

# 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:

- a. Air Quality,
- b. Water Quality,
- c. Solid/Hazardous Waste,
- d. Ecological Engineering,
- e. Natural Resources Management,
- f. Environmental Systems,
- g. Environmental Informatics and
- h. Environmental Biotechnology.

## Admission 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. Students must submit a complete curriculum vitae, copies of transcripts from each institution of higher education attended, a statement of purpose describing their research interests, and three letters of recommendation from their academic or professional contacts. 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).

## 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 12 credit hours of course work 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.

## Engineering, Ph.D.

Director of the Program: Dr. Mahesh Hosur  
Contact: 361-593-4519

The Ph.D. program in Engineering is designed to ensure that a student has a good understanding of fundamental areas within their chosen specialization, while providing the student with in-depth knowledge in at least one area of their chosen specialization, and teaching the student the entire research process, such that they are capable of performing independent research. A graduate of the Ph.D. in Engineering program is perfectly poised to pursue a career in academia, a national lab, or industry, working in research and development. The specializations currently offered include: 1) Chemical Engineering, 2) Civil Engineering, 3) Electrical Engineering, 4) Mechanical Engineering, and 5) Sustainable Energy Engineering.

## Admission Requirements

Admission is highly competitive and decisions are based on the evaluation of multiple factors, including the need, capacity, and resources of the program. The general admission for the Ph.D. program in Engineering requires that applicants:

- Must have earned a bachelor's degree in engineering or a master's degree in engineering or science
- Submit a curriculum vitae, copies of transcripts from each institution of higher education attended, a statement of purpose describing research interests, and three letters of recommendation
- Completed application along with payment of a nonrefundable application fee
- Submit copy of the English Proficiency Exams score for applicants whose native language is not English. Acceptable exams are Test of English as a Foreign Language (TOEFL), Duolingo English test (DET), Pearson English Test (PET), International English Language Testing System (IELTS).

## Specific Admission Requirements for Direct BS to Ph.D. Route

- Must have earned a bachelor's degree in a specific discipline offered as a specialization within the Ph.D. in Engineering program; students with bachelor's degree in a related discipline (e.g., physics) should first obtain a master's degree in the desired specialization before being admitted into the Ph.D. program.
- Must have faculty willing to advise the student; otherwise he/she would be provisionally admitted into the Ph.D. program with a condition that they obtain a M.S. degree.
- No minimum GPA; if a faculty agrees to supervise and fund a student, the student should be admitted.
- A direct admit Ph.D. student (i.e., has a B.S. but not an M.S. degree) who has received any form of support from TAMUK (e.g., TA, RA, fellowship, etc.) is NOT allowed to switch to an M.S. degree without receiving written approval from his/her major advisor and the Director of the Ph.D. program.
- A direct admit Ph.D. student is required to complete a total of 93 credits, including at least 42 credits of didactic coursework to fulfill the degree requirements.

## Coursework Requirements

- A total of 63 credits to meet the graduation requirements
- A total of 6 credits of required didactic courses: 1) Advanced Engineering Math, and 2) Seminar and Research Integrity, which are 3 credits each
- A minimum 18 credits of didactic 6xxx coursework, which includes the above 6 credits
- A minimum 30 credits of dissertation
- Remaining 15 credits can be a combination of additional coursework, dissertation or summer internships
- 5xxx courses can be taken for additional coursework
- Total summer internship credits earned are limited to 3 credits at 1 credit/internship

A full-time status courses load is nine-semester credit hours during the fall or spring semester, six-semester credit hours during 10-week summer semester, and three-semester credit hours during summer I and summer II sessions. For students at the dissertation stage, enrollment in Research/ Dissertation Writing courses constitutes a full load.

## Funding Support

Departments may have limited teaching assistantships available to support Ph.D. students. Research assistantship funding, if any, is at the discretion of the grant Principal Investigator and/or the major advisor.

## Transfer Credits

The student may transfer up to a maximum of 12 credits for graduate courses taken at any other accredited institution. Transfer credits may be recommended by the major advisor under both core and elective categories. These courses must not be part of requirements of a prior degree earned and have a grade of B and above. A student should work with his/her major advisor and the Director of the Ph.D. program to submit necessary documents for approval of transfer credit.

## 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 Engineering.

## Advisory Committee

During the first year of his/her study in the Ph.D. program, the student and his/her Major Advisor must recommend to the Director of the program the student's Advisory Committee consisting of a minimum of three members including the Major Advisor. The Advisory Committee shall also serve as the Examination Committee.

