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I. Engineering Education Systems and Design Program PhD Program Description

The Polytechnic School (TPS), one of six schools in the Ira A. Fulton Schools of Engineering, has a vibrant engineering education research community. The Engineering Education Systems and Design (EESD) PhD program aims to increase our understanding and design of engineering education ecosystems, including the multiple inputs, outputs, and interactions within these ecosystems. The program will prepare students to conduct research on aspects of these ecosystems that are related to their scholarly interests. Upon completion of the program, students will be equipped to take competitive positions in top-tier research institutions as exemplary scholars and teachers, or as leaders in engineering education in a variety of education settings (e.g., universities, science centers, government agencies, museums, policy setting institutions, industries).

PhD students entering the program have a background in engineering or a related field and are passionate about developing their skills as engineering education researchers. They are committed to contributing to the engineering education research programs at TPS while also developing new research directions that emerge from their experiences as PhD students. During their coursework, which includes multiple doctoral level project courses, students in the program will learn and have the opportunity to apply a variety of theoretical frameworks and research methodologies. Students will engage with faculty who are diverse both in the methods they use for conducting research (e.g., quantitative, qualitative, and mixed-methods) and the populations they study using these methods, which range from makers in informal learning spaces to students and faculty in post-secondary engineering education programs and early career professionals.

II. Objectives of this Handbook

This handbook has been developed for students who are enrolled in, or considering applying for admission to, the Engineering Education Systems and Design (EESD) PhD Program at TPS. The objective of this handbook is to provide program specific information regarding admissions, curricular requirements and both university and programmatic policies and procedures. As such, this handbook is complementary to The Polytechnic School Graduate Handbook and to the ASU Graduate Education Policies and Procedures Handbook. It is the responsibility of the student to obtain and familiarize themselves with these documents.

III. Admission Requirements

Eligibility

All applicants must have a Bachelor’s degree and/or a Master’s of Science degree in an engineering discipline or closely related field from a regionally accredited institution. Most students who are admitted to the program will have a Master’s degree in an engineering or closely related discipline with a cumulative GPA of 3.25 (scale is 4.0 = A). In addition, students who have demonstrated exceptionally good performance in their undergraduate programs but do not have a master’s degree in an engineering or closely related field can be admitted. This track requires a cumulative undergraduate GPA of 3.75/4.0 or better coupled with a record of research and/or leadership accomplishments.

Application Process

The admission process begins with the online Graduate Education application, which can be found online here:
https://webapp4.asu.edu/programs/t5/majorinfo/ASU00/ESEESDPHD/graduate/false. The application requires that following items must be submitted:

1. 2 Letters of Recommendation
2. CV/Resume
3. Essays:
   a) Statement of Purpose: Submit online a 300- to 500-word statement of purpose describing your motivation and rationale for obtaining a PhD in the Engineering Education Systems and Design program at Arizona State University and how it relates to your long-term career goals.
   b) Teaching Statement: Submit online a 200- to 300-word statement communicating your perspective on effective instruction. Also indicate the types of undergraduate engineering courses for which you would be interested in serving as a Teaching Assistant.
   c) ASEE Writing Sample: Find and read an article that interests you from last summer’s American Society for Engineering Education’s Annual Conference and Exposition (https://peer.asee.org/). Then, write and submit online a 300- to 500-word statement including the following information: 1) the citation (title, author(s), year) for the article, 2) the reason you selected the particular article, and 3) in what ways, if any, does this article relates to your potential future research interests?
4. Official transcripts from each college or university attended.
5. Official GRE general exam scores.
6. Scores from the Test of English as a Foreign Language (TOEFL) or the International English Testing System (IETLS) are required of all international applicants except those from countries whose native language is English. The requirement can be found at: http://graduate.asu.edu/admissions/international/english_proficiency.

Application Deadlines
The priority application deadlines begin January 15th of the same year for Fall semester admission and August 15th of the preceding year for Spring semester admission. Applications submitted after this deadline may still be considered.

IV. Degree Requirements

Fundamental Requirement of the PhD Degree
The PhD degree is the highest academic credential conferred by the University. Attainment of a PhD requires that a student demonstrate the capacity to produce and sustain original independent research in their chosen field, and that this research be validated through publication in reputable peer reviewed journals.

PhD Plan of Study (iPOS)
Before the beginning of the third semester of enrollment in the EESD PhD Program, all PhD students are required to file a Plan of Study (iPOS) though MyASU. A minimum of 84 semester credit hours are required for the PhD degree, distributed as follows:

- A maximum of 30 credit hours of coursework from a previous Master’s degree in Engineering or a closely related field may be applied to the PhD. Students who completed
an accelerated Master’s degree in which some courses from their undergraduate degree also were counted toward their master’s degree will transfer fewer than 30 credit hours to the PhD.

- Six core courses, totaling 18 credit hours that are intended to expose mature students to fundamental topics in engineering education
- 12 credit hours of elective coursework that is directly in support of the research area. A maximum of two 400 level courses may be included in this total.
- 12 credit hours of EGR 792, Research.
- 12 credit hours of EGR 799, Dissertation.
- Students who enter the program without a Master’s degree in Engineering or a closely related field will be required to take an additional 30 credit hours of coursework.

Core Curriculum
The core curriculum for the EESD degree consists of 18 credits that are intended to expose mature students to fundamental topics in engineering education. The core courses, along with their catalog descriptions are:

- **EGR 535: Engineering Innovation and Entrepreneurship**
  Provides knowledge of innovation and entrepreneurship practices and experience in the application of engineering systems innovation within an entrepreneurial setting of driving a product or process to successful launch.

- **EGR 565: Qualitative Methods for Engineering Education Research**
  This course provides a deep, empirical exposure to interpretive research methods in engineering education research.

