DOCTORAL PROGRAMS IN ENGINEERING

Environmental Engineering, Ph.D.
Tushar Sinha, Doctoral Graduate Coordinator
Contact: 361-593-3061

The Doctor of Philosophy degree in Environmental Engineering offered by the Department of Environmental Engineering at Texas A&M University-Kingsville prepares students for careers in research, teaching and environmental management. As environmental issues transcend media and geographic borders, it is increasingly important for the environmental professional to be able to address issues and derive solutions from a holistic basis. Students enrolled in the program are exposed to the fundamental principles, tools and applications in Environmental Systems Engineering spanning eight areas:

1. Air Quality,
2. Water Quality,
3. Solid/Hazardous Waste,
4. Ecological Engineering,
5. Natural Resources Management,
6. Environmental Systems,
7. Environmental Informatics and

Entrance Requirements
Students must hold a minimum of a baccalaureate degree and an acceptable combination of GRE scores, TOEFL or IELTS score (international students) and grade point average. Applications will be considered on an individual basis. Contact the Doctoral Graduate Coordinator, Department of Environmental Engineering for details.

Graduate Committee
The student’s Advisory Committee will be comprised of at least four faculty members in addition to the research adviser. At least two of the members, in addition to the research adviser, must be from the Department of Environmental Engineering. The College of Graduate Studies will assign one additional non-voting faculty member, the Graduate College Representative (GCR).

Sustainable Energy Systems Engineering, Ph.D.
Director of the Program: Dr. Mahesh Hosur
Contact: 361-593-4519

The Ph.D. program in Sustainable Energy Systems Engineering within the Frank H. Dotterweich College of Engineering is a multidisciplinary program that integrates various fields of engineering and science. The theme of the Ph.D. program addresses various aspects of energy research including the sustainable utilization of fossil fuels and renewable resources, design of devices for efficient energy conversion, smart distribution and storage of energy, and sustainability and environmental impact of energy-related activities. The program provides students with opportunities to participate in the intricate and interdisciplinary engineering and science research topics in energy-related fields and enables students of exceptional ability to undertake cutting-edge research in energy-related topics. It also prepares students to solve problems in an increasingly complex, dynamic and global energy society, prepares candidates to become entrepreneurs creating innovative solutions, and to be successful in their chosen career paths.

Admission Requirements
The general admission for the Ph.D. program in Sustainable Energy Systems Engineering requires that applicants must have earned, at a minimum, a master’s degree in engineering or science, must submit a complete curriculum vitae, copies of transcripts from each institution of higher education attended, a statement of purpose describing their research interests, three letters of recommendation from their academic or professional contacts, a nonrefundable application fee, GRE scores, and TOEFL score for applicants whose native language is not English. Admission is highly competitive and decisions are based on the evaluation of multiple factors, including the need, capacity, and resources of the program.

Faculty
Wayne H. King Department of Chemical Engineering and Natural Gas Engineering

Doctoral Faculty
Alexander, Matthew L. Associate Professor, Wayne H. King Department of Chemical and Natural Gas Engineering; B.S., Trinity University; M.S., Georgia Institute of Technology; Ph.D., Purdue University.
Mills, Sr., Patrick  Professor, Wayne H. King Department of Chemical and Natural Gas Engineering; B.S., Tri-State University; M.S., Washington University in St. Louis; D.Sc., Washington University in St. Louis.

Xiao, Chongwei  Associate Professor, Wayne H. King Department of Chemical and Natural Gas Engineering; B.A., Hubei University (China); M.E., Beijing Institute of Technology (China); Ph.D., University of Wyoming.

**Department of Civil and Architectural Engineering**

**Doctoral Faculty**

Shen, Hui  Assistant Professor, Department of Civil and Architectural Engineering; B.S., East China Jiaotong University (China); M.S., Tongji University (China); Ph.D., Purdue University.

