

MS IN CIVIL ENGINEERING



SACRAMENTO STATE
Redefine the Possible

In Workflow

1. CE Committee Chair (j.garcia@csus.edu)
2. CE Chair (khan@csus.edu)
3. ECS College Committee Chair (abadi@csus.edu)
4. ECS Dean (101010646@csus.edu)
5. Academic Services (catalog@csus.edu)
6. Senate Curriculum Subcommittee Chair (curriculum@csus.edu)
7. Dean of Undergraduate (james.german@csus.edu; renee.leonard@csus.edu)
8. Dean of Graduate (cnewsome@skymail.csus.edu)
9. Catalog Editor (catalog@csus.edu)
10. Graduate Studies (jdsmall@csus.edu; mxiong@csus.edu)
11. Registrar's Office (wlindsey@csus.edu)

Approval Path

1. Sat, 17 Sep 2022 22:01:50 GMT
Jose Garcia (j.garcia): Approved for CE Committee Chair
2. Sun, 18 Sep 2022 00:26:26 GMT
Ghazan Khan (khan): Approved for CE Chair
3. Fri, 14 Oct 2022 16:26:24 GMT
Masoud Ghodrat Abadi (abadi): Approved for ECS College Committee Chair
4. Fri, 14 Oct 2022 16:46:20 GMT
101010646: Approved for ECS Dean

History

1. May 2, 2018 by clmig-jwehrheim
2. Oct 11, 2018 by Kaitlyn Ehrmantrout (k.ehrmantrout)
3. Dec 3, 2018 by 211448342
4. Jan 18, 2022 by Julie Fogarty (fogarty)
5. Aug 4, 2022 by 302822325
6. Aug 10, 2022 by 302822325

Date Submitted: Sat, 17 Sep 2022 00:56:25 GMT

Viewing: MS in Civil Engineering

Last approved: Wed, 10 Aug 2022 19:18:05 GMT

Last edit: Sat, 17 Sep 2022 00:56:24 GMT

Changes proposed by: Ghazan Khan (216292896)

Academic Group: (College)

Engineering & Computer Science

Academic Organization: (Department)

Civil Engineering

Catalog Year Effective:

2022-2023 Catalog

Individual(s) primarily responsible for drafting the proposed degree major program:

Name (First Last)	Email	Phone 999-999-9999
Ghazan Khan	khan@csus.edu	916-278-3886

Type of Program Proposal:

Major

Program Change Type:

Non-Substantive

Title of the Program:

MS in Civil Engineering

Designation: (degree terminology)

Master of Science

Briefly describe the program proposal (new or change) and provide a justification:

All edits to the catalog language for MS in Civil Engineering are to utilize consistent language and provide additional clarity to students regarding admission and program requirements, plus correction some errors. Specifically, updates to the catalog language to better describe the different specializations in the civil engineering MS program (Environmental, Geotechnical, Transportation, Structural, and Water Resources engineering). The MS in Civil Engineering program has five specialization areas and does not have any concentrations. As such, edits were made to the language to ensure consistent use of the word specialization in place of a couple of instances of the word concentration. In the "Admission Procedure" section, students were confused by the GRE requirement. The single bullet regarding GRE requirement was split into two to clearly present information to perspective students when GRE scores are required. In the "Program Requirements" section, minor edits made and an additional sentence added to clearly present the number of units requirement for the program. Corrections in the list of "Specialization Courses" section that were errors when all graduate courses in the CE department were renumbered in the recent past.

University Learning Goals**Graduate (Masters) Learning Goals:**

Critical thinking/analysis
 Communication
 Information literacy
 Disciplinary knowledge
 Intercultural/Global perspectives
 Professionalism
 Research (optional)

Program Learning Outcomes**Program Learning Outcomes**

Learning Outcome
1. Succeed in professional employment at their chosen specialty of environmental, geotechnical, structural, transportation, or water resources engineering.
2. Identify, analyze, and solve complex practical civil engineering problems in their chosen field of specialty.
3. Communicate effectively about technically complex engineering problems to peers, other professionals, decision makers, and the general public, in the conduct of their work.

Will this program be required as part of a teaching credential program, a single subject, or multiple subject waiver program (e.g., Liberal Studies, Biology) or other school personnel preparation program (e.g., School of Nursing)?

No

Catalog Description:

Total units required for the MS: 30 - Includes research or independent study and units required in area of specialization (see Program Requirements below)

Program Description

Civil Engineering encompasses a broad range of professional activities. The four years of undergraduate preparation for the Bachelor of Science degree are devoted to fundamental analytical principles and basic design applications. For technical competence in specialized areas and continued effectiveness on the job, graduate study is becoming increasingly necessary.