- **EGR 671: Applications of Qualitative Methods for Engineering Education Research**
  This course provides a deep, situated exposure to making and handling data in qualitative engineering education research projects.

- **EGR 572: Quantitative Methods for Engineering Education Research**
  Introduction to the specific quantitative analysis techniques used in the field of engineering education, with special focus on instrument design, ANOVA, and multiple regression. Prior coursework or experience with basic statistical techniques is necessary to be successful in this course.

- **EGR 673: Applications of Quantitative Methods for Engineering Education Research**
  Application of quantitative analysis techniques to an engineering education research project. Specific focus on data collection, instrument development, and ANOVA / Regression analysis techniques. Prior coursework or experience with basic statistical techniques is necessary to be successful in this course.

- **EGR 574: Engineering Education Systems in Context**
  This course provides a systems understanding of current trends in engineering education research to engage engineering education research graduate students with the latest developments in the field in which they will situate their research projects.

Elective Coursework
In addition to the core courses, which total 18 credit hours, students are required to complete at least 12 hours of additional, elective coursework. These courses must be chosen in consultation with the advisor/co-advisors and should be designed to develop a depth of expertise in the research
area of interest. Examples of courses that are likely to be relevant to students in this program include:

- EGR 598: Mixed Methods for Engineering Education Research
- EGR 502: Principles of Independent Research
- EPA 565: Critical Topics in Education Policy
- EDP 504: Learning and Instruction
- EDP 540: Theoretical Views of Learning
- EDP 554: Analysis-of-Variance Methods
- EDT 506: Educational Evaluation
- EDT 501: Foundations and Issues in Educational Technology
- EDT 523: Distance Education Theory and Practice
- PSY 512: Advanced Learning
- PSY 530: ANOVA
- PSY 531: Multiple Regression in Psychological Research
- PSY 560: Online Search and Decision Making
- PSY 562: Advanced Human Factors
- PSY 591: Human Systems Engineering Methods
- Others

Additional Coursework for Students who Enter the EESD PhD Program without a Master's Degree in Engineering or a Closely Related Field.

In addition to the other degree requirements, EESD students who entered the program without a Master’s degree in an engineering or closely related field must take 30 credit hours of coursework meeting the requirements below.

- At least 18 credit hours in a particular engineering discipline. The student will work with his/her advisor/co-advisors to ensure that the selected courses are related and provide depth in a particular engineering discipline. (Of note is that EGR 502 is not considered a course that is part of a particular engineering discipline).
- At most 9 credit hours in support of the student’s EESD research area. These courses provide added depth in research methods / topic areas related to their dissertation work.
- If the student does not have any formal research experience, it is also recommended (though not required) that he/she take the 3 credit-hour research methods course.

Additional Coursework for Students Entering the EESD PhD Program with an Accelerated Master's Degree

Students admitted to the EESD program with an accelerated master’s degree in engineering or a closely related field in which some courses from their undergraduate degree also were counted toward their master’s degree have some additional coursework requirements. Such students should first work with the EESD graduate advisor (polygrad@asu.edu or 480-727-4723) to determine the number of credit hours that can be applied to the EESD PhD from their master’s degree. Additional coursework to arrive at a total of 30 credit hours for this portion of the degree requirements will then need to be taken (e.g., if 18 credit hours transfer in from the accelerated master’s degree, then an 12 additional credit hours of coursework will be required to complete the
EESD PhD). The student should work with his/her advisor/co-advisors to select the additional courses to take in order to obtain these credit hours.

Sample Plans of Study (iPOS)

Tables 1 and 2 give two example iPOS. These examples are not meant to imply that students in EESD should follow one of these two iPOS, but rather are there to illustrate that different focuses can be obtained through a student’s coursework. In both cases, the elective courses (18 hours beyond the core course) are highlighted in bold.

Table 1: Sample iPOS 1

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Semester</strong></td>
<td></td>
</tr>
<tr>
<td>EGR 574</td>
<td>Engineering Education Systems in Context</td>
</tr>
<tr>
<td>EGR 572</td>
<td>Quantitative Methods for Engineering Education Research</td>
</tr>
<tr>
<td>EGR 565</td>
<td>Qualitative Methods for Engineering Education Research</td>
</tr>
<tr>
<td><strong>Second Semester</strong></td>
<td></td>
</tr>
<tr>
<td>EGR 535</td>
<td>Engineering Innovation and Entrepreneurship</td>
</tr>
<tr>
<td>EGR 673</td>
<td>Applications of Quantitative Methods for Engineering Education Research</td>
</tr>
<tr>
<td>EGR 671</td>
<td>Applications of Qualitative Methods for Engineering Education Research</td>
</tr>
<tr>
<td><strong>Third Semester</strong></td>
<td></td>
</tr>
<tr>
<td>EGR 575</td>
<td>Mixed Methods for Engineering Education Research</td>
</tr>
<tr>
<td>EDT 502</td>
<td>Design and Development of Instruction</td>
</tr>
<tr>
<td>EGR 592</td>
<td>Research (3 credit hours)</td>
</tr>
<tr>
<td><strong>Fourth Semester</strong></td>
<td></td>
</tr>
<tr>
<td>EDP 540</td>
<td>Theoretical Views of Learning</td>
</tr>
<tr>
<td>EDT 506</td>
<td>Educational Evaluation</td>
</tr>
<tr>
<td>EGR 592</td>
<td>Research (3 credit hours)</td>
</tr>
<tr>
<td><strong>Fifth Semester</strong></td>
<td></td>
</tr>
<tr>
<td>EGR 592</td>
<td>Research (6 credit hours)</td>
</tr>
<tr>
<td>EGR 599</td>
<td>Dissertation/Thesis (3 credit hours)</td>
</tr>
<tr>
<td><strong>Sixth Semester</strong></td>
<td></td>
</tr>
<tr>
<td>EGR 599</td>
<td>Dissertation/Thesis (9 credit hours)</td>
</tr>
</tbody>
</table>

