Department of Civil Engineering  
Doctor of Philosophy (Ph.D.) Degree Requirements  
Area of Study: Water Resources Engineering

The Doctor of Philosophy (Ph.D.) degree requires 64 credit hours of approved courses and research beyond the Master of Science (M.S.) degree [96 credit hours beyond the Bachelor of Science (B.S.) degree], and a dissertation.

NOTE: All documents requiring departmental signatures must be submitted to the Civil Engineering Graduate Office at least one day prior to the Office of Graduate Studies deadline.

In addition to fulfilling the University requirements for the Doctor of Philosophy (Ph.D.) degree, a student enrolled in the Civil Engineering graduate program in the area of Water Resources Engineering must satisfy the following department requirements:

- A minimum of 32 credit hours of graduate level coursework taken through Texas A&M University\(^1\) (a minimum of 24 credit hours if the student already has taken at least another 24 credit hours of graduate course work for the Master of Science (M.S.) or Master of Engineering (M.E.) degree at Texas A&M or equivalent university).
- Remaining coursework requirement can be met by 32 hours of CVEN 691

The following area requirements and/or recommendations\(^2\):

- **Recommended Coursework:**
  - CVEN 423 Geomatics for Civil Engineers
  - CVEN 455 Urban Stormwater Management
  - CVEN 458 Hydraulic Engineering
  - CVEN 463 Hydrology
  - 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
  - CVEN 673 Transport Phenomena in Porous Media
  - CVEN 674 Groundwater Engineering
  - CVEN 675 Stochastic Hydrology
  - CVEN 681 Seminar in Environmental and Water Resources Engineering

  Relevant CVEN, OCEN, MEMA, and other Graduate Courses per recommendations of the advisory committee and department requirements

- **Qualifying Exam:** During the first semester of study, an oral Qualifying Exam will be scheduled with members of the Civil Engineering Water Resources faculty and a Civil Engineering faculty member outside the Water Resources area. The exam should be taken within the first two semesters of study. At this examination, the student will give a presentation of research work completed for a previous degree and questions can cover material addressed in the required coursework for the Water Resources area.
• Degree Plan: An advisory committee must be formed and a Degree Plan must be submitted and approved by the advisory committee after passing the Qualifying Exam and by the end of the fourth semester of study.

• Written Preliminary Exam: After completion of the coursework listed on the Degree Plan (with the exception of CVEN 691 Research), a Written Preliminary Exam will be scheduled with members of the advisory committee. This exam consists of written questions from the advisory committee. Each question should be given over a period of one day, and the exam in total should be given over a period of one week.

• Research Proposal: A draft Research Proposal must be submitted to the advisory committee chair at least 2 weeks (10 working days) prior to revision and subsequent submittal to other members of the advisory committee. These other members of the advisory committee will be provided at least 2 weeks (10 working days) prior to the Oral Preliminary Exam to review the revised draft Research Proposal. Thus, the draft Research Proposal must be submitted to the advisory committee chair at least 4 weeks (20 working days) prior to the Oral Preliminary Exam.

• Oral Preliminary Exam: After passing the Written Preliminary Exam, an Oral Preliminary Exam will be scheduled with members of the advisory committee. At this examination, the student will give a presentation of the Research Proposal. The questions in this exam will cover the Written Preliminary Exam, the Oral Preliminary Exam presentation, and any relevant coursework.

• Completion of Dissertation: A draft Dissertation must be submitted to the advisory committee chair at least 3 weeks (15 working days) prior to revision and subsequent submittal to other members of advisory committee. These other members of the advisory committee will be provided at least 2 weeks (10 working days) to review the revised draft Dissertation prior to the Final Defense. Thus, the draft Dissertation must be submitted to the advisory committee chair at least 5 weeks (35 working days) prior to the Final Defense.

• Final Defense: A Final Defense consisting of an oral examination will be scheduled with all of the advisory committee members. At this examination, the student will give a presentation of the research work completed for the degree and documented in the Dissertation.

1 Certain courses within the College of Engineering are prohibited from use on the degree plan unless written justification is made by the student’s advisor and approved by the Departmental Graduate Advisor prior to enrolling in the course. Please see Departmental Graduate Advisor for listing of prohibited courses.

