provides guidance in developing the Plan of Study (POS)
3. Support degree progression by reviewing and approving forms in GradPath as needed.

4. Serves as the student's Graduate Committee Chair, and

Promotes academic progress by providing regular, timely guidance, and feedback.

6.5.1. Faculty Eligible to Serve as MS Major Professor

The Major Professor must be a member of the Biosystems Engineering Graduate Faculty (see Appendix D). A Graduate Faculty member from other programs/departments may not serve as the sole major professor but may serve as a co-chair/co-major professor.

6.6. MS Graduate Committee

Each graduate student shall form a graduate committee. The Master's Graduate Committee is responsible for approving the student's proposal, reviewing the master's thesis/report, and assessing the Final Oral Defense and the report/thesis for awarding the Master's degree.

The responsibilities of the graduate committee are to:

1. Mentor the graduate students in their research and research practices
2. Assist students in selecting courses to develop skills and knowledge
3. Approve graduate students' plans of study
4. Meet with the graduate student at least once a semester
5. Review and approve graduate students' progress reports
6. Assess student progress and measure their ability to meet program objectives
7. Attend and judge the final oral defense

6.6.1. Faculty Eligible to Serve on the MS Graduate Committee

The Master's Graduate Committee must consist of three members. At least two committee members must be Biosystems Engineering Graduate Faculty members. The third member can be another BE faculty member or a graduate faculty member from another program/department. If the third member is not a member of a Graduate Faculty, they must be approved by the Graduate College to serve as a special member. Special member requests are initiated by the Academic Program Manager and approved by the Graduate College [https://grad.arizona.edu/forms/gsas/special-member-request]. Please contact the Academic Program Manager to initiate and process the Special Member request. Appendix D lists the criteria for the departmental Graduate Faculty, as well as a list of current members of the Biosystems Engineering Graduate Faculty.

6.7. MS Thesis/Graduate Report Requirements

The thesis option represents the standard and traditional format for presenting the findings of the master's research project. This option provides an opportunity for students to demonstrate their ability to communicate their work in writing, serving as preparation for the dissertation and potentially marking the beginning of their publishing record.

Students may choose the graduate report option when:

- The research project is not funded.
- The research is limited in scope.
- The research work is probably not publishable, but there could be interest in the information (industry or another entities).
- The research is related to a specific project at their place of employment.
- The MS program will be a terminal degree.

Depending on the project's scope, the major professor may require the thesis route. Graduate Assistantship

(GA) and tuition waiver awards may also require the thesis route.

Once the Plan of Study has been submitted and the thesis/report option is declared, the student is expected to complete the option indicated in the Plan of Study. NOTE: AMP students cannot formally declare their option in UACCESS GradPath until the Graduate College processes their BEMS applications.

6.7.1. Thesis Option

Students are required to:
Submit a minimum of one journal article for publication or receive approval for submission to a refereed journal from their Major Professor, and.

1. Be listed as the first author in the paper approved for submission, and
2. Consistently use a standard style guide for in-text citations and in the Reference/Citation List. See additional guidance in Appendix B.

Copies of archived thesis papers are available through the University Libraries [https://libguides.library.arizona.edu/type/theses].

6.7.2. Graduate Report Option

Students must submit a graduate report to their committee following the format required by the department. Typically, if the student conducts experimental research, they will use the thesis option format minus the paper requirement.

6.8. Research Proposal

The Research Proposal is a plan with sufficient academic merit about a research topic that meets the standards of clarity, originality, and feasibility set by the graduate program, advisor, and committee. The candidate must include the title of their Research Proposal in their Plan of Study. A draft of the Research Proposal will be completed in the second semester of the BE 501 course requirement. The final Research Proposal will be completed by the end of the 2nd semester in the program and submitted to the appropriate BE Graduate Programs D2L Assignment box. The MS Research Proposal must indicate the selected option: thesis or report.

6.9. Final Oral Defense/Examination

6.9.1. Dates and Deadlines

Scheduling the Final Oral Defense and satisfying all the requirements relating to the Final Oral Defense is the student's sole responsibility. All students should refer to the Graduate College Dates and Deadlines website when planning their oral defense [https://grad.arizona.edu/gsas/degree-requirements/important-degree-dates-and-deadlines. It is very critical that students coordinate this important and time sensitive step with their advisor and committee, failure to follow deadlines may result in major delays.

6.9.2. MS Thesis/Report Defense Process

The following lists the steps needed to complete the Master's Thesis or Report Defense:

1. While students are highly encourage to start writing earlier, upon completion of the research work, the student writes their report or thesis and presents it to their advisor for an initial review and approval then to their Master's Graduate Committee as the final draft (penultimate version) not less than one month before the proposed defense date, recognizing that the defense date needs to be at least one week before the Graduate College final submission deadline of the semester the student plans to graduate. This will give you time to deal with unforseen scheduling conlficts and delays and gives yoru committee a chance to review your work.
2. The student should coordinate with their Master's Graduate Committee to determine the review

process schedule before the proposed defense date.

3. Once the committee approves the proposed defense date, then at least one week but no more than two weeks before, the student sends to their committee the departmental *Final Oral Defense Approval form* (forms are found in Appendix E and the BE Graduate Program D2L site in the Forms section). This form indicates that the committee has read the report/thesis and believes the student is ready to defend the report/thesis.
4. The committee then signs the *Final Oral Defense Approval* form, and the student uploads it to the appropriate D2L assignment folder.
    - If the committee determines that the student is not ready to defend, the Chair and student will then send an email notice with a new "Program Completion Date (Expected Graduation Term)" to the Academic Program Manager, the BE Director of Graduate Studies, and the Graduate College Degree Check Advisor [https://grad.arizona.edu/directories/degreeauditors.html].
5. Once the candidate is approved to defend, the student may set the defense date in consultation with the committee members.
    - Students should plan and allow time for any additional revisions or edits that may be required during the oral defense when scheduling their defense with the committee and considering the Graduate College Dates and Deadlines for archiving the final approved thesis [https://grad.arizona.edu/gsas/degree-requirements/important-degree-dates-and-deadlines].
6. Upload the MS Defense Announcement to the appropriate D2L assignment folder. The Announcement template is available on the D2L Graduate Programs Student Support site >> Content >> Forms.
7. Upload the completed and signed *Journal Article Certification* form to the appropriate D2L assignment folder. NOTE: MS-thesis candidates must complete *at least* one journal article, which must be included in either the body or the appendix of the thesis. The *Journal Article Certification* usually involves the major professor confirming that your manuscript has been published, is under review, or has been or will be submitted.
8. Once the approved Journal Article Certification, Final Oral Defense Approval, and Defense Announcement forms are uploaded to D2L, the Academic Program Manager will send the student's announcement out to the students, staff, and faculty in the department. **The student is responsible for sending a calendar reminder to their committee members**.

The Major Professor (Graduate Committee Chair) presides over the Final defense examination. Each of the Thesis/Report Committee members should receive a copy of the thesis/project report approved by the student's Major Professor (not necessarily the library-ready copy) at *least two weeks before the expected date of the Final Defense examination*. This copy may differ slightly from the version previously shared with the committee in preparation for the defense and will be further revised if changes are required following the oral defense.

The examination cannot exceed three hours, and is composed of two parts:

1. **Public presentation**. During the first part (about 30-45 minutes), the student gives an oral presentation of the thesis/report in an open public seminar. The presentation may be briefly interrupted to allow questions for clarification or on fundamental principles directly related to the thesis/report, although this is not generally encouraged.
2. **Committee Assessment**. The second part of the examination consists of a closed-to-the-public questioning by the committee members on the student's knowledge of the discipline and their research project.

Please refer to the Final Oral Examination Instructions located under Steps to Defense on the BE Graduate Program D2L site [https://d2l.arizona.edu/d2l/le/content/1043691/viewContent/10909473/View].

Members of the committee must be present for the entire examination. Per Graduate College policies, a member may participate in the Defense remotely (e.g., via Zoom, Skype, or GoToMeeting). If a member cannot participate in person or remotely, the student must replace them with another tenured, tenure-track, or continuing-appointment committee member and update their Committee Appointment form.

Students are discouraged from serving food or drinks other than water during their oral defense. NOTE: Bottled water is available from department with prior arrangement.

