



Graduate Handbook

PhD in Engineering, Specialization in Engineering Education Research

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Engineering Education Research: Graduate Student Handbook

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I. Handbook Objectives

This handbook serves as supplement to the UNL Graduate Studies Policies document <https://catalog.unl.edu/graduate-professional/graduate/>. This handbook only articulates the policies that are unique to the PhD in Engineering with a Specialization in Engineering Education Research program. Note that UNL Graduate Studies manages policies concerning timelines for establishing your Program of Studies and Supervisory Committee and other steps to Doctoral Degree Steps to Completion <https://www.unl.edu/gradstudies/academics/program-steps/doctoral-degree-steps-to-completion>.

II. Doctoral Overview

The completion of requirements of the **PhD in Engineering with a Specialization in Engineering Education Research** program confers the degree of Doctor of Philosophy (PhD).

Upon graduation, students will be able to:

- employ rigorous research skills to critique and make significant contributions to engineering education theory, practice and policy within an engineering discipline
- design, implement, and assess research-based pedagogies, curricula, and assessment strategies within and across engineering disciplines and other STEM disciplines.
- lead, communicate, enact the creative spirit, and work in diverse teams to change education within and across engineering disciplines and other STEM disciplines.
- be an active member in the vibrant local ([DBER Group](#)), national (e.g., [American Society for Engineering Education](#)), and international (e.g., [European Society for Engineering Education](#), [Australasian Association for Engineering Education](#)) community of engineering education researchers with a rich history ([Engineering Education Pioneers](#))
- promote diversity, equity, and inclusion (DEI) in engineering and embed considerations and practices for DEI in all aspects of one's work

III. Supervisor & Supervisory Committee

A Supervisor is assigned as part of the admissions process. To change supervisor, request a Change of Supervisor form from the EER Graduate Chair and then submit the completed form to the EER Graduate Committee. If all parties are in agreement, the Graduate Committee will endorse the change. If not, a neutral member of the Graduate Committee will be assigned to assist with negotiations. The COE Associate Dean of Graduate Education will be involved in an as-needed basis.

The PhD student's Supervisory Committee shall consist of four members, at least two of which (i.e., the chair (or one co-chair) and one other member) must be classified as a College of Engineering Discipline-Based Education Research (DBER) faculty member (<https://engineering.unl.edu/DBER/>).

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IV. Program of Studies

The requirements for the PhD in Engineering with a Specialization in Engineering Education Research include three areas of coursework. These areas include the courses that comprise the specialization, research methods courses, and two electives to support interests, career goals, and dissertation work. A minimum of 30 credit hours of coursework is required on the Plan of Study.

Table 1. Minimum Requirements

	Credit Hours
EER Specialization (ENGR 824, ENGR 833, ENGR 834)	9
Research Methods (Track-Specific)	12
Other Core Courses (GEOS 811-Seminar & ENGR 891-Theory)	6
Electives (8XX and 9XX course numbers, not seminars)	6
Engineering Discipline Courses (non-thesis/dissertation credits)	12
Research/Dissertation (ENGR 999)	12
TOTAL	90*

*Credit hour column does not add up to 90 – additional credits are needed beyond the minimum for degree completion.

A. Specialization in Engineering Education Research Courses

The specialization in engineering education consists of 9 credits that are intended to introduce students to fundamental topics in engineering education. The specialization required courses, along with their descriptions are:

- **ENGR 824: Unique Concerns of Engineering Education (3 cr hr)**
In this introduction to engineering education research as a field of inquiry, the purposes and contexts of engineering education will be illuminated through readings and discussions of its historical roots, current expressions, and future directions. This course will investigate the research on: engineering design, teaming, diversity & inclusion.
- **ENGR 833: STEM Teaching (3 cr hr)**
This learning experience is designed to provide graduate level training on teaching at the postsecondary level. Evidence-based teaching methods applicable to Science, Technology, Engineering, and Mathematics (STEM) will be investigated and a learner-based pedagogy will be used to engage those in the course to experience STEM practices. The common element of problem solving is emphasized across all STEM disciplines allowing for discovery, exploration, and application of critical thinking skills. Primary tasks include developing a unit on Canvas that includes learning outcomes, lecture and activities, and assessments, a teaching philosophy, and engaging with technologies that support and enhance teaching and learning.
- **ENGR 834: Framing STEM Education Research (3 cr hr)**
In this course, students will be introduced to the basic types of research study designs (quantitative, qualitative, and mixed methods) through examples in STEM education. Students will learn to identify an educational problem in STEM education, pose a research question, and support the need for a study through literature review. Students will become

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familiar with how theories of learning and thinking are used to predict or explain research findings. This is a discussion-based course that leads to the production of five artifacts: IRB certification; research paper critiques focusing on quantitative and qualitative studies, and a research proposal and an IRB application.

B. Research Methods

Research methods coursework must be taken to provide depth in a particular approach while providing exposure to the breadth of common approaches. The emphasis of coursework is to be selected to support dissertation work and career goals.

Quantitative Emphasis. For those seeking to build depth in quantitative research methods, 12 credit hours must be taken with 6 credit hours of statistical methods, 3 credit hours of measurement, and 3 credit hours of qualitative methods.

Qualitative Emphasis. For those seeking to build depth in qualitative research methods, 12 credit hours must be taken with 6 credit hours of qualitative methods, 3 credit hours of statistical methods, and 3 credit hours of measurement.

Mixed Methods. For those seeking to learn to effectively combine quantitative and qualitative research methods, the requirements for the Mixed Methods Research Certificate <https://www.unl.edu/gradstudies/academics/programs/MMRS-GCER> must be met.

The entry level courses that can be used for both the quantitative and qualitative emphases are as follows:

- Statistical Methods: EDPS 859 Statistical Methods 1.
- Qualitative Methods: EDPS 900K Qualitative Approaches to Educational Research 1
- Measurement: EDPS 870 Introduction to Educational and Psychological Measurement 1

C. Other Core Courses

- **ENGR 891: Theory in STEM Education Research (3 cr hr)** This course will delve into the role of theory and conceptual frameworks in STEM education research. Students will develop an understanding of relevant STEM education theories and learn to apply these theories in educational research studies. Course activities will involve collectively reading, discussing, synthesizing, critiquing, and communicating ideas around this topic.
- **GEOS 811: STEM Education Seminar (3 cr hr)**
Acquire familiarity with the broad range of current STEM education research, outreach, and other activities taking place at UNL and across the nation in order to build a larger context for and connections to one's own STEM research and activities.

D. Engineering Courses

Advanced coursework in an engineering discipline provides context for the research performed in engineering education. Twelve credit hours of 800 or 900 level coursework in engineering are required.

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E. Electives

An additional 6 credit hours of coursework should be selected to support completion of the dissertation and career goals. The electives should be discussed with the Supervisor.

V. Qualifying Examination

The purpose of the qualifying exam is to determine whether a student has acquired the foundational skills necessary to complete dissertation work. Through this exam, students will be expected to demonstrate:

- Basic research skills for independent research
- General knowledge of the engineering education field
- Written and oral communication skills appropriate for education research

Students are required to complete the qualifying exam prior to the start of their fourth academic-year semester of full-time enrollment. Students must have completed the EER Specialization courses and as well as a graduate level introduction to statistics (e.g., EDPS 859) and qualitative research methods (e.g., EDPS 900K).

The Qualifying Exam will be written, administered, and evaluated by an Examining Committee. This committee will consist of three UNL DBER faculty members selected by the EER Graduate Committee. One member will serve as the chair and be the student's point of contact. The chair(s) of the student's Supervisory committee will not serve on this committee.