Outline of the Process for Obtaining the PhD Degree

The PhD in EESD will be awarded to candidates that complete the curriculum and demonstrate the capacity to produce independent scholarship to advance the field of engineering education. For full time students, this process is nominally about four years long. However, the evolution of a research project is difficult to predict and the time required to finish the degree can vary substantially among individuals. Details of these milestones are discussed later in this document, but a short outline of the process is given below:

1. Within your first 12 months in the program, identify faculty member(s) to serve as the advisor/co-advisors, and establish a supervisory committee (see section V for details)
2. Complete the 18-credit core curriculum
3. Complete the qualifying examination upon completion of the core courses (see section VI for details)
4. Complete additional coursework sufficient to meet the degree requirements (see section IV for details)
5. Work with your advisor to file an Approved Plan of Study (iPOS)
6. Pass the comprehensive exam, thus advancing to candidacy (see section VII for details)
7. Complete all coursework on your iPOS.
8. Write the dissertation and successfully defend the work (see section VIII for details)

Table 2: Sample iPOS 2

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Semester</td>
<td></td>
</tr>
<tr>
<td>EGR 574</td>
<td>Engineering Education Systems in Context</td>
</tr>
<tr>
<td>EGR 572</td>
<td>Quantitative Methods for Engineering Education Research</td>
</tr>
<tr>
<td>EGR 565</td>
<td>Qualitative Methods for Engineering Education Research</td>
</tr>
<tr>
<td>Second Semester</td>
<td></td>
</tr>
<tr>
<td>EGR 535</td>
<td>Engineering Innovation and Entrepreneurship</td>
</tr>
<tr>
<td>EGR 673</td>
<td>Applications of Quantitative Methods for Engineering Education Research</td>
</tr>
<tr>
<td>EGR 671</td>
<td>Applications of Qualitative Methods for Engineering Education Research</td>
</tr>
<tr>
<td>Third Semester</td>
<td></td>
</tr>
<tr>
<td>EGR 575</td>
<td>Mixed Methods for Engineering Education Research</td>
</tr>
<tr>
<td>PSY 532</td>
<td>Analysis of Multivariate Data</td>
</tr>
<tr>
<td>EGR 592</td>
<td>Research (3 credit hours)</td>
</tr>
<tr>
<td>Fourth Semester</td>
<td></td>
</tr>
<tr>
<td>EGR 502</td>
<td>Principles of Independent Research</td>
</tr>
<tr>
<td>PSY 533</td>
<td>Structural Equation Modeling</td>
</tr>
<tr>
<td>EGR 592</td>
<td>Research (3 credit hours)</td>
</tr>
<tr>
<td>Fifth Semester</td>
<td></td>
</tr>
<tr>
<td>EGR 592</td>
<td>Research (6 credit hours)</td>
</tr>
<tr>
<td>EGR 599</td>
<td>Dissertation/Thesis (3 credit hours)</td>
</tr>
<tr>
<td>Sixth Semester</td>
<td></td>
</tr>
<tr>
<td>EGR 599</td>
<td>Dissertation/Thesis (9 credit hours)</td>
</tr>
</tbody>
</table>

V. PhD Supervisory Committee

In the EESD PhD Program, the PhD supervisory committee shall consist of at least three members, including the primary advisor/co-advisors. At least three (for committees larger than three) of the members of the supervisory committee must be faculty approved to serve on committees in the EESD PhD Program, and the Executive Committee for the EESD PhD Program must approve any members that are not in this category, or that are from outside of ASU. Typically, the advisor/co-advisors, in consultation with the student, will establish the committee. As a group, the basic responsibilities of members of the supervisory committee include: providing guidance for the student’s research program, administering the comprehensive exam, and administering and evaluating the dissertation defense.

Selecting Advisor/Co-Advisors
The dissertation advisor/co-advisors plays a central role in the student’s maturation into an independent scholar, and this relationship is critical to your success. In the EESD PhD Program, a student may select to have one advisor or two co-advisors. The individual student’s research plans will dictate whether one advisor or two co-advisors is more appropriate for the anticipated dissertation work. Notably, in the co-advisor model, there is not one faculty member who serves as the primary “chair/advisor” and then another who serves as “co-chair/co-advisor.” Rather, both faculty members serve as equal co-advisors to the student. It is the student’s responsibility to identify advisor/co-advisors within the first 12 months of the program. To assist in this process, students are strongly encouraged to initiate conversations with faculty about their research interests, works styles, and expectations for advisees. The most productive advisor-advisee
relationships are those that are not only intellectually synergistic, but also have shared or complementary expectations and work styles. As a student goes through the process of finding advisor/co-advisors, he/she might also find it helpful to talk with other students in the program to get their perspectives on working with particular members of the faculty. Ultimately, both the student and the advisor/co-advisors need to formally agree on the advisor/co-advisors-advisee relationship. Shortly thereafter, the student should begin discussing and investigating potential research topics with their advisor/co-advisors.

Rights and Responsibilities of the Student
Students are responsible for identifying advisor/co-advisors with whom they would like to work and for inviting the collaboration. As previously discussed, the best examples of these relationships will include synergistic research interests as well as personalities and workstyles. Once the advisor/co-advisors-advisee relationship has been established, the following are examples of things that the student should be responsible for:

- Discussing course registration and plan of study with advisor/co-advisors before registering each semester
- Completing and engaging in courses in the degree program
- Making independent progress on defining the dissertation topic
- Seeking opportunities for funding, where relevant
- Making regular progress on dissertation and journal article writing
- Regularly consulting with your committee about your progress in the program

Finally, while we anticipate most advisor-advisee relationships to be fruitful and constructive, there are cases in which advisor/co-advisors/advisee (or, in cases with co-advisors, co-advisor/co-advisor) relationships do not work as anticipated, and this can produce a stressful situation that impedes progress. In such cases, the student has the right to discontinue working with one (or both) of his/her advisor/co-advisors and to identify new advisor/co-advisors with whom he/she would like to work. The recommended course of action in such cases is to discuss the situation with the EESD Program Chair, who will work with the student to facilitate the transition in the smoothest fashion.