The Civil Engineering Department offers a graduate program of study leading to a Master of Science degree in Civil Engineering in the following areas of specialization:

- **Environmental Engineering** - analysis, design, and management of natural and engineered water systems including drinking water, wastewater, and stormwater; solid and hazardous waste management and regulations; air quality management and pollution control technologies;
- **Geotechnical Engineering** - properties and behavior of soil; seepage analysis with application to design of foundation, retaining structures, earth dams and slopes; soil improvement and ground stabilization; geosynthetics inclusions, soil dynamics, and earthquake engineering;
- **Structural Engineering** - advanced structural analysis methods; structural systems; advanced concrete and steel analysis and design applied to buildings and bridges; seismic analysis and design;
- **Transportation Engineering** - transportation engineering and planning, traffic flow theory, and system management applicable to all modes with emphasis on highway and multi modal transportation; interdisciplinary study with other areas of civil engineering as well as with non-engineering areas may also be arranged; and
- **Water Resources Engineering** - advanced hydraulics and hydrologic design and analysis of water systems, modeling of hydraulic and hydrologic water systems, hydrometeorology analysis, steady and non-steady analysis of groundwater movement of confined and unconfined aquifers, modeling of groundwater movement, and planning, management, and operation of water resource systems.

The MS in Civil Engineering consists of a choice of courses within a specialization, a choice of elective courses, a writing intensive course, a mathematics or statistics course, and culminating requirements; all selected by the student and approved by an advisor.

Admission Requirements: Course prerequisites and other criteria for admission of students to the degree major program, and for their continuation in it.

Admission Requirements

Admission as a classified graduate student in Civil Engineering requires:

- an undergraduate degree in Civil Engineering; and
- a minimum 2.8 GPA.

In addition, the merit of past academic endeavor and/or professional experience, potential for future study, and professional goals may also be considered for granting admission through submission of the civil engineering department supplemental application form.

Applicants who have deficiencies in admission requirements that can be removed by specified additional preparation may be admitted with conditionally classified graduate status.

Students with a baccalaureate degree in engineering majors other than Civil Engineering (e.g., Electrical and Electronic, Industrial, Mechanical, or Surveying) or in other non-engineering scientific disciplines (e.g., Mathematics, Physics, or Geology) who wish to pursue the graduate program in Civil Engineering may be considered on an individual basis. Such students may be admitted as conditionally classified students and will be required to complete a specifically designed list of undergraduate prerequisite courses in engineering and/or mathematics, physics, and chemistry to correct undergraduate deficiencies. Such a student must have an approved study program on file with the Department while undertaking this qualifying work. Upon completion of these courses with a GPA of 2.8 or better, the student may apply for classified graduate status in Civil Engineering.

Admission Procedures

All prospective graduate students, including Sacramento State graduates, must submit:

- an online application for admission; and
- one set of official transcript from all colleges and universities attended, *other than Sacramento State*.
- Civil Engineering department supplemental application form included in the online application.
- GRE test score if a student does not have an ABET-accredited engineering degree.
- GRE test score if a student does not meet the minimum 2.8 GPA requirement.

For more admissions information and application deadlines, please visit the Office of Graduate Studies website (<http://csus.edu/gradstudies/>).

After being admitted, students must meet with an advisor and complete a Graduate Student Advising Form (obtainable in the Civil Engineering Department). This advising form must be kept current and on file in the Department Office.

Minimum Units and Grade Requirements for the Degree

Total units Required for the MS: 30; includes research or independent study and units required in specializations (see Program Requirements below)

Minimum Cumulative GPA: 3.0. No course in the program of study may have a grade below "C+".

Advancement to Candidacy

Each student must file an application for Advancement to Candidacy, indicating a proposed program of graduate study. This procedure should begin as soon as the graduate student has:

- removed any deficiencies in admission requirements;
- obtained classified graduate status;
- completed at least 12 units in the graduate program with a minimum 3.0 GPA, including at least three courses at the 200-level;

- taken the Graduate Writing Intensive (GWI) course in the degree program within the first two semesters of coursework at California State University, Sacramento; and
- selected and obtained approval for a culminating requirement (Plan A, B, or C).

Advancement to Candidacy form is submitted online. The student fills out the form after planning a degree program in consultation with their faculty advisor. The completed form is then approved by the Graduate Coordinator of the Department and submitted to the Office of Graduate Studies. Any subsequent deviations from an approved Advancement to Candidacy form would require the submission of a petition for exception form.


All graduate degree programs are subject to general University requirements for graduate degrees, explained in the *Graduate Degree Requirements* section of this catalog.

As defined by policy <http://www.csus.edu/umannual/acadaff/fsm00010.htm>, a change in units constitutes a substantive change to the program. If your changes constitute a substantive change, please refer back to the "Program Change Type" field above to ensure that "Substantive" is selected.

Program Requirements: (If new courses are being created as part of a new program, it will be useful to propose courses first.)

Program Requirements

Total number of required units for degree is 30. Variable units are listed due to variable culminating requirement units.

