Zachry Department of Civil Engineering
Doctor of Philosophy (PhD) Degree Requirements
Area of Study: Environmental Engineering

Last Revision: September 2014

The Doctor of Philosophy (Ph.D.) degree is a research-oriented degree requiring performance of independent research that is the original work of the candidate. In addition, a minimum of **64** semester credit hours of approved courses is required beyond the Masters degree (96 credit hours beyond the Bachelors degree). The university and the department place limitations on courses that can be used to meet these requirements. Departmental requirements are described below and university requirements are described in the Texas A&M University Graduate Catalog (http://www.tamu.edu/admissions/catalogs/). Schedules, forms, and procedures for graduate students are provided by the Office of Graduate Studies (http://ogs.tamu.edu/). All degree candidates have the obligation of knowing and adhering to all relevant university and departmental requirements.

The following department requirements apply to students pursuing a PhD degree in the Zachry Department of Civil Engineering.

- The student's degree plan must include a **minimum of 32 credit hours of non-research course work**. Non-research course work includes all courses other than CVEN 691. If a student already has taken at least 24 credit hours of non-research course work for a Masters degree, then the minimum requirement for non-research coursework on the PhD degree plan is reduced to 24 credit hours.
- All documents requiring departmental signatures must be submitted to the Civil Engineering Graduate Office at least one day prior to the deadline set by the Office of Graduate Studies.

The following items discuss expectations for the major steps toward the PhD degree. A number of other requirements on these steps are specified by the Office of Graduate Studies (http://ogs.tamu.edu/) and many are described in the university catalog (http://www.tamu.edu/admissions/catalogs/). The candidate has the obligation to be informed of these requirements and adhere to them.

- Qualifying Exam: The qualifying exam is a departmental requirement and is usually scheduled once per year in January. It will be prepared and administered by members of the Environmental Engineering faculty. The exam includes both written and oral components and information on the content of the exam will be distributed. Students entering the program in the Fall semester are expected to take the exam the following January. Students entering in the Spring or summer semesters are expected to take the next available exam, which may be scheduled before January.
- Degree Plan: An advisory committee should be formed and a degree plan should be submitted and approved by the advisory committee soon after passing the qualifying exam. Normally, this should be done before the end of the second full semester of study. The Fall and Spring semesters are considered "full semesters", while the summer semester is not.
- Preliminary Exam: The preliminary exam should be scheduled a student completes, or nears completion of non-research course work on the degree plan (specific limitations are described in the graduate catalog). Normally this should occur before the end of the fifth full semester (Fall or Spring) of study. The advisory committee will schedule and administer the written and oral portions of the exam. The oral preliminary exam is often combined with a discussion of the candidate's research proposal.
- Research Proposal: A candidate must prepare a dissertation proposal that describes the research to be conducted in fulfillment of the requirements for the degree. This should be done as soon as the research project can be outlined in reasonable detail, but usually no later than the end of the

fifth full semester (Fall or Spring) of study. The research proposal should describe the proposed research, including relevant background information, and clearly demonstrate how this research will make a unique contribution of new knowledge to the student's area of study. Upon approval of the research proposal by the advisory committee chair, it should be submitted to other members of the advisory committee. Normally, this should occur at least 2 weeks (10 working days) prior to the meeting of the advisory committee at which the proposal will be reviewed. This meeting will normally be the oral part of the preliminary exam, but it can be a separate meeting.

Ph.D. Level Environmental Engineering Courses

The Appendix list includes courses in the Environmental Engineering program and other courses that are typically taken by environmental engineering students. Ph.D. students normally will have taken the core classes or their equivalent as part of the previous education.

Appendix: List of core, elective and other relevant courses[1]

Course	**Freq.(yr^{-1})**
A) Core Courses	
CVEN 601 Environmental Engineering Processes III (Bella Chu)	1
CVEN 619 Environmental Engineering Processes I (Qi Ying)	1
CVEN 620 Environmental Engineering Processes II (Bill Batchelor)	1
B) Other Mandatory Courses	
CVEN 681 Environmental Seminar	1
*C) Elective Courses**	
CVEN 603 Environmental Engineering Management (Rabi Mohtar)	1
CVEN 604 Engineering Analysis of Treatment Processes (Bill Batchelor)	1
CVEN 605 Environmental Measurements (Bella Chu)	1
CVEN 606 Environmental Engineering Design I (Bill Batchelor)	Variable
CVEN 607 Engineering Aspects of Air Quality (Qi Ying)	Variable
CVEN 609 Environmental Control of Oil and Hazardous Materials	Variable
CVEN 610 Environmental Risk Assessment (Robin Autenrieth)	Variable
CVEN 682 Environmental Remediation of Contaminated Sites (Bill Batchelor)	Variable
CVEN 684 Professional Internships	Variable
CVEN 685 Directed Studies MS/ME	Fall/Spring
CVEN 689 Special Topics - Advanced Biological Treatment and Technology in Environmental Engineering (Bella Chu) - Air Quality Modeling (Qi Ying)	Variable
CVEN 691 Research	Variable

* The environmental engineering area is expecting to have two additional faculty members. Additional courses may become available in Fall 2015.