## 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 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 purpose of the qualifying exam (QE) is to ensure that the Ph.D. student has sufficient knowledge in at least 4 fundamental areas in specific discipline. The written QE will be designed based on the undergraduate courses (listed below for each specialization) and is offered once per year in the middle of the Fall semester (normally late September or October). If needed, it may be offered in the Spring/Summer semesters.

Upon the recommendation of the major advisor and the department chair, a student holding an active professional engineer license may be exempt from the written QE by the Ph.D. program director upon verification of the active status of the license.

All Ph.D. students are required to take the written QE as soon as they pass the core courses with a grade of B or higher. They may pass all portions of the exam with at least a 70% in no more than two attempts, or pass (with an A or B) the corresponding undergraduate/graduate course(s) for sections failed on the written QE. The appropriate corresponding undergraduate course is determined by the department administering the section of the written QE that the student failed. Note that undergraduate courses may not be covered by the student's tuition waiver; therefore, the student may be required to pay to take an undergraduate course him/herself. Failure to pass the Ph.D. qualifying exam will result in the dismissal of the student from the program.

The Ph.D. written QE consists of four 2-hour written exams covering fundamental discipline specific material in four areas, selected by the student, with approval from his/her major advisor. Suggested subjects for QE for different specializations are listed below.

### **chemical engineering specialization**

- Biochemical Engineering
- Chemical Process Design
- Chemical Reactor Engineering
- Conservation Principles
- Fluid Transport Phenomena
- Heat Transport Phenomena
- Mass Transport Phenomena
- Natural Gas Process
- Process Dynamics and Control
- Process Simulation
- Statics and Dynamics
- Thermodynamics
- Unit Operations

### **Civil Engineering Specialization**

- Construction Materials
- Environmental Engineering
- Geotechnical Engineering
- Hydraulics and Fluid Mechanics
- Hydrology
- Mechanics of Composites
- Reinforced Concrete Design
- Static and Dynamics
- Strength of Materials
- Structural Analysis
- Structural Steel Design
- Surveying
- Transportation Engineering

### **Electrical Engineering Specialization**

- Applied Electromagnetics
- Circuits I
- Computer Networks
- Data Structures and Algorithms
- Digital Design
- Electric Drives
- Electronics I
- Embedded Systems: non-processor specific assembly and C language programming
- Operating Systems
- Random Signals
- Signals & Systems
- Software Engineering I

## Mechanical Engineering Specialization

- Aerodynamics
- Aerospace Structures
- Engineering Design and Simulation
- Engineering Vibrations
- Fluid Mechanics
- Heat Transfer
- Human Factors and Ergonomics
- IC Engines
- Machine Design
- Materials Science
- Mechanics of Composites
- Nuclear Engineering
- Operations Research
- Polymer Science and Engineering
- Robotics
- Statics and Dynamics
- Strength of Materials
- Supply Chain Management
- Thermodynamics

## Sustainable Engineering Specialization

- Select a combination of 4 of the above specialization areas.

In exceptional cases, advisors need to work with the director of the Ph.D. program to choose subjects that are not in the list.

## Seminars/Reports

From the second semester of enrollment until graduation, all Ph.D. students are required to submit a progress report including the degree plan, writeup on the progress in dissertation research, and timeline toward completion of the degree requirements. All students are required to give at least one seminar to their committee members each year during his/her course of study, starting with the year of passing the QE, in order to ensure proper progression toward completion of the degree requirements. The final seminar shall be his/her Final Oral Examination for the degree. The student is required to attend all seminars scheduled by the department/college.

## Admission to Candidacy

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

- Successful completion of the QE
- Selection of a Major Advisor
- Selection of an Advisory Committee
- Filing of a final degree plan
- Submission and successful defense of a dissertation proposal

## Candidacy Examination

The purpose of the candidacy exam is to ensure that the student has sufficient understanding of the technical literature in his/her field, and has formulated a research topic and a plan that is sufficient for earning the Engineering Ph.D. degree. The candidacy exam consists of a written proposal (15-page max) and an oral presentation (approximately 30 minutes plus questions) of his/her Ph.D. research work, which is evaluated by his/her advisory committee. This research proposal should include:

- Objective of the research work or the hypothesis he/she wishes to investigate
- Explanation of why this topic is significant
- Explanation of what others have done with discussions on what other have not done in the area
- Explanation of how the student proposes to investigate this topic
- Preliminary results; and submitted, accepted, and published papers, if any
- Expected results and implications

The written proposal must be given to the advisory committee at least seven (7) days before the oral exam. A student must pass the QE before taking the candidacy exam. The candidacy exam is typically taken after the required coursework has been completed. It is strongly recommended that the student take the candidacy exam at least one year prior to the dissertation defense.