6.9.3. Reporting Final Oral Defense (Examination) Results

After the Defense:

1. The student's Graduate Committee will determine if the student passed, passed with revisions, or failed the exam.
2. The Major Professor (Committee Chair) will submit the results to the Academic Program Manager via email. Results must be reported to the Graduate College before the date the degree is conferred [https://grad.arizona.edu/gsas/degree-requirements/important-degree-dates-and-deadlines].
3. If the candidate passes the final oral defense without revisions, the student may proceed with archiving their documents in ProQuest.
   - The Major Professor (Committee Chair) notifies the Academic Program Manager of the student's "Pass with no revisions" status and processes a Change of Grade Form in UAccess Instructor.
   - The Department Academic Program Manager records the results of the MS defense in GradPath after receiving confirmation of approval of the FINAL thesis from the Major Professor.
   - Candidates who complete the MS Thesis option must archive the final approved thesis electronically in ProQuest [https://www.etdadmin.com/?siteId=63].
   - Candidates who completed the MS Report option must upload a copy of the report to the BE Graduate D2L Assignment box; they do **not** submit their final report in the ProQuest system.
   - Candidates must provide electronic copies of the final thesis/report to the Major Professor and Committee members. The candidate is advised to check with their Major Professor for any special requirements.
4. If the candidate **passed the final oral defense *with* revisions**, the following steps need to be taken:
   - The Graduate Committee must set a deadline for the student to resubmit the required corrections/edits or delegate this responsibility to the chair.
   - The Major Professor (Committee Chair) ensures that the student completes the committee's recommendations and notifies the Academic Program Manager that the revisions are completed and the student has met the degree requirements. The Chair processes the Change of Grade in UAccess Instructor.
   - The Department Academic Program Manager records the results of the MS defense in GradPath after receiving confirmation of approval from the Major Professor.
   - Candidates who complete the MS Thesis option must archive the final approved thesis electronically in ProQuest [https://grad.arizona.edu/degree-services/dissertaions-theses/submitting-and-archiving-your-thesis].
   - Candidates who completed the MS Report option must upload a copy of the report to the BE Graduate D2L Assignment box; they do **not** submit their final report in the ProQuest system.
   - Candidates must provide electronic copies of the final thesis/report to the Major Professor and Committee members. The candidate is advised to check with their Major Professor for any

special requirements.

5. If the candidate **fails the final oral defense**, the candidate may be granted a second examination upon the recommendation of the major department. The result of the second examination is final. Students who fail the examination should meet with their committee members to discuss the next steps. However, with timely planning, consistent communication with the advisor and committee, and following the steps outlined above, this situation can be effectively avoided and should never arise.

7. Doctor of Philosophy (PhD) Degree in Biosystems Engineering and Biosystems Analytics & Technology

Earning a Doctor of Philosophy (PhD) degree at The University of Arizona requires outstanding scholarship and distinguished research that results in a dissertation making a significant contribution to the discipline's body of knowledge. This section outlines the requirements for completing a PhD degree in the Biosystems Engineering Department.

PhD students should become familiar with the BE program and Graduate College requirements. They are also expected to review the Graduate College Policies and Procedures [http://grad.arizona.edu/degreecert] and the degree requirements for PhD degrees [http://grad.arizona.edu/gsas/degree-requirements/doctor-philosophy].

7.1. Pursuing a PhD after an MS at the University of Arizona

For admission into either PhD program, the department requires a minimum GPA of 3.3 in the student's MS program. A student may use a maximum of 25 credits from their UA Biosystems Analytics & Technology or UA Biosystems Engineering master's degree(s) towards their doctorate program [https://grad.arizona.edu/gsas/degree-requirements/doctor-philosophy#Credit%20Requirements,%20Transfer%20Credit,%20Prior%20Learning].

7.2. Major Professor

In the first few weeks after joining the program, students must meet with the BE Director of Graduate Studies to discuss options and procedures for choosing a Major Professor. A permanent Major Professor must be selected by the *end of the first semester of study*. The candidate's Major Professor should specialize in the student's main field of interest. The primary role of the Major Professor is to guide the student in coursework and to keep the student informed on whether they are making satisfactory progress. The Major Professor will act as the student's mentor, serve as the Graduate Committee chair, and is responsible for *helping* the student select their PhD Graduate Committee members and develop a Plan of Study and research proposal in collaboration with the Graduate Committee. The Major Professor is responsible for meeting with the student at least once a semester to review the student's progress.

The primary responsibilities of a Major Professor include the following:

1. Serves as a resource for academic information for their graduate student(s).
2. Provide guidance in developing the plan of study.
3. Support degree progression by reviewing and approving forms in GradPath as needed.
4. Serves as the student's Graduate Committee Chair, and
5. Promotes academic progress by providing regular, timely guidance, and feedback.

7.2.1. Faculty Eligible to Serve as the PhD Major Professor

The Major Professor must be a member of the Biosystems Engineering Graduate Faculty. A list of faculty members who can serve on doctoral committees as sole committee chairs is provided in Appendix D. No

other faculty member can serve as the sole chair of a doctoral committee. Faculty not meeting the endorsement criteria set in Appendix D will need a BE Graduate Faculty member who does meet the endorsement criteria set in Appendix D to serve as co-chair.

NOTE: The Academic Program Manager will serve as the Administrative Advisor. The Administrative Advisor will assist the candidate with all graduate forms, entering information into GradPath, checking procedures, and other administrative activities.

7.3. PhD Graduate Committee

The PhD Graduate Committee approves the Doctoral Degree Plan of Study and serves as the committee for the Final Oral Defense of the Doctoral Dissertation. It may also serve as the Comprehensive Examining Committee. Since the PhD Graduate Committee plays such a central role in the doctoral program, it should be formed soon after the selection of the major professor.

The responsibilities of the graduate committee are to:

1. Mentor the graduate students in their research and research practices.
2. Assist students in selecting courses to develop skills and knowledge.
3. Approve graduate students' plans of study.
4. Meets with the graduate student at least once a semester.
5. Reviews and approves graduate students' progress reports.
6. Assess student progress and measure their ability to meet program objectives.
7. Attend and judge the final oral defense.

7.3.1. Faculty Eligible to Serve on the PhD Graduate Committee

The PhD Graduate Committee consists of at least three faculty members representing the major subject area and one or more faculty members representing the minor subject area. At least two faculty members with expertise in major subject must be from the Biosystems Engineering Graduate Faculty; the third member may be from within or outside the department. The Graduate College requires a minimum of three members, all of whom must be Graduate Faculty members or approved as equivalent. Appendix D outlines the criteria for departmental Graduate Faculty for both graduate programs and provides a list of Biosystems Engineering Graduate Faculty members. A student may request that a non-Graduate Faculty member expert be admitted as a Special Member if their expertise is considered critical to the PhD. Please contact the Academic Programs Manager to process the Special Member request [https://grad.arizona.edu/forms/gsas/special-member-request].

7.4. Credit Requirements for PhD

For a PhD in Biosystems Engineering, a candidate must complete 63 units (minimum) consisting of 45 non-dissertation units and 18 Dissertation (BE 920) units. All required credit units must be graduate-level coursework (500 level or above) completed at The University of Arizona or approved equivalent transfer units.

7.4.1. Minimum Course Requirements for BAT PhD

For a PhD in Biosystems Analytics & Technology, students must complete a minimum of 63 units consisting of the following:

- 1 unit BE 597A
- 1 unit of BE 693 (section # under faculty sponsor)
- 2 units of BE 501
- 3 units of BE 513

- 3 units of BE 534
- 3 units of ENVS 508
- 4 units of BE 596A (presenting)
  - EXCEPTION: Candidates with a BAT/BE MS degree may apply 2 units of BE 596A credits completed in the MS program towards the 4 units of BE 596A requirements.
  - Any units exceeding the 4 units of BE 596A will not be listed on the student's Plan of Study
- 4 units of 596B (non-presenting)
  - EXCEPTION: Candidates with a BAT/BE MS degree may apply 2 units of BE 596B credits completed in the MS program towards the 4 units of BE 596B requirements.
  - Continuous enrollment in BE 596B for each semester they are not presenting is expected. Students must receive approval from the Department to be excused from this requirement.
  - As per the Graduate College policies, any unit exceeding the 4 required units will not be listed on the student's Plan of Study.
- 12 to15 units of elective courses per approval of Major Professor (depending on the required minor units)
  - may choose a 1-unit lab rotation experience (BE 593) as an elective
- 18 units (minimum) of Dissertation units (BE 920)
- 9 to12 units in the minor, depending on the Minor Department requirements

7.4.2. Minimum Course Requirements for BE PhD

For a PhD in Biosystems Engineering, students must complete a minimum of 63 units consisting of the following:

- 1 unit BE 597A
- 1 unit of BE 693 (section # under faculty sponsor)
- 2 units of BE 501
- 3 units of BE 513
- 3 units of ENVS 508
- 4 units of BE 596A (presenting)
  - EXCEPTION: Candidates with a BAT/BE MS degree may apply 2 units of BE 596A credits completed in the MS program towards the 4 units of BE 596A requirements.
  - Any units exceeding the 4 required units will not be listed on the student's Plan of Study
- 4 units of BE 596B (non-presenting)
  - EXCEPTION: Candidates with a BAT/BE MS degree may apply 2 units of BE 596B credits completed in the MS program towards the 4 units of BE 596B requirements.
  - Continuous enrollment in BE 596B for each semester they are not presenting is expected. Students must receive approval from the Department to be excused from this requirement
  - As per the Graduate College policies, any units exceeding the 4 required units of BE 596B will not be listed on the student's GradPath Plan of Study
- 6 units of either Numerical Analysis or other approved Mathematics/Statistics/Modeling courses
- 9 units of BE courses (limit of 3 units of house-numbered courses, i.e., 592, 593, 599)
  - may choose a 1-unit lab rotation experience (BE 593) as an elective
- 0 to 3 units of elective courses per approval of Major Professor (depending on the required minor units)
  - may choose a 1-unit lab rotation experience (BE 593) as an elective
- 18 units (minimum) of Dissertation units (BE 920)
- 9 to 12 units in the minor, depending on the Minor Department requirements

All courses in the Plan of Study must be taken for a grade (A, B, C) except for BE 693 (Teaching Internship)

and 1 unit of lab rotation (BE 593).

