ENGINEERING EDUCATION (PHD)

The Ph.D. in Engineering Education, through its coursework and research programs, provides students with the skills and competencies needed to conduct high quality educational research in the context of engineering programs at both the pre- and post-secondary level. Graduates will be well-qualified to work in academic, industrial, or governmental settings, and excel at identifying, creating, and expanding connections between engineering and the social sciences.

Engineering Education is cross-disciplinary, and students are encouraged to take courses in engineering, curriculum and instruction, educational psychology, and other relevant disciplines with approval from their major advisor. Students may apply up to 6 credits of 3000- or 4000-level courses approved in advance by their Major Advisor toward the Ph.D. as long as those courses were not included on their undergraduate plan of study.

Program Learning Outcomes:

- Graduates will be able to conduct high-quality educational research and/or assessment and evaluation in a variety of settings, including higher education, K-12 settings, non-profits, and private industry.
- Graduates will be able to synthesize information from multiple fields to contribute to knowledge generation at the intersection of engineering and the social sciences.
- Graduates will be supported to bring socio-cultural and critical perspectives of engineering with a focus on justice, diversity, equity, and inclusivity into work in higher education, K-12 settings, non-profits, or private industry.
- Graduates will be able to integrate evidence-based practices from engineering education research into formal and informal educational settings.

Minimum of 39 credits of graduate coursework including:

Required Core Courses

Course	Title	Credits
ENGR 5610	Foundations in Engineering Education Research	3
ENGR 5620	Power and Politics of STEM Education	3
ENGR 5410	Scientific Communication	1
ENGR 5420	Engineering Internships and Careers in Industry	1
ENGR 5430	Teaching Engineering: Communication and Pedagogy	1
Theories in Education		
Select one of the following:		
EDCI 5004	History of Educational Thought	
EDCI 5008	Philosophical Analysis in Education	
EDCI 5810	Workshop in Education	
EDCI 5885	Introduction to Critical Pedagogy	
EDCI 6094	Seminar	
EPSY 5510	Learning: Its Implication for Education	
EPSY 5530	Theories of Learning, Cognition and Instruction	
EPSY 6550	Situated Cognition	
Practicum		
CE/ENVE 6920	Doctoral Teaching Practicum	3
Seminar (up to three credits)		
ENGR 6901	Engineering Education Seminar	1
Educational Research Methods Courses		**12**
EDCI 6000	Qualitative Methods of Educational Research	3
EPSY 5605	Quantitative Methods in Research I	3
EPSY 5607	Quantitative Methods in Research II	3
Research Methods Elective		
Select one of the following:		
EDCI 6005		
EDCI 6860	Educational Inequities Research Methods	
EDLR 6052	Qualitative Methods of Educational Research II	
EPSY 5195	Workshop in Education	
EPSY 5602	Educational Tests and Measurements	
EPSY 5610	Applied Regression Analysis for the Education Sciences	
EPSY 5613	Multivariate Analysis in Educational Research	
EPSY 5621	Construction of Evaluation Instruments	
EPSY 5641	Research Design and Measurement for Data Science	
EPSY 5643	Text Analytics	
EPSY 6469	Single Subject Research in Education	
EPSY 6611	Hierarchical Linear Modeling	
EPSY 6615	Structural Equation Modeling	
EPSY 6615	Structural Equation Modeling	
EPSY 6619	Advanced Modeling Using Latent Variable Techniques	
EPSY 6621	Program Evaluation	
EPSY 6623	Advanced Program Evaluation	
EPSY 6636	Measurement Theory and Application	
EPSY 6637	Item Response Theory	
EPSY 6651	Introduction to Methods for Causal Inference Using Educational Data	
EPSY 6655	Advanced Causal Inference with Data	
EPSY 6601	Methods and Techniques of Educational Research	

Engineering Education Concentrations

Depending upon their background and career plans, students may choose from an existing concentration, or, with the approval of their Major Advisor, select coursework with a coherent theme that supports their research or career goals.

Engineering Field Concentration

9 credits in discipline-based courses (e.g. CHEG, ME, ECE) at the 5000-level or higher chosen in consultation with the Major advisor.

Advanced Methods Concentration

9 additional credits beyond the required educational methods courses focused on advanced educational research methods.

Course	Title	Credits
EDCI 6005		
EDCI 6860	Educational Inequities Research Methods	
EDLR 6052	Qualitative Methods of Educational Research II	
EPSY 5195	Workshop in Education	
EPSY 5602	Educational Tests and Measurements	
EPSY 5610	Applied Regression Analysis for the Education Sciences	
EPSY 5613	Multivariate Analysis in Educational Research	
EPSY 5621	Construction of Evaluation Instruments	
EPSY 5641	Research Design and Measurement for Data Science	
EPSY 5643	Text Analytics	
EPSY 6469	Single Subject Research in Education	
EPSY 6611	Hierarchical Linear Modeling	
EPSY 6615	Structural Equation Modeling	
EPSY 6619	Advanced Modeling Using Latent Variable Techniques	
EPSY 6621	Program Evaluation	
EPSY 6623	Advanced Program Evaluation	
EPSY 6636	Measurement Theory and Application	
EPSY 6637	Item Response Theory	
EPSY 6651	Introduction to Methods for Causal Inference Using Educational Data	
EPSY 6655	Advanced Causal Inference with Data	
EPSY 6655	Advanced Causal Inference with Data	
other courses in consultation with Major Advisor		

Theories in Education/Learning Science Concentration

9 credits focused on interdisciplinarity, theories of knowledge, or epistemology. Students may select from Theories in Education list, or other courses in consultation with their Major Advisor.

Course	Title	Credits
EDCI 5004	History of Educational Thought	
EDCI 5008	Philosophical Analysis in Education	
EDCI 5810	Workshop in Education	
EDCI 5885	Introduction to Critical Pedagogy	
EDCI 6094	Seminar	
EPSY 5510	Learning: Its Implication for Education	
EPSY 5530	Theories of Learning, Cognition and Instruction	
EPSY 6550	Situated Cognition	

Engineering and Human Rights Concentration

9 credits approved by the Major Advisor in consultation with EHRI faculty.

Individualized Concentration

9 credits as approved by the Major Advisor.

Additional Requirements

The Ph.D. in Engineering Education does not have a foreign language requirement. Ph.D. students must maintain a cumulative GPA of at least 3.0 across all coursework. For students entering with a master's degree, up to 15 credits of previous graduate coursework may be counted toward the Ph.D.

All Ph.D. students must also complete at least 15 credits of GRAD 6950 Doctoral Dissertation Research. All full-time Ph.D. students must enroll in the one-credit seminar course, ENGR 6901 Engineering Education Seminar, at least three times during their degree, for a total of three credits.

Qualifying Exam and Dissertation: Ph.D. students must pass a qualifying examination as administered by faculty affiliated with the Engineering Education graduate program. Ph.D. candidates must prepare and orally defend a dissertation proposal, as well as prepare and publicly defend the Ph.D. dissertation. The dissertation research must generate at least three works that are publishable in a peer-reviewed journal or peer-reviewed conference proceeding appropriate to the field, and at least one of these should be a first-author publication. For multiple author manuscripts, the manuscript must be accompanied by a brief explanation of the student's role in the manuscript. Exceptions can be made for non-first author manuscripts in which the student has contributed heavily with approval by the Major Advisor. At least one of these works must be published or accepted by the time of a student's defense, and the others either in review or in the final stages of preparation for submission.