

Overview:

The Construction Science and Management (CSM) track of the Doctor of Philosophy (Ph.D.) in Civil Engineering (CE) Program is a collaborative educational and research effort between the Civil and Environmental Engineering Department and the Construction Science Department. It offers the opportunity for students with construction science, civil engineering or other related backgrounds to pursue advanced studies in their areas of interest. The educational objectives are to produce graduates who have advanced technical knowledge in Construction Management and to develop research and educational skills that are essential in the global market. The degree will be awarded to candidates who have profound knowledge in their area of expertise and who demonstrate original contribution to current theory and applications in the field.

The regulations for this degree comply with the general University regulations (refer to Student Policies, General Academic Regulations, and the Graduate Catalog, Doctoral Degree Regulations).

1.1 Admission Requirements:

Applicants must satisfy the following requirements, in addition to satisfying the University-wide graduate admission requirements (refer to Student Policies, Admission Policies):

- A Bachelor of Science degree and/or a Master of Science degree from an accredited university, and a minimum grade point average of 3.0 in upper-division and/or graduate courses. The degrees should be in civil engineering, construction science and management, architecture or other related disciplines.
- Three letters of recommendation from persons familiar with the applicant's academic potential.
- Official Graduate Record Examination (GRE) scores.
- A letter of research/specialization interest.
- A résumé/curriculum vita.

Applications must be submitted online to the UTSA Graduate School. Incomplete applications will not be considered. Acceptance to the CSM track Ph.D. in CE is determined by the CSM faculty graduate committee. Full-time students accepted to the program are eligible for financial support in the form of competitive teaching assistantships, research assistantships, or research fellowships. Awards are contingent upon available funding.

1.2 Degree Requirements:

The Construction Science and Management (CSM) track of the Doctor of Philosophy (Ph.D.) in Civil Engineering (CE) Program requires that students: a) complete a minimum of semester credit hours as described below, b) pass the qualifying exam, c) pass the comprehensive exam, d) write a doctoral dissertation, e) publish peer-review papers, and f) pass a final dissertation defense.

Students with a Master's Degree are required to have a minimum of 60 semester credit hours to graduate. These credits will be distributed as follows:

- A. Core curriculum CE courses. (9 Semester credit hours)
- B. CSM courses or other electives (18 Semester credit hours)
- C. Graduate seminar (3 Semester credit hours)
- D. Doctoral research and dissertation (30 Semester credit hours)

Students with only a baccalaureate degree are required to have a minimum of 75 semester credit hours to graduate. These credits will be distributed as follows:

- A. Core curriculum CE courses. (9 Semester credit hours)
- B. CSM courses or other electives (33 Semester credit hours)
- C. Graduate seminar (3 Semester credit hours)
- D. Doctoral research and dissertation (30 Semester credit hours)

A. Core curriculum CE courses

Student must select required “Core curriculum CE course” from the list below. Other courses could be substituted, if they are approved by the Chair of CSM faculty graduate committee before the courses are taken by the student:

CE 5013	Civil Engineering Systems Analysis	3 SCH
CE 5023	Finite Elements Methods	3 SCH
CE 5043	Advanced Civil Engineering Statistics	3 SCH
CE 5143	Numerical Methods in Civil Engineering	3 SCH
CE 5293	Geographic Information Systems	3 SCH
CE 5453	Transportation Engineering	3 SCH
CE 5463	Foundation Engineering	3 SCH
CE 5643	Sustainable Energy Systems	3 SCH
CE 5703	Special Topics in Hydraulics and Hydrology	3 SCH
CE 5713	Special Topics in Structures	3 SCH
CE 5733	Special Topics in Environmental engineering	3 SCH
CE 5743	Special Topics in Geotechnical Engineering	3 SCH
CE 6953	Independent Studies	3 SCH

B. CSM courses or other electives

Student must select required CSM courses or other electives from the list below according to his/her selected track of study and the requirements above. Other courses could be substituted, if they are approved by the Chair of CSM faculty graduate committee before the courses are taken by the student:

CSM 5133	Construction Practice in a Global Setting	3 SCH
CSM 5223	Building Information Modeling for Construction Management	3 SCH
CSM 5243	Sustainable Construction and Delivery	3 SCH
CSM 5413	Advanced Topics in Construction Systems	3 SCH
CSM 5423	Advanced Topics in Project Controls and Scheduling	3 SCH
CSM 5433	Construction Safety Planning and Management	3 SCH
CSM 5633	Advanced Construction Management	3 SCH
CSM 6951	Independent Study	1 SCH
CSM 6953	Independent Study	3 SCH
CSM 6973	Special Topics	3 SCH
CSM 6976	Special Topics	6 SCH
CSM 6643	Artificial Intelligence in Construction Management	3 SCH
CSM 7103	Decision-Making in Construction Management	3 SCH
CSM 7113	Resiliency within the Built Environment	3 SCH
CSM 7203	Research Methods	3 SCH

C. Graduate seminar

Students must enroll in 3 semester credit hours of CSM 7011 Construction Graduate Seminar.

D. Doctoral research and dissertation

Students must select 15 semester credit hours of Doctoral Research and 15 semester credit hours of Doctoral Dissertation from the list below:

CSM 7213 ⁽¹⁾	Doctoral Research	3 SCH
or CSM 7212 ⁽¹⁾	Doctoral Research	2 SCH
or CSM 7211 ⁽¹⁾	Doctoral Research	1 SCH
CSM 7313 ⁽²⁾	Doctoral Dissertation	3 SCH
or CSM 7312 ⁽²⁾	Doctoral Dissertation	2 SCH
or CSM 7311 ⁽²⁾	Doctoral Dissertation	1 SCH

(1) After Qualifying Exam and Prior to Comprehensive Exam.

(2) After Successful Defense of Comprehensive Exam.

1.3 Dissertation Committee

Students must choose a Dissertation Committee consisting of at least four members. The chair of the committee must be a member of the graduate faculty from the CSM Department and the remaining members must be members of the graduate faculty. A minimum of one committee member must be a graduate faculty member from a different technical area within the CSM Department, or from a different department at UTSA, or an external member not affiliated with UTSA. Students must submit the names of their Dissertation Committee to the Chair of CSM faculty graduate committee by the end of their second semester of study. The Dissertation Committee will guide students with: a) a plan of study based on the career goals, b) research proposal submission plan, c) peer-review publication plan, and d) dissertation preparation.

1.4 Advancement to Candidacy

1.4.1 Qualifying Examination

Ph.D. students advance to candidacy after completing their written and/or oral qualifying examinations. First, students must complete fundamental courses and then take the written or oral qualifying examination. Full-time students must take the written qualifying examination by the end of their second semester of study. Part-time students need to take the written qualifying examination at a time dictated by the CSM graduate studies committee. The qualifying examination may include questions on fundamentals and applied topics related to the core CE and CSM elective courses selected by the students. In addition, the students will be asked to carry out a critical review of CSM research publications. A written qualifying examination will be administered by a committee composed of two members of the graduate faculty from the student's track and appointed by the Chair of CSM faculty graduate committee. Students will be allowed to take an oral qualifying examination in lieu of the written exam. Oral qualifying examinations will be administered by the student's dissertation committee. No more than two attempts to pass the qualifying examination are permitted. Students who fail the qualifying examination twice will be terminated from the program.

1.4.2 Comprehensive Examination

Students must take their oral comprehensive examination within two semesters after passing their qualifying examination. The oral comprehensive examination is a dissertation proposal defense. The dissertation proposal should describe the topic, the literature review, research hypothesis or measurable objective, the proposed methodology for the experimental approach, data collection approach, data analysis and anticipated results. The dissertation proposal must also highlight the novelty and potential contribution of the topic to the scientific field including intellectual merit and broad impacts. The student's Dissertation Committee chair must approve the student's research proposal before scheduling the oral examination. No more than two attempts to pass the comprehensive examination are permitted. Students who fail the comprehensive examination twice will be terminated from the program. Upon successful completion of the oral comprehensive examination, students advance to Ph.D. candidacy and are allowed to take Doctoral Dissertation credit hours. Results of the written and/or oral examinations must be reported by the chair of the Dissertation Committee to the CSM faculty graduate committee and the Dean of the Graduate School.

Admission into the Doctoral program does not guarantee advancement to candidacy. After advancement to candidacy, the student's Dissertation Committee can be changed at the student's request and with the approval of the chair of the Dissertation Committee.