7.5. Transfer Credit

Graduate credit earned at other approved institutions, if accepted by the department and the Graduate College, may be counted toward the PhD degree requirements. Students who wish to have Graduate Transfer units apply toward their PhD degree must communicate with the Academic Program Manager about the desired substitutions and may be required to provide course descriptions and/or syllabi.

Transferred units are subject to the following conditions:

1. The BE Graduate Committee, the minor committee advisor and the Graduate College must approve the credits.
2. The minimum grade for transferred credits must be an A, a B, or the equivalent at the institution where the course was taken.
3. Transferred units may not count toward more than one doctorate.
4. A maximum of 30 units of transfer coursework may be applied toward the PhD requirements.

The Graduate Committee will review the petition and determine if the transfer course meets the program objectives. If the request is approved, the course may be listed on the Plan of Study. Please reference Graduate College Transfer Credit policies, [https://catalog.arizona.edu/policy/courses-credit/credit/graduate-transfer-credit], and contact the BE Academic Program Manager.

7.6. PhD Minor Requirements for BAT and BE PhD Candidates

BAT/BE PhD students are required to complete a minor. The minor subject area may be taken inside or outside the BE Department, BUT it must be in a different area than the major focus. The student may choose one or two minor areas in consultation with their Major Professor. Students must select their Minor advisor and receive approval from their BE Major Professor before completing the Graduate College Minor application and filing their POS. The Minor Advisor will serve on the PhD Graduate Committee.

The minor department determines specific requirements. The Graduate College requires at least nine (9) units of minor coursework; however, minor programs require nine (9) to twelve (12) units. Students must confirm the minor requirements with the minor program [https://grad.arizona.edu/catalog/].

- Suggested minors for BE PhD: Soil, Water, and Environmental Science; Plant Sciences; Chemical and Environmental Engineering; Civil Engineering and Engineering Mechanics; Electrical and Computer Engineering; Hydrology and Water Resources; Resource Economics; Mathematics; Renewable Natural Resources; Systems and Industrial Engineering; Aerospace and Mechanical Engineering; Biomedical Engineering; and Optical Science.
- Suggested minors for BAT PhD: Bioinformatics, Biostatistics, Controlled Environment Agriculture, Ecology, Health Informatics, Informatics, Management Information Systems, Math, Microbiology, Natural Resources, Remote Sensing, Renewable Natural Resources, Science Information Systems, and Statistics.

7.7. Requirements for Minoring in BAT or BE

To minor in Biosystems Analytics & Technology or Biosystems Engineering, a candidate must complete 10 units consisting of:

- 9 units of departmental courses determined by the student and their BAT/BE minor advisor, and
- at least 1 unit of BE 596A, Graduate Seminar presentation.

If departmental PhD students minor in one of the BE department's BAT or BE programs, and as per the Graduate College policies, PhD students cannot double-dip between Major and Minor coursework. See the

Courses Shared Between Degrees section on the Grad College Doctor of Philosophy requirements page: "No course may be counted toward the requirements for more than two plans (at UA or elsewhere)."

Students must select their BAT/BE Minor advisor and receive approval from their Major advisor before completing the Graduate College Minor application and filing their POS. The Minor Advisor will serve on the PhD Graduate Committee.

7.8. Teaching Experience Requirement

The BE department recognizes that many PhD students will take on faculty roles and teach at universities or colleges. Students are required to complete the PhD Teaching Experience plan (see Appendix E or D2L Graduate Programs Student Support site >> Content >> Forms). Students must have a plan, select a teaching experience advisor, and receive approval from their Major Professor. The Teaching Experience Advisor must be a BE Faculty member, not necessarily the Major Professor. A report must be submitted to the internship advisor at the end of the teaching internship. The completed Teaching Experience Plan will be submitted to the appropriate D2L assignment folder.

All PhD students must have at least one unit of teaching to document their teaching experience. The following are methods to fulfill this teaching experience.

Graduate Teaching Experience Options:

1. BE 693 Internship. Students will serve as a GTA for one semester and enroll in 1 unit under their Major Professor's BE 693 internship section. The GTA Internship must have significant teaching responsibilities.
2. Take FCSC/CALS 596E, Learner-Centered Teaching for Online Delivery: This seminar course introduces students to common pedagogical issues associated with assisting in and teaching learner-centered courses in online formats.
3. Take IA 697A, Learner-Centered Teaching: This seminar course is designed for graduate students who serve as teaching assistants/graders or who plan to pursue a career in teaching. Pedagogical issues central to teaching/learning at the college level, such as learning styles, classroom climate, and culture, will be covered.
4. Take IA 697B, Using Technology in Teaching: This seminar course combines in-depth reading and discussion related to pedagogical issues in using technology in teaching and learning with guided, individually focused training and practice in using technology in teaching.
5. Take IA 697G, Universal Design: Inclusive Learning Environments: This course comprehensively reviews the theory, strategies, and techniques used in instructional design processes that foster inclusive learning environments for all learners. The curriculum addresses characteristics of learners such as learning differences and preferences and 21st-century learning attributes, approaches for utilizing differentiated instruction, engagement and motivation techniques, classroom management tactics, and universal design strategies. Emphasis will be placed on the critical literature review as practically applied to various learning environments and contexts in post-secondary education.
6. Complete the Graduate Teaching Certificate through the University Center for Assessment, Teaching & Technology (https://academicaffairs.arizona.edu/cirtl-certificate).

7.9. Time Limitation

PhD Students must complete their degree within five years of passing the Comprehensive Examination. A student who has not finished within that time period may be allowed to retake the Comprehensive Examination with the permission of the BE Graduate Program Director.

7.10. Plan of Study

In collaboration with their Major Professor, each student is responsible for developing a Plan of Study by the end of their first semester. The Plan is to be filed in GradPath no later than the end of the second semester in residence. The Plan of Study identifies:

1. Approved Transfer courses.
2. Courses already completed and planned at The University of Arizona, which the student intends to apply toward the graduate degree, and
3. Approved Minor courses.

Before submitting their Plan of Study in GradPath, the student must receive approval from their PhD Graduate Committee, Major Professor, Minor Advisor, the BE Director of Graduate Studies, the BE Academic Program Manager, and the Graduate College. Courses listed in the POS must match the actual course enrollment/course completion posted in UAccess. After receiving approval for their POS, students who make changes to their UAccess course enrollments must modify and submit the POS for reapproval. For more information on the doctoral plan of study, please refer to [https://grad.arizona.edu/gsas/degree-requirements/doctor-philosophy#plan-of-study]

7.11. Research Proposal (Prospectus) for the Dissertation

The Research Proposal is a plan with sufficient academic merit about a research topic that meets the standards of clarity, originality, and feasibility set by the graduate program, advisor, and committee. The candidate must include the title of their Research Proposal in their Plan of Study. A draft of the Research Proposal will be completed in second semester of BE 501 course requirements. OR, in the case of Ph.D. candidates who have already completed BE 501 in their master's degree program, the Research Proposal draft will be completed no later than the end of the 2nd semester in the program. The final Research Proposal will be completed by the end of the 3rd semester in the program and must submit their dissertation research prospectus proposal title in the GradPath Plan of Study form.

7.12. Comprehensive Examination

Admission to graduate study does not imply admission to candidacy for an advanced degree. Before admission to candidacy for the doctoral degree, the student must pass the Doctoral Comprehensive Examination (a general examination in the chosen fields of study). This examination is designed to assess the student's comprehensive knowledge of both the major and minor fields of study, evaluating breadth across the general research area and in depth within the specialization. The exam should be taken only after the student has completed at least 90% of their coursework. Its outcome determines whether the student is permitted to continue the PhD program as a BE PhD candidate.

7.12.1. Comprehensive Examination Structure

As per the Graduate College guidelines, "Each program determines the format and administration of the written portion. The minor department controls the minor portion of the written examination and may waive it at their discretion. The Comprehensive Examination is considered a single examination and is composed of two parts:

1. A written exam covering the major and minor fields. Each committee member decides upon the time allotted to complete the written portion. A student must take and pass the written portion before taking the oral portion.
2. An oral exam will be conducted after the student passes the written exam. During the oral exam, faculty committee members have both the opportunity and responsibility to assess the student's broad knowledge of the chosen field and depth in areas of specialization. Discussion of proposed dissertation research may also be included. The oral exam is conducted with the candidate's

Comprehensive Examination Committee and should last at least an hour but no more than three hours, in accordance with the Graduate College policy. The BE Department recommends holding the oral exam within two weeks of passing the written portion, though the Graduate College allows it to be completed up to three (3) months before the Final Oral Defense. The exact time and place of the oral comprehensive exam must be scheduled with the department and announced in GradPath using the Announcement of Doctoral Comprehensive Exam form (see Section 7.13.3).

- NOTE: Students are discouraged from serving food or drinks other than water for their oral defense. Bottled water can be obtained from the department with prior arrangement.

