



ENGINEERING EDUCATION RESEARCH
UNIVERSITY OF MICHIGAN

Engineering Education Research Program

Graduate Manual

Effective for students enrolling in
Fall 2018 or later

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eer.engin.umich.edu

Table of Contents

1. Introduction	1
2. Admission	2
2.1. Application to the EER Program	2
2.2. Deferrals	2
3. General Academic Policies	2
3.1. English Proficiency	2
3.2. Enrollment Status	3
3.3. Grade Requirements	3
3.4. Course Withdrawal	3
3.5. Transfer of Credit	3
3.6. Graduation	3
3.7. Honor Code	4
3.8. International Students	4
3.9. Petition for Waiver or Modification of Policy or Requirement	4
4. Ph.D. Degree	4
4.1. Ph.D. Degree Coursework	5
4.2. Cognate Course Requirement	5
4.3. Ph.D. Degree Plan of Study	5
4.4. Embedded Master's Degree	5
4.5. Ph.D. Degree Research Requirements	6
4.6. Other Ph.D. Degree Requirements	6
5. Ph.D. Degree Milestones and Timeline	6
5.1. Qualifying Examination	6
5.2. Candidacy	7
5.3. Dissertation Proposal Examination (DPE)	8
5.4. Oral Defense	8
5.5. Timeline For the EER Ph.D.	9
6. Academic Probation and Dismissal	10
6.1. Satisfactory Academic Progress	10
6.2. Progress Reports	10
6.3. Unsatisfactory Progress	10
6.4. Academic Probation	11
6.5. Dismissal	11
6.6. Option to Appeal	11
6.7. Professional Conduct	12
7. EER Course Information	12
7.1. Engineering Education Core	12
7.2. Research Methods Core	12
7.3. Specialization Electives	13
7.4. Immersive Learning Experience	13
8. Master's Degree	14
8.1. Master's Degree Coursework	14
8.2. Master's Degree Plan of Study	15
9. Certificate in EER	15
9.1. Application to the EER Certificate	15
9.2. Certificate Requirements	15
10. Additional Resources	16

1. INTRODUCTION

The Engineering Education Research (EER) Program at the University of Michigan (U-M) comprises a small core of EER courses and experiential learning requirements, and it builds on courses on research methods as well as elective courses from the Schools of Education, Information, and Social Work, the Departments of Psychology Public Policy, and Sociology, and other units across the university. The program comprises a Master's of Science (M.S.) degree and a Doctor of Philosophy (Ph.D.) degree, both of which enroll students who have already earned a Bachelor's of Science (B.S.) and an M.S. degree in a traditional engineering discipline. The program also offers an EER Certificate for students earning a Ph.D. in a traditional engineering discipline.

The **EER Core Faculty*** teach courses in the EER program and work with graduate students to refine students' plans of study, establish research projects, and guide the dissertation research. The intentional combination of course-based and experiential learning is intended to promote interdisciplinary and transdisciplinary research in engineering education and allow students to individualize their learning experience. The program further encourages linkages across U-M and the College of Engineering by fostering an intellectual community of faculty and students committed to the study and improvement of engineering education across the K-16 educational system who will benefit from a regular seminar series and additional activities to promote community.

The market for EER professionals is strong, and EER graduates earning an M.S. or Ph.D. degree have a number of job options including tenure-line faculty in traditional engineering or engineering education departments, instructors or research scientists in universities or national labs, professional staff in centers for teaching and learning, administrators in educational institutions or federal agencies, learning scientists at educational IT companies, and higher-educational liaisons to industry.

This EER Graduate Manual provides information on the requirements for the **EER Ph.D. Degree**, the **EER M.S. Degree**, and the **EER Certificate**. The manual is subject to change; however, any changes that affect currently enrolled students will only be enforced if they will be beneficial to the students' academic studies. Such changes will be communicated to all students affected.

The EER Ph.D. and M.S. degrees are part of U-M's Horace H. Rackham School of Graduate Studies (Rackham) which publishes the Graduate School Academic Policies with regulations that apply to all graduate students. Students in the EER Program should consult both this EER Graduate Manual and the Rackham Academic Policies guide (<https://rackham.umich.edu/academic-policies/>).

The **EER Graduate Chair** (eer-grad-chair@umich.edu) oversees graduate admissions, recruiting, Qualifying Examinations, fellowships, and graduate degree requirements, and serves as academic advisor for EER master's students.

The **EER Financial Administrator** (eer-fin-admin@umich.edu) is responsible for processing fellowships and employment paperwork for EER graduate students

The **EER Graduate Coordinator** (eer-grad-coordinator@umich.edu.) can help students navigate the policies and guidelines of both the EER Program and Rackham. The coordinator is responsible for issues related to student admissions, advising, curricula, and degree audits. The coordinator will also refer students to the other appropriate U-M organizations.

* Through a unique College of Engineering initiative, several tenured/tenure-track faculty whose primary area of scholarship is EER are embedded in traditional engineering departments. These *EER Core Faculty* maintain a thriving EER portfolio, contribute to the EER community, and teach in and support the mission of their home engineering departments.

2. ADMISSION

2.1. APPLICATION TO THE EER PROGRAM

Admission to the EER Program is through Rackham (<https://eer.engin.umich.edu/admissions/>). It is the applicant's responsibility to ensure the EER Program receives the completed application materials by the specified deadlines.

All students entering EER Program must have already earned both B.S. and M.S. degrees in a traditional engineering discipline. Thus, to be considered for admission to the EER Program, all applicants must either have already completed or be currently enrolled and on track to complete a master's degree in a traditional engineering discipline prior to enrolling in the EER Program (students whose only master's degree is in EER are not eligible to apply for the Ph.D.). This requirement ensures that (1) students enter the program with the technical engineering expertise necessary to understand the context critical for developing high quality EER research, and (2) students graduate from the program with marketable skills and ample career opportunities. Application for both the EER Ph.D. and M.S. degrees can be completed at the Rackham website, and applying to the program requires:

- A completed application form;
- An academic statement of purpose that describes how the EER Program will support the student's career and educational goals;
- A personal statement that describes background and life experiences that have influenced the student's decision to pursue an EER degree at U-M;
- Three letters of recommendation;
- Transcripts from B.S. and M.S. degrees and from other previous academic coursework;
- Current GRE scores (completed no more than five years prior to application); and
- TOEFL scores (for all non-native English speakers).