A. Exam Timeline

Declaration of Intent	Students must notify their advisor 2 months in advance of their intention to take the exam.
Required Documentation to Proceed	Students must assemble, in consultation with the chair(s) of their Supervisory Committee, the following documents and submit them to the EER Graduate Chair six weeks prior to the exam. <ol style="list-style-type: none">1. Unofficial transcripts that show you have met (or will meet on the current semester) the course requirements for the Qualifying Exam2. Draft of Approved Program of Study as per the Office of Graduate Studies' Doctoral Degree Steps to Completion3. List of three distinct areas of research interest each with a short paragraph summarizing your interest in the area. These topics will be considered by the Examining Committee when formulating the student's exam.4. Written response to the following question: What are your career plans upon degree completion?
Written Exam	Students will be given a 2-week window to complete the written portion of the qualifying exam (details below).
Oral Exam	Two weeks following the submission of the written exam, students will engage in the oral portion of the exam. The time/date will be set as agreed upon by the student and Examination Committee but must be completed no more than three weeks after the conclusion of the written portion of the exam.
Exam Results	The outcome of the exam will be delivered to the student at the conclusion of the oral exam.

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B. Written Exam

The written portion of the exam will consist of two parts:

1. Proposal for a Research Study

For a topic selected by the Examining Committee, the students will be required to prepare a proposal for a study. The proposal will consist of three main sections: (1) Introduction, (2) Literature Review, and (3) Methods plus References. The study must be either qualitative or quantitative. A decision on the methods must be declared to the Examining Committee no later than one week into the written exam period.

2. Paper Critique

The student will prepare a full paper critique on a published study selected by the Examining Committee. Both a qualitative and quantitative paper will be provided to the student. The student must critique the one that uses methods not used in their written proposal.

C. Oral Exam

The oral exam will be scheduled for 2 hours. This is a closed-door examination attended by the student and the Examination Committee. The student will deliver a 30-minute presentation overview of their proposal and paper critique. The presentation will be followed by a 90-minute question-and-answer session.

For the oral, the focus is as follows:

Critique – Strengths and weaknesses as if presenting to an editorial board

Proposal - Justify the gap in literature, overview plan, and highlight alignment

D. Expected Behavior During the Exam

This exam is an individual exam. During the exam, the student may ask clarifying questions of the Examining Committee.

Once the qualifying exam is released to the student, the student, at a minimum, must submit a completed Paper Critique and an outline for each of the three sections of the research study proposal. Failure to do so will result in their enrollment in the EER program being terminated.

E. Outcomes

The Examining Committee will use a rubric to evaluate the written and oral portions of the exam. The exam result is either pass or fail. Committee feedback will be shared with the chair(s) of the student's Supervisory Committee. A student who passes is able to continue in the EER program.

A student that fails may take the exam a second time. The student must take the exam the second time no later than the end of the next AY semester. If the student does not pass the exam a second time, their enrollment in the EER program will be terminated.

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VI. Comprehensive Examination & Candidacy

For the comprehensive examination, the student will be required to write and orally defend a research proposal describing their dissertation research. Research proposals should follow the format for project narratives used by the NSF. (It is not necessary to include the budget, conflict of interest, current and pending support, or other forms.)

Timing wise, this exam should be completed prior to significant data collection. There should be time for the Supervisory Committee to provide input on or redirect the dissertation work.

A. Exam Timeline

Declaration of Intent	Students must notify the chair(s) of their Supervisory Committee 2 months in advance of their intention to take the exam.
Required Documentation to Proceed	Students must assemble, in consultation with the chair(s) of their Supervisory Committee, the following documents and submit them to the EER Graduate Chair six weeks prior to the exam. 1. Unofficial transcripts 2. CV 3. Draft of Application for Admission to Candidacy form
Written Exam	The written proposal must be submitted to the Supervisory Committee chair at least two weeks prior to the date of the oral defense of the proposal. The chair will then distribute the proposal to the Supervisory Committee if the proposal is acceptable.
Oral Exam	Two weeks following the submission of the written exam, students will engage in the oral portion of the exam. The time/date will be set as agreed upon by the student and their Supervisory Committee but must be completed no more than three weeks after the conclusion of the written portion of the exam.
Exam Results	The outcome of the exam will be delivered to the student at the conclusion of the oral exam.