7.12.2. Comprehensive Examination Committee and Form

Students should receive verbal approval from their Major Professor and PhD Graduate Committee members before submitting the Comp Exam form in GradPath. The Comprehensive Examination Committee must consist of a minimum of four (4) members. In the BE department, the practice is for the Comprehensive Examination Committee to consist of the PhD Graduate Committee with an additional member(s) and the Major Professor as the Comprehensive Exam Committee Chair. The additional member(s) should be tenured or tenure-track or an approved special member. Special members must be pre-approved by the Dean of the Graduate College. The Graduate College requires the Academic Programs Manager to initiate the Special Member Request [https://grad.arizona.edu/forms/gsas/special-member-request]. Please contact the Academic Program Manager to process the Special Member request. Any members beyond the fourth should also be tenured or tenure-track faculty members or approved special members. Once the GradPath committee form is approved, the student will proceed to the Announcement of Comprehensive Examination.

NOTE: All committee members, including the Minor Advisor, must be present and participate in the Comprehensive Examination.

7.12.3. Announcement of Comprehensive Examination

Once the Comprehensive Examination Committee has agreed on a time and place for the exam, the student must complete the Announcement of Comprehensive Examination form in GradPath. The GradPath form must be approved by the Major Professor, Minor Advisor, BE Director of Graduate Studies, BE Academic Program Manager, and the Graduate College. Once approved, the GradPath will automatically notify the examining committee of the date and time of the Comprehensive Exam.

7.12.4. Reporting the Results of the Comprehensive Examination

Based on the student's combined performance in the written and oral portions, the examining committee awards a pass or fail grade. The Major Professor reports the final results of the Comprehensive Examination in GradPath. In addition, each committee member completes an assessment form of the oral comprehensive exam performance. The Major Professor is responsible for collecting completed assessment forms and submitting them to the Academic Program Manager. These will be compiled for the Academic Program Review.

If the student passes the comprehensive exam, the student will advance to Candidacy and proceed to complete the PhD Graduate Committee Appointment form. If the student fails the comprehensive exam, they are permitted to make a second attempt to pass the examination if recommended by the examining committee. Students will be allowed *no more* than one retake. For more information on the Comprehensive Examination, please refer to [https://grad.arizona.edu/gsas/degree-requirements/doctor-philosophy] and Policies and Procedures for Oral Comprehensive Examination for Doctoral Candidacy [https://arizona.app.box.com/v/grad-gsas-comporalexam].

7.13. Dissertation Requirements

PhD students must submit a minimum of two (2) papers for publication. The dissertation must be submitted to the PhD Graduate Committee for review and approval four weeks before the defense is scheduled. The student needs to:

1. Be listed as the first author in at least one of the papers.
2. Upload a signed Journal Article Certification form.
3. Use a standard style guide (such as the ASABE, Chicago, APA, MLA, or style guide of the journal for which the papers are submitted). See additional guidance in Appendix B.

Dissertation format requirements can be found in Appendix B. BE PhD candidates should review the Graduate College manual to ensure their Dissertation is in the proper format. For more information on formatting, please refer to [https://grad.arizona.edu/gsas/dissertations-theses/dissertation-and-thesis-formatting-guides]. Copies of archived Dissertations are available via the University Libraries [https://libguides.library.arizona.edu/type/theses].

7.14. Final Oral Defense

A student must be in good academic standing to schedule the Final Oral Defense. The examination focuses on the research work and dissertation itself but can include general questioning related to the field(s) of study within the scope of the dissertation. The student may schedule the Final Oral Defense after receiving approval from the graduate committee. The Final Defense must be scheduled through the GradPath Announcement form at least two weeks in advance. The Major Professor, who serves as the committee chair, presides over the examination. The Defense is closed to the public, except for an initial public seminar portion during which the student presents the dissertation and entertains questions. The Oral Defense must be completed within three hours, and all members of the PhD Graduate Committee must be present for the entire examination. Students should send the Graduate College Final Oral Defense Instructions link to their Major Professor at least one week before the defense date. For more information on the UA's policy on the Final Oral Defense, go to https://arizona.app.box.com/v/grad-gsas-finaldefnsinstr. Students are discouraged from serving food or drinks other than water for their oral defense. NOTE: Bottled water can be obtained from the department with prior arrangement.

Per Graduate College policies, a member may participate in the Defense remotely (i.e., via Zoom, Skype, or GoToMeeting). If a member cannot participate in person or remotely, the student must find another tenured, tenure-track, or continuing-appointment committee member and update their Committee Appointment form.

7.14.1. Dates and Deadlines

NOTE: All candidates should refer to the Graduate College Dates and Deadlines website before beginning the following steps at https://grad.arizona.edu/gsas/degree-requirements/important-degree-dates-and-deadlines. ***Scheduling the Final Oral Defense and satisfying all the requirements relating to the Final Oral Defense is the student's sole responsibility***.

7.14.2. Final Oral Defense Process

The following outlines the steps for completing the final oral defense of a student's dissertation. Refer to the Biosystems Graduate Programs D2L site for the Timeline/Checklist (an Excel spreadsheet):
While we recommend the writing should start as earlier as practical, upon completion of the research work, the student writes their dissertation and presents the final draft (penultimate version) to their PhD Graduate Committee not less than one month before the proposed defense date, this ensures that the defense date is scheduled at least one week before the Graduate College's final archival date of the semester in which the student plans to graduate.

1. The Committee decides if they need 1 or 2 weeks to review the dissertation.

2. Once the committee approves the proposed defense date, then at least one week but no more than two weeks before, the student sends to their committee the departmental *Final Oral Defense Approval* form (forms are found in Appendix E and the BE Graduate Program D2L site in the Forms section). This form indicates that the committee has read the dissertation and believes the student is ready to defend the dissertation.
3. The committee then signs the *Final Oral Defense Approval* Form, and the student uploads it to the appropriate D2L assignment folder.
    - If the PhD Graduate Committee determines that the PhD student is not ready to defend, the Academic Program Manager will decline the Announcement of the *Final Oral Defense Approval* form in GradPath and notify the BE Director of Graduate Studies and Department Head of the decision. The Major Professor and the student will send an email notice with the new "Program Completion Date (Graduation Term)" to the Academic Program Manager, the BE Director of Graduate Studies, and the Graduate College Degree Check Advisor.
4. Upload a completed and signed *Journal Article Certification* form to the appropriate D2L assignment folder. Note: PhD candidates must publish *at least* 2 journal articles that must be included in the dissertation body or appendices.
5. After an approved *Final Oral Defense* form is uploaded to the D2L student support site, PhD candidates may schedule the date of their final oral defense.
    - Students should be aware of the submission date for archiving the final approved dissertation before they set their final oral examination date. Students should consider and reserve time for additional revisions/edits that may be assigned at the Oral Defense. Refer to the Graduate College's Dates and Deadlines [https://grad.arizona.edu/gsas/degree-requirements/important-degree-dates-and-deadlines].
6. The student must submit the Departmental PhD Defense Announcement to the appropriate D2L assignment folder.
7. Students must also submit their PhD defense announcement form and PhD Defense Committee form in GradPath.
8. NOTE: the GradPath Announcement, signed Final Oral Defense Form, Journal Article Certification, and Department Defense announcement form should be submitted to the appropriate BE Graduate Program D2L Assignment boxes at least two weeks before their expected defense date.
9. NOTE: Students are discouraged from providing food and beverages, except water, for the oral defense. The department can provide bottled water upon request with prior arrangment.

The Academic Program Manager will approve the GradPath Announcement of Oral Defense form once the approved Journal Paper Certification, Final Oral Defense, and Defense Announcement forms are submitted to the appropriate D2L assignment boxes.

7.14.3. Reporting Results of the Final Oral Defense

After the Final Oral Defense, the candidate's PhD Graduate Committee will determine if the student passed, passed with revisions, or failed. The Committee must follow the Graduate College procedures for the Final Oral Defense located at https://arizona.app.box.com/v/grad-gsas-finaldefnsinstr.

If the student passes the final oral defense without revisions:

1. The student may proceed with the dissertation submission.
2. The Major Professor should submit a Change of Grade Form to the Academic Program Manager and report the results in GradPath.

If the student passed the final oral defense with revisions:

1. The PhD Graduate Committee must determine the date the student needs to resubmit the corrections to the committee.

2. The Major Professor will need to enter this date in the GradPath form.
3. After the PhD Graduate Committee approves the final corrected revisions, the Major Professor emails the Graduate Auditor and the Academic Program Manager confirming the results for degree completion and submits a Change of Grade Form in GradPath. Once the final revisions are approved, the student will be advised to complete the submission process.

If the student fails the final oral defense, they must contact the Graduate College.

7.15. Dissertation Submission

Following a successful Final Oral Defense:

1. The candidate must submit an approved dissertation in electronic format to the University's ProQuest system. For further instructions, refer to the Dissertation/Thesis Submission site at https://grad.arizona.edu/gsas/degree-requirements/doctor-philosophy#final-oral-defense.
2. In addition, the candidate's Major Professor and PhD Graduate Committee may require copies of the dissertation in electronic format. Check with your Major Professor for any special requirements.