Permission to schedule the oral examination must be requested of the Graduate School by the student's major advisor using the Request to Schedule Examination form. **The request to schedule must be received by the Graduate School at least two (2) weeks prior to the examination.** Notification by the Graduate School will confirm the scheduled examination. After passing both the qualifying examination and candidacy examination (together referred to as the comprehensive/preliminary examination by the graduate school), the student becomes a candidate for the Ph.D. degree.

## 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 advisory committee and the graduate dean must approve the dissertation.

## Dissertation Defense

- The candidate must pass a final oral examination before being awarded the Ph.D. degree. The advisory committee shall serve as the examining committee of which the major advisor serves as chair. Members in addition to the advisory committee members may be added to the examination committee. Any addition and/or substitutions must be approved by the Dean of the Graduate Studies.
- The final examination shall cover the dissertation and the fundamental knowledge thereof. Permission to schedule the final examination must be required by the Office of Research and Graduate Studies by the student's major advisor using the Request to Schedule Examination form. **The Office of Graduate Studies must receive the request to schedule at least two (2) weeks prior to the examination.** Notification by the Office of the Graduate Studies will confirm the scheduled examination.
- The dissertation in a near final form must be given to the committee members no fewer than seven (7) days prior to the examination. If this seven (7) day stipulation cannot be met, the student must either secure the concurrence of all committee members or reschedule the examination. At the conclusion of the examination, the examining committee shall record, in writing, approval or disapproval of the dissertation research. The Report of Final Examination must be filed within the Office of Research and Graduate Studies within seven (7) days of the examination.
- Continuous enrollment is required until all degree requirements are completed, including submitting final copies of the dissertation.

## Publication Requirement

***In it strongly recommend that all doctoral students have at least one paper accepted for publication in a peer reviewed journal prior to receiving their Ph.D. degree.*** Choice of acceptable journals is up to the student's major advisor and advisory committee.

## Completion

The degree "Doctor of Philosophy" will be conferred on those students who:

- Complete required course work
- Are admitted to candidacy
- Maintain (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 cumulative grade point average of 3.0 or better on a scale of 4.0
- Successfully defend the dissertation in the presence of the Major Advisor, Examination Committee and the Graduate College Representative

## Submission Requirements

The student and the student's major advisor are responsible for getting the necessary signatures and submission of all the forms and documents needed to the Office of Research and Graduate Studies at all stages of the student's tenure at Texas A&M-Kingsville. These include, but are not limited to:

- Qualifying examination report form
- Dissertation proposal submission form
- Signature page
- Dissertation status report form documenting dissertation defense
- Copyright form
- Plagiarism check report (e.g., TurnItIn Report)
- Dissertation submission file upload form

***For the latest requirements, refer to the Graduate Studies Home page.***

## 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 12 credit hours of course work 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.

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

### Department 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.

**Amaya, Joseph** Assistant Professor of Practice, Wayne H. King Department of Chemical and Natural Gas Engineering; B.S., Texas A&M University-Kingsville; M.S., Texas A&M University-Kingsville; Ph.D., Texas A&M University-Kingsville.

**Cabezas, Jose** Professor of Practice, Wayne H. King Department of Chemical and Natural Gas Engineering; B.S., Escuela Superior Politécnica del Litoral (Ecuador); M.S., Texas A&M University-Kingsville; Ph.D., Texas A&M University-Kingsville.

**Duarte, Horacio** Associate Professor, Wayne H. King Department of Chemical and Natural Gas Engineering; B.S., Instituto Tecnológico Regional de Durango (Mexico); M.Eng., Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico); Ph.D., Texas A&M University.

**Fan, Zhaoqi** Associate Professor, Wayne H. King Department of Chemical and Natural Gas Engineering; B.Sc., China University of Petroleum (China); Ph.D., China University of Petroleum (China); Ph.D., University of Regina (Canada).

**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.

**Pilehvari, Ali** Professor, Wayne H. King Department of Chemical and Natural Gas Engineering; Interim Chair; B.S., Tehran Polytechnique (Iran); M.E., University of Tulsa; Ph.D., University of Tulsa.