Students admitted to the EER Ph.D. program will be assigned an EER Faculty Advisor. We expect the EER Faculty Advisor to serve in that capacity through the student's successful completion of the PhD. This assignment, however, is flexible, and mechanisms are in place to allow students to identify a different EER Faculty Advisor if appropriate or necessary.

2.2. DEFERRALS

Deferrals may be available for up to one term under special conditions (<https://rackham.umich.edu/admissions/applying/respond-to-the-offer/#deferring>). Typically, circumstances such as employment, enrollment at another institution, funding, or indecisiveness regarding enrollment are not appropriate justifications for requesting deferred enrollment. It is the policy of the EER Program that requests for a one-year deferral will require a new application. To request a deferral, send an email to eer-grad-coordinator@umich.edu.

3. GENERAL ACADEMIC POLICIES

3.1. ENGLISH PROFICIENCY

Based on English language proficiency test scores (such as the TOEFL), some students will be encouraged by Rackham to take specific academic writing or speaking courses offered by the English Language Institute (ELI) to support their studies. The ELI courses are typically 1 to 3 credits, and they will help students gain capability and confidence in English. These courses will not count toward the degree or grade point average (GPA).

The quality of a student's written and spoken English is also evaluated when Ph.D. students participate in the oral Qualifying Examination and Dissertation Proposal Examination presentations. Students who are unable to complete degree requirements or make satisfactory progress toward the degree because of significant deficiency in English may be placed on probation. If the EER faculty consider students to be otherwise qualified for the EER Program, taking English as a Second Language courses may be recommended.

3.2. ENROLLMENT STATUS

To be considered full-time, students who are not serving on a Graduate Student Instructor (GSI) or Graduate Student Research Assistant (GSRA) appointment must be enrolled in at least 8 credits in a given term, while students who are serving on a GSI or GSRA appointment must be enrolled in at least 6 credits in a given term. Students who enroll in fewer than these credits will be considered to be enrolled part-time. Courses in the English Language Institute do not count towards enrollment status, nor does Visit/Audit of a class.

Students who maintain part-time enrollment will accrue a per-credit tuition charge, while those who enroll full time are charged a flat tuition rate based on residency and candidacy status. Michigan residents qualify for in-state tuition, and students who achieve candidacy qualify for a lower tuition rate.

3.3. GRADE REQUIREMENTS

Except for research credits (EER 690, EER 990, and EER 995) which are graded as “S” (satisfactory) or “U” (unsatisfactory), all courses must be letter-graded. Grades are assigned according to the following Rackham scale:

A+	4.3	B+	3.3	C+	2.3	D+	1.3
A	4.0	B	3.0	C	2.0	D	1.0
A-	3.7	B-	2.7	C-	1.7	D-	0.7

Graduate students must maintain a GPA of at least 3.0, based on Rackham’s 4.0 scale, and only course grades of B– or better will be counted towards the credit hour requirements for the EER Ph.D. or M.S. degree. Students whose cumulative GPA falls below 3.0 on the 4.0 scale may be placed on probation, as described in Section 6.

3.4. COURSE WITHDRAWAL

At the beginning of each term, there is a drop/add period (the first three weeks of classes) during which students are allowed to register for courses through Wolverine Access without penalty. University-wide deadlines are set by the Office of the Registrar (<https://ro.umich.edu/calendars>). After the drop/add deadline, students may continue to drop and add courses through Wolverine Access, but this will be considered a “late-drop” or “late-add.” A late-drop will result in students receiving a “W” grade on the transcript (signifying withdraw), which cannot be removed from the transcript.

After the eighth week of a full term (fourth week of a half term), courses may be dropped or changed to Visit/Audit status only under exceptional circumstances and with the approval of the course instructor, the EER Faculty Advisor, and the EER Graduate Chair.

3.5. TRANSFER OF CREDIT

Students who wish to transfer credits must follow the Rackham Transfer of Credit guidelines (<https://rackham.umich.edu/navigating-your-degree/transfer-of-credit-information/>), and they may only apply the transfer credit towards Specialization Electives of the EER program. Specifically, with approval from the EER Graduate Chair, students may be allowed to transfer up to 6 credits from external institutions or 15 credits from within U-M. Transferred credits must be used in whole and cannot be split (e.g. students cannot choose to only use 2 credits earned from a 4 credit course).

To transfer credits, students must first have completed 8 credits of letter-graded graduate-level courses at U-M and must have a minimum GPA of 3.0. Transfer credits can only be awarded for courses that are at the 500-level or higher. Students must have earned a “B” grade or higher in the course, and students cannot have used the course to satisfy any undergraduate or graduate degree requirements.

3.6. GRADUATION

Graduation for the M.S. or Ph.D. degree is not automatic. Students who have completed the degree requirements must (1) submit a signed, completed final M.S. or Ph.D. Plan of Study to the EER Graduate Coordinator and (2) apply for graduation via Wolverine Access. The last day to apply for graduation for the M.S. degree for the current term is the

last day of classes (not the final exam period). Ph.D. students must complete all requirements by the stated deadlines to qualify for graduation.

3.7. HONOR CODE

The EER Program at U-M follows the College of Engineering Honor Code which outlines standards of ethical conduct. (<https://elc.engin.umich.edu/policies-and-interpretations/>). The Honor Council investigates reported violations of the Honor Code.

3.8. INTERNATIONAL STUDENTS

Curricular Practical Training (CPT) for F-1 Students

The intent of CPT is for students to engage in practical job experience that directly relates to their academic program of study. Students must choose their internships carefully with the understanding that any job that is NOT specifically related to the applicant's major area of study, will likely result in the denial of the CPT request.

International students who wish to enroll in CPT should contact the EER Graduate Coordinator (eer-grad-coordinator@umich.edu) to receive the CPT instruction form and complete all necessary paperwork. Credit for CPT (RACK 998) may not be counted toward any EER degree requirements.