Upon receipt of the finalized dissertation, the Dean of the Graduate College will recommend the conferral of the doctoral degree by the Arizona Board of Regents. Once the Graduate College Degree Auditor receives the result for the Defense, they will send the student information on the Dissertation Submission process.

7.16. Dual Degrees

Dual degree programs allow qualified students to earn two degrees with fewer total credit hours by sharing a set number of units between the programs. The number of shared units varies by the dual degree program. For details, students should contact the individual departments offering the dual degree programs.

APPENDIX A

EXAMPLE OF PLAN OF STUDY FOR THE ACCELERATED MASTER'S PROGRAM (AMP) in BIOSYSTEMS ENGINEERING

Senior Year/1st Year in AMP

Course	Unit	Course	Unit
Fall Semester		Spring Semester	
BE 496A, Seminar in Engr Careers & Professions	1	ENGR 498B (Cross-disciplinary Design)	3
ENGR 498A, Cross-disciplinary Design	3	400-level TECH Elective	3
BE 447/547, Sensors and Controls	3	500-level*, TECH Elective	3
400/500-level (BE) Design Elective	3	Tier 2 ART/HUM	3
AME 324A, Mechanics of Materials	3	BE 501*, Research Methods	2
Tier 2 INDV	3	BE 596B*, Grad Seminar, non-presenting	1
BE 597A*, Academic & Career Prep for Graduate Students	1	ENVS 508*, Technical Writing	3
BE 596B*, Grad Seminar, non-presenting	1		
Total	18	Total	18

*These classes are dual-enrolled, taken during the student's senior year, and meet the BEBS and BEMS requirements.

2nd Year in AMP

Course	Unit	Course	Unit
Fall Semester		Spring Semester	
BE 596A, Grad Seminar, presenting	1	BE 596A, Grad Seminar, presenting	1
500-level BE Elective	3		3
500-level TECH Elective	3		
BE 910 (Thesis) or BE 909 (Engineering Report)	3	BE 910 (Thesis) or BE 909 (Engineering Report)	2
Total	10	Total	8

APPENDIX B

THESIS/ GRADUATE REPORT/DISSERTATION REQUIREMENTS

Thesis/Dissertation
Publication Requirements

Objectives

MS Thesis Option and PhD students must submit papers for publication in refereed scientific journals by the time of their Final Oral Examination. The primary objective of this requirement is:

i. To encourage graduate students to learn the submission/publication processes of refereed journals before graduation.
ii. To derive a publishable article from the thesis/dissertation and research project.

Example Thesis and Dissertation papers completed under this option are available in the department for checkout. These are also available through the UA library system. If you have any questions, please contact the Director of Graduate Studies and/or your Faculty Advisor.

Guidelines

- MS – Serve as the first author on a paper/manuscript derived from the current MS research project that has either been published or approved for submission to a refereed journal by the major advisor.
- PhD – Contribute as an author on two papers/manuscripts based on the PhD research project, with first authorship on at least one. These must be either published or approved for submission to a refereed journal by the major advisor.

- Each manuscript requires a *Journal Article Certification form* signed by the Major Professor. The completed Journal Article Certification form must be uploaded to the appropriate D2L assignment folder. NOTE: All forms can be found in Appendix E of this manual, on the Graduate Program D2L support site under 'Forms', and the BE website.

- The student's Graduate Committee will determine when the dissertation is ready for defense. Students are encouraged to coordinate this process with their advisor and committee well in advance must provide a copy of the penultimate report, thesis, or dissertation *four weeks* (minimum) before the scheduled defense. Failure to follow these guidelines may result in the student having to postpone the defense to the following semester.

Recommended Thesis/Dissertation Format

Examples of Sample Pages and formatting guidelines for dissertations and theses can be found on the Graduate College site: https://grad.arizona.edu/gsas/dissertations-theses. All Theses and Dissertations are required to be archived in the UA Campus Repository. Typically, the elements of the thesis or dissertation are:

1 Title Page (required format)
2 Committee Approval Page
3 Acknowledgments and Dedication (optional)
4 Table of Contents
  4.1 Include all chapters & major sections; if you report sub-sections, be consistent in listing all subsections at the same level.
  4.2 List of Figures/Illustrations (from Introduction & Present Study)
  4.3 List of Tables (from Introduction & Present Study)
5 Abstract
6 Chapter 1. Introduction
  6.1 Explanation of the problem(s), objectives, and uniqueness.
  6.2 The relationship of the manuscripts included and your contribution to each of the manuscripts. The published or publishable work must be logically connected and coherently integrated into the dissertation. Simply binding reprints or collections of publications together is not acceptable as a thesis or dissertation in either format or concept.
  6.3 Specify your role in the research and production of the manuscript(s). Where research efforts are part of a larger collaborative project, identify one aspect of the project as your own and demonstrate an original contribution.
  6.4 An overall literature review and background.
7 Chapter 2. Present Study
  7.1 Overall summary.
  7.2 Overall conclusions and recommendations.
8 Appendices:
  8.1 Manuscript No. 1[1] (required for both theses and dissertations)
  8.2 Manuscript No. 2[1] (required for dissertations, optional for theses)
  8.3 Supplementary materials include data tables, additional references, graphs, computer programs, and maps.
  8.4 All appendix pages are part of the single pagination sequence of the thesis/dissertation.

[1]The first page of each manuscript must include the title, a list of co-authors, and the refereed journal to which the manuscript was submitted. The statement of permission for the use of copyrighted material should be attached if needed.

Recommended Graduate Report (Non-thesis) Format

Students may choose the graduate report option when:

- The research project is not funded.
- The research is limited in scope.
- The MS program will be a terminal degree.
- The research work is probably not publishable, but there could be interest in the information (industry or other entities).
- The research is related to a specific project at their place of employment.

Graduate reports shall follow the more traditional thesis format without the requirement of a publishable paper embedded in the thesis. NOTE: Follow the Graduate College standard format/style guide throughout the text.

1 Title Page (required format)
2 Committee Approval Page
3 Acknowledgments and Dedication (optional)
4 Table of Contents
  4.1 Include all chapters & major sections; if you report sub-sections, be consistent in listing all subsections at the same level.
  4.2 List of Figures/Illustrations (from Introduction & Present Study)
  4.3 List of Tables (from Introduction & Present Study)
5 Abstract
6 Chapter 1. Introduction
  6.1 Explanation of the problem(s), objectives, and uniqueness
  6.2 Justification for the research
7 Chapter 2. Literature Review
8 Chapter 3. Methods and Materials
9 Chapter 4. Discussion of Results
10 Chapter 5. Summary and Recommendations
11 Appendices:
  11.1 Supplementary materials include data tables, additional references, graphs, computer programs, and maps.
  11.2 All appendix pages are part of the single pagination sequence of the report.

Additional Formatting Guidelines for Reports, Theses, and Dissertations

Standard Style Guides

A standard style guide for the use of in-text citations and their associated full citation in the References or Citations List must be used for all reports, theses, and dissertations. Standard style guides include, but are not limited to:

ASABE: https://www.asabe.org/GuideForAuthors
APA: https://apastyle.apa.org/style-grammar-guidelines/references/examples
MLA: https://style.mla.org/works-cited/citations-by-format/
Chicago: https://www.chicagomanualofstyle.org/tools_citationguide.html

Purdue OWL is an excellent source for APA and MLA style guidelines with examples: https://owl.purdue.edu/index.html.

MS Word has a reference manager within the References tool, and you can select from a wide variety of style guides. You can also use a reference manager, such as Medeley (https://www.mendeley.com/reference-management/reference-manager) or Microsoft OneNote (a free personal note-taking management app that includes a reference management system).

Use of Hyperlinks – linking to text, titles, tables, or figures within the document

Using hyperlinks to navigate the document's text, titles, tables, or figures is discouraged. If hyperlinks are needed, then the full title, table or figure number must be used in case the hyperlink becomes broken or if the document is in hard-copy form. For example, when referencing Table 3 in the Appendix, the text would read: “Please refer to Table 3 in the Appendix.” The hyperlink would include the words “Table 3 in the Appendix.”