**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

### Department Faculty

**Aguiniga, Francisco** Professor, Department of Civil and Architectural Engineering; B.S., University of Michoacan (Mexico); M.S., University of Illinois at Urbana-Champaign; Ph.D., Texas A&M University.

**Al-Hamdan, Osama** Associate Professor, Department of Civil and Architectural Engineering; B.Sc., Jordan University of Science and Technology (Jordan); M.Sc., University of Alabama in Huntsville; Ph.D., University of Alabama in Huntsville.

**Al-Qudah, Omar M** Assistant Professor of Practice, Department of Civil and Architectural Engineering; B.S., Mu'tah University (Jordan); M.S., Jordan University of Science and Technology (Jordan); Ph.D., The University of Texas at El Paso.

**Bailey, Breanna** Professor, Department of Civil and Architectural Engineering; Chair; B.S., Texas A&M University; M.S., University of Illinois at Urbana-Champaign; Ph.D., Texas A&M University.

**Choi, Jong-Won** Associate Professor, Department of Civil and Architectural Engineering; B.S., Korea University (South Korea); M.S., Georgia Institute of Technology; Ph.D., Georgia Institute of Technology.

**Faruqi, Mohammed A** Professor, Department of Civil and Architectural Engineering; B.S.C.E., Texas A&I University; M.S.C.E., Texas A&I University; M.Eng., Pennsylvania State University; Ph.D., University of Arkansas.

**Glusing, James** Associate Professor, Department of Civil and Architectural Engineering; B.Arch., University of Houston; M.Arch., University of Houston.

**Hessami, Amir** Associate Professor, Department of Civil and Architectural Engineering; B.S., Fedowski University (India); M.S., Sharif University of Technology (Iran); Ph.D., Texas A&M University.

**Liu, Xiaoyu** Associate Professor, Department of Civil and Architectural Engineering; B.S., Nanjing University of Science and Technology (China); M.S., Tongji University (China); Ph.D., University of Nebraska-Lincoln.

**Rouzmehr, Fouzieh** Assistant Professor, Department of Civil and Architectural Engineering; B.S., University of Guilan (Iran); M.S., University of Guilan (Iran); M.S., Texas Tech University; Ph.D., Texas Tech University.

**Shen, Hui** Associate 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

### Department Faculty

**Alam, Mohammad S** Professor, Department of Electrical Engineering and Computer Science; 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.

**Ammari, Habib M** Associate Professor, Department of Electrical Engineering and Computer Science; B.S., Faculty of Sciences of Tunis (Tunisia); M.S., Southern Methodist University; Ph.D., University of Texas at Arlington.

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

**Fu, Xiangang** Assistant Professor of Practice, Department of Electrical Engineering and Computer Science; B.S., Ocean University of China (China); M.S., Ocean University of China (China); Ph.D., University of Alabama.

**Girgis, Hani Zakaria** Assistant Professor, Department of Electrical Engineering and Computer Science; B.S., The State University of New York at Buffalo; M.S., The State University of New York at Buffalo; Ph.D., The State University of New York at Buffalo.

**Goyal, Ayush** Assistant Professor, Department of Electrical Engineering and Computer Science; B.S., Boise State University; Ph.D., University of Oxford (United Kingdom).

**Hicks, David** Associate Professor, Department of Electrical Engineering and Computer Science; B.S., Angelo State University; M.C.S., Texas A&M University; Ph.D., Texas A&M University.

**Khan, Maleq** Associate Professor, Department of Electrical Engineering and Computer Science; B.S., Bangladesh University of Engineering and Technology (Bangladesh); M.S., North Dakota State University; Ph.D., Purdue University.

**Kim, Taesic** Associate Professor, Department of Electrical Engineering and Computer Science; B.S., Changwon National University (South Korea); M.S., University of Nebraska-Lincoln; Ph.D., University of Nebraska-Lincoln.

**Leung, Chung S** Associate Professor, Department of Electrical Engineering and Computer Science; B.S., Florida Institute of Technology; M.S., Florida Institute of Technology; Ph.D., Florida Atlantic University.

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

**Mishra, Avdesh** Assistant Professor, Department of Electrical Engineering and Computer Science; B.S., Tribhuvan University (Nepal); M.S., University of New Orleans; Ph.D., University of New Orleans.

**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.

**Nijim, Mais** Professor, Department of Electrical Engineering and Computer Science; B.S., Princess Sumaya University for Technology (Jordan); M.S., New Mexico State University; Ph.D., New Mexico Institute of Mining and Technology.