Responsibilities of the Advisor/Co-Advisors
Once a faculty member has agreed to advise/co-advise a doctoral student, he/she assumes responsibility for overseeing that student’s progress, including scholarly and professional development. Aspects of this responsibility may include, but are not limited to:

- Providing guidance on the Plan of Study (iPOS), committee member selection, identification of funding opportunities
- Approving iPOS
- Providing timely responses and meetings to requests for help
- Providing detailed, regular feedback and input to dissertation research data collection, analysis, and writing projects
- Providing advice on professional development
- Serving as a reference for letters of recommendation
- Making introductions to colleagues in professional networks
• When applicable, communicating effectively and frequently with the student’s co-advisor
• Coordinating with committee members during the comprehensive exam
• Assessing both the qualifying and comprehensive exams
• Creating and distributing to the student the annual formative assessment
• Bringing required paperwork from the graduate college to the comprehensive exam and dissertation defense
• Recording and sharing with the student any revisions required at the completion of the comprehensive exam and dissertation defense

Responsibilities of Committee Members
Once a faculty member has agreed to serve on the committee of a doctoral student, he/she assumes a supportive (to the advisor/co-advisors) role in overseeing the student’s progress, including scholarly and professional development. Responsibilities of committee members may include, but are not limited to:

• Reviewing the dissertation document
• Advising on research design, analysis methods, writing, etc., in cooperation with the advisors
• Signing off on key milestones (e.g., comprehensive exams, dissertations, etc.)
• Providing feedback to the advisor/co-advisors for the annual formative assessment letters
• Submitting questions to the advisor/co-advisors in support of the student’s comprehensive exam

VI. Qualifying Examination
Upon completion of all six core courses (see Section IV) and the selection of an advisor/co-advisors, both of which typically take place within the first year in the program, all students must complete the qualifying exam. The exam should be submitted by September 15 or February 15 of the semester following the student’s completion of the core courses.

In preparation for the qualifying exam, students should gather evidence that demonstrates their proficiency in each of the four evaluation criteria described in Table 3. A single piece of evidence should be selected for each of the evaluation criteria. The evidence can be gathered from coursework, research experiences, or other sources as identified by the students’ advisor/co-advisor.

After collecting the six pieces of evidence, the student should write a 5-10 page reflection that at least approximately follow the S-A-I-D format, shown in Figure 1 and adapted from Hogan, C., Creative and reflective journal processes. The Learning Organization, 1995. 2(2): p. 4. The reflection should refer to the supplied pieces of evidence and should read as a continuous narrative (with sectioning, as necessary / appropriate). The reflection, along with the four pieces of evidence as appendices, should be submitted as a single .docx or .pdf file to the student’s advisor/co-advisor.

The exam will be assessed by the advisor/co-advisors along with one member of the EESD Executive Committee. Students who pass the exam will have demonstrated potential in each of the four evaluation criteria, along with effective written communication skills. Students that do
not demonstrate potential in one or more of the evaluation criteria will not pass the exam. There are three possible outcomes of the first attempt at the qualifying exam:

1. Pass, with no restrictions
2. Fail, with an option of one re-examination
3. Fail, dismissal from the program.

Students that fall into the second category will be advised with respect to actions they should take before the second attempt at the qualifying exam. This advice may include recommendations for deficiency courses, but if such a recommendation is made, these deficiency courses may not be used as part of the PhD iPOS. Students whom are seriously deficient on the first attempt at the exam and those that fail the exam a second time will be dismissed from the program.

Table 3: Qualifying Exam Evaluation Criteria

<table>
<thead>
<tr>
<th>Qualifying Exam Criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthesizing Literature</td>
<td>Student demonstrates the ability to synthesize relevant literature, including identifying common themes, making connections, and reconciling differences</td>
</tr>
<tr>
<td>Qualitative Research Methods</td>
<td>Student demonstrates ability to appropriately apply qualitative research methods (i.e., to the correct type of research problem using the correct analysis tools and drawing appropriate conclusions)</td>
</tr>
<tr>
<td>Quantitative Research Methods</td>
<td>Student demonstrates ability to appropriately apply quantitative research methods (i.e., to the correct type of research problem using the correct analysis tools and drawing appropriate conclusions)</td>
</tr>
<tr>
<td>Knowledge of the Field</td>
<td>Student demonstrates awareness of the breadth of the field of engineering education as well as depth of knowledge in at least one area</td>
</tr>
</tbody>
</table>

**VII. Comprehensive Examination**

EESD students are required to pass a comprehensive examination after passing the qualifying exam and no later than one year after completion of the degree program coursework (excluding research and dissertation credit hours). The examination will be administered by the supervisory committee, and exam is a rigorous process that, upon successful completion, elevates the student’s status to that of PhD candidacy. It is the responsibility of the student, in consultation with the research advisor/co-advisors, to schedule the time at which the student takes the exam. To begin the exam, students provide the advisor/co-advisors with a written document containing the following (notably, the student should have reviewed this document with his/her advisor/co-advisors prior to distributing to the committee).

- A description of the rationale (i.e., why is this an interesting problem to be researched?, research questions to be answered through the publication, what have others done?), and research methods (including experimental design, participants, data collection instruments, anticipated data analysis methods) for the dissertation. For students following the three-paper dissertation format, this should focus on the first paper only and should be...
supplemented by ideas about follow-up research questions to be addressed in the other articles.