APPENDIX C

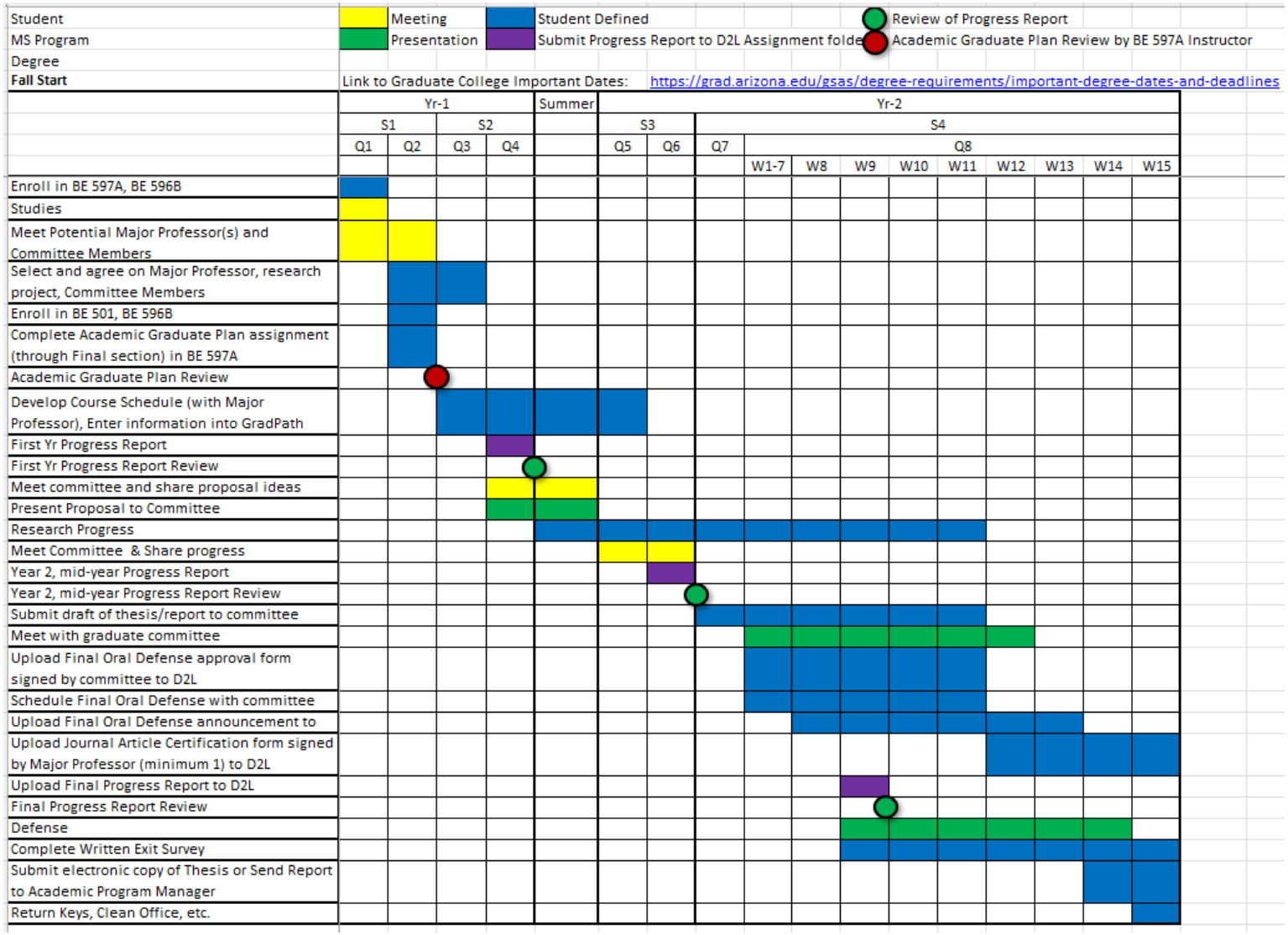
TIMELINES/CHECKLISTS FOR COMPLETING THE STEPS IN THE BE AMP, BAT/BE TRADITIONAL MS, AND BAT/BE PhD DEGREES

All timelines/checklists for completing the steps for the BE AMP, BAT/BE Traditional MS, and BAT/BE PhD degree programs are located in the Biosystems Graduate Programs D2L site [https://d2l.arizona.edu/d2l/home/1043691] as Excel spreadsheets (see either the Forms section or respective Program pages). They are optional but highly recommended to help you plan your academic program and meet milestones.

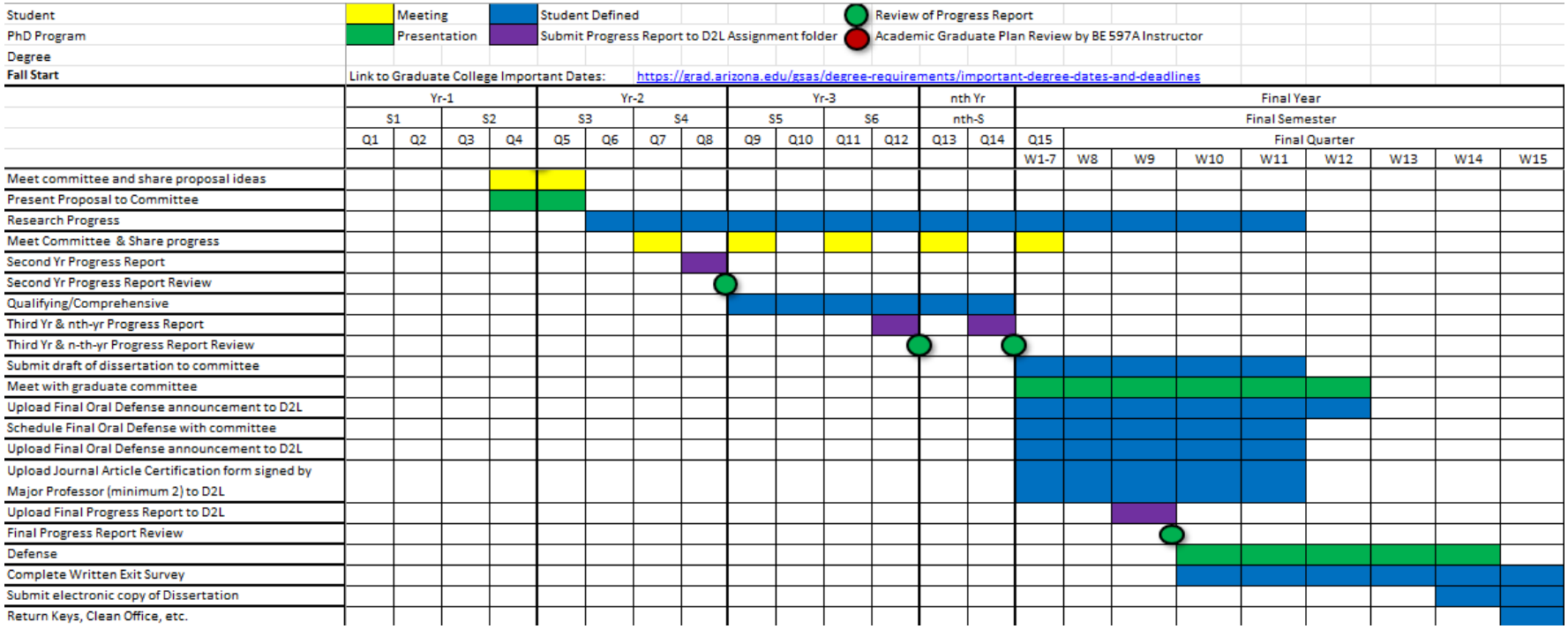
[Link to AMP Timeline/Checklist in the BE Graduate Programs D2L site]

Student		Meeting		Student Defined															
Accelerated Masters Program		Presentation		Submit Progress Report to D2L Assignment folder															
Degree																			
Fall Start	Link to Graduate College Important Dates:					https://grad.arizona.edu/gsas/degree-requirements/important-degree-dates-and-deadlines													
	Yr-0 (Jr Year, BS)	Yr-1 (Sr Year, BS)				Summer	Yr-2, MS												
		S1		S2			S3		S4										
	Q0	Q1	Q2	Q3	Q4		Q5	Q6	Q7	Q8									
										W1-7	W8	W9	W10	W11	W12	W13	W14	W15	
Meet Academic Advisor & Director of Grad Studies																			
Meet Potential Major Professor(s) and Committee Members																			
Select and agree on Major Professor, research project, Committee Members																			
Enroll in BE 501, 596B																			
Complete Academic Graduate Plan assignment (through Final section) in BE 597A																			
Academic Graduate Plan Review																			
Apply to Graduate School																			
Develop Course Schedule (with Major Professor), Enter information into GradPath																			
First Yr Progress Report																			
First Yr Progress Report Review																			
Meet committee and share proposal ideas																			
Present Proposal to Committee																			
Research Progress																			
Meet Committee & Share progress																			
Year 2, mid-year Progress Report																			
Year 2, mid-year Progress Report Review																			
Submit draft of thesis/report to committee																			
Meet with graduate committee																			
Upload Final Oral Defense approval form signed by committee to D2L																			
Schedule Final Oral Defense with committee																			
Upload Final Oral Defense announcement to D2L																			
Upload Journal Article Certification form signed by Major Professor (minimum of 1 paper) to D2L																			
Upload Final Progress Report																			
Final Progress Report Review																			
Defense																			
Complete Written Exit Survey																			
Submit electronic copy of Thesis or Send Report to Academic Program Manager																			
Return Keys, Clean Office, etc.																			

[Link to MS Program Timeline/Checklist in the BE Graduate Programs D2L site]



[Link to PhD Timeline/Checklist in the BE Graduate Programs D2L site]



APPENDIX D

Biosystems Analytics & Technology Graduate Faculty

To be eligible to serve on a graduate committee in the Biosystems Analytics & Technology program, a faculty member must meet one or more of the following criteria:

1. Tenured/Tenure-eligible departmental Faculty
2. Continuing Status/Continuing-eligible departmental Faculty
3. Career Track departmental Faculty
4. Emeritus status departmental Faculty
5. 5. Graduate faculty members in other programs without an FTE in BE, IF the::
    a. Faculty member has a doctoral degree in analytics or a related analytics field, or a discipline related to any of the program research focus areas, OR
    b. Faculty currently holds a previously held "courtesy appointment" (i.e., 0% FTE or jointly-appointed position) in BE.