**Department of Electrical Engineering and Computer Science**

**Doctoral Faculty**

Alam, Mohammad S  Professor, Department of Electrical Engineering and Computer Science; Dean, Frank H. Dotterweich College of Engineering; B.S., Bangladesh University of Engineering and Technology (Bangladesh); M.S., Bangladesh University of Engineering and Technology (Bangladesh); M.S., Wayne State University; Ph.D., University of Dayton.

Challoo, Rajab  Professor, Department of Electrical Engineering and Computer Science; B.S., Wichita State University; M.S., Wichita State University; Ph.D., Wichita State University.

McLauchlan, Lifford L  Associate Professor, Department of Electrical Engineering and Computer Science; B.S., Texas A&I University; M.S., Texas A&I University; Ph.D., Texas A&M University.

Nekovei, A. Reza  Professor, Department of Electrical Engineering and Computer Science; B.S., University of Maine; M.S., University of Maine; Ph.D., University of Rhode Island.

Noore, Afzel  Professor, Department of Electrical Engineering and Computer Science; Associate Dean for Undergraduate Affairs, Frank H. Dotterweich College of Engineering; B.E., University of Madras (India); M.S., Indian Institute of Technology (India); Ph.D., West Virginia University.

Zhang, Xuewei  Assistant Professor, Department of Electrical Engineering and Computer Science; B.S., Tsinghua University (China); M.S., Tsinghua University (China); Ph.D., Massachusetts Institute of Technology.

**Emeritus**

Diersing, Robert  Professor of Electrical Engineering, Department of Electrical Engineering and Computer Science; Executive Director, High-Performance Computing Center; B.B.A., Texas A&I University; M.S., Texas A&I University; M.B.A., Corpus Christi State University; Ph.D., Texas A&M University.

**Department of Environmental Engineering**

**Doctoral Faculty**

Bezares-Cruz, Juan  Assistant Professor, Department of Environmental Engineering; B.S., University of Puerto Rico (Puerto Rico); M.S., Purdue University; Ph.D., University of Texas at El Paso.

Camacho, Lucy M  Associate Professor, Department of Environmental Engineering; B.S., Technische Universitat Dresden (Germany); M.S., Technische Universitat Dresden (Germany); Ph.D., New Mexico State University.

Clapp, Lee  Professor, Department of Environmental Engineering; B.S., University of Maine; M.S., University of Wisconsin-Madison; Ph.D., University of Wisconsin-Madison.

Jones, Kim  Professor, Department of Environmental Engineering; Regents Professor; B.S., United State Military Academy, West Point; M.S., The University of Texas at Austin; M.S., Georgia Institute of Technology; Ph.D., Georgia Institute of Technology.

Ramirez, David  Associate Professor, Department of Environmental Engineering; Chair; B.S., Universidad Autonoma de Aguascalientes (Mexico); M.S., University of Illinois at Urbana-Champaign; Ph.D., University of Illinois at Urbana-Champaign.

Ren, Jianhong  Professor, Department of Environmental Engineering; B.S., Beijing Polytechnic University (China); M.S., Drexel University; Ph.D., Northwestern University.

Sinha, Tushar  Assistant Professor, Department of Environmental Engineering; B.Engr., Maharana Pratap University of Agriculture and Technology (India); M.S., Indian Institute of Technology Delhi (India); Ph.D., Purdue University.
Department of Mechanical Engineering and Industrial Engineering

Doctoral Faculty

Hossain, Mohammad  Assistant Professor, Department of Mechanical and Industrial Engineering; B.S., Chittagong University of Engineering and Technology (Bangladesh); M.S., North Carolina A&T State University; Ph.D., Texas A&M University.

Hosur, Mahesh  Professor, Department of Mechanical and Industrial Engineering; Associate Dean of Graduate Studies, Frank H. Dotterweich College of Engineering; B.Eng., Karnataka University (India); M.Tech., Indian Institute of Technology (India); Ph.D., Indian Institute of Science (India).

Jin, Kai  Professor, Department of Mechanical and Industrial Engineering; B.S., Nankei University (China); Ph.D., Texas Tech University.

Lee, Sangsoo  Associate Professor, Department of Mechanical and Industrial Engineering; B.En., Sogang University (South Korea); M.S., Sogang University (South Korea); Ph.D., Georgia Institute of Technology.