**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.

**Park, Sung-won** Professor, Department of Electrical Engineering and Computer Science; B.E., Hanyang University (South Korea); M.E., Hanyang University (South Korea); M.S.E.E., University of New Mexico; Ph.D., University of New Mexico.

**Smith, Scott** Professor, Department of Electrical Engineering and Computer Science; B.S., University of Missouri; B.S., University of Missouri; M.S., University of Missouri; Ph.D., University of Central Florida.

**Toscano, George** Assistant Professor of Practice, Department of Electrical Engineering and Computer Science; B.S., Bangladesh University of Engineering and Technology (Bangladesh); M.S., Bangladesh University of Engineering and Technology (Bangladesh); Ph.D., University of Texas at Arlington.

**Verma, Amit** Professor, Department of Electrical Engineering and Computer Science; B.Tech, Institute of Technology (India); M.S., Vanderbilt University; Ph.D., Georgia Institute of Technology.

**Yilmaz, Muhittin** Associate Professor, Department of Electrical Engineering and Computer Science; B.S., Gazi University (Turkey); M.Sc., Pennsylvania State University; Ph.D., Pennsylvania State University.

**Yilmazer, Nuri** Associate Professor, Department of Electrical Engineering and Computer Science; B.S., Cukurova University (Turkey); M.S., University of Florida; Ph.D., Syracuse University.

**Zhang, Xuwei** Associate 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; 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

### Department Faculty

**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.

**Rajib Bhuiyan, Mohammad Adnan** Assistant Professor, Department of Environmental Engineering; B.S., Bangladesh University of Engineering and Technology (Bangladesh); M.S., Bangladesh University of Engineering and Technology (Bangladesh); Ph.D., Purdue University.

**Ramirez, David** 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** Associate Professor, Department of Environmental Engineering; B.Eng., 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

### Department Faculty

**Alam, Shah** Associate Professor, Department of Mechanical and Industrial Engineering; B.S., Bangladesh University of Engineering and Technology (Bangladesh); M.S., Bangladesh University of Engineering and Technology (Bangladesh); M.S., South Dakota School of Mines & Technology; Ph.D., Louisiana State University.

**Elkassabgi, Yousri** Professor, Department of Mechanical and Industrial Engineering; B.S., Alexandria University (Egypt); M.S., University of Waterloo (Canada); Ph.D., University of Houston.

**He, Fei** Associate Professor, Department of Mechanical and Industrial Engineering; B.S., Hunan University of Science and Technology (China); M.S., University of Rhode Island; Ph.D., The State University of New York.

**Hossain, Mohammad** Associate Professor, Department of Mechanical and Industrial Engineering; B.S., Chittagong University of Engineering and Technology (Bangladesh); M.S., Northern 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).

**Isensee, Grady** Lecturer I, Department of Mechanical and Industrial Engineering; B.S., Texas A&M University; M.S., Texas A&M University-Kingsville.

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

**Khan, Ovais** Visiting Assistant Professor, Department of Mechanical and Industrial Engineering; B.S., The Nadirshaw Eduljee Dinshaw University of Engineering and Technology (Pakistan); M.S., King Fahd University of Petroleum & Minerals (Saudi Arabia); Ph.D., Wichita State 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** Professor, Department of Mechanical and Industrial Engineering; B.Eng., Tsinghua University (China); Ph.D., Texas Tech University.

**Mogilidda, Rajashekar** Lecturer I, Department of Mechanical and Industrial Engineering; B.Tech., Shanmugha Arts, Science, Technology, and Research Academy (India); M.S., Texas A&M University-Kingsville.

**Oh, Joon-Yeoul** Associate Professor, Department of Mechanical and Industrial Engineering; B.S., Chong-Ju University (South Korea); M.S., Chong-Ju University (South Korea); M.S., New Mexico State University; Ph.D., New Mexico State University.

**Ozcelik, Selahattin** Professor, Department of Mechanical and Industrial Engineering; Interim 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.

**Wei, Bin** Assistant Professor, Department of Mechanical and Industrial Engineering; B.Eng., Hebei Normal University of Science and Technology (China); M.Eng., Hebei University of Engineering (China); Ph.D., Ontario Tech University (Canada).

**Yang, Xue** Associate Professor, Department of Mechanical and Industrial Engineering; B.S., Tsinghua University (China); M.S., Tsinghua University (China); Ph.D., Purdue 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.