Optional Practical Training (OPT) for F-1 Students

OPT is defined in the Federal Regulations as temporary employment directly related to a student's field of study. During OPT, students remain in F-1 status. The end result of the OPT request process is an Employment Authorization Document (EAD) issued by United States Citizenship and Immigrations Services (USCIS). Processing OPT applications typically requires 60 to 90 days. Some STEM students may be eligible for a 17-month extension of OPT.

Reduced Course Load (RCL) for F-1 Students

International students who drop below full-time status or who need fewer than 8 credits to complete their program requirements, should contact the EER Graduate Coordinator (eer-grad-coordinator@umich.edu) and should apply for RCL through the International Center (<http://internationalcenter.umich.edu>).

Please note that students are eligible for RCL only if they have not yet completed their degree requirements. Due to Federal regulations, students must apply for their degree in the term in which they complete their degree requirements. If students wish to remain in the country after completing their requirements, they must apply for OPT. The International Center can provide more information

3.9. PETITION FOR WAIVER OR MODIFICATION OF POLICY OR REQUIREMENT

If there are special circumstances that warrant it, students may petition for a waiver or modification of EER Program policies or requirements. Students should first seek the advice of their EER Faculty Advisor, and then must complete the Petition Request Form. The EER Faculty Advisor must approve this request and then submit it to the EER Graduate Coordinator (eer-grad-coordinator@umich.edu) who will submit it to the proper unit for final approval.

4. PH.D. DEGREE

The EER Ph.D. is a typical research-based doctoral degree. It provides essential coursework and other learning experiences that will prepare students to publish in top tier engineering education and education journals, to compete for federal grants and contracts, and enter into multiple career paths. Students who are admitted to the EER Ph.D. program will be assigned an **EER Faculty Advisor**, who is a member of the EER Core Faculty, or two EER Faculty Co-Advisors (one of whom must be a member of the EER Core Faculty). The EER Faculty Advisor is intended to serve as the primary academic and research advisor.

4.1. PH.D. DEGREE COURSEWORK

The Ph.D. degree requires a minimum of 36 graduate-level credit hours. The credit distribution is shown in Table 1.

Table 1. Credit distribution for Ph.D. Degree

Category	# courses	# credits
Engineering Education Core	2	6
Research Methods Core	4	12 (minimum)
Specialization Electives	5	15 (minimum)
Immersive Learning Experience	1	3
Total	12	36 (minimum)
Additional Research Experience	n/a	48 (approximately)

The courses that comprise these requirements are described in more detail in Section 6. Up to 6 credits of EER 690: *Graduate Independent/Directed Study* may be counted towards Specialization Electives. Besides EER 690, all courses used for the Ph.D. degree coursework requirements must be letter-graded and may not be marked as satisfactory/unsatisfactory. Courses that **do not count** toward Ph.D. degree coursework requirements include the following: courses with number 990, 995; course with “doctoral,” “dissertation,” or “preliminary” in the title; RACK 998 (Curricular Practical Training); courses from the English Language Institute; courses with insufficiently advanced content and level; and courses which substantially duplicate the content and level of courses already completed.

4.2. COGNATE COURSE REQUIREMENT

Rackham requires Ph.D. students to complete at least 4 credits of coursework outside of their major research/interest area. Only letter-graded, graduate-level courses outside of the EER Program may be used to meet this cognate requirement. Students completing an EER graduate degree will automatically fulfill this requirement by satisfying the mandatory number of Specialization Electives.

4.3. PH.D. PLAN OF STUDY

Students will plan their program of study and select the courses for the Ph.D. in consultation with the EER Graduate Chair and their EER Faculty Advisor. Students are required to submit an initial Ph.D. Plan of Study, approved and signed by the EER Graduate Chair, at the beginning of their first term (within a month after the beginning of the first term). Failing to do so will risk the ability to register the following term.

Students are also required to obtain pre-approval and signature from the EER Graduate Chair and EER Faculty Advisor on a revised Ph.D. Plan of Study each time they wish to make changes to it, and they must obtain approval for a final Ph.D. Plan of Study in their final term. Failing to do so will risk the ability to graduate. It is highly recommended that students meet with the EER Graduate Chair to discuss the plan at the beginning of each term

The final Ph.D. Plan of Study must satisfy all Rackham coursework requirements (including GPA, residency, and cognate requirements, see <https://rackham.umich.edu/policy/section4/>).

4.4. EMBEDDED MASTER'S DEGREE

Students who enter the EER Ph.D. Program are automatically enrolled in the EER M.S. Program (described in Section 6). Students will complete all of the academic requirements for the master's degree as they pursue the EER Ph.D., and they will be eligible to add the M.S. degree upon successful completion of the 30 credits of master's degree coursework. To add the master's degree, students must submit a final M.S. Plan of Study (approved and signed) to the EER Graduate Coordinator at the beginning of the term in which they will complete the master's degree requirement.

4.5. PH.D. DEGREE RESEARCH REQUIREMENTS

Extensive engagement in research is an expectation throughout the EER doctoral experience, and all EER Ph.D. students will be required to conduct independent research for their dissertation. The ongoing research apprenticeship will ideally begin in the first or second term as students begin work on directed research (EER 690: *Graduate Independent/Directed Study*) with their EER Faculty Advisor, and most students will enroll in 6 credits of directed research (EER 690) within their first three terms. Up to 6 credits of EER 690 may be counted towards the Specialization Electives.

Beyond EER 690, EER students are required to conduct advanced dissertation research experience. After students have identified a dissertation research area, they should enroll in up to 8 credits of EER 990: *Dissertation Research/Pre-Candidate*, under the supervision of their EER Faculty Advisor, every term until candidacy. Upon achieving candidacy, students must enroll in 8 credits of EER 995: *Dissertation Research/Candidate*, under the supervision of their EER Faculty Advisor, every Fall and Winter term until defending their dissertation. Enrollment in the Spring/Summer term does not count toward required research credits except when students are defending their dissertation during the summer months.

4.6. OTHER PH.D. DEGREE REQUIREMENTS

Responsible Conduct of Research and Scholarship

Prior to achieving candidacy, Ph.D. students must complete the College of Engineering's Responsible Conduct of Research and Scholarship (RCRS) program, consisting of four distinct workshops. More information and a link to register for the free workshops is available at the RCRS website (<http://rcrs.engin.umich.edu>).