Li, Hua  Associate Professor, Department of Mechanical and Industrial Engineering; B.Eng., Tsinghua University (China); Ph.D., Texas Tech University.

Ozcelik, Selahattin  Professor, Department of Mechanical and Industrial Engineering; Chair; B.S., Technical University of Istanbul (Turkey); M.S., Texas A&I University; Ph.D., Rensselaer Polytechnic Institute.

Peel, Larry D  Professor, Department of Mechanical and Industrial Engineering; B.S., Utah State University; M.S., Virginia Polytechnic Institute and State University; Ph.D., Brigham Young University.

Zhou, Hong  Professor, Department of Mechanical and Industrial Engineering; B.S., Northern Jiaotong University (China); M.S., Southeast University (China); Ph.D., Tennessee Technological University.

Courses

Environmental Engineering (EVEN)

EVEN 6102  Grad Sem in Environmental Engr  1 SCH (0-1)
Provides students with exposure to multidisciplinary opinions on current and future environmental issues from industrial, scientific, academic, governmental and engineering experts, in an environment that fosters productive exchange of ideas. Prerequisite: graduate standing in EVEN or related discipline. Credit/Noncredit.

EVEN 6301  Environ and Occupational Health  3 SCH (3-0)

EVEN 6304  Internship in Environ Engnr  1-3 SCH (1-3)
Allows environmental engineering graduate students to participate in internships with industry, government and environmental consulting companies in career-based practical activities to broaden the skills obtained through curricular education. Attention will be given to select opportunities where the job training enhances the particular research needs of each student. Credit/Noncredit.

EVEN 6305  Res in Environmental Engr  3 SCH (0-3)
Research for Thesis or Dissertation.

EVEN 6306  Proposal/Dissertation Research  1-3 SCH (0-0-1-3)
Students are allowed no more than 6 hours of registrations to complete a dissertation proposal.

EVEN 6308  Fundmns Solid Hazardous Waste  3 SCH (3-0)
Overview of pertinent federal and state regulations. Fundamentals of solid/hazardous waste generation, management, treatment and disposal. Emphasis on the modeling aspects of the fate and transport of hazardous waste in the environment. Discussions of assessment planning, waste minimization, effective management of waste material and the application of treatment and disposal technologies.

EVEN 6309  Fundmns Air Qual and Polutn Contr  3 SCH (3-0)
Classification of air pollutants by the Clean Air Act and its amendments. Fundamental theories of air pollution and atmospheric science. Air pollution meteorology, atmospheric dispersion modeling and an introduction to air quality models. Control technology of gaseous air pollutants, process design variables applications.

EVEN 6311  Air Quality Modeling  3 SCH (3-0)
Physico-chemical process analysis of the atmosphere. Discussion of air quality models, types and applications. Development of an atmospheric chemical transport model for urban and regional scale applications. Performance evaluation and statistical assessment of air quality models. Stochastic modeling and analysis of air quality problems. Prerequisite: MATH 3320.

EVEN 6312  Sur Water Quality Modeling  3 SCH (3-0)
Ecological and human effects assessment; environmental decision criteria; monitoring strategies; environmental exposure assessment; development of pollutant transport, fate and persistence models; model parameter estimation. Prerequisites: MATH 3320.
**EVEN 6313**  Ground Water Contaminant  3 SCH (3-0)
Advanced topics in groundwater flow problems and contaminant transport modeling, including groundwater transport model selection, initialization and calibration with an emphasis on model application to regional water resources protection and planning. Prerequisites: MATH 3320.

**EVEN 6314**  Ecosystem Modeling  3 SCH (3-0)
Discussion of ecosystem models, types and applications. Emphasis is placed on incorporation of relevant forcing functions and system processes into models to predict design outcomes for restoration and re-creation. Ecosystem modeling definitions, concepts and principles in their application to understanding ecosystem response to human induced perturbations. Development of a dynamic, ecosystem computer simulation model. Prerequisite: MATH 3320.