- A plan and for the completion of the dissertation (including, at least, an estimated timeline for key milestones and ideas for professional development/plans to learn more)

Notably, this document is not intended to be a lengthy prospectus document. Instead, the document should be as concise as possible while still clearly and completely conveying the required information. Upon receiving the document from the students, the advisor/co-advisors distribute this document to the other members of the supervisory committee. Within what is typically about a one week time frame, all supervisory committee members are responsible for submitting questions to the advisor/co-advisors. Questions should help the student refine his/her research plans so that he/she can successfully complete the dissertation. Questions from supervisory committee members may be on any topic that the faculty member deems relevant, but should support the development of this outcome, and any particular response requirements (e.g., length, formatting, etc.) should be included with the questions. Examples of types of questions that might be submitted include:

- Questions directing the student to investigate potentially appropriate methods.
- Questions directing the student to potentially relevant articles for review
- Questions about potentially relevant theoretical frameworks
- Questions requesting particular analyses of sample (or collected) datasets
The advisor/co-advisors is responsible for coordinating the final set of questions to be distributed to the student from among those submitted by the members of the supervisory committee. The final set of questions will be distributed to the student by his/her advisor/co-advisors within what is typically about two weeks of submission of the original document. Students will then typically have between two and six weeks to return to the advisor/co-advisors a written document containing responses to the questions. The exact duration of time each student has to respond to the questions will be determined by the advisor/co-advisors in consultation with the student.

Within about two weeks of submission of the written responses to the advisor/co-advisors, the student will meet with his supervisory committee to orally respond to questions that committee members have about the submitted document. At the conclusion of the oral exam, the comprehensive exam is considered complete, and there are three possible outcomes:

- **Pass**
- **Pass, with major revisions**
- **Pass, with minor revisions**
- **Fail, dismissal from the program.**

If a student passes the comprehensive exam with major revisions, the required revisions will be documented by the faculty advisor/co-advisors. Additionally, a timeline will be provided within which the student must make the revisions and resubmit the written document. All committee members will then review the revised document to evaluate whether the revised document sufficiently addresses concerns. If it does, the students will have passed the exam. If not, the student is dismissed from the program.

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**S-A-I-D Reflection Format for EESD Qualifying Exam**

**Situation: What actually happened?**
Describe the event (i.e., creating the evidence), the circumstances, and the people involved. Keep it factual.

**Affect: What was its impact on you personally?**
Describe how you reacted to the event (positive or negative), perhaps in terms of how you felt about it at the time or subsequently. This description might explain why the event was so significant for you; why it was an “A-ha moment.”

**Interpretation: What did you learn from the experience?**
Describe what you learned from the event. Explain in what ways this new learning either confirms or contradicts your prior knowledge, theories or understandings about engineering education research.

**Decision: What did you decide to do so that you can become a better engineering education researcher?**
If it was a ‘positive’ (affirming) learning event, describe how you will ensure that the skill/ability you demonstrated will become part of your regular professional arsenal. If it was a ‘negative’ learning event, describe what you will do differently in the future to avoid having to learn the same lesson again the hard way.

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Figure 1: EESD Reflection Format
If a student passes the comprehensive exam with minor revisions, the required revisions will be documented by the faculty advisor/co-advisors. Additionally, a timeline will be provided within which the student must make the revisions and resubmit the written document. The advisor/co-advisors will then review the revised document to evaluate whether the revised document sufficiently addresses concerns. If it does, the students will have passed the exam. If not, the student is dismissed from the program.

Upon completion of the comprehensive exam, students should have a finalized set of research questions and methods for their dissertation work. Passing this examination elevates the student to the status of candidacy for the PhD degree. This process is documented with Report of Doctoral Examination form available on the EGR program website. The faculty advisor/co-advisors is responsible for bringing these forms to the exam, for capturing the exam result, for documenting revisions as specified by the committee, and for submitting the form to the TPS graduate advising office for processing.

VIII. Dissertation

All dissertations from ASU doctoral students must follow the formatting guidelines specified by the university (https://graduate.asu.edu/format-manual). Use American Psychological Association guidelines for writing style, references and citations, and reporting outcomes (http://www.apastyle.org/). Additionally, for the EESD PhD Program, dissertations can follow one of two formats:

1. In the three-paper format, the dissertation is composed of three related articles. These articles then comprise Chapters 2, 3, and 4 of the dissertation itself, while Chapters 1 and 5 represent an introduction and conclusion, respectively. This dissertation model promotes the dissemination of student’s dissertation findings in preparation for the academic job market.

2. For cases in which the three-paper format does not fit well with the student’s research questions, a more general format, to be decided on with the student and his/her advisor/co-advisors can be utilized.

Dissertation Defense

The completion of a PhD coincides with entry into the community of scholars, and publication of the research conducted in preparing the dissertation in peer-reviewed forums is considered a strong indication of the quality of the work and the capacity of the candidate to contribute to this community as their career unfolds. Students are encouraged to attend and submit their work to conference proceedings during the course of their program and, in consultation with their research advisor, students are required to submit at least one paper based on the dissertation research to a relevant and impactful journal.

The oral defense of the dissertation is a public examination that is administered by the supervisory committee. Students are responsible for working with their advisor/co-advisors and supervisory committee to schedule the defense such that all necessary deadlines and requirements established by the Graduate College are met, including submission of the completed dissertation to the Office of Graduate Education for format review at least 10 days before the oral defense. (Please see the 10-Day Working Calendar: https://graduate.asu.edu/file/10-working-day-calendar to identify permissible defense dates.) Importantly, your thesis defense must also be officially scheduled via your MyASU website under the My Programs and Degree Progress “Defense” tab for ASU
Graduate Education. This scheduling must be made at least ten working days prior to the actual defense.