2 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.
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<thead>
<tr>
<th>Course</th>
<th>MS or PhD</th>
<th>Frequency (per year)</th>
<th>Comments</th>
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<tbody>
<tr>
<td>CVEN 423 - Geomatics for Civil Engineering</td>
<td>MS/ME, PhD</td>
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<td>CVEN 627 - Engineering Surface Water Hydrology</td>
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<td>CVEN 664 - Water Resources Engineering Planning and Management</td>
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<td>CVEN 681 - Seminar in Environmental and Water Resources Engineering</td>
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<td>CVEN 684 - Professional Internship</td>
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<td>CVEN 685 - Directed Studies</td>
<td>MS/ME, PhD</td>
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<tr>
<td>CVEN 691 - Research</td>
<td>MS/ME, PhD</td>
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**Other Suggested CVEN Courses**

*General*
- CVEN 624 Infrastructure Engineering and Management
- CVEN 661 Research methods for Civil Engineers
- CVEN 662 Experimental Methods in Civil Engineering
Fluid Mechanics
CVEN 679  Theory of Fluid Mechanics Models
CVEN 680  Advanced Computation Methods for Fluid Flow
CVEN 688  Computational Fluid Dynamics

Environmental Engineering
CVEN 601  Environmental Engineering Processes III
CVEN 619  Environmental Engineering Processes I
CVEN 620  Environmental Engineering Processes II
CVEN 603  Environmental Engineering Management
CVEN 604  Engineering Analysis of Treatment Systems
CVEN 605  Environmental Measurements
CVEN 606  Environmental Engineering Design I
CVEN 609  Environmental Control of Oil and Hazardous Materials
CVEN 610  Environmental Risk Assessment

Construction Engineering
CVEN 641  Construction Engineering Systems

Geotechnical Engineering
CVEN 647  Numerical Methods in Geotechnical Engineering
CVEN 649  Physical and Engineering Properties of Soil

Other Suggested Courses in Other Programs/Departments

Agricultural Economics
AGEC 604  Natural Resource Economics

Atmospheric Sciences
ATMO 601  Fundamentals of Atmospheric Dynamics
ATMO 621  Atmospheric Science
ATMO 629  Climate Change
ATMO 631  Climate Modeling
ATMO 655  Satellite Data in Meteorology

Biological and Agricultural Engineering
BAEN 669  Water Quality Engineering
BAEN 672  Small Watershed Hydrology
BAEN 673  Modeling Small Watersheds

Coastal and Ocean Engineering
OCEN 671  Ocean Wave Mechanics
OCEN 672  Coastal Engineering
OCEN 674  Ports and Harbors
OCEN 678  Fluid Dynamics for Ocean and Environmental Engineering
OCEN 682  Coastal Sediment Processes
OCEN 683  Estuary Hydrodynamics
OCEN 688  Marine Dredging
Forestry Science
FRSC 608  Remote Sensing for Natural Resources Management
FRSC 651  Geographic Information Systems
FRSC 652  Advanced Topics in Geographic Information Systems
FRSC 653  Computer Programming for Natural Resources Applications

Geology
GEOL 610  Field Methods in Hydrogeology
GEOL 621  Contaminant Hydrogeology
GEOL 625  Applied Ground Water Modeling
GEOL 631  Engineering Geomorphology

Geography
GEOG 626  Fluvial Geomorphology
GEOG 646  Periglacial Geomorphology

Industrial Engineering
INEN 622  Linear Programming
INEN 623  Nonlinear and Dynamic Programming
INEN 625  Simulation Methods and Applications
INEN 629  Engineering Optimization

Law
RENR 662  Environmental Law and Policy

Management
MGMT 639  Negotiations
MGMT 640  Managing for Creativity and Innovation
MGMT 643  Foundations of Managerial Law
MGMT 655  Survey of Management
MGMT 678  International Management
ACCT 640  Accounting Concepts and Procedures I
FINC 635  Financial management for Non-Business

Statistics
STAT 601  Statistical Analysis
STAT 602  Statistical Methods of Regression Analysis
STAT 626  Methods in Time Series Analysis
STAT 651  Statistics in Research I
STAT 652  Statistics in Research II

Urban and Regional Planning
PLAN 623  Development Planning in Third World Countries