**EVEN 6315**  Fund of water Quality Engr  3 SCH (3-0)

**EVEN 6316**  Fundamentals of Environ Biotech  3 SCH (3-0)
Overview of microbiology fundamentals and development of quantitative tools for describing stoichiometry, microbial energetics, microbial kinetics, biofilm kinetics and bioreactor mass balances. Application of these tools for designing processes for treating solid, liquid and gas phase pollutants, including solid waste composting, wastewater treatment, sludge digestion, bioremediation and air biofiltration. Analysis of complex biological systems involving dynamic multispecies interactions.

**EVEN 6318**  Enviro System Modeling  3 SCH (3-0)
Designed to introduce the basic approaches for modeling environmental systems. Impacts from anthropogenic activities to the environment will be systematically evaluated via the use of various simulation approaches. Case studies in understanding complex environmental systems will be incorporated to enhance the integrated skills available for model synthesis via multidisciplinary analysis. Prerequisite: MATH 3320.

**EVEN 6319**  Chem Prin of Envir Eng Design  3 SCH (3-0)
Discussions and applications of chemical principles in disinfection, air pollution, geochemistry and aquatic, microbial, redox and coagulation chemistry in systems design for environmental engineering. Introduction to chemical computer models for environmental applications. An overview of the biogeochemistry of natural water systems and the chemistry of the atmosphere.

**EVEN 6320**  Envir Risk and Mgmt of Risk  3 SCH (3-0)
Quantitative and qualitative topics in the characterization of environmental risk and the development of acceptable concentrations. Evaluation of models to develop guideline concentrations and regulatory options and actions to manage risk.

**EVEN 6325**  Physical-Chem Water Treatment  3 SCH (3-0)
Overview of the theory and mechanisms governing physical and chemical water treatment processes. Application of chemical and physical process theory to the practical design of systems for water and wastewater treatment and residuals management. Basic design features of the treatment systems are presented, with an emphasis on the underlying principles. Prerequisite: graduate standing.

**EVEN 6329**  Environ Monitor and Measurements  3 SCH (1-3)
An integrated experience in developing and designing laboratory experiments and field sampling campaigns, acquiring and analyzing high quality data for understanding environmental phenomena and presenting experimental results using state-of-the-art communication tools. Emphasis is also on project-oriented, team-based projects that promote collaborative learning.

**EVEN 6330**  Ecological Engineering  3 SCH (3-0)
Discussion of the fundamental processes and attributes of natural systems, including hydrology, biogeochemistry and ecology, with the emphasis on the engineer’s role in creating and restoring natural systems. Techniques for terrestrial, aquatic and wetland ecosystem creation and restoration, including assessment, planning and construction.

**EVEN 6331**  Industrial Ecology  3 SCH (3-0)
Discussion of similarities between ecological systems and industrial systems with the emphasis on material cycles, energy flow, organizational structures and how industries can learn from their natural counterpart. Fundamentals of natural ecosystems as models for the design, creation and operation of industrial ecosystems. Role of engineered ecosystems in industrial ecosystems (e.g., residual-product resource recovery, contaminated site remediation water conservation). Discussion of pollution prevention tools for industrial and process design, including green chemistry and green engineering approaches to process and product design, and environmental performance evaluation tools, including life cycle assessment.

**EVEN 6332**  Environmental Data Analysis  3 SCH (3-0)
Topics concerning the unique characteristics of environmental data, the process of statistical characterization, the identification of system changes, the usefulness of non-parametric approaches and the utilization of data in characterizing risk and the determination of acceptable environmental cleanup standards to manage risk. Prerequisites: MATH 3320.

**EVEN 6340**  Decision Sci for Environ Systm  3 SCH (3-0)
Provides the fundamentals of decision science theory in support of large-scale complex environmental systems analysis. Discussions and lectures will cover the realm of multi-criteria decision-making. The basics of multi-attribute decision-making and multi-objective stochastic programming, gray programming, fuzzy programming and their combinations will be emphasized.
EVEN 6341 Enviromental Informatics 3 SCH (3-0)
Introduction to environmental data types and structures. Discussion of database design and tools, data warehousing; environmental information management using Geographic Information Systems (GIS), theory and environmental application of remote-sensing technologies; environmental knowledge management and decision support using knowledge-based systems.