Students are also responsible for reserving a room for the defense, and ensuring all necessary equipment is available. In addition, the dissertation must be delivered to all members of the supervisory committee at least 10 working days before the oral defense. The format of the oral defense will be established by the supervisory committee subject to the constraint that the defense includes both a public forum followed by a closed session limited to the supervisory committee. Prior to being eligible to schedule their dissertation defense, students in the EESD PhD Program must have submitted to a peer-reviewed journal at least one manuscripts.

The dissertation defense is an opportunity for the candidate to present and explain the relevance of the results of their research to the academy and to offer the community the opportunity to evaluate and comment on both the quality of the research and the qualifications of the candidate. At the completion of the exam, the supervisory committee will meet in closed session to further discuss the performance and qualifications of the candidate and cast their vote on whether or not the candidate has passed the exam. Passing the exam requires that the major advisor and a majority of the supervisory committee vote in the affirmative. The possible outcomes of the defense are Pass, Pass with minor revisions, Pass with major revisions, or Fail. The committee will discuss the results of their decision with the candidate, including all subsequent steps that are necessary.

After the defense the advisor/co-advisors must deliver a copy of the Doctoral Defense Report to the graduate advising office of The Polytechnic School, and, when all revisions are complete, the student must upload the final version of the dissertation through the MyASU and ProQuest.

IX. EESD Authorship guidelines

This portion of the handbook describes authorship guidelines for the dissemination of research for students and faculty affiliated with the EESD PhD Program. Much of it is based on guidelines found here: [http://www.britisoc.co.uk/publications/guidelines-reports/authorship-guidelines.aspx](http://www.britisoc.co.uk/publications/guidelines-reports/authorship-guidelines.aspx). These guidelines can also be used to initiate a discussion about authorship--preferably early in the process.

**General Guidelines**

Authorship should be discussed between researchers at an early stage in any project and renegotiated as necessary. Many disputes can be avoided by a clear, common understanding of standards for authorship. Early drafts of papers should include authorship and other credits to help resolve any future disputes.

Students should normally be the first author on any multi-authored article based on their thesis or dissertation. Students should also be first author on papers for which they assume responsibilities of lead - author (see later section); of note is that this is true even if their primary advisor/co-advisors are not co-authors on the paper.

**Attributing Authorship**

Authorship should be reserved for those, and only those, who have made significant intellectual contribution to the research. Participation solely in the acquisition of funding, general supervision
of the research group, or status as primary advisor or co-advisor of a student is not sufficient for authorship. Honorary authorship is not acceptable.

Everyone who is listed as an author should have made a substantial direct academic contribution (i.e., intellectual responsibility and substantive work) to at least two of the four main components of a typical scholarly project or paper:

a) Conception or design. Examples of this may include development of research questions and designing the methodologies to support those research questions such as, interview protocol development, rubric development, and experimental designs.

b) Data collection and processing. Examples of this may include conducting interviews, development of IRB protocols, observations, data collection to support survey development, and data cleaning.

c) Analysis and interpretation of the data. Examples of this may include running analysis such as factor analyses, data coding, constructing narratives, thematic analysis, placing findings in the context of the literature.

d) Writing substantial sections of the paper. Examples of this may include writing sections of the manuscript associated with contributions a-c above.

Everyone who is listed as an author should have critically reviewed successive drafts of the paper and should approve the final version. Everyone who is listed as author should also be able to defend the paper as a whole (although not necessarily all the details).

**Responsibilities of Authors**

**First Author:** Takes the lead in writing and formatting. This includes not only writing substantial portions of the manuscript, but also coordinating with co-authors about writing responsibilities and coordinating the manuscript submission process. The lead author is also responsible for establishing a timeline for writing, and leading the incorporation of revisions as manuscript reviews are returned.

**Other Authors:** Are responsible for supporting the writing of the manuscript as suggested by the lead author (and typically corresponding to contributions related to points a - c in the Attributing Authorship section). They are also responsible for critically reviewing and revising/editing successive drafts of the paper prior to submission and adhering to the timeline established by the lead author.

**Corresponding Author:** Responsible for all communications with the journal to which the manuscript was submitted and for communicating associated status updates with the other authors. In many cases, the first author also serves as the corresponding author, but there are circumstances in which it is more appropriate for other authors to serve as corresponding author. The decision about who should serve as corresponding author should be made collectively between all authors.

**Author Order**

Those who have met the requirements of being an author should follow the first author based on the size of their contributions. When there is not a clear difference in the sizes of contributions, refer to earlier guidelines regarding authorship orders for untenured and student authors. A footnote can be used if all authors feel they have contributed equally to the paper.
Decisions about Acknowledgements
All those who make a substantial contribution to a paper without fulfilling the criteria for authorship should be acknowledged, usually in an acknowledgement section specifying their contributions. Additionally, papers presenting work that was supported by a grant should, in most cases, acknowledge the funding agency (typically, standard language is provided for this by the funding agency itself).

Timeline/ Pace of Article
First authors should establish a reasonable timeline for manuscript submission in concert with co-authors.

X. Student Funding
There are a variety of mechanisms through which students can obtain financial support during their PhD studies, including obtaining a Research Assistantship (RA), Teaching Assistantship (TA), Fellowships, and Hourly Positions. Each of these funding mechanisms is discussed in more detail in this section, as is the distinction between these funding mechanisms and the student’s dissertation topic. Also of note is that students may be financially supported through different types of funding during the course of their PhD program.

