



# USF TAMPA

## New Accelerated Program Development Form

### Bachelor's to Master's

Accelerated Programs allow academically qualified students to complete an undergraduate Bachelor's degree and a graduate master's degree on an accelerated timeline, graduating sooner than in traditional programs.

Development Process:

- 1) Review the Accelerated Program Guidelines
- 2) Contact the Undergraduate Studies office or Graduate School for consultation
- 3) Complete this form and create the Catalog Copy
- 4) Submit through internal college processes for approval
- 5) Submit to Undergraduate Council for review and approval
- 6) Submit to Graduate School for Graduate Council approval

For questions, contact either Undergraduate Studies [cynthiab@usf.edu](mailto:cynthiab@usf.edu) or the Graduate School at [cdh@usf.edu](mailto:cdh@usf.edu)

APPROVALS	Approval of the Accelerated Degree Program: __BS__ / __MS__ in the program (Major) of Civil Engineering/Master of Science in Civil Engineering  <i>(e.g. BS/MS in Biology)</i>			
	Name (Printed)	Signature	Action	Date
Faculty Name and Email	Dr. Sarina Ergas		Email:	
Dept. Chair	Dr. Manjriker Gunaratne		<input type="checkbox"/> Approve <input type="checkbox"/> Disapprove	
School Committee Chair or other required approval (if applicable)			<input type="checkbox"/> Approve <input type="checkbox"/> Disapprove	
College Committee Chair			<input type="checkbox"/> Approve <input type="checkbox"/> Disapprove	
College Dean/designee	Sanjukta Bhanja		<input type="checkbox"/> Approve <input type="checkbox"/> Disapprove	
Undergraduate Council (UGC) Chair/designee		UGC approved 8/28/17	<input type="checkbox"/> Approve <input type="checkbox"/> Disapprove	
Undergraduate Studies Dean/designee			<input type="checkbox"/> Approve <input type="checkbox"/> Disapprove	
Graduate Council (GC) Chair/designee		GC approved 11/13/17	<input type="checkbox"/> Approve <input type="checkbox"/> Disapprove	
Graduate School Dean/designee			<input type="checkbox"/> Approve <input type="checkbox"/> Disapprove	

ACCELERATED PROGRAM INFORMATION	UNDERGRADUATE	GRADUATE
<b>Degrees</b> (e.g. B.A., B.S., M.A., M.S., M.U.R.P., etc.)	<b>B.S.C.E.</b>	<b>M.S.C.E.</b>
<b>Program Names</b> (a.k.a. "Major") (e.g. Biology, Math, etc.)	<b>Civil Engineering</b>	<b>Master of Science in Civil Engineering</b>
<b>College(s)</b>	<b>Engineering</b>	<b>Engineering</b>
<b>Department(s) (if applicable)</b>	<b>Civil &amp; Environmental Engineering</b>	<b>Civil &amp; Environmental Engineering</b>
<b>Proposed Effective Date for first admissions</b>	<b>Fall 2017</b>	
<b>Program Description</b> (provide a brief description of the program. Do not include requirements, just what the program is about, highlights, etc.)	<p><b>Students pursuing a B.S.C.E. in Civil Engineering will earn a Master of Science in Civil Engineering in an accelerated manner by sharing 2 Civil Engineering graduate courses (6 credit hours) taken as upper-level departmental (Technical) electives as part of B.S. program. The B.S.C.E. requires a total of 131 hours and the M.S. requires 30 hours. By sharing 6 credit hours, the total credit hours earned will be 155 hours.</b></p>	
<b>Is this a single pathway option (e.g. thesis only) or a multi-path option (e.g. thesis and non-thesis, etc.)?</b>		<b>This is a single pathway as this Master's requires a Thesis.</b>

<b>Curriculum Requirements</b>	
<p><b>GPA Requirements</b> Programs must establish a minimum undergraduate GPA requirement of at least 3.33 overall and a minimum GPA requirement of 3.50 in the major, having taken a minimum of 15 hours in the undergraduate major, for students to be admitted to an accelerated program. <b>Note what your Program requirements will be (may be more restrictive, but not less than what's noted above)</b></p> <p>Students must have a minimum of a "B" (3.00) in each graduate course. Consequences for not obtaining at least a "B" in each graduate course must be noted in the Departmental Accelerated Program requirements. <b>Note what the Program's policy will be for students who earn less than a "B" in a graduate course (University Policy allows for courses with "C" or higher count</b></p>	<p><b>GPA Requirements</b></p> <p><b>3.33 overall and 3.5 in the major</b></p> <p><b>Policy for where a student earns less than a "B" in a graduate Course:</b></p> <p><b>Students must maintain an overall and program requirement of 3.0 in the two graduate electives taken as part of accelerated program. In the case a grade lower than a "B" is obtained, the student must take</b></p>