EVEN 6342 Enginerring Optimizatn Environ Sys 3 SCH (3-0)
Provides the fundamentals of optimization theories and their real world application potential for environmental systems planning and pollution control. Class discussions of fundamental operational research techniques cover linear programming, integer programming, dynamic programming and nonlinear programming. Case studies are designed to deal with the typical planning, design and operation problems for environmental infrastructure systems with regard to complex multidisciplinary decision-making.

EVEN 6343 Environmental Mgmt Syst 3 SCH (3-0)
Introduces the basic knowledge of current environmental management systems applied in both public and private sectors. Class discussions will cover conventional development of ISO 14001 Environmental Management Systems (EMS) for various levels of organizations. Possible extensions of internal and external environmental auditing, environmental label and life cycle assessment can be made based on relevant Total Quality Environmental Management (TQEM) requirements. Case studies emphasize enterprise strategic environmental management planning for organizations and their stakeholders, in the context of environmental regulatory, law and policy. Topics will be linked with ecoproduct evaluation, environmental performance evaluation and green production planning to search for strategies compatible with ISO 14001-accreditation.

EVEN 6345 Environmental Regs&Policy 3 SCH (3-0)
Overview of federal and state regulations and international agreements for the protection of human and environmental health. Legal, social, political and economic patterns and processes, which set the stage for the development of environmental policy. Impacts and interactions of environmental regulation and policy on the design and implementation of environmental management systems in the public and private sectors. Discussion of environmental ethics and interactions with the environmental engineering profession and with the formulation of environmental regulations and policy.

EVEN 6356 Spec Top in Environ Eng 3 SCH (3-0)
Courses offered under this Special Topics denomination concentrate on themes not present in the current EVEN curriculum, or can also be offered to strengthen and provide further depth of study in important areas of environmental engineering. Topics vary to reflect new developments and interests on emerging areas of environmental engineering. May be repeated when topic changes.

### Sustainable Energy Systems Engineering (ESEN)

**ESEN 6102 Seminar in ESEN 1 SCH (1-0)
Exposure to multidisciplinary options on current and future issues on Sustainable Energy Systems from industrial, scientific, academic, governmental and engineering experts, in an environment that fosters productive exchange of ideas. Credit/Noncredit. Prerequisite: Graduate Standing.**

**ESEN 6303 Adv T: Sustainable Energy Syst 3 SCH (3-0)
One or more advanced topics. May be repeated when topic changes.**

**ESEN 6306 Proposal/Dissertation 3 SCH (3-0)
Proposal. The abstract and signature page of the proposal should be filed with the Office of Graduate Studies upon successful defense by the student and approval of the document by the dissertation committee. Dissertation Defense. Student must successfully defend a dissertation. A quorum of the members of the dissertation committee is required for the defense. The Graduate Council Representative must be in attendance for the defense. Dissertation. A candidate must complete a dissertation which is acceptable to the student's advisory committee and the Dean of the Graduate Studies. To be acceptable, the dissertation must give evidence that the candidate has pursued a program of research, the result of which reveals superior academic competence and a significant contribution to knowledge.**

**ESEN 6310 Sust Energy Sys & Policy 3 SCH (3-0)
An overview of existing and upcoming renewable energy technologies. Fundamentals of energy generation in each approach are presented in detail. Assessment of technologies is attained based on comparative sustainability. Evaluation of energy generation technologies is established via life cycle assessment of climate change impact. Trends and probable future energy scenarios are discussed.**

**ESEN 6311 Fund Pow Gen & Energy Storage 3 SCH (3)
Updated power generation and storage technologies. Design and evaluation of various types of power generation, storage systems, and its components using fundamentals of interdisciplinary engineering principles and a software. Prerequisites: MEEN 5321 and MEEN 5347.**