Funding vs. Dissertation
We explicitly note here that the source of financial support and the selection of the student’s dissertation topic are not, by definition, related. While a student may choose to do his/her dissertation around work that aligns with an RA (or hourly research) position and may choose as advisor/co-advisors the PI/Co-PI on the project, it is not required that this be the case. Similarly, students are not required to select as their advisor/co-advisors the PI/CO-PI for the research projects upon which their funding is obtained. In cases where the two (funding + dissertation topics) are not aligned, a student is able to work as an RA on one project and then complete his/her dissertation on a different project (with potentially different faculty as advisor/co-advisors). Also of note is that students are encouraged to publish papers and conference proceedings based on work completed during the course of a RA (or hourly) position, whether or not this aligns with their dissertation topic. See section IX for authorship guidelines about who should serve as co-authors with the student on publications.

Research Assistantships (RAs)
Students funded with RA positions typically receive a bi-weekly stipend as well as full (or partial, depending on the degree of financial support) tuition and health benefits. The positions may be for a single semester or academic year, and are renewable based on the availability of funding and the decision of the PI/Co-PIs on the grant. Students working as RAs are responsible for supporting the research agenda established by the PI/Co-PI on the grant. While the specific requirements of an RA on a particular grant will be decided by the PI/CO-PIs for the project, RAs on a research project are typically responsible for at least the following:

- Making progress on research tasks (i.e., literature reviews, data collection, IRB submissions, data analysis, writing) in concert with guidelines specified by the project’s PI/Co-PI
- Preparing for and attending research group (and individual) meetings
• Meeting research deadlines or communicating the reasons for deadlines that are not (or will not be) met
• In concert with the PI/Co-PIs on the project, seeking out publication opportunities, both conferences and journals (see section IX on authorship guidelines)

Also, notably, all students in the Ira A. Fulton Schools of Engineering must be enrolled in 12 credit hours if they are funded as a TA or RA.

**Hourly Research Positions**
Along with RA positions, funded research projects often have research positions that are paid on an hourly basis. These positions do not typically include the tuition and health benefits offered by RA positions, but the responsibilities are similar. While the specific requirements of an hourly researcher on a particular grant will be decided by the PI/CO-PIs for the project, researchers paid hourly are typically responsible for at least the following:

• Making progress on research tasks (i.e., literature reviews, data collection, IRB submissions, data analysis, writing) in concert with guidelines specified by the project’s PI/Co-PI
• Preparing for and attending research group (and individual) meetings
• Meeting research deadlines or communicating the reasons for deadlines that are not (or will not be) met
• In concert with the PI/Co-PIs on the project, seeking out publication opportunities, both conferences and journals (see section IX on authorship guidelines)

**Teaching Assistantships (TAs)**
Students funded with Teaching Assistantship positions typically receive a bi-weekly stipend as well as full (or partial, depending on the degree of financial support) tuition and health benefits. The positions may be for a single semester or academic year, and are renewable based on the availability of funding, the need for TAs, and past performance as a TA. TA positions are awarded from The Polytechnic School Director’s office and are not determined by individual faculty members affiliated with the EESD PhD Program. Notably, all students in the Ira A. Fulton Schools of Engineering must be enrolled in 12 credit hours if they are funded as a TA or RA.

**Fellowships**
A fellowship provides financial support to graduate students without any associating teaching or research responsibilities. They are most typically awarded from a competitive applicant pool on the basis of merit. Two specific fellowship opportunities are listed below, but there are many additional fellowships to which EESD students could consider applying. Interested students should work with their advisor/co-advisors to identify appropriate opportunities.

• NSF Graduate Research Fellowship:  [https://www.nsfgrfp.org/](https://www.nsfgrfp.org/)
• Fulton Schools of Engineering Dean’s Fellowship:  [http://engineering.asu.edu/grad/graduate-fellowships/deans-fellowship/](http://engineering.asu.edu/grad/graduate-fellowships/deans-fellowship/)
XI. Grades, Academic Performance Standards, and Enrollment Constraints

Students enrolled in the EESD PhD program at the Polytechnic School must meet all university requirements in addition to the specific program requirements described in this document. The ASU Graduate Education satisfactory progress policies apply to all graduate students at ASU, and are outlined at graduate.asu.edu/sites/default/files/ASU_Graduate_Policies_and_Procedures.pdf. Meeting both the University and the Polytechnic School academic performance requirements requires that all PhD students must achieve a 3.25 GPA for each semester for which they are enrolled and achieve a cumulative grade point average of 3.25 or better in three different grade point average calculations:

- The grade point average in all courses numbered 500 or higher that appear on the transcript, except those that were listed as deficiencies in the original letter of admission
- The grade point average in all coursework that appears on the approved program of study
- The grade point average in all post-Master’s coursework taken at ASU.

Courses with grades of “D” (1.00) and “E” (0.00) cannot appear on the iPOS but will be included when calculating the Graduate GPA. Courses with a “W” or an “I” grade cannot appear on the iPOS and may be considered lack of satisfactory progress if there is more than one occurrence during the student’s graduate program of study.

Evaluation of Student Progress

At the end of every academic year, each EESD student will be provided with an assessment of their progress. This feedback is primarily formative and will be delivered in the form of a letter written by the student’s advisor/co-advisors, incorporating feedback from the committee members (and course instructors, where appropriate). The feedback will discuss the student’s strengths and areas for improvement in areas such as research, communication, teaching (where relevant), and academic performance/preparation. Also included in the feedback will be a designation that the student is placed under one of the following three categories:

- Satisfactory progress means that the student is progressing satisfactorily in their research, communication, teaching (where relevant), and academic performance/preparation
- Academic probation means the student has failed to meet all of the semester or cumulative GPA requirements outlined above or failed to make satisfactory progress in their research efforts
- Withdrawal from the program due to lack of satisfactory progress toward the degree

Students will be placed on probation if they fail to meet all of the GPA requirements, fail to make satisfactory progress toward completion of their thesis, or receive a grade of “D” or “E” in any course. Students placed on academic probation will receive a letter explaining the reasons for the probationary status, the required actions to return to normal status and the consequences if those conditions are not met.