Conference Presentation(s)

At a minimum, all EER Ph.D. students, regardless of their career paths, are required to author (or co-author) one conference paper and present research findings at one international conference before graduation. Most students, and particularly those students preparing for faculty and other research-oriented careers, will author and co-author additional publications related to their research during the course of their program to prepare them for the job market. This requirement will be enforced by the EER Faculty Advisor.

5. PH.D. DEGREE MILESTONES AND TIMELINE

5.1. QUALIFYING EXAMINATION

The Qualifying Examination requires students to synthesize and apply knowledge from their coursework as they execute an EER research project. Ideally, the Qualifying Examination will serve as preparation for the dissertation research, but this is not a requirement. The Qualifying Examination consists of a **written research proposal** accompanied by an **oral presentation and examination**. The written research proposal should identify a research need from the EER literature, articulate a relevant research question, provide a detailed review of the literature, outline a basic research project (not necessarily related to the student's dissertation research) to address that question, and collect and analyze data. The oral presentation and examination should allow students to demonstrate their expertise and knowledge.

Qualifying Examination Committee

The *Qualifying Examination Committee*, formed by the EER Graduate Chair, will consist of two EER faculty members (neither of whom may be the student's EER Faculty Advisor or Co-Advisor). The committee will review the written research proposal, conduct the oral presentation and examination, and deliberate in private on the outcome of the Qualifying Examination (graded Pass/Fail). The EER Faculty Advisor may attend the oral presentation but may not be present during the deliberations of the *Qualifying Examination Committee*.

Timing for the Qualifying Examination

The Qualifying Examination will be offered each April and December, and Ph.D. students must take the Qualifying Examination either in the semester during which they complete the master's degree coursework or the following semester. In the year leading up to the Qualifying Examination, students are expected to have regular conversations with their EER Faculty Advisor to plan and refine ideas for the Qualifying Examination.

Students must register their intent to take the Qualifying Examination by January 15 (if they wish to take the April examination) or September 15 (if they wish to take the December examination) by submitting a 3-page outline of the written research proposal to their EER Faculty Advisor through an online portal. The outline should describe a research need in the field of EER and provide an overview of the research proposed to address the need. Then the EER Faculty Advisor shall review the outline, provide feedback, and approve the proposal by January 30 (for the April examination) or September 30 (for the December examination). Upon obtaining approval, students should execute the research in preparation for the Qualifying Examination at the end of the semester.

Students should coordinate with their *Qualifying Examination Committee* to schedule the oral presentation and examination to occur between April 10–30 or December 1–20. Two calendar weeks prior to the scheduled presentation and examination, students must submit the written research proposal to the online portal for review by the committee.

Students should typically take the Qualifying Examination during the fourth term in the program, and the EER program's deadline for students to pass the exam is the end of the third year. The *Qualifying Examination Committee* may permit students who fail the Qualifying Examination to petition to the EER Graduate Chair for a second opportunity to pass the exam or may dismiss students without probation at the end of the term in which the Qualifying Examination is taken. In the latter case, the level of funding will continue through the term in which the Qualifying Examination is failed.

5.2. CANDIDACY

Advancing to candidacy is a prestigious milestone on the way to the Ph.D., and students are expected to do so within three years of enrolling in the Ph.D. program, as stipulated by Rackham. Deadlines for completing the requirements to advance to candidacy are found at the Rackham website (<https://rackham.umich.edu/navigating-your-degree/candidacy-deadlines>).

To advance to candidacy, students must:

- 1) Complete all 30 credit hours of master's degree coursework for EER (note that credits elected for Visit/Audit status do not meet this requirement, nor do any EER 990 credits) and be in satisfactory academic standing,
- 2) Pass the EER Qualifying Examination,
- 3) Satisfy all Rackham candidacy requirements (including GPA, residency, etc.; see <https://rackham.umich.edu/navigating-your-degree/candidacy-requirements/>).
- 4) Complete the College of Engineering's Responsible Conduct of Research and Scholarship (RCRS) program.

A student who completes the 30 credits of master's degree coursework but does not pass the Qualifying Examination within the three-year time frame will be released from the program with an M.S. degree in EER., unless Rackham has granted a petition request for additional time because of extenuating circumstances.

Candidacy is not automatic. Once all EER and Rackham requirements are satisfied, students must apply for candidacy by submitting the appropriate forms to the EER Graduate Coordinator (eer-grad-coordinator@umich.edu). These forms include the Ph.D. Plan of Study approved by the EER Graduate Chair and the EER Faculty Advisor.

Course Enrollment During Candidacy

Upon achieving candidacy, students must maintain full-time enrollment by registering for 8 credits of EER 995: *Dissertation Research/Candidate* under the supervision of their EER Faculty Advisor every term until defending their dissertation (students who are defending in the Spring or Summer may register for 4 credit hours in a Spring or Summer half term). No part-time enrollment is allowed.

In addition to EER 995: *Dissertation Research/Candidate*, candidates may elect one course per term, for a total of not more than 4 credits, without paying additional tuition. This course may be taken for credit or for Visit/Audit status. Students who do not elect a course during a term of EER 995 enrollment may elect two courses in the next term of EER 995 enrollment; however, no more than one course may be deferred in this manner (an additional course may not be taken in anticipation of taking none in a future term of EER 995 enrollment).

Thus, as students may have up to 6 remaining credits of coursework after achieving candidacy, they can complete the coursework in two consecutive terms.

Candidates who choose to take more courses than those for which they are eligible with the candidacy tuition rate will be assessed additional tuition per credit hour. Students are responsible for covering the additional tuition costs accrued, even if they are being funded through a fellowship, GSI, or GSRA position.

5.3. DISSERTATION PROPOSAL EXAMINATION (DPE)

The Dissertation Proposal Examination (DPE) requires students to propose their dissertation research. This examination includes a **written research proposal** for the planned dissertation research and an **oral presentation and examination**. The dissertation proposal should identify a significant research need in the EER literature, articulate a series of relevant research questions, provide a detailed review of the literature, outline an original, advanced research project to address that question, and possibly include initial research results. The oral presentation and examination should allow students to demonstrate their expertise and knowledge about the proposed research area.