**ESEN 6312 Energy Sys Integ & Design 3 SCH (3-0)
A unique system-of-systems concept to energy systems integration. The relationships among electricity, thermal, and fuel systems and data and information networks to ensure optimal integration and interoperability across the entire energy system spectrum. Prerequisites: Graduate Standing.**

**ESEN 6313 Adv Eng Math 3 SCH (3)
Foundation of calculus, Stochastic processes, Fundamentals of Mathematical Analysis, Optimization principles. Prerequisites: 5000 level Math Course or instructor approval.**

**ESEN 6321 Smart Grids 3 SCH (3-0)
Fundamentals of smart power grids, technology advances in transmission and distribution systems, policy drivers, assets and demand management, and smart grid security. Prerequisites: graduate standing and approval from instructor.**
ESEN 6324  Power Electronics  3 SCH (3-0)
Power semiconductor devices, Dynamic modeling and control of switch mode power converters, Soft-switching and resonant converter topologies, High frequency power magnetic components, Power electronics modeling, control. Optimization and design for smart grids with renewable energy resources, advanced practical converter design for contemporary systems. Prerequisites: A basic power electronics course or the instructor consent.

ESEN 6325  Solar Power  3 SCH (3-0)
Traditional solar cell architectures, 1st and 2nd generation solar cells, nanotubes and nanowires based solar cells, thin-film organic conjugates solar cells, CIGS solar cells, plasmonic effects and light trapping. Prerequisite: graduate standing.

ESEN 6326  Characterization of Materials  3 SCH (3-0)
This course on materials characterization techniques is designed to help engineers and scientists who have little background in materials analysis to realize the abundance of analytical methods available to provide information about their components. Characterization describes those features of composition and structure of materials that are significant for a particular preparation, study of properties or use, and suffice for reproduction of the material. The topics covered are vacuum theory, imaging techniques, vibration spectroscopy, electron emission spectroscopy, X-ray diffraction, techniques for characterization of thermal, mechanical and electrical properties. Prerequisite: Undergraduate degree in engineering or physical sciences.

ESEN 6328  Nanofab & Nanoscale Dev  3 SCH (3-0)
This course is designed to give students experience in nanofabrication methods such as thin film disposition, etching and lithography to manipulate a wide variety of materials including dielectrics, semiconductors, organics, polymers, metallic materials and molecular films. In addition, this course will introduce MEMS/NEMS and CMOS devices. Prerequisite: Undergraduate degree in engineering or physical sciences.

ESEN 6329  Adv T: Multiphysics Modelling  3 SCH (3-0)
Review of the macroscopic and microscopic transport laws and conservation principles that occur in the analysis of sustainable engineering systems involving multiscale and multiphysics phenomena. Methods for constructing models that involve coupling between electrical, mechanical, fluid flow, energy transport and species transport are presented through various examples and case studies. The efficient utilization of modern software tools to generate solutions, such as MATLAB and COMSOL Multiphysics, will extensively be taught along with the underlying mathematical and computational science. Graduate standing in engineering or permission of the instructor is required.

ESEN 6331  Thermal Systems Engineering  3 SCH (3-0)
Understanding of the general theory of designing thermal systems. The dynamics and factors affecting the design of thermal systems. Prerequisites: MEEN 3347 and MEEN 3392.

ESEN 6332  Advanced Combustion  3 SCH (3-0)
Understanding of the general theory of combustion and its application to premixed diffusion flames, detonation, ignition, and turbulent diffusion flames. Environmental combustion considerations. Prerequisite: MEEN 3347

ESEN 6334  Energy Resource Mngmnt & Optim  3 SCH (3-0)
Advanced knowledge related to energy resource management and optimization. Different types of energy resources, including petroleum and natural gas, electricity, and renewable energy. Comprehensive real world examples to describe various optimization problems, risk and logistics management, and regulations. The latest policy initiatives and recent trends in energy resource management. Prerequisites: graduate standing and approval from instructor.