<p>toward graduate degree requirements, with an overall and program GPA requirement of 3.00)</p>	<p>another approved graduate elective and obtain a grade of "B" or higher.</p>
<p><b>List courses to be shared</b> Typically, up to twelve (12) hours of graduate credit may be shared between the graduate and undergraduate degree. Although, with Graduate Council and Graduate School approval, programs may offer accelerated programs with more shared credits.</p> <p>List the undergraduate courses that will be replaced by graduate courses</p> <p>Ex: BIO 2100, satisfied by BIO 6245 BIO 2200, satisfied by BIO 6600</p>	<p><b>B.S.C.E. in Civil Engineering (CIP 14.0801) requires 131 hours</b> <b>(a) total includes 18 credit hours of upper-level departmental (technical) electives</b> <b>(b) student enters B.S. in major after completing the state mandated common core prerequisites – typically the first semester of the second year.</b></p> <p><b>Master of Science in Civil Engineering degree requires 30 hours. The total credit hours after sharing 2 courses (6 credit hours) is 155.</b></p> <p>Students may <b>choose two of the following</b> five 6000-level course options to meet the upper-level undergraduate Technical elective requirement:</p> <ol style="list-style-type: none"> <li>1) TTE 4005 Transportation Engineering II, satisfied by any (3 credit) 6000- level TTE prefixed graduate course.</li> <li>2) CEG 4012 Geotechnical Engineering II, satisfied by any (3 credit) 6000- level CEG prefixed graduate course.</li> <li>3) CWR 4812 Capstone Water Resources/Environmental Design, satisfied by ENV 6564 Environmental Engineering Design.</li> <li>4) Free Technical elective, satisfied by any (3 credit) 6000- level CEG, TPT, CES, CGN, or CWR course.</li> <li>5) Free Technical elective, satisfied by any (3 credit) 6000- level CEG, TPT, CES, CGN, or CWR course.</li> </ol> <p><b>No required major or state mandated common core prerequisite undergraduate course are being replaced by any graduate courses</b></p>
<p><b>Program of Study</b> Programs must complete a Program of Study, develop a plan for academic advising, and tracking of students, including notation of potential financial aid impact.</p>	<p>Attach a representative example. Be certain it matches the degree requirements listed below.</p>

## **PROGRAM OF STUDY**

### **Proposed Accelerated Program of Study**

A Civil Engineering Major will pursue the normal semester plan sequence listed from the current USF Undergraduate Catalog, replacing six credit hours of upper-level departmental (Technical) electives with six credit hours of graduate coursework.

Academic Advising: Once declaring an interest in the Accelerated B.S.C.E./M.S.C.E. Program, the student will meet with an undergraduate Civil Engineering Advisor and graduate Civil Engineering Advisor. The student will complete "Application Form" as provided by the Graduate School.

Plan of Study: At the time the application is completed, a plan of study template with shared courses will be completed and signed by both undergraduate and graduate advisors. With the help of the advisors, the student will identify two approved graduate that meet both the B.S.C.E. departmental (Technical) upper-level elective requirement and M.S.C.E. requirements in the attached sample semester plan for the B.S.C.E. degree.

Possible Impact on Financial Aid: The regular undergraduate financial aid is generally not affected. When the student is planning to graduate with the B.S., the financial aid can be affected after that. When completing the Application Form for the Accelerated Program, the applicant will be required to take their entire course/semester plan to the USF Financial Aid office and discuss the financial aid implications with them in detail.

Tracking of Students: During the B.S.C.E. program, Accelerated Student applicant will meet with both the undergraduate and graduate advisors each semester to ensure successful completion of the Program requirements. When applying for their B.S.C.E. graduation, students will complete the USF Accelerated Program Progression Form, and enter the Civil Engineering Master's Program and be advised by the graduate advisor for the remaining degree requirements (see attached).

Benefits: The sharing of 2 courses or 6 credit hours will mean that only 24 hours out the 30 required for M.S.C.E. will be remaining, so a student can potentially finish their degree in only 2 semesters or 1 calendar year (instead of the minimum of 3 semesters) and save tuition dollars on 2 graduate level courses. This can enhance the quality of graduate program by attracting high performing students.