Dissertation Committee

The *Dissertation Committee* is responsible for reviewing the written research proposal, conducting the oral examination, and deliberating on the outcome of the Dissertation Proposal Examination (DPE). The committee should be formed by the student, in consultation with the EER Faculty Advisor. It should be chaired by the EER Faculty Advisor (or co-chaired by the EER Faculty Co-Advisors if applicable), and it should comprise three or more additional members, including at least two EER Core Faculty members and at least one cognate member who is not part of the EER Core Faculty. The EER Graduate Chair must approve the student's *Dissertation Committee*.

All members of the *Dissertation Committee* should bring important content and/or methodological expertise to the committee and should be willing to guide students as they progress through the dissertation process. Cognate members will typically be selected from a field that is substantially related to the research topic chosen by students (e.g., education, psychology, organizational theory and behavior)

The committee must satisfy Rackham's Guidelines for Dissertation Committees (<http://www.rackham.umich.edu/current-students/dissertation/committees>). All members of the *Dissertation Committee* should have graduate faculty status. Request for committee members who do not have graduate faculty status must be approved through Rackham.

Timing for the DPE

Students should typically complete the DPE by the end of the third year in the program, and the EER program's deadline for students to complete the DPE is the end of the fourth year in the program. Students who fail the DPE will be permitted to petition for a second opportunity to pass the exam within six months.

Once students have successfully passed the DPE, they should meet informally (or formally at the discretion of the committee chair) with the *Dissertation Committee* at least once per year.

5.4. ORAL DEFENSE

Each Ph.D. Candidate must prepare a written dissertation, giving evidence of their abilities to (1) conduct original, advanced research, (2) present the results of that research in well-written form, and (3) defend the work orally in an open examination. The dissertation is the most important aspect of the PhD program experience. Students should prepare a rough draft of the dissertation and provide it to all members of the *Dissertation Committee*, collecting their comments, before preparing a final draft.

A final and complete copy of the written dissertation must be submitted to all members of the *Dissertation Committee* at least 14 business days before the scheduled date of the Oral Defense to allow sufficient time for a written evaluation. The committee members will then review the written dissertation and, if all members of the committee deem it acceptable, the Oral Defense will be held. The Oral Defense will be a public seminar presented by the candidate, with an open question period, followed by a question period with just the *Dissertation Committee* on the candidate's research.

Following the Oral Defense, the *Dissertation Committee* may require minor edits to the dissertation, and after the committee approves the final draft of the dissertation, it must be formatted to meet Rackham's standards. Students are also required to set up a pre-defense meeting and a post-defense meeting with Rackham to complete the doctoral degree requirements (<https://rackham.umich.edu/navigating-your-degree/completing-doctoral-degree-requirements/>).

Rackham requires students to enroll in 8 hours of EER 995: *Dissertation Research/Candidate* during the term of the Oral Defense, and students must defend and complete all Rackham degree requirements before the final doctoral degree deadline for the term.

Rackham allows a grace period of several additional weeks beyond the end of each term for Ph.D. students to complete all of the doctoral degree requirements (<https://rackham.umich.edu/policy/section4/>). The grace period enables students to complete their work without needing to register for the new term. However, the degree is still awarded at the end of the new term.

Timing for the Oral Defense

Students should typically defend their dissertation by the end of the fifth year in the program, and the Rackham deadline for doing so is by the end of year seven.

5.5. TIMELINE FOR THE EER PH.D.

The Ph.D. coursework and research activities are unique to each student. Therefore, the Ph.D. degree timeline is subject to flexibility in timing. A representative timeline for the EER Ph.D. is shown in Table 2.

Table 2. Representative Timeline for EER Ph.D.

Year: Term	Coursework	Research Activities	Milestones
Year 1: Fall	Enroll in 2 or 3 courses	Attend EER seminars and events	
Year 1: Winter	Enroll in 2 or 3 courses	Attend EER seminars and events	
Year 1: Sp/Su		Conduct research with EER Faculty Advisor	
Year 2: Fall	Enroll in 2 or 3 courses	Conduct research with EER Faculty Advisor	Prepare for Qualifying Exam Complete RCRS program
Year 2: Winter	Enroll in 2 or 3 courses	Conduct research for dissertation proposal	Pass Qualifying Exam Earn M.S. degree Advance to candidacy
Year 2: Sp/Su		Conduct research for dissertation proposal	
Year 3: Fall	Enroll in up to one course	Conduct research for dissertation proposal	Form <i>Dissertation Committee</i>
Year 3: Winter	Enroll in up to one course	Conduct research for dissertation proposal	Pass Dissertation Proposal Exam
Year 3: Sp/Su		Conduct Ph.D. research	Present research at conference
Year 4: Fall	Enroll in up to one course	Conduct Ph.D. research	Update <i>Dissertation Committee</i>
Year 4: Winter	Enroll in up to one course	Conduct Ph.D. research	

Year 4: Sp/Su		Conduct Ph.D. research	Publish journal paper
Year 5: Fall	Enroll in up to one course	Conduct Ph.D. research	Prepare for Oral Defense Update <i>Dissertation Committee</i>
Year 5: Winter	Enroll in up to one course	Conduct Ph.D. research	Pass Oral Defense Make required dissertation revisions Graduate with Ph.D.

The deadline for achieving key milestones is as follows:

- Students must pass the Qualifying Examination and advance to Candidacy by the end of the Year 3
- Students must pass the Dissertation Proposal Examination by the end of Year 4
- Students must complete the Ph.D. degree by the end of the seventh year (students who take longer than five years may lose departmental financial support).

Students may be granted four additional months (one term) to complete each milestone with approval from both the EER Graduate Chair and the EER Faculty Advisor. Students who take more than seven years to earn the Ph.D. degree must submit a petition to Rackham requesting an extension.

6. ACADEMIC PROBATION AND DISMISSAL

6.1. SATISFACTORY ACADEMIC PROGRESS

Guaranteed financial support and continued enrollment are contingent upon students maintaining satisfactory progress in the following ways:

- Maintain a cumulative GPA of 3.0 or higher on a 4.0 scale,
- Pass the Qualifying Examination by the end of Year 3,
- Complete the Dissertation Proposal Examination by the end of Year 4,
- Maintain adequate progress toward completion of the dissertation, and
- Follow university standards of professional conduct.