Anyone who does not fit into one of the categories above will be considered a "Special Member" and cannot serve till approved by the Graduate College. See Section 1.2 https://grad.arizona.edu/policies/academic-policies/graduate-faculty-policy.

Biosystems Engineering Graduate Faculty

To be eligible to serve on a graduate committee in the Biosystems Engineering program, a faculty member must meet one or more of the following criteria:

1. Tenured/Tenure-eligible departmental faculty
2. Continuing Status/Continuing-eligible departmental faculty
3. Career Track departmental faculty
4. Emeritus status departmental faculty
5. Graduate faculty members in other programs without an FTE in BE, IF the:
    a. Faculty member has a doctoral degree in BE or a related engineering field, or a discipline related to any of the program research focus areas, OR
    b. Faculty currently holds a previously held "courtesy appointment" (i.e., 0% FTE or jointly-appointed position) in BE.

Anyone who does not fit into one of the categories above will be considered a "Special Member" and cannot serve till approved by the Graduate College. See Section 1.2 https://grad.arizona.edu/policies/academic-policies/graduate-faculty-policy.

- *Andrade-Sanchez, Pedro, Associate Professor and Extension Specialist, PhD, 2004, University of California, Davis. Precision agriculture.
- Barreto, Armando, Assistant Professor of Practice, PhD, 2013, University of Arizona. Research and teaching interests in topics related to climate change, water conservation, crop mapping, global vegetation changes and phenology.
- *Barton, Jennifer, Jointly appointed Professor in Biomedical Engineering, PhD, 1998, The University of Texas at Austin. Translational biomedical optics and the prevention and early detection of cancer.
- *Cuello, Joel, Professor, PhD, 1994, Pennsylvania State University. Bioreactor design and scale up, algae production systems, controlled-environment systems, and cell and organ cultures regulations.
- *Didan, Kamel, Professor and BE Director of Graduate Studies, PhD, 1999, University of Arizona. Remote sensing, geospatial data science, vegetation and land surface phenology algorithms development, modeling time series analysis, drone engineering, and precision observation with drones.
- *Duan, Guohong "Jennifer," Jointly appointed Associate Professor in Civil Engineering & Engineering Management, PhD, 1998, University of Mississippi. Experimental studies and computational simulation of turbulent flow, sediment transport, and channel morphological processes.
- Elshikha, Diaa Eldin, Assistant Professor, Assistant Irrigation Specialist Maricopa Ag Center. Precision agriculture, irrigation and water management, and field observation with drones.
- *Franklin, Edward, Jointly-appointed Associate Professor in Agricultural Education, PhD, 2000, Oklahoma State University. Renewable energy.
- *Gerba, Charles, Jointly-appointed Professor in Environmental Science, PhD, 1973, University of Miami, Miami, Florida. Environmental microbiology.
- Hooks, Triston, Assistant Professor of Practice, PhD, 2020, New Mexico State University. Controlled environment agriculture. Hydroponic systems, vine and specialty crops, integrated pest management, sustainable substrates and organic hydroponics, the effect of light quality on plant phytonutrients, plant physiology and salinity tolerance.
- *Kacira, Murat, Interim Department Head, Professor and Director of the Controlled Environment Agriculture Program, PhD, 2000, Ohio State University. Controlled environment agriculture, food, agricultural, and biological engineering.
- *Karanikola, Vasiliki (Vicky), Jointly-appointed Assistant Professor in Chemical and Environmental Engineering, PhD, 2015, University of Arizona. Desalination, membrane filtration, and water treatment.
- *Li, Haiquan, Assistant Professor, PhD, 2010, National University of Singapore. Bioinformatics, biological mechanisms, clinical informatics, computer science, data mining, translational bioinformatics, and statistics.
- *Lyons, Eric, Jointly-appointed Professor in Plant Sciences, PhD, 2008, University of California, Berkeley. Biosystems analytics, cyberinfrastructure for life sciences, computational systems for genomes, and advanced visualization of genomic data.
- *Martin, Edward, Professor and Extension Specialist, Associate Vice President and Director, Cooperative Extension, PhD, 1992, Michigan State University. Water resources, irrigation management.
- *Ogden, Kimberly, Jointly-appointed Professor in Chemical & Environmental Engineering, PhD, 1991, University of Colorado, Boulder. Bioreactor design for the production of alternative e-fuels from algae and sweet sorghum and microbiological water quality.
- *Pepper, Ian, Jointly-appointed Professor in Soil, Water, and Environmental Sciences and Director of the Water Quality Center, PhD, 1975, The Ohio State University. Soil microbiology.
- *Piegorsch, Walter, Jointly-appointed Professor in Mathematics & Chair of Statistics GIDP, PhD, 1984, Cornell University. Statistics.

- *Pryor, Barry, Professor, Jointly-appointed Professor in Plant Sciences, PhD, 1999, University of California, Davis. Controlled environment agriculture, mycology, fungal detection, and control.
- *Rasmussen, Craig, Jointly-appointed Professor in Environmental Sciences, PhD, 2004, University of California, Davis. Soil forming processes, soil-landscape evolution.
- *Recsetar, Matthew "Rex," Assistant Professor and Extension Specialist, PhD, 2019, University of Arizona. Aquaculture engineering, fish culture, aquaponics, controlled environment agriculture, sustainable food systems, innovative cannabis culture systems.
- *Siemens, Mark, Associate Professor, and Extension Specialist, PhD, 1996, University of Arizona. Specialty crops mechanization, agricultural machine design and testing, tillage.
- Tamimi, Akrum, Assistant Professor of Practice, PhD, 1995, University of Arizona. Water resources, wastewater treatment, irrigation, biosystems engineering, civil engineering, and environmental engineering.
- *Waller, Peter, Associate Professor, PhD, 1990, University of California, Davis. Water quality engineering, irrigation engineering, and drainage engineering.
- *Yoon, Jeong-Yeol, Professor, PhD, 2004, University of California, Los Angeles. Biosensors, water safety, lab-on-a-chip, protein nanoarray, immunoassay, biomaterials.

The following faculty members are retired, hold emeritus status, or have moved to other institutions, but continue to maintain a relationship with BE

- *Slack, Donald, Emeritus Professor, PE, PhD, 1975, University of Kentucky. Irrigation scheduling, water resources, infiltration, porous media flow, soil, and water conservation engineering.
- *Yitayew, Muluneh, Emeritus Professor, PhD, 1982, University of Arizona. Irrigation engineering, hydraulics, and water resources engineering.
- *Farrell-Poe, Kathryn "Kitt," Emeritus Professor, and Extension Specialist, PhD, 1990, Purdue University. Water quality, onsite wastewater treatment, safe drinking water, extension education/outreach.
- *Fitzsimmons, Kevin, Jointly-appointed Professor in Environmental Science, PhD, 1999, University of Arizona. Aquaculture.
- *Giacomelli, Gene, Emeritus Professor and Extension Specialist, PhD, 1983, Rutgers University. Horticultural engineering, energy conversion engineering, bioresource engineering, greenhouse engineering design, and hydroponic crop production.
- Hall, Caitlyn, Assistant Professor of Practice, PhD, 2021, Arizona State University. Soil and water remediation, bioremediation, ecological engineering, climate change, policy, law, disaster epidemiology, environmental science communication, water treatment, sustainability, disaster and hazard resilience, civic engagement, and environmental justice.
- *Hurwitz, Bonnie, Associate Professor, PhD, 2012, University of Arizona. Bioenvironment & one health, functional metagenomics, big data, system biology, bioinformatics and computational biology.

APPENDIX E

FORMS

THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE & LIFE SCIENCES
COLLEGE OF ENGINEERING
Biosystems Engineering

PhD TEACHING EXPERIENCE

The BE department recognizes that many PhD students will end up in faculty roles and teaching at universities or colleges. We want to help prepare you for that event. Therefore, all PhD students must have one unit of BE 693, Teaching Experience Internship, to document their teaching experience. You have six methods from which to choose to meet the teaching experience internship. Methods 1-4 outlined below are classes that you can take instead of signing up for BE 693 to help you learn more about teaching in higher education.