## Civil Engineering (CEEN)

### **CEEN 6303** Special Topics in Civil Eng **3 SCH (3-0)**

Courses offered under this Special Topics denomination concentrate on themes not present in the current CEEN curriculum, or can also be offered to strengthen and provide further depth of study in important areas of civil engineering. Topics vary to reflect new developments and interests and interests in emerging areas of civil engineering. May be repeated when topic changes.

### **CEEN 6306** Proposal/Dissertation Research **1-9 SCH (0-0-1-9)**

Students undertaking dissertation research in civil engineering towards fulfilling doctoral dissertation proposal and dissertation requirements are required to register for this course.

## Computer Science (CSEN)

### **CSEN 6303** Special Topics in Computer Sci **3 SCH (3-0)**

Courses offered under this Special Topics denomination concentrate on themes not present in the current EECS curriculum, or can also be offered to strengthen and provide further depth of study in important areas of computer science. Topics vary to reflect new developments and interests on emerging areas of computer science, such as cryptography, the Internet of Things, and wireless sensor networks, to name a few. May be repeated when topic changes.

## Electrical Engineering (EEEN)

### **EEEN 6303** Spec Tops in Elec Engineering **3 SCH (3-0)**

Courses offered under this Special Topics denomination concentrate on themes not present in the current EECS curriculum, or can also be offered to strengthen and provide further depth of study in important areas of electrical engineering. Topics vary to reflect new developments and interests on emerging areas of electrical engineering. May be repeated when topic changes.

### **EEEN 6306** Prop/Dissertation Research **9 SCH (0-0-9)**

Students undertaking dissertation research towards fulfilling doctoral dissertation proposal and dissertation requirements are required to register for this course.

### **EEEN 6310** Intell. Control Optimization **3 SCH (3-0)**

Artificial intelligence, Biomimicry, Fuzzy Logic, Neural Networks, Deep Learning, General Algorithms, and Expert Systems for Intelligent Control Systems and Optimization. Prerequisite: Graduate Standing

### **EEEN 6311** Nonlinear Systems **3 SCH (3-0)**

Nonlinear systems and stability, linearization, phase plane analysis, describing functions, Lyapunov stability, feedback linearization, singular perturbations, model reduction, chaos control and sliding mode control. Prerequisite: Graduate Standing

### **EEEN 6383** Robust System Theory **3 SCH (3-0)**

Signal and system norms, Structured and unstructured uncertainty, Robustness (stability and performance) analysis in time and frequency domains, Convex Optimization (Linear Matrix Inequalities (LMI), Semi-definite programming), Linear Fractional Transformations (LFT), H<sub>2</sub> and H<sub>∞</sub> and u controller designs, Youla parametrization, Linear parameter varying (PV) systems. Prerequisite: A Linear Systems Analysis Course.

### **EEEN 6385** Adaptive Array Systems **3 SCH (3-0)**

Antenna Parameters, Terminology, Antenna Arrays, Spatial Filtering, Adaptive Antenna Arrays, Mutual Coupling & Correlation, Narrowband Array Systems (Beam Steering, Grating Lobes, Amplitude Weights), Adaptive Arrays (Spatial Covariance Matrix, Multi-beam Arrays, Scanning Arrays, Switched Beam Beamformers, Fully Adaptive Beamformers, Fourier Method, Capon's Minimum Variance, The MUSIC Algorithm, ESPRIT, Maximum Likelihood Techniques, Spatial Smoothing.

## Engineering (PHEN)

### **PHEN 6304 Seminar & Research Integrity 3 SCH (3-0)**

Exposure to ethics topics in the engineering profession and in scientific research. Methods for review of the scientific literature, and its use in developing a novel research objective and plan. Pre-requisite: admission to the PhD in Engineering program.

### **PHEN 6313 Adv Eng Math 3 SCH (3-0)**

Foundation of calculus, Stochastic processes, Fundamentals of Mathematical Analysis, Optimization principles. Prerequisites: 5000 level Math Course or instructor approval.

## 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)**

Overview of pertinent regulations and regulatory infrastructure. Development and application of the fundamental principles that determine environmental and occupational health. Discussion of methods for controlling environmental occupational hazards. Introduction to Environmental Health and Safety Information Systems.

### **EVEN 6304 Internship in Environ Engrng 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 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 Fundmnl 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 Fund 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 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 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 Measurmnts 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 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 System 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 Enginerng Optimzatr Envron 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 6354 Enviromental 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 Enginerng 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.