6.2. PROGRESS REPORTS

To document progress towards the Ph.D., all students are required to submit a Progress Report by February 1 each year, and EER Faculty Advisors are required to review the reports and submit their evaluations by February 15. Failure to submit the Progress Report may result in being placed on probation (as determined by the *Academic Probation Committee*, Section 6.4).

The EER Core Faculty will meet to review all completed Progress Reports and will provide a written evaluation of each student's progress by February 28. The evaluation will indicate one of three possible outcomes: (1) satisfactory progress, (2) progress that is of concern, or (3) unsatisfactory progress. If progress is of concern, students will be required to submit a follow up Progress Report within two months.

The student, EER Graduate Chair, or EER Faculty Advisor may also initiate an evaluation at any time by submitting a Progress Report.

6.3. UNSATISFACTORY PROGRESS

If students are making unsatisfactory progress, either in one or more of the ways outlined in Section 6.1 or as revealed on the Progress Report as described in Section 6.2, the EER Graduate Coordinator will notify Rackham, which will place the notation of "Unsatisfactory Academic Standing" on the student's academic record (i.e., the unofficial transcript). Making unsatisfactory progress may lead to students being placed on probation (as determined by the *Academic Probation Committee*, Section 6.4), the termination of the guarantee of financial support, and dismissal from

the Ph.D. program. Students with unsatisfactory academic standing may not advance to candidacy, may not be granted a degree or certificate, and may only change programs or transfer credits with permission of the admitting program.

6.4. ACADEMIC PROBATION

When students are found to have made unsatisfactory progress, an *Academic Probation Committee* consisting of two EER faculty members will be formed by the EER Graduate Chair, and this committee will determine whether students are to be placed on probation. The terms of probation will be individually-designed based on the situation and as agreed upon by the EER Graduate Chair, the EER Faculty Advisor, and the student. The agreed-upon terms will be outlined on the Probation Agreement Form. The EER Graduate Chair will notify the students and Rackham in writing before the probationary period begins, explaining the reasons and conditions of probation; the start and end dates of the probationary period (note, the duration of the probationary period may be no less than two months); terms of funding support; conditions, if any, for returning to satisfactory standing; and options for appeal. “Academic Probation” will be noted on the transcript. The EER Graduate Chair will enforce the terms of probation.

Students who have been placed on probation may withdraw or may request a leave of absence (due to medical or personal reasons independent of the probation) from Rackham, during which time students will be separated from the university. The withdrawal or leave will stop the clock on the probationary period, which resumes when students return to active status or are reinstated. Probation will remain in effect until the conditions are remedied or students are dismissed.

Length of the Probationary Period

The probationary period may be no shorter than two months of the fall or winter term, and it will normally conclude at the end of that term. For students placed on probation within two months of the end of the fall term, the probationary period will extend into the winter term for a total of at least two months. For students placed on probation within two months of the end of the winter term, the probationary period may include the spring or summer half-terms or the following fall term, for a total of at least two months. Students may be placed on probation starting in the spring or summer half term for a minimum of two months, and students do not need to be enrolled during these half terms.

Funding Students on Probation

The level of funding prior to probation should be continued through the probationary period. Thus, students with guaranteed financial support will continue to be funded while on probation (i.e., students will continue to receive tuition and fees, stipend, and insurance benefits). Funding for the probationary period shall be arranged by the EER Faculty Advisor in discussion with the EER Graduate Chair.

6.5. DISMISSAL

At the end of the probationary period, and upon the recommendation of the EER Graduate Chair and the consent of Rackham, students may either be returned to satisfactory academic standing or be dismissed from the program. Dismissal will occur by decision of the *Academic Probation Committee*. The EER Graduate Chair will notify students and Rackham in writing of the dismissal decision. Students with guaranteed financial support will continue to be funded until the end of the term in which dismissal occurs.

Students may choose to change their EER Faculty Advisor, for example, due to a mismatch in research interests. Students must have an EER Faculty Advisor at all times in order to remain in satisfactory academic standing. If a student secures external funding (e.g., as a Graduate Student Instructor), the student may have a gap between advisors for up to a single semester. If a student is without an EER Faculty Advisor at the start of a second semester, the student can be declared to be in “Unsatisfactory Academic Standing” by the EER Graduate Chair and placed on probation.

6.6. OPTION TO APPEAL

Students may appeal the probation or dismissal decision. In this case, the EER Graduate Chair will establish a new *Academic Probation Committee*, none of whom are members of the original committee. This committee will either confirm or overturn the probation or dismissal decision. Students may use Rackham’s Academic Dispute Resolution

process only for procedural issues of fair and equal treatment under the policy of the program, and not to appeal the academic reasons for the decision.

6.7. PROFESSIONAL CONDUCT

Students who fail to meet standards of academic or professional integrity or who have been found responsible for violations of other University standards of conduct may be placed on probation or dismissed in accordance with separate procedures described in Rackham Academic and Professional Integrity Policy.

7. EER COURSE INFORMATION

To complete a graduate degree in EER, students must complete courses from the Engineering Education Core and the Research Methods Core, as well as Specialization Electives and, for the Ph.D., the Immersive Learning Experience. Information about these courses is included here.

7.1. ENGINEERING EDUCATION CORE

The purpose of the Engineering Education Core is to provide a bridge into this interdisciplinary program by integrating engineering and education concepts, providing breadth and depth of knowledge, and providing the foundation for an area of specialization. The Engineering Education Core comprises the following two courses (6 credit hours):

- EER 601: *Foundations of Engineering Education Research* (3 credits, to be offered every fall term)
Introduction to the field of EER, the conduct of educational research and its application to engineering education; current literature in EER; the use of theoretical and conceptual frameworks to guide EER; and professional development opportunities in EER.
- EER 602: *Theoretical and Conceptual Frameworks in Engineering Education Research* (3 credits, to be offered every winter term)
In-depth examination of relevant theories from education, psychology, and other disciplines; focus on how the theories apply to EER and can guide research and advance knowledge and practice.