METHODS

1. FCSC/CALS 596E, Learner-Centered Teaching for Online Delivery (1 unit; Fall, Spring). This seminar course introduces students to common pedagogical issues associated with assisting in and teaching learner-centered online courses.
2. IA 697A, Learner-Centered Teaching (3 units; Fall, Spring). This course provides a foundation for learner-centered teaching. It includes theories of adult learning, approaches to the course and lesson design, techniques to assess learning and development of reflective teaching practices. It is appropriate for instructors who want to improve their teaching and is required for students in the Certificate in College Teaching program.
3. IA 697B, Using Technology in Teaching (3 units; Fall, Spring). This course combines in-depth reading and discussion related to pedagogical issues in the use of technology in teaching and learning with guided, individually focused training and practice in using technology in teaching.
4. IA 697G, Universal Design: Inclusive Learning Environments (3 units; Fall, Spring). This course comprehensively reviews the theories, strategies, and techniques used in instructional design processes that foster inclusive learning environments for all learners. The curriculum addresses characteristics of learners such as learning differences and preferences and 21st-century learning attributes, approaches for utilizing differentiated instruction, engagement and motivation techniques, classroom management tactics, and universal design strategies. Emphasis will be placed on critical review of the literature as practically applied to various learning environments and contexts in post-secondary education.
5. Complete the Certificate in College Teaching through the Office of Instruction & Assessment (https://grad.arizona.edu/catalog/programinfo/CLTCRTG or http://cct.oia.arizona.edu)
6. If the GTA experience has significant teaching responsibilities, serve as a GTA for one semester.

PROOF OF COMPLETION

Graduate Teaching Experience Option	*Proof of Completion*
FCSC/CALS 596E	*Class grade*
IA 697A	*Class grade*
IA 697B	*Class grade*
IA 697G	*Class grade*
Certificate in College Teaching through OIA	*Copy of Certificate*
GTA, one semester	*Assessment by GTA instructor*

THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE & LIFE SCIENCES
COLLEGE OF ENGINEERING
Biosystems Engineering

PhD TEACHING EXPERIENCE PLAN

Student Name _____ Student ID #_____

Method to achieve credit for completing the Teaching requirements.

- ☐ BE 693 GTA, one semester*
- ☐ FCSC/CALS 596E (in lieu of signing up for BE 693)
- ☐ IA 697A (in lieu of signing up for BE 693)
- ☐ IA 697B (in lieu of signing up for BE 693)
- ☐ IA 697G (in lieu of signing up for BE 693)
- ☐ Graduate Teaching Certificate

Semester and year, the student is expected to complete their teaching experience. _____

Student's Signature_____

Date _____

* The following section needs to be completed

Teaching Experience Advisor Name _____

Instructor's BE 693 Section Number (if applicable)_____

Instructor's Signature _____ Date _____

THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE & LIFE SCIENCES
COLLEGE OF ENGINEERING
Biosystems Engineering

JOURNAL ARTICLE CERTIFICATION

(needs to be completed before Final Oral Defense & uploaded to the appropriate assignment folder in the Biosystems Graduate Programs D2L)

As the Major Professor of the Graduate student below, I have read and acknowledge that the journal article(s) submission requirement has been met with the following information:

Student Name: _____

Journal Article 1 Title: _____

Name of Journal Submitted to: _____

Status of Article:
☐ *Published,* ☐ *Submitted,* ☐ *Pending Submission**
(*NOTE: if Pending Submission is selected, please provide expected submission date: _____)

Journal Article 2 Title: _____

Name of Journal Submitted to: _____

Status of Article:
☐ *Published,* ☐ *Submitted,* ☐ *Pending Submission**
(*NOTE: if Pending Submission is selected, please provide expected submission date: _____)

_____ _____

Major Professor Date

FINAL ORAL DEFENSE APPROVAL FORM

As members of the Graduate Committee, we certify that we have read the Thesis/Report/Dissertation and confirm that the student is ready to defend.

*Student:*_____ *Student ID:*_____

Title: _____

APPROVED BY:

Major Professor *(print and sign name)*	Date
Committee Member *(print and sign name)*	Date
Committee Member *(print and sign name)*	Date
Committee Member *(print and sign name)*	Date

APPENDIX F

ASSESSMENT RUBRICS

THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE & LIFE SCIENCES
COLLEGE OF ENGINEERING
Biosystems Engineering

PhD Oral Comprehensive Examination Assessment & Rubrics

Candidate:	**Date/time**:	**Place:**
Examining Committee		
Member	**email**	**Pass/Fail**

Note: Please fill out this form as soon as the Oral Comprehensive Examination concludes. This form and rubric are used to assess all PhD students after completing their comprehensive examination. The data collected will be used to support our Annual Program Review (APR) to assess Outcome 1. They will provide our unit with the necessary information for adjusting our programs, reinforcing current practices, and/or student performance expectations.

Attribute	1 - Poor	2 - Fair	3 - Good	4 -Very Good	5 - Excellent	Score
General Knowledge						
Depth and breadth of knowledge in the focus area						
Knowledge of Fundamental principles in engineering						
Overall response to questions						
Research literature						
Research purpose						
Research methods						
Research theoretical background						
Total						

Rubric

Scoring will use these guidelines and consider the student's focus area, fundamental principles in engineering and/or analytics, research field literature, research methods, general theoretical background, and answers to questions.

Score	Description
Poor	Very poor answers and knowledge were demonstrated by a lack of accurate responses to most of the questions, even with some help.
Fair	Limited knowledge, as demonstrated by significant difficulties in responding to only a few of the questions with some aid.
Good	Adequate knowledge as demonstrated by accurate responses to most questions with some help at times.
Very Good	Accurate answers without difficulties and adequate knowledge, as demonstrated by complete responses to most questions without any prompting.
Excellent	Excellent and thorough knowledge as demonstrated by accurate responses to all questions.

THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE & LIFE SCIENCES
COLLEGE OF ENGINEERING
Biosystems Engineering

Report/Thesis/Dissertation Oral Defense Evaluation Form

01/21/22

Student Name: _____

Title of Report/Thesis/Dissertation: _____

Committee Member: _____ **Date:** _____

Directions:
Evaluate this student's engineering report/thesis/dissertation oral defense of the research with a score between 1 (Poor) and 5 (Excellent) for each of the criteria described below using the attached rubric. Briefly comment on the rationale if your score is less than 5. Submit your completed scoring sheet to the committee chair before leaving the defense.

Score (1 – 5)	Criterion	Comment
	Organization of Oral Defense	
	Presentation Style	
	Presentation Pace	
	Content: Depth	
	Content: Accuracy	
	Use of Visual Aids	
	Responsiveness to Audience	

Report/Thesis/Dissertation Oral Defense Rubric

Criteria	Excellent – 5 pts	Very Good – 4pts	Good – 3 pts	Fair – 2 pts	Poor – 1 pt
Organization	Presentation is clear and logical. Listener can easily follow line of reasoning.	Presentation is generally clear. Few minor points with Confusion.	Presentation is generally clear. Few minor points may are confusing.	Listener can follow presentation with effort. Organization Not well thought out.	Presentation is very confused and unclear. Listener cannot follow it.
Presentation Style	Demonstrates effective presentation skills. Speaker is easy to hear and understand. Good eye contact.	Style is generally appropriate. Listener had no trouble hearing or understanding. Eye contact mostly good.	Style is generally appropriate. Listener had some trouble hearing or understanding. Eye contact is inconsistent.	Presentation is too informal or unprepared. Difficult to hear or understand. Much of information is read. Eye contact is poor.	Presentation is consistently at an inappropriate level. Information is read. Speaker can't be heard or understood. No eye contact.
Presentation Pace	Presentation is a planned conversation, paced for audience understanding.	Speaker's pacing is just about right	Speaker's pacing is somewhat too fast or too slow.	Speaker's pacing is too fast, too slow, repetitive, or skipping important details.	Presentation is far too long or far too short.
Content: Depth	Design, methods, results, discussion, and conclusions are clearly and coherently elucidated. Logical and persuasive agreement between data and conclusions. Impact and implications of results and "where do we go from here" discussed.	Description of project and results is generally clear. Somewhat adequate discussion of what results mean with little missing.	Description of project and results is generally clear. Some discussion of what results mean.	Some components of project description are minimal or missing. Little discussion of what the results mean.	Description of project and results are very difficult to follow. No discussion of meaning of results. Listeners learn little.
Content: Accuracy	Information given is consistently accurate. Facts and calculations are correct.	No significant errors are made. Listeners recognize a few errors are a result of oversight or nervousness.	Some errors are made. Listeners recognize the errors are a result of oversight or nervousness.	Enough errors made to be distracting, but some information is accurate.	Information is so inaccurate that listener cannot depend on the presentation.
Use of Visual Aids	Aids prepared in professional manner. Font is large enough to be seen by all. Well organized. Main points stand out.	Aids contribute, most material supported by aids. Font size is appropriate for reading.	Aids contribute, but only some material supported by aids. Font size is appropriate for reading.	Aids are poorly prepared or used inappropriately. Font is too small. Too much information is included.	No aids are used, or they are so poorly prepared that they detract from the presentation.
Responsiveness to Audience	Responds well to questions. Restates and summarizes when needed.	Generally responsive to questions without prompting.	Generally responsive to questions with some help at times.	Reluctantly interacts with audience. Responds poorly to questions.	Avoids audience interaction. Not responsive to audience.

THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE & LIFE SCIENCES
COLLEGE OF ENGINEERING
Biosystems Engineering

Exit Survey for MS and PhD Students Near Graduation in the Department of Biosystems Engineering

Each student will complete a written exit survey. The written exit survey is a measure of your perceptions of whether you met the program's educational objectives and other information to help us improve our graduate programs. The written exit survey is on the D2L Graduate Programs support website under Forms in Content.