## Mechanical Engineering (MEEN)

**MEEN 6303 Special Topics Mechanical Eng 3 SCH (3-0)**

One or more advanced topics to strengthen and provide further depth of study in important areas of Mechanical Engineering. May be repeated when topic changes.

**MEEN 6306 Proposal/Dissertation Research 1-9 SCH (0-0-1-9)**

This course is for doctoral students undertaking dissertation research to take towards fulfilling doctoral dissertation proposal and dissertation requirements.

**MEEN 6321 Adv Eng Data Analysis & Opt 3 SCH (3-0)**

Data collection and random sampling methods for engineering applications, advanced probability and data analysis for engineering problems, linear and non-linear regressions including multi-variable regression, and heuristic optimization algorithms.

**MEEN 6325 Analytical Dynamics 3 SCH (3-0)**

Generalized coordinates and forces. Hamilton's principle and equations. Quasi-coordinates and quasi-velocities. Gibbs-Appel equations. Kane's equations. Stability of nonlinear dynamic systems. Analyses of nonlinear dynamic systems. Prerequisite: engineering graduate student.

**MEEN 6326 Advanced Control Systems 3 SCH (3-0)**

Input-output and state space representation of linear continuous and discrete time dynamic systems. Controllability, observability, and Lyapunov stability. Design and analysis of single and multi-variable feedback control systems. State observer, linear quadratic optimum control, linear robust control. Application to engineering system.

**MEEN 6327 Nonlinear Solid Mechanics 3 SCH (3-0)**

Constitutive equations for nonlinear behaviors of solids. Nonlinear strains and stresses of solids. Material and geometric nonlinearities of solids. Nonlinear deformation, buckling and stability analyses of bars, frames, plates and shells. Prerequisite: engineering graduate student.

**MEEN 6330 Advanced Composite Materials 3 SCH (3-0)**

General characteristics of composite Materials, Polymer-, Metal, Ceramic-Matric Composites; glass, carbon, Kevlar, and natural fibers; thermoset and thermoplastic polymers, fabrication methods, experimental characterization - morphological, static and dynamic, nanocomposites. Prerequisites: graduate standing in science or engineering with materials science (MEEN 3344) or equivalent course taken in undergraduate study.

**MEEN 6331 Advanced Polymer Science 3 SCH (3-0)**

Structure and properties of polymeric materials, polymer-solvent thermodynamics, physical and mechanical properties such as viscosity, glass transition, viscoelasticity, rheology, fatigue, creep, toughening principles. Prerequisite: graduate standing in science or engineering with materials science (MEEN 3344) or equivalent course taken in undergraduate study.

**MEEN 6332 Adv Mech Composites & Design 3 SCH (3-0)**

Lamina Stress-Strain Relationships, Effective Moduli and Strength of a Continuous Fiber-Reinforced Lamina, Hygrothermal Behavior, Analysis of Laminates, and Selection of Laminate Designs. Prerequisite: graduate standing in science or engineering with strength of materials (CEEN 3311) or equivalent course taken in undergraduate study.

**MEEN 6333 Nondestructive Evaluation Tech 3 SCH (3-0)**

Importance of NDE in engineering design, manufacturing, maintenance and service, principles of NDE techniques such as penetrant, ultrasonics, Acoustic Emission, Magnetic Particle, and eddy current testing, emerging technologies in the field of NDE. Prerequisite: graduate standing in science or engineering.

## 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 1-9 SCH (0-0-1-9)**

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 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 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 6333** Advanced Wind Farm Design **3 SCH (3-0)**

Advanced knowledge of wind farm design, development, and operation, including wind power estimation, wake flow effect, wind turbine selection, location selection, and layout optimization.

**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)**

Basics of Wind Energy and Power, Kinetic Energy of Wind, Properties of Wind, Statistical Distribution of Wind Speed, Wind Measurement and Sensors, Deploying Wind Turbines in Grid, Environmental Impact of Wind Turbines, Wind Classes, Shear, Operation and Control. Prerequisite: graduate standing.

**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.

## Environmental Engineering, Ph.D.

### Degree requirements for the PhD in Environmental Engineering:

- 63 credit hours including: 24 to 36 hours of classroom graduate-level courses, 6 cr hours of graduate seminar (EVEN 6102), and 21 to 33 hours of research (EVEN 6306).
- Students should successfully complete the Ph.D. Qualifying Exam.
- Students should successfully defend dissertation proposal and final dissertation.