7.2. RESEARCH METHODS CORE

The application of educational research methods to the engineering context requires students to adopt a new learning paradigm, and the purpose of the Research Methods Core is to provide deep knowledge of EER approaches and guide students in the development of their research theses. As such, in consultation with the EER Faculty Advisor, EER Ph.D. students must select and complete four research methods courses (two courses in quantitative methods and two courses in qualitative methods) that align with the area of research interest. Students completing the EER M.S. degree must complete three courses from the Research Methods Core. Multiple courses exist across the university to fulfill this requirement.

The quantitative and qualitative methods courses in the School of Education are recommended, because they regularly enroll engineering graduate students and they address the engineering context; however, based on their plan of study, students may benefit from other research methods courses offered by different disciplines.

Sample courses that could satisfy the two-course **quantitative research methods** requirement:

- EDUC 695: Research in Educational Practice
- EDUC 707/PSYCH 707: Psychometric Theory
- EDUC 793: Introduction to Quantitative Methods in Educational Research
- EDUC 795: Quantitative Methods for Non-Experimental Research Methods
- EDUC 803/PSYCH 804: Structural Equation Modeling
- EDUC 820/PUBPOL 712: Causal Inference in Education Research
- PSYCH 614: Advanced Statistical Methods
- PSYCH 711: Questionnaire Design and Evaluation
- PUBPOL 713: Causal Inference in Education Research and Policy
- SOC 610: Statistical Methods
- SOC 612: Applied Sampling

Sample courses that could satisfy the two-course **qualitative research methods** requirement:

- EDUC 732: Critical Race Methodologies
- EDUC 737: Introduction to Discourse Analysis
- EDUC 792: Methods in Educational Research: Qualitative
- EDUC 891: Qualitative Methods Workshop
- SOC 522: Qualitative Research Methods I
- SOC 523: Qualitative Research Methods

7.3. SPECIALIZATION ELECTIVES

The purpose of the Specialization Electives requirement is to allow students to develop depth of knowledge in one area of EER. Thus, students should propose a coherent set of five Specialization Elective courses (at least 15 credits) to support their dissertation research. At least two of these five courses should be from outside the EER program to satisfy the cognate requirement.

The Specialization Elective courses include, but are not limited to, existing courses offered in the College of Engineering, the School of Education, and across the university. Students may elect to use up to 6 credits of EER 690: *Graduate Independent/Directed Study* towards their Specialization Electives, and EER Core Faculty will also likely develop and teach electives in their research area (e.g., *Outreach and Mentoring in Engineering Higher Education* or *Learning Analytics and their Application to Engineering Education*). Prerequisite requirements, where they exist, can typically be waived with permission of the instructor, and the core EER courses are expected to provide the necessary background for the non-engineering courses listed here:

- EDUC 601/SI 549: Transformative Learning and Teaching with Technology
- EDUC 602: Videogames, Learning, and School Design
- EDUC 607: Contemporary Approaches to Educational Assessment
- EDUC 662: Learning and Development in Higher Education
- EDUC 709: Motivation in the Classroom
- EDUC 760: Access and Equity
- EDUC 762: Curriculum in Higher Education
- EDUC 764: Public Policy
- EDUC 791: Foundations of Teaching & Learning
- EDUC 831: Theory and Research on Learning and Instruction in Science
- EDUC 834: Designing Science Learning Environments
- EDUC 863: Institutional Research
- EDUC 867: Organizational Theory and Behavior
- ENGR 580: Teaching Engineering
- IOE 536: Cognitive Ergonomics
- ME 599: Front End Design
- PSYC 655: Psychology of Women
- PSYC 681: Survey of Social Psychology
- PSYC 682: Advanced Social Psychology
- PSYC 708: Cognition and Instruction in the Classroom
- PSYC 751: Cognitive Development
- PSYC 759: Developmental Psychology
- PUBPOL 510: The Politics of Public Policy
- PUBPOL 621: Introduction to Policy Writing
- PUBPOL 650: Introduction to Science and Technology Policy Analysis
- PUBPOL 682: Leadership & Communication in State-Level Policy Making
- SI 549: Transformative Learning and Teaching with Technology
- SI 588: Fundamentals of Human Behavior
- SI 671: Data Mining: Methods and Applications
- SOC 530: Social Demography
- SOC 580: Disability Studies
- SW 504: Diversity and Social Justice
- SW 710: Behavior and Environment

7.4. IMMERSIVE LEARNING EXPERIENCE

A key element of the EER Ph.D. degree is a required 3-credit Immersive Learning Experience (EER 610: *Practicum – Immersive Learning Experience*). This experience will typically be completed during the second year in the program, and it will enable students to develop a robust skill set in applying knowledge acquired from coursework to practical needs or real-world problems in engineering education. The Immersive Learning Experience will also connect students to academic and non-academic role models who serve as mentors during this practicum experience.

Two basic types of Immersive Learning Experiences will be offered: (1) teaching apprenticeships and (2) internships. Students preparing for faculty positions or other professional staff positions in academia will typically pursue the

teaching apprenticeship, while students seeking post-graduate positions in administrative, policy, or outreach settings will typically complete an internship for their Immersive Learning Experience.

Teaching apprenticeships will provide a more complete teaching experience than what is typically afforded through a GSI appointment as students collaborate with an engineering faculty member to plan and teach an engineering course. The engineering faculty member who serves as the instructor for the course will serve as a teaching mentor, ensuring that students assume significant responsibility for curriculum design, lesson planning, assessment, grading, and instruction.

Internships will provide on-the-job professional experience, and they will be offered in on-campus or off-campus settings. For example, students who are engaged in research related to outreach programming might work in the College of Engineering’s Center for Educational Diversity and Outreach (CEDO) or at the Museum of Science and Industry in Chicago to develop or evaluate educational programming; students interested in educational evaluation and assessment might work in the School of Education’s Center for Educational Design, Evaluation, and Research (CEDER) to gain hands-on experience in evaluating STEM education programs; and students who study or endeavors to have a career in a public policy setting might pursue a summer internship at the National Science Foundation or the White House Office of Science and Technology Policy.