1.5 Dissertation and Peer-Review Publications

Candidates must demonstrate their ability to conduct independent research by completing an original dissertation and publishing peer-reviewed scientific papers. The Dissertation Committee guides, critiques and finally approves the candidate's dissertation. The format of the dissertation must follow the doctoral degree regulations of the Graduate School as documented in this catalog.

1.6 Final Oral Dissertation Defense

The final oral defense consists of a public presentation of the dissertation work by the Doctoral candidate followed by a question/answer period by his/her Dissertation Committee. In addition, candidates must demonstrate their ability to publish scholarly articles in peer-reviewed journals and conferences. The student must notify the Graduate School in writing two weeks prior to the final scheduled oral defense. Results of the oral defense are reported to the Dean of the Graduate School. Awarding of the degree is based on the approval of the candidate's Dissertation Committee and the recommendation of the Dean of the Graduate School, who certifies the completion of all University-wide requirements.

2 Construction Science and Management (CSM) Courses

CSM 5133. Construction Practice in a Global Setting. (3-0) 3 Credit Hours.

Seminar dealing with national and international business and legal environments in the construction industry. Topics include agreement and delivery options, forms of construction, project procedures and administration, liability, contract documents, and ethics. Course Fees: SAP1 \$25; STSA \$15.

CSM 5223. Building Information Modeling for Construction Management. (3-0) 3 Credit Hours.

Advanced techniques used in development and management of Building Information Models. Emphasis on constructability and management. Course Fees: SAP1 \$25; STSA \$15.

CSM 5243. Sustainable Construction and Delivery. (3-0) 3 Credit Hours.

Sustainability principles applied to design, construction and operation of built environment. Emphasis on site management and constructability. Course Fees: SAP1 \$25; STSA \$15.

CSM 5413. Advanced Topics in Construction Systems. (1-4) 3 Credit Hours.

The management of the construction process pertaining to large, complex, and unique buildings. The management of sustainable construction, adaptive use of existing buildings, and historic preservation projects will be included. (Formerly ARC 5413. Credit cannot be earned for both CSM 5413 and ARC 5413.) Course Fees: SAP1 \$25; STSA \$15.

CSM 5423. Advanced Topics in Project Controls and Scheduling. (3-0) 3 Credit Hours.

Advanced techniques used in scheduling and planning processes in construction project control, including resource allocations and schedule recovery. Course Fees: SAP1 \$25; STSA \$15.

CSM 5433. Construction Safety Planning and Management. (3-0) 3 Credit Hours.

Current construction safety and health issues. Development of site-specific plans and methodology to provide hazard reduction on job sites. Course Fees: SAP1 \$25; STSA \$15.

CSM 5633. Advanced Construction Management. (3-0) 3 Credit Hours.

Prerequisite: Consent of instructor. Organization and integration of construction resources and activities to include consideration of ethical practice, scheduling, methods of construction, project planning and management, cost accounting, and personnel utilization. Course Fees: SAP1 \$25; STSA \$15.

CSM 6943. Construction Internship. (0-0) 3 Credit Hours.

Prerequisites: Graduate standing, 18 semester credit hours of graduate work, and consent of instructor. Supervised full-time construction work experience with public agencies or private companies. Individual conferences and written reports required. Course Fees: SAP1 \$25; STSA \$15.

CSM 6951. Independent Study. (0-0) 1 Credit Hour.

Prerequisites: Graduate standing and permission in writing (form available) of the instructor and the Graduate Advisor of Record. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally or not often available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours will apply to the degree. Course Fees: SAP1 \$25; STSA \$5.

CSM 6953. Independent Study. (0-0) 3 Credit Hours.

Prerequisites: Graduate standing and permission in writing (form available) of the instructor and the Graduate Advisor of Record. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally or not often available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours will apply to the degree. Course Fees: SAP1 \$25; STSA \$15.

CSM 6973. Special Topics. (3-0) 3 Credit Hours.

Prerequisite: Graduate standing or consent of instructor. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Topics courses may be repeated for credit when topics vary, but not more than 6 hours of CSM 6973 or 12 hours of CSM 6976 will apply to the degree. Course Fees: SAP1 \$25; STSA \$15.