Students pursuing a B.S.C.E. in Civil Engineering will earn an M.S. in Civil Engineering in an accelerated manner by sharing 2 ECE-prefixed graduate courses (6 credit hours) taken as upper-level Technical electives as part of B.S. program. The B.S. requires a total of 131 hours and the M.S. requires 30 hours. By sharing 6 credit hours, the total credit hours earned will be 155 hours.

### **Target Students and Expected Outcomes**

Academically high achieving undergraduate students in the B.S.C.E. program with high overall and major GPA will be targeted for the accelerated program. Expected outcomes are that the increase in M.S.C.E. degrees granted, increase in graduate SCH, and enhancement of the quality of the graduate program by addition of academically accomplished students. In addition, some of these M.S.C.E students will continue on to Ph.D. programs in Engineering and Physical Science and enhance the doctoral programs as well.

### **Description and Requirements**

For admission to the program a student must:

1. Have completed 15 hours in the undergraduate major
2. Have a minimum 3.33 GPA overall; and
3. Have a minimum undergraduate 3.50 GPA in the major.

### **Shared B.S./M.S. Requirements**

The shared courses are listed below:

Students choose two courses from the following options

- 1) TTE 4005 Transportation Engineering II, satisfied by any (3 credit) 6000- level TTE prefixed graduate course.
- 2) CEG 4012 Geotechnical Engineering II, satisfied by any (3 credit) 6000- level CEG prefixed graduate course.
- 3) CWR 4812 Capstone Water Resources/Environmental Design, satisfied by ENV 6564 Environmental Engineering Design.
- 4) Free Technical elective, satisfied by any (3 credit) 6000- level CEG, TPT, CES, CGN, or CWR course.
- 5) Free Technical elective, satisfied by any (3 credit) 6000- level CEG, TPT, CES, CGN, or CWR course.

### **Undergraduate Degree Requirements:**

#### **CIVIL ENGINEERING (ECE) (CIP = 14.0801) - TOTAL DEGREE HOURS: 131**

#### **Entrance and Continuation Requirements for the Civil Engineering Department**

College of Engineering students who have fully met the below admission requirements and are in good academic standing, may declare a major in Civil Engineering. Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses. Once admitted, the Department may have continuation requirements which specify minimum performance standards in core engineering courses which must be met before further registration in the Department is granted.

##### *Minimum Admission Requirements for the Civil Engineering Department*

1. Completion of:
  - o Calculus I (MAC 2311 or MAC 2281) and Calculus II (MAC 2312 or MAC 2282) and Calculus III (MAC 2313 or MAC 2283)
  - o Calculus-based Physics I with Lab (PHY 2048 and PHY 2048L)
  - o Calculus-based Physics II with Lab (PHY 2049 and PHY 2049L)
  - o General Chemistry I with Lab (CHM 2045 and CHM 2045L) or (CHS 2440 and CHS 2440L)with a minimum grade of a C in each course and a 3.0 GPA (based on best attempt) in these prerequisites
2. A minimum overall GPA of 2.0
3. A minimum USF GPA of 2.0

##### *Minimum Continuation Requirements for the Civil Engineering Department*

Continuation requires a minimum grade of C- as well as a 2.5 GPA (based on best attempt) for the following courses:

- EGN 3311 Statics
- EGN 3331 Mechanics of Materials
- EGN 3353 Basic Fluid Mechanics
- EGN 3365 Materials

### **GPA and Grade Requirements**

Unless otherwise stated, the minimum acceptable grade in all BSCE required math, science, engineering, and specialization courses is a C- or higher. Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

### **Tracks**

In addition to designated common coursework in engineering mechanics, civil, and environmental engineering, students undertake a concentration of 15 hours of coursework plus a 3-hour capstone design course and a 1 hour Professional and Ethical Issues in Engineering.

### **Departmental Policies**

In addition to the College's graduation requirements, the department has the following policies:

- All students must participate in mandatory advising prior to each term.
- All students must participate in department assessment activities and successfully complete an exit interview before graduating.
- All students must consider the advice of the Department to complete and pass the Fundamentals of Engineering Exam (F.E. Exam).
- All students must periodically provide writing samples as part of the department's writing assessment program.

## **STATE MANDATED COMMON COURSE PREREQUISITES**

Unless stated otherwise, a grade of C is the minimum acceptable grade in prerequisite courses.