ESEN 6335  Wind Power  3 SCH (3-0)

ESEN 6337  Nuclear Power  3 SCH (3)
Nuclear and atomic physics, Interactions and measurement of radiation with matter, Nuclear reactor and nuclear power, Nuclear reactor theory, Nuclear reactors control, Basics of neutron and reactor physics, neutron diffusion and reactor critical, Nuclear materials and waste, and environmental issues. Prerequisites: Differential Equations, Atomic Structure.

ESEN 6341  Advanced Chemical Kinetics  3 SCH (3-0)
Theory and applications of the principles of reaction kinetics to reactions involving substances in the gaseous, liquid, or solid state with an emphasis on those that occur in the energy sciences and sustainable reacting systems. Reactions catalyzed by organo-metallic complexes or solid heterogeneous catalysts and the analysis of transport-kinetic interactions for multiphase fluid-fluid and fluid-solid systems. Experimental techniques for measurement of reaction rates for both single phase and multiphase reaction environments. Prerequisites: Graduate standing and permission of instructor.

ESEN 6343  Adv Eng Math for Energy Sys  3 SCH (3-0)

ESEN 6351  Sust Construction & Materials  3 SCH (3-0)
This course introduces students to the well-known green building council's Leadership in Energy & Environmental Design (LEED) suite of standards to explain the best practices in building procurement and delivery systems, Canadian Home Builders Association (CHBA) green guidelines, and green roads. Prerequisite: graduate standing.
Degree Requirements
Environmental Engineering, Ph.D.

Coursework


Research in Environmental Engineering, Environmental Engineering Graduate Seminar


Initial Degree Plan
The student must file an initial degree plan with the Graduate Dean within one semester of being admitted to the Ph.D. program in Environmental Engineering. The PhD degree plan must include 24 to 36 credits of coursework, 6 credit hours of graduate seminar, and 21 to 33 credit hours of research.

Normal Course Load
A full-time status course load is 9 credit hours during the fall or spring semesters, and 3 credit hours each summer. For students at the dissertation stage who have completed all required coursework, enrollment in Research/Dissertation (EVEN 6306) constitutes full load.

Research Credits
Research credits (EVEN 6306) counted towards the doctoral degree plan must be associated with documented achievements, the first being successful completion of the doctoral qualifying exam. Letter grades ('A', 'B', etc.) in EVEN 6306 will be assigned only for the research proposal and for the dissertation defense; all other research credits used for the final degree plan will be assigned a grade of 'CR'. Students who make satisfactory research progress during a semester, but without documented achievements will be assigned a grade of 'S', while students making unsatisfactory progress will be assigned a grade of 'U'. Examples of documented achievements include, but are not limited to, the development of a new research methodology, research-related presentations at professional conferences, and publication of research in peer-reviewed journals.

Course Longevity
A student must complete all requirements for the doctoral degree, including the dissertation, within ten consecutive years of initial registration. Graduate credits older than ten years are not applicable toward a doctoral degree without written permission of the Graduate Dean.

All doctoral course work (including the dissertation) will be satisfactorily completed by the doctoral student in a maximum of 99 semester credit hours. If the Graduate Dean approves in writing that a student may proceed beyond the 99 credit hour limit, the student will be assessed out-of-state tuition.

Qualifying Examination
The student must successfully complete a qualifying examination after completing 15 credit hours of coursework and before completing the first 30 credit hours applicable toward the Ph.D. degree, as defined in the initial degree plan. The qualifying exam will be formulated by the faculty in the Department of Environmental Engineering with the purpose of evaluating the student's grasp of the fundamental topics considered necessary for the successful completion of a Ph.D. in Environmental Engineering. Students failing to pass the qualifying exam may be denied candidacy. Recommendations will be made to students passing the qualifying exam concerning modifications to the initial degree plan to fill identified knowledge gaps. The students must complete their dissertation proposal within the first 45 hours of their doctoral study.