D) Other Relevant Courses

Water Resources Courses

CVEN 627 Engineering Surface Water Hydrology
CVEN 628 Advanced Hydraulic Engineering
CVEN 658 Civil Engineering Applications of GIS
CVEN 664 Water Resources Engineering Planning and Management
CVEN 665 Water Resources Systems Engineering
CVEN 674 Groundwater Engineering
CVEN 675 Stochastic Hydrology

[1] All coursework should be discussed with advisory committee chair before enrolling in course. All coursework must be consistent with the student's chosen field of study and commensurate with graduate study.

Other CVEN Courses
CVEN 673 Transport Through Porous Media
CVEN 679 Theory of Fluid Mechanics Models
CVEN 680 Advanced Computation Methods for Fluid Flow
CVEN 688 Computational Fluid Dynamics
Relevant Geotechnical or Ocean Engineering courses w/pre-requisites.

Mathematics and Statistics Courses
MATH 601 Methods of Applied Math
MATH 602 Partial Differential Equations
MATH 609 Numerical Analysis
STAT 601 Statistical Analysis
STAT 602 Statistical Methods of Regression Analysis

Business Certificate Courses
The following four courses are required to earn a Certificate in Business, but at most two of them can be used in a M.E. degree program.
ACCT 640 Accounting Concepts and Procedures
FINC 635 Financial Management for Non-Business
MGMT 655 Survey of Management
MKTG 621 Survey of Marketing

Other Classes
AGEC 604 Natural Resource Economics
AGEC 659 Ecological Economics
AGEC 689 Water Resource Economics
AGRO 605 Pedology
AGRO 611 Introduction to Environmental Biophysics
AGRO 614 Biodegradation and Bioremediation (VAPH 614)
AGRO 615 Reclamation of Drastically Disturbed Lands
AGRO 616 Land Disposal of Waste
AGRO 617 Advanced Soil Physics
AGRO 650 Mode of Action and Environmental Fate of Herbicides
AGRO 670 Basic Environmental Toxicology
ATMO 601 Fundamentals of Atmospheric Dynamics
ATMO 602 Principles of Atmospheric Physics and Chemistry
ATMO 613 Advanced Atmospheric Chemistry
ATMO 629 Climate Change
ATMO 631 Climate Modeling
ATMO635 Atmospheric Thermal Dynamics
ATMO661 Atmospheric Turbulence
BAEN 651 Geographic Information Systems
BAEN 652 Advanced Topics in GIS
BAEN 669 Water Quality Engineering
BAEN 670 Air Pollution Engineering
BAEN 672 Small Watershed Hydrology

BAEN 673 Modeling Small Watersheds
BAEN 674 Vadose Zone Hydrology
BICH 601 Fundamentals of Biochemistry I
BIOL 650 Genomics
BIOT 601 Biotechnology Principles and Techniques I
BIOT 602 Biotechnology Principles and Techniques II
CHEN 624 Chemical Engineering Kinetics and Reactor Design
CHEN 629 Transport Phenomenon
CHEN 651 Biochemical Engineering
GEOG 626 Fluvial Geomorphology
GEOG 651 Remote Sensing for Geographical Analysis
GEOL 610 Field Methods in Hydrogeology
GEOL 620 Geology of Groundwater
GEOL 621 Contaminant Hydrogeology
GEOL 621 Contaminant Hydrology
GEOL 625 Applied Groundwater Modeling
GEOL 628 Geomorphology and Geology of Water Resources
GEOL 631 Engineering Geomorphology
GEOL 635 Engineering Geology
GEOL 641 Environmental Geochemistry
GEOL 642 Chemical and Isotopic Evolution of Groundwater
OCEN 678 Fluid Dynamics for Ocean and Environmental Engineering
OCNG 629 Lower Food Web Dynamics of Aquatic Ecosystems
OCNG 650 Aquatic Ecology
OCNG 676 Marine Environmental Policy: A Survey
POLS 645 Politics, Policy and Administration
RENR 650 Leadership Development and Management of Environmental NGOs
RENR 659 Ecological Economics
RENR 660 Environmental Impact Analysis for Renewable Natural Resources
RENR 662 Environmental Law and Policy
RENR 664 Coastal Zone Management
RLEM 601 Ecology and Land Uses
RLEM 601 Rangeland Resource Management
RLEM 623 Ecohydrology
RLEM 633 Wetland Plant Taxonomy
RLEM 640 Wetland Delineation
WFSC 611 Estuarine Ecology
WFSC 615 Mariculture
WFSC 628 Wetland Ecology
WFSC 629 Aquatic Ecology
WHMS 601 Applications and Problems in Hydrological Science
WHMS 602 Contemporary Issues in Water Resources