Code	Title	Units
Specialization Courses (15 Units)		
15 units are required as outlined in the Specialization Courses section below		15
Mathematics/Statistics (3 Units)		
Select one of the following: ¹		3
ENGR 201	Engineering Analysis I	
ENGR 202	Engineering Analysis II	
ENGR 203	Engineering Statistics	
Writing (3 Units)		
CE 200	Civil Engineering Professional Writing 	3
Elective Courses (3-6 Units)		
Select 3 or 6 units of electives ^{2,3}		3 - 6
Culminating Requirement (3-6 Units)		
Select one of the following CE 500 requirements: ³		3 - 6
<i>Plan A</i>		
Master's Thesis (3 or 6 units) Approval by the faculty thesis advisor and by a second faculty or an expert in the area of study is required. The thesis must comply with University standards for format and is filed in the University Library. The Master's Thesis should be the written product of a systematic study of a significant problem. It identifies the problem, states the major assumptions, explains the significance of the undertaking, sets forth the sources for and methods of gathering information, analyze the data, and offers a conclusion or recommendation. The finished product evidences originality, critical and independent thinking, appropriate organization and format, and thorough documentation. The work should be associated with engineering research or innovation. No more than 3 units may be awarded for a topic directly related to a topic studied of CE 299. A public presentation is required.		
<i>Plan B</i>		
Master's Project (3 or 6 units) Approval by the faculty thesis advisor and by a second faculty or an expert in the area of study is required. A Master's Project should be a significant undertaking appropriate to the engineering profession. It evidences originality and independent thinking, appropriate form and organization, and rationale. It is described and summarized in a written report that includes a discussion of the project's significance, objectives, methodology and a conclusion or recommendation. The work should be associated with practical engineering applications. The report must comply with University standards for format and will be filed in the University Library. No more than 3 units may be awarded for a topic directly related to a topic studied for CE 299. A public presentation is required.		
<i>Plan C</i>		
Directed Study with Comprehensive Exam (3 units). Approval of one faculty member is required for Directed Study. The comprehensive examination is administered by a committee of three faculty members. A written report and a public presentation are required on the directed study. The format of the comprehensive examination can be written, oral, or both.		
¹	With advisor approval. Students pursuing an emphasis in Environmental Engineering, Water Resource Engineering or Transportation Engineering must take ENGR 203. Students pursuing an emphasis in Structural Engineering must take ENGR 201 or ENGR 202.	
²	Elective courses (including CE 299) selected with prior approval of the student's faculty advisor in the area of interest. In addition to 200-level courses, these may also include the technical electives (but not the required courses) from the civil engineering undergraduate curriculum. Not more than 3 units of CE 299 may be taken without prior approval of the Graduate Coordinator.	
³	Total required units for degree is 30. Variable units are listed due to variable culminating requirement units. If 3 units of culminating requirement are selected, 6 units of electives are required, and vice versa.	

Specialization Courses

Units required: 15 -- a minimum of 12 units must be taken from one of the following five areas of specialization. Up to 3 units can be satisfied by 200 level coursework (not including CE 299) outside the chosen area of specialization.

Code	Title	Units
Environmental Engineering		
CE 232	Groundwater Hydrology	
CE 251	Environmental Quality Processes I	
CE 252	Environmental Quality Processes II	
CE 253	Environmental Quality Processes III	
CE 254	Water Quality Management	
CE 255	Transport of Chemicals in Soil Systems	
CE 281	Systems Analysis of Resources Development	
Geotechnical Engineering		
CE 270	Advanced Soil Mechanics and Foundation Engineering I	
CE 271	Advanced Soil Mechanics and Foundation Engineering II	
CE 272	Geotechnical Modeling	
CE 273	Ground Modification Engineering	
CE 274	Soil Dynamics and Earthquake Engineering	
CE 275	Geosynthetics	
Structural Engineering		
CE 260	Matrix Structural Analysis	
CE 261	Finite Element Analysis	
CE 262	Nonlinear Structural Analysis	
CE 263	Advanced Steel Design	
CE 264	Advanced Design in Reinforced Concrete	
CE 266	Dynamics and Earthquake Response of Structures	
CE 267	Structural Systems for Buildings	
CE 268	Pre-stressed Concrete Bridge Design	
Transportation Engineering		
CE 241	Analysis and Control of Traffic Systems	
CE 242	Transportation Planning	
CE 243	Traffic Flow Theory	
CE 244	Advanced Transportation Facility Design	
CE 245	Pavement Design	
CE 275	Geosynthetics	
Water Resources Engineering		
CE 230	Water Resources Planning	
CE 231	Hydrometeorology	
CE 232	Groundwater Hydrology	
CE 234	Advanced Engineering Hydraulics	
CE 235	Hydrologic Modeling	
CE 281	Systems Analysis of Resources Development	

For graduate programs, the number of declared undergraduate major and the degree production over the preceding years of the corresponding baccalaureate program:

NA

Fiscal Impact to Change an Existing Program

Indicate programmatic or fiscal impact which this change will have on other academic units' programs, and describe the consultation that has occurred with affected units:

NA

Provide a fiscal analysis of the proposed changes:

NA

How will the above changes be accommodated within the department/College existing fiscal resources?

NA

Will the proposed changes require additional resources?

No

What additional space, equipment, operating expenses, library, computer, or media resources, clerical/technical support, or other resources will be needed?

NA

Key: 164