Admission to Candidacy
The student must apply for candidacy in the Ph.D. program in Environmental Engineering within 45 hours of completion applicable to the Ph.D. degree as defined in their initial degree plan. Admission to candidacy requires:

- Successful completion of the qualifying exam
- Selection of a Research Adviser
- Selection of an Advisory Committee
- Filing of a final degree plan
Dissertation Proposal
After passing the doctoral qualifying exam, PhD candidates are required to develop a 15-page research proposal following the general format guidelines of a federal funding agency (e.g., the National Science Foundation). PhD candidates must defend the research proposal within one year after passing the doctoral qualifying exam.

Dissertation
All candidates will be required to conduct an original scientific or engineering investigation that will become the basis for the Ph.D. dissertation. The student’s graduate committee and the graduate dean must approve the dissertation.

Completion
The degree “Doctor of Philosophy” will be conferred on students after:

• Being admitted to candidacy.
• Maintaining (for all courses identified on their final degree plan as being applicable and non-foundation or leveling, to the Ph.D. degree) a minimum grade of “C” in each course and a cumulative grade point average of 3.0 or better on a scale of 4.0.
• Completing 21 to 33 credits of research (EVEN 6306) with grades of ’A’, ’B’, or ’CR’.
• Successfully defending the dissertation in the presence of the Research Adviser, Advisory Committee and the Graduate College Representative.

Sustainable Energy Systems Engineering, Ph.D.

Coursework


Degree Requirements
The Ph.D. program includes a total of 63 Semester Credit Hours (SCH) beyond the master’s degree. This will include 12 SCH required core courses, 15-18 SCH elective courses, 27-30 SCH of research in sustainable energy systems engineering dedicating to student’s dissertation work, and 6 SCH of graduate seminar. Students must also pass qualifying examination, be admitted to candidacy, and must successfully defend doctoral dissertation.

Initial Degree Plan
The student must file an initial degree plan with the Graduate Dean within one semester of being admitted to the Ph.D. program in Sustainable Energy Systems Engineering.

Course Longevity
A student must complete all requirements for the doctoral degree, including the dissertation, within ten consecutive years of initial registration. Graduate credits older than ten years are not applicable toward a doctoral degree without written permission of the Graduate Dean.

All doctoral course work (including the dissertation) will be satisfactorily completed by the doctoral student in a maximum of 99 semester credit hours. If the Graduate Dean approves in writing that a student may proceed beyond the 99 credit hour limit, the student will be assessed out-of-state tuition.

Qualifying Examination
The student must successfully complete a qualifying examination soon after completing core courses. The qualifying exam will be formulated by the faculty associate with the program to evaluate the student’s grasp of the fundamental topics considered necessary for the successful completion of a Ph.D. in Sustainable Energy Systems Engineering. Students failing to pass the qualifying exam after two attempts may be discontinued from the program. Recommendations will be made to students passing the qualifying exam concerning modifications to the initial degree plan to fill identified knowledge gaps. The students must complete their dissertation proposal within the first 45 hours of their doctoral study.

Admission to Candidacy
The student must apply for candidacy in the Ph.D. program in Sustainable Energy Systems Engineering within 45 hours of completion applicable to the Ph.D. degree as defined in their initial degree plan. Admission to candidacy requires:

• Successful completion of the qualifying exam
• Selection of a Research Adviser
• Selection of an Advisory Committee
• Filing of a final degree plan
• Submission and successful defense of a dissertation proposal

**Dissertation**
All candidates will be required to conduct an original scientific or engineering investigation that will become the basis for the Ph.D. dissertation. The student’s graduate committee and the graduate dean must approve the dissertation.

**Completion**
The degree “Doctor of Philosophy” will be conferred on those students:

• Admitted to candidacy.
• Maintaining (for all courses identified on their final degree plan as being applicable and non-foundation or leveling, to the Ph.D. degree) a minimum grade of “C” in each course and a cumulative grade point average of 3.0 or better on a scale of 4.0.
• Successfully defending the dissertation in the presence of the Research Adviser, Advisory Committee and the Graduate College Representative.
• Normal Course Load
• A full-time status course load is nine-semester credit hour during the fall or spring semesters and three-semester credit hour during each summer session. For students at the dissertation stage, enrollment in Research/Dissertation Writing courses constitutes a full load.