B. Written Exam

The written exam will consist of a 15-page, single-spaced research proposal for the dissertation. Research proposals should follow the format for project narratives used by NSF, as determined by the Supervisory Committee. The following sections should be included:

1. Problem Statement | Motivation | Significance
2. Literature Review
3. Theoretical and Conceptual Frameworks
4. Research Questions and/or Hypotheses
5. Methodology
6. Plan of Work
7. Timeline
8. Broader Impacts
9. Intellectual Merit

If the Supervisory Chair deems the written exam unacceptable, the Supervisory Committee will be notified within 1 business day of proposal receipt and the exam will be terminated.

If the student desires to contest the decision of the Supervisory Committee Chair, it must be submitted in writing to the EER Graduate Chair.

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C. Oral Exam

The oral exam will be scheduled for 2 hours. This is a closed-door examination attended by the student and the Supervisory Committee. The student will deliver a 30-minute presentation overview of their proposal. The presentation will be followed by a 90-minute question-and-answer session.

D. Outcomes

The Supervisory Committee will use a rubric to evaluate the written and oral portions of the exam. The exam result is either pass, minor revisions needed, or major revisions need.

If the student passes, the student may submit the “Application for Admission to Candidacy” for the doctoral degree, noting the dates of completing the comprehensive examination(s).

If minor or major revisions are requested, the student will be asked to revise their proposal and provide a response back to their supervisory committee about how they addressed each revision request (a similar format to manuscript revisions).

VII. Dissertation and Final Oral Examination

In the semester prior to defending the dissertation, the Candidate should become familiar with the timeline and details of requirements laid out by Graduate Studies.

For the dissertation defense, the Candidate will be required to prepare a written dissertation and orally defend the dissertation. The contents of the dissertation will be determined by the Chair and confirmed by the Supervisory Committee.

Two weeks prior to the date scheduled for the final oral examination, an announcement is prepared by the Candidate. This announcement should include: the dissertation title; the name of the Candidate and the Chair/Co-Chair of the Candidate’s committee; a short (approximately 250 word) abstract; and the time, date and location of the oral examination. This announcement is sent to the Engineering Education Research Graduate Chair for dissemination to all DBER faculty and students.

The final oral examination for the doctoral degree is two hours in length. The first hour is open to members of both the University community and the public. During the dissertation presentation and general questioning, all persons may be present. The second hour is closed with only the Candidate and Supervisory Committee present. During this period, the Supervisory Committee will first meet without the Candidate to discuss the Candidate’s presentation. The Candidate will then be invited back in to participate in discussion period with the Supervisory Committee. Once the discussion has ended, the Candidate will be asked to leave the room and the Supervisory Committee will discuss the outcome before notifying the Candidate.

A. Outcomes

The Supervisory Committee will use a rubric to evaluate the dissertation and oral. For possible outcomes, candidates should refer to the UNL Graduate Studies Policies document:

<https://catalog.unl.edu/graduate-professional/graduate/>

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If minor or major revisions requested for the dissertation, the Candidate will be asked to revise their dissertation and provide a response back to their supervisory committee about how they addressed each revision request (a similar format to manuscript revisions).

VIII. Vacation Policy for Students on Assistantships

All vacations and leaves must be planned in advance and approval obtained from your graduate advisor. There are many times when a student's presence is absolutely necessary for the proper conduct of research. Conflicts can be avoided by careful and advanced planning. **School breaks such as Christmas, Thanksgiving, and Spring Break are work periods**, except for days declared as official University holidays (<https://hr.unl.edu/general/holidayschedule.shtml/>). Beyond the official University holidays, students are allowed up to 10 workdays of vacation. When going on vacation or leave, a telephone number and/or address should always be left with your graduate advisor.