Each Immersive Learning Experience must be approved by the *EER Practicum Lead* and must entail a minimum of 320 hours (e.g., full time for 8 weeks or 20 hours/week over 16 weeks). The EER faculty will cultivate a network of professionals who are willing to offer internships to EER doctoral students and to serve, with an EER faculty member, as a co-advisor for the EER students they directly supervise. EER affiliate faculty members with related expertise and/or experience may serve as the EER co-advisor.

When students are engaged in the teaching apprenticeships or internships, the *EER Practicum Lead* will facilitate student reflections on the experience. Following those experiences, students will enroll in EER 610: *Practicum – Immersive Learning Experience*, will prepare a brief formal report, and will provide an oral presentation to the EER community at an annual program for faculty and EER graduate students. The *EER Practicum Lead* will conduct the course, review the report and presentation, and assign course grades for the students.

8. MASTER’S DEGREE

The goal of the EER M.S. Program is to provide foundational knowledge of EER topics, theories, and research methods as well as a specialization appropriate to students’ intended career path. Students may earn the M.S. degree in one of two ways. First, the M.S. degree is an embedded master’s attained during the EER doctoral program. Students admitted to the Ph.D. program will earn the master’s degree after completing 30 credit hours of master’s degree coursework (typically within two years). Doctoral students who successfully attain the M.S. degree and who also pass the Qualifying Examination will achieve Candidacy and continue for the Ph.D. Second, students may apply for and be admitted to the EER Program to earn a stand-alone EER M.S. degree. In either case, students must satisfy the EER Graduate requirements outlined in this manual, as well as those outlined in the Rackham Academic Policies.

8.1. MASTER’S DEGREE COURSEWORK

The master’s degree requires a minimum of 30 graduate-level credit hours. The credit distribution is shown in Table 3.

Table 3. Credit distribution for Master’s Degree

Category	# courses	# credits
Engineering Education Core	2	6
Research Methods Core	3	9 (minimum)
Specialization Electives	5	15 (minimum)
Total	10	30 (minimum)

The courses that comprise these requirements are described in more detail in Section 6. Up to 6 credits of EER 690: *Graduate Independent/Directed Study* may be counted towards the Specialization Electives. Besides EER 690, all courses used for the master's degree coursework requirements must be letter-graded and may not be marked as satisfactory/unsatisfactory. Courses that **do not count** toward master's degree coursework requirements include the following: courses with number 990, 995; course with "doctoral," "dissertation," or "preliminary" in the title; RACK 998 (Curricular Practical Training); courses from the English Language Institute; courses with insufficiently advanced content and level; and courses which substantially duplicate the content and level of courses already completed.

8.2. MASTER'S DEGREE PLAN OF STUDY

The M.S. Plan of Study outlines which courses students propose to satisfy the specific master's degree requirements. Students are required to submit an initial M.S. Plan of Study, approved and signed by the EER Graduate Chair, at the beginning of their first term (within a month after the beginning of the first term). Failing to do so will risk the ability to register the following term.

Students are also required to obtain pre-approval and signature from the EER Graduate Chair on a revised M.S. Plan of Study each time they wish to make changes to it, and they must obtain approval for a final M.S. Plan of Study in their last term. Failing to do so will risk the ability to graduate. It is highly recommended that students meet with the EER Graduate Chair to discuss the plan at the beginning of each term.

Note: Students are responsible for submitting to the EER Graduate Coordinator an updated, signed final M.S. Plan of Study when applying for graduation. Failure to submit the final M.S. Plan of Study could delay graduation.

9. CERTIFICATE IN EER

Students earning a Ph.D. in a traditional engineering discipline at U-M may apply to earn the Rackham Certificate in EER to learn and practice the skills needed to be proficient in the field of EER. The certificate requires 9 credit hours of coursework (with a B average) and a related engineering education research project. Students are responsible for ensuring that the coursework also complies with Rackham's policies (<https://rackham.umich.edu/policy/section7/>).

9.1. APPLICATION TO THE EER CERTIFICATE

U-M engineering graduate students who have completed at least one term in a Rackham program and who are in satisfactory academic standing are invited to apply online (<https://eer.engin.umich.edu/graduate-certificate/>) at any time. The following materials must be submitted at the time of applying:

- Letter of application describing the reasons for pursuing the certificate;
- Certificate Plan of Study listing the courses expected for the certificate and the timeline for enrolling in them;
- Current transcript; and
- Letter of advisor's support (this letter is not required for students whose research advisor is one of the EER Core Faculty).

Students should apply for the Rackham Certificate in EER **prior** to completing the requirements to ensure the plan of study is approved.

9.2. CERTIFICATE REQUIREMENTS

Effective Fall 2019, students who apply to enroll in the certificate are expected to complete the following:

- The two courses of the Engineering Education Core
 - EER 601: *Foundations of Engineering Education Research* (3 credits)
 - EER 602: *Theoretical and Conceptual Frameworks in Engineering Education Research* (3 credits)
- One course from the Research Methods Core
- An EER project comprising either an:
 - Approved EER project equivalent to a 3-credit class (a paid or unpaid research experience); or

- Additional 3-credit course that has, as part of its requirements, a substantial EER project (this could be an independent study).

The set of courses comprising the Certificate Plan of Study must be approved prior to completing them.

10. ADDITIONAL RESOURCES

The Rackham Graduate School Student Handbook and the Engineering College Bulletin are among the numerous U-M publications available online. The Rackham Handbook gives details about the graduate degree requirements imposed by the Graduate School, and should be consulted by all graduate students. Some important topics include the continuous enrollment policy and fees.

- Rackham Graduate School: <http://www.rackham.umich.edu>
- College of Engineering: <http://www.engin.umich.edu/college/>
- U-M Wolverine Access: <https://wolverineaccess.umich.edu/>
- U-M Registrar: <http://ro.umich.edu>
- Student Financial Services: <http://www.finance.umich.edu/finops/student>
- U-M International Center: internationalcenter.umich.edu
- EER Department: <https://eer.engin.umich.edu>
- College of Engineering Honor Code: <https://elc.engin.umich.edu/about/>
- Student Rights and Responsibilities: <https://oscr.umich.edu/article/statement-student-rights-and-responsibilities>