Code	Title	Semester Credit Hours
<b>Core Courses</b>		<b>21</b>
EVEN 6354	Enviromental Regs&Policy	
EVEN 6319	Chem Prin of Envir Eng Design	
EVEN 6102	Grad Sem in Environmental Engr *	
Choose at least TWO course from the following:		6
EVEN 6308	FundmnlS Solid Hazardous Waste	
EVEN 6309	Fund Air Qual and Polutn Contr	
EVEN 6316	Fundamentls of Environ Biotech	
EVEN 6325	Physical-Chem Water Treatment	
Choose at least ONE of the following environmental modeling or data courses:		3
EVEN 6318	Enviro System Modeling	
EVEN 6332	Environmental Data Analysis	
<b>Dissertation (EEEN 6306)</b>		<b>21-33</b>
<b>Other Electives</b>		<b>9-21</b>
<b>TOTAL</b>		<b>63 Credits</b>

\* Must take EVEN 6102 six (6) times.

**Graduate-level elective courses available in the program are as follows:**

Code	Title	Semester Credit Hours
EVEN 6304	Internship in Environ Enginrng	1-3
EVEN 6311	Air Quality Modeling	3
EVEN 6312	Sur Water Quality Modeling	3
EVEN 6313	Ground Water Contaminant	3
EVEN 6329	Environ Monitor and Measurmnts	3
EVEN 6340	Decision Sci for Environ System	3
EVEN 6341	Enviromental Informatics	3
EVEN 6342	Enginerng Optimzatrn Environ Sys	3
EVEN 6356	Spec Top in Environ Enginerng	3

Students can take up to two courses (6 credits) outside by department by consulting with your research/academic advisor. One additional course may be taken outside the department (3 credits) with approval of the departmental graduate committee.

**Engineering, Ph.D.****Degree requirements for the Ph.D. program for those admitted with a Master's Degree in Engineering**

- A total of 63 credits to complete the requirements for the degree.
- Students should successfully complete the Ph.D. Qualifying Exam.
- Students should successfully defend dissertation proposal and final dissertation.

Code	Title	Semester Credit Hours
<b>Core Courses</b>		
PHEN 6304	Seminar & Research Integrity	3
PHEN 6313	Adv Eng Math	3
<b>Dissertation (CEEN 6306 or EEN 6306 or MEEN 6306 or ESEN 6306)</b>		<b>30-45</b>
<b>Mandatory 6000 level courses</b>		<b>12</b>
<b>Other Electives (5000 or 6000 level courses)</b>		<b>0-15</b>
TOTAL		63 Credits

Code	Title	Semester Credit Hours
<b>Elective Courses</b>		
CEEN 6303	Special Topics in Civil Eng	3
EEEN 6303	Spec Tops in Elec Engineering	3
EEEN 6310	Intell. Control Optimization	3
EEEN 6311	Nonlinear Systems	3
EEEN 6383	Robust System Theory	3
EEEN 6385	Adaptive Array Systems	3
MEEN 6303	Special Topics Mechanical Eng	3
MEEN 6321	Adv Eng Data Analysis & Opt	3
MEEN 6325	Analytical Dynamics	3
MEEN 6326	Advanced Control Systems	3
MEEN 6327	Nonlinear Solid Mechanics	3
MEEN 6330	Advanced Composite Materials	3
MEEN 6331	Advanced Polymer Science	3
MEEN 6332	Adv Mech Composites & Design	3
MEEN 6333	Nondestructive Evaluation Tech	3

ESEN 6303	Adv T: Sustainable Energy Syst	3
ESEN 6306	Proposal/Dissertation	1-9
ESEN 6310	Sust Energy Sys & Policy	3
ESEN 6311	Fund Pow Gen & Energy Storage	3
ESEN 6312	Energy Sys Integ & Design	3
ESEN 6321	Smart Grids	3
ESEN 6325	Solar Power	3
ESEN 6326	Characterization of Materials	3
ESEN 6328	Nanofab & Nanoscale Dev	3
ESEN 6329	Adv T: Multiphysics Modelling	3
ESEN 6331	Thermal Systems Engineering	3
ESEN 6333	Advanced Wind Farm Design	3
ESEN 6334	Energy Resource Mngmnt & Optim	3
ESEN 6335	Wind Power	3
ESEN 6341	Advanced Chemical Kinetics	3

In exceptional cases, students may be admitted directly to the Ph.D. program with a Bachelor of Science in Engineering degree. In such cases, students must complete 30 credits of graduate level courses in addition to the 63 credits as required above.