A student will be recommended for withdrawal from the program if he/she fails to meet the probationary standards outlined in their probationary letter. The student will receive a letter from the Polytechnic School explaining reasons for recommendation for withdrawal. The student will have ten (10) calendar days from the date of the letter to appeal the decision to the EESD Executive
Committee. The EESD Executive Committee will review the appeal, and the EESD Program Chair, on behalf of the committee, will provide a written explanation of the outcome. If the outcome is favorable, the student will be required to sign an agreement acknowledging the recommendations of the Committee and the consequences if the agreements are not met.

If the appeal is not granted in favor of the student, the EESD Program Chair, on behalf of the EESD Executive Committee, will recommend that the TPS Director’s Office withdraw the student from the program. The student will then have the opportunity to appeal to the Polytechnic School Academic Standards Committee, which reviews the student’s case and makes the final recommendation to the Polytechnic School Dean’s Office and the program.

**Policy on Maximum Course Load**

Registration in nine credits is considered a full-time load for graduate students at ASU, and graduate Students in the Ira A. Fulton Schools for Engineering are restricted to a maximum of 12 credits per semester. Exceptions to register for more than 12 credits require approval of the EESD Program Chair. Also, students in the Ira A. Fulton Schools of Engineering must be enrolled in 12 credit hours if they are funded as a TA or RA.

**Continuous Enrollment Requirement**

Once admitted to the EESD PhD Program, students must be continuously enrolled for at least one credit hour during each fall and spring semester. Summer registration is required for students taking examinations, completing culminating experiences, defending dissertations, or graduating from the degree program in that semester. This credit must appear on the Plan of Study or must be an appropriate graduate-level course (e.g. 595, Continuing Registration). Courses with grades of “W” and “X” are not considered valid registration for continuous enrollment purposes.

Students planning to discontinue enrollment for a semester or more must request approval for a leave of absence (Request to Maintain Continuous Enrollment) through the Plan of Study (iPOS) petition. The ASU Office of Graduate Education allows for a leave of absence for a maximum of two semesters during a student’s entire program. Students who wish to take advantage of this policy must submit a Request to Maintain Continuous Enrollment to the Polytechnic School graduate advising office for review and approval. This petition (Request to Maintain Continuous Enrollment), must be approved by the EESD Program Chair and by the Office of Graduate Education, and must be submitted and approved before the start of the semester of the anticipated absence.

An approved leave of absence will enable students to re-enter their program without reapplying to the university and the graduate program. Students who do not enroll for a fall or spring semester without an approved Request to Maintain Continuous Enrollment are considered withdrawn from the university under the assumption that they have decided to discontinue their program. A student removed for this reason may reapply for admission to resume their degree program; the application will be considered along with all other new applications to the degree program. A student with a Graduate Education approved Request to Maintain Continuous Enrollment is not required to pay tuition and/or fees, but in turn is not permitted to place any demands on university faculty or use any university resources. See the ASU Graduate Policies and Procedures for more information.
Time Limit for Degree Completion
Doctoral Students at ASU must complete all work within a ten-year period, which begins with the semester and year of admission. Graduate courses taken prior to admission that are included on the Plan of Study must have been completed within three years of the semester and year of admission to the program (previously awarded master’s degrees used on the Plan of Study are exempt). The supervisory committee and the Dean of the Office of Graduate Education must approve any exceptions. See the ASU Graduate Policies and Procedures for more information.

XII. Advising
The Polytechnic School Graduate Advising Office is responsible for advising all graduate students with respect to progress toward the degree and program, school, college and university ASU Policies and Procedures. Questions involving details of academic content in courses, professional practice, and research can be discussed with faculty advisor/co-advisors or the EESD Program Chair.

XIII. Professionalism and Honor Code
The highest standards of academic integrity and compliance with the university’s Student Code of Conduct are expected of all graduate students in academic coursework and research activities. Students are expected to obtain, read and follow the University’s Student Code of Conduct requirements (ABOR 5-308) which can be obtained at https://eoss.asu.edu/dos/srr/codeofconduct, as well as the Fulton Engineering Honor Code, which may be found at: http://engineering.asu.edu/integrity/. The failure of any graduate student to uphold these standards will result in serious consequences, including suspension or expulsion from the university and/or other sanctions as specified in the academic integrity policies of the Polytechnic School, as well as the University.

Violations of academic integrity include, but are not limited to: cheating, fabrication of data, tampering, plagiarism, or aiding and/or facilitating such activities. At the graduate level, it is expected that students are familiar with these issues and take personal responsibility in their work. It is the student’s responsibility to become familiar with the academic integrity policies at the program, college and university levels.

XIV. Other Useful Pieces of Information
Travel grants are available through the Graduate Professional Student Association (GPSA) to support individual student travel to conferences, trainings, workshops, and other activities related to your program of study or professional development. For information about how to apply for the travel grants, see the following website: https://gpsa.asu.edu/funding/travel/.

XV. List of EESD Teaching Faculty
The following faculty are those that regularly teach required courses in the EESD PhD Program. Additional information on each faculty member can be found in the TPS faculty directory here: http://poly.engineering.asu.edu/directory/

- Jennifer Bekki, Associate Professor, EESD Graduate Program Chair, EESD Executive Committee Member
- Samantha Brunhaver, Assistant Professor
• Adam Carberry, Assistant Professor
• Shawn Jordan, Assistant Professor
• Nadia Kellam, Associate Professor, EESD Executive Committee Member
• Micah Lande, Assistant Professor
• Jeremi London, Assistant Professor
• Ann McKenna, Professor, Director of The Polytechnic School