CSM 6976. Special Topics. (6-0) 6 Credit Hours.

Prerequisite: Graduate standing or consent of instructor. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Topics courses may be repeated for credit when topics vary, but not more than 6 hours of CSM 6973 or 12 hours of CSM 6976 will apply to the degree. Course Fees: SAP1 \$25; STSA \$30.

CSM 6643. Artificial Intelligence in Construction Management. (3-0) 3 Credit Hours.

This course introduces the concepts of artificial intelligence and machine learning to help construction students build data-driven solutions without necessarily requiring prior machine learning knowledge. Students will also learn to analyze multidimensional data and develop machine learning models in Python using datasets that are relevant to the CSM discipline. Course Fees: SAP1 \$25; STSA \$15.

CSM 7103. Decision-Making in Construction Management. (3-0) 3 Credit Hours.

Decision processes can range from quantitative computational analysis to qualitative experiential evaluations. This course provides a set of practical tools and theoretical frameworks to help construction managers address the challenges of decision-making and problem-solving. Course Fees: SAP1 \$25; STSA \$15.

CSM 7113. Resiliency within the Built Environment. (3-0) 3 Credit Hours.

This course provides a thorough understanding of resiliency issues and its interrelation with the built environment by retrospectively investigating technological progress, addressing current issues, and contemplating on possible futures. Course Fees: SAP1 \$25; STSA \$15.

CSM 7203. Research Methods. (3-0) 3 Credit Hours.

This course provides guidance on research formulation and methodologies adopted for scientific and engineering experiments, model building and simulations, exploration and analysis of multidimensional data. Students are introduced to concepts necessary for producing research proposals, executing the research, and reporting the results. Course Fees: SAP1 \$25; STSA \$15.

CSM 7011. Construction Graduate Seminar. (1-0) 1 Credit Hours.

Will include presentations of current research by faculty, invited guests who are experts in fields related to construction science and management, and advanced graduate students who are about to complete their dissertation research. . May be repeated for credit. The grade report for the course is either "CR" (satisfactory) or "NC" (unsatisfactory). Course Fees: SAP1 \$25; STSA \$15.

CSM 7211. Doctoral Research. (0-0) 1 Credit Hours.

Prerequisite: Consent of advisor. Research work carried out by the student under the supervision of their Dissertation Committee. May be repeated as necessary, but no more than 15 hours may be applied to the Doctoral degree. Course Fees: SAP1 \$25; STSA \$15.

CSM 7212. Doctoral Research. (0-0) 2 Credit Hours.

Prerequisite: Consent of advisor. Research work carried out by the student under the supervision of their Dissertation Committee. May be repeated as necessary, but no more than 15 hours may be applied to the Doctoral degree. Course Fees: SAP1 \$25; STSA \$15.

CSM 7213. Doctoral Research. (0-0) 3 Credit Hours.

Prerequisite: Consent of advisor. Research work carried out by the student under the supervision of their Dissertation Committee. May be repeated as necessary, but no more than 15 hours may be applied to the Doctoral degree. Course Fees: SAP1 \$25; STSA \$15.

CSM 7311. Doctoral Dissertation. (0-0) 1 Credit Hours.

Prerequisite: Successful defense of comprehensive exam. Dissertation work carried out by the student under the supervision of their Dissertation Committee. May be repeated as necessary, but not more than 15 hours may be applied to the Doctoral degree. Course Fees: SAP1 \$25; STSA \$15.

CSM 7312. Doctoral Dissertation. (0-0) 2 Credit Hours.

Prerequisite: Successful defense of comprehensive exam. Dissertation work carried out by the student under the supervision of their Dissertation Committee. May be repeated as necessary, but not more than 15 hours may be applied to the Doctoral degree. Course Fees: SAP1 \$25; STSA \$15.

CSM 7313. Doctoral Dissertation. (0-0) 3 Credit Hours.

Prerequisite: Successful defense of comprehensive exam. Dissertation work carried out by the student under the supervision of their Dissertation Committee. May be repeated as necessary, but not more than 15 hours may be applied to the Doctoral degree. Course Fees: SAP1 \$25; STSA \$15.

Contact Us:

For additional information, please contact the CSM track coordinator:

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