The following are transferable courses from a Florida College System institution that will be accepted in the Math/Science/Engineering areas:

#### *Mathematics:*

##### **Courses at USF**

MAC 2281 Engineering Calculus I  
MAC 2282 Engineering Calculus II  
MAC 2283 Engineering Calculus III  
MAP 2302 Differential Equations

##### **Courses at a Florida College System Institution**

MAC X311 **or** MAC X281  
MAC X312 **or** MAC X282  
MAC X313 **or** MAC X283  
MAP X302 **or** MAP X305

#### *Natural Sciences:*

##### **Courses at USF**

CHM 2045/CHM 2045L General Chemistry I with Lab  
CHS 2440/2440L General Chemistry for Engineers with

##### **Courses at a Florida College System Institution**

CHM X045/X045L **or** CHM X045C **or**  
CHS X440/X440L

lab

PHY 2048/2048L General Physics I - Calculus Based with  
Lab

PHY X048/X048L **or** PHY X048C **or** PHY  
X043/X048L

PHY 2049/2049L General Physics II - Calculus Based with  
Lab

PHY X049/X049L **or** PHY X049C **or** PHY  
X044/X049L

## **REQUIREMENTS FOR THE MAJOR IN CIVIL ENGINEERING - TOTAL MAJOR HOURS: 110**

### **Major requirements for the B.S.C.E. Degree:**

#### **Major Core (110 hours)**

##### **Math and Science (27 credit hours)**

- MAC 2281 Engineering Calculus I or MAC 2311 Calculus I
- MAC 2282 Engineering Calculus II or MAC 2312 Calculus II
- MAC 2283 Engineering Calculus III or MAC 2313 Calculus III
- MAP 2302 Differential Equations or EGN 3433 Modeling and Analysis of Engineering Systems
- CHS 2440 General Chemistry for Engineers or CHM 2045 General Chemistry I
- CHS 2440L General Chemistry for Engineers Laboratory or CHM 2045L General Chemistry I Laboratory
- PHY 2048 General Physics I
- PHY 2048L General Physics I Laboratory
- PHY 2049 General Physics II
- PHY 2049L General Physics II Laboratory

**Basic Engineering (26 credit hours)**

- EGN 3000 Foundations of Engineering
- EGN 3000L Foundations of Engineering lab
- GLY 3850 Geology for Engineers
- EGN 1113 Introduction to Design Graphics
- EGN 3321 Dynamics
- EGN 4453 Numerical and Computer Tools I in Civil & Environmental Engineering
- EGN 3331L Mechanics of Materials Laboratory
- EGN 3343 Thermodynamics
- EGN 3443 Probability and Statistics for Engineers
- EGN 3615 Engineering Economics with Social and Global Implications
- EGN 3373 Introduction to Electrical Systems I

**Continuation Courses (12 credit hours)**

- EGN 3311 Statics
- EGN 3365 Materials Engineering
- EGN 3331 Mechanics of Materials
- EGN 3353 Basic Fluid Mechanics

**Specialization (21 credit hours)**

- EGN 4454 Numerical and Computer Tools II in Civil & Environmental Engineering
- ENV 4001 Environmental Systems Engineering
- TTE 4004 Transportation Engineering I
- CES 3102 Structures I
- CWR 4202 Hydraulics
- ENV 4004L Environmental/Hydraulics Engineering Lab
- CEG 4011 Geotechnical Engineering I
- CEG 4011L Geotechnical/Transportation Laboratory
- CGN 4122 Professional and Ethical Issues in Engineering

**Technical Writing (3 credit hours)**

- ENC 3246 Communications for Engineers (WRIN)

**Capstone Design (3 credit hours)**

- Structures/Materials/Geotechnical Track: CES 4750 Capstone Structural/Geotechnical/Material Design
- Geotechnical/Transportation Track: CEG 4850 Capstone Geotechnical/Transportation Design
- Environmental/Water Resources Track: CWR 4812 Capstone Water Resources/Environmental Design

**Civil Engineering Track and Capstone Design Requirements (18 credit hours)**

Civil Engineering students choose one of the three 18-credit hour tracks listed below:

- **Structures/Materials/Geotechnical Track**
  - CES 4702 Concepts of Concrete Design
  - CES 4605 Concepts of Steel Design
  - CGN 4851 Concrete Construction Materials
  - CEG 4012 Geotechnical Engineering II **or** TTE 4005 Transportation Engineering II
  - Technical Elective (three credit hours total, from the approved list of courses)
  - CES 4750 Capstone Structural/Geotechnical/Material Design
- **Geotechnical/Transportation Track**
  - CGN 4851 Concrete Construction Materials
  - CEG 4012 Geotechnical Engineering II
  - TTE 4005 Transportation Engineering II
  - Technical Elective (six credit hours total, from the approved list of courses)
  - CEG 4850 Capstone Geotechnical/Transportation Design
- **Environmental/Water Resources Track**
  - ENV 4417 Water Quality and Treatment
  - CWR 4540 Water Resources Engineering I
  - CEG 4012 Geotechnical Engineering II **or** TTE 4005 Transportation Engineering II
  - Technical Elective (six credit hours total, from the approved list of courses)
  - CWR 4812 Capstone Water Resources/Environmental Design

## Eight Semester Plan

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full-time students. Note: Items that are critical are marked with a "!" and are included in the plan for a student to stay on track.

<b>Semester 1</b>	<b>Credit Hours</b>	<b>Semester 2</b>	<b>Credit Hours</b>
<u>MAC 2281</u> or <u>MAC 2311</u>	4	<u>MAC 2282</u> or <u>MAC 2312</u>	4
<u>CHM 2045</u> or <u>CHS 2440</u>	3	<u>ENC 1102</u> Composition II	3
<u>ENC 1101</u> Composition I	3	<u>PHY 2048</u> General Physics I - Calculus Based	3
<u>SGES</u> General Education Core Social Sciences	3	<u>EGN 1113</u> Introduction to Design Graphics	3
<u>CHM 2045L</u> or <u>CHS 2440L</u>	1	<u>PHY 2048L</u> General Physics I Laboratory	1
<u>EGN 3000L</u> Foundations of Engineering Lab	1	<u>CAFA</u> FKL/Gen Ed Fine Arts	3
! <u>EGN 3000</u> Foundations of Engineering	1	Semester Hours:	17
Semester Hours:	15		

### Summer

#### Summer Opportunities

<b>Semester 3</b>	<b>Credit Hours</b>	<b>Semester 4</b>	<b>Credit Hours</b>
<u>MAC 2283</u> or <u>MAC 2313</u>	4	<u>EGN 3353</u> Basic Fluid Mechanics	3
<u>PHY 2049</u> General Physics II - Calculus Based	3	<u>EGN 3321</u> Dynamics	3
<u>EGN 4453</u> Numerical & Computer Tools I in Civil & Env Eng	3	<u>SGEH</u> General Education Core Humanities	3
<u>EGN 3311</u> Statics	3	<u>EGN 3331</u> Mechanics of Materials	3
<u>PHY 2049L</u> General Physics II Laboratory	1	<u>EGN 3331L</u> Mechanics of Materials Laboratory	1
<u>EGN 3365</u> Materials Engineering I	3	<u>EGN 3433</u> or <u>MAP 2302</u>	3
Semester Hours:	17	Semester Hours:	16

### Summer

	<b>Credit Hours</b>
<u>ENC 3246</u> Communication for Engineers	3
<u>EGN 3615</u> Engineering Economics with Social and Global Implications	3
<u>CAGC</u> FKL/Gen Ed Human and Cultural Diversity in a Global Context	3
Semester Hours:	9

<b>Semester 5</b>	<b>Credit Hours</b>	<b>Semester 6</b>	<b>Credit Hours</b>
<u>ENV 4001</u> Environmental Systems Engineering	3	<u>CWR 4202</u> Hydraulics	3
<u>EGN 4454</u> Numerical & Computer Tools II in Civil & Env Eng	3	<u>CES 3102</u> Structures I	3
<u>EGN 3443</u> Probability and Statistics for Engineers	3	<u>CAHU</u> FKL/Gen Ed Humanities (with HHCP)	3
<u>EGN 3343</u> Thermodynamics I	3	CE Track Elective	3
<u>TTE 4004</u> Transportation Engineering I	3	<u>ENV 4004L</u> Environmental/Hydraulics Engineering Lab	1
Semester Hours:	15	<u>GLY 3850</u> Geology For Engineers	3
		Semester Hours:	16

### Summer

Internship/Co-op Participation

	<b>Credit Hours</b>
Semester Hours:	0

<b>Semester 7</b>	<b>Credit Hours</b>	<b>Semester 8</b>	<b>Credit Hours</b>
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<u>CEG 4011</u> Geotechnical Engineering I	3	<u>CEG 4850</u> or <u>CES 4750</u> or <u>CWR</u>	3
CE Track Elective	3	<u>4812</u>	
CE Track Elective	3	CE Track Elective	3
<u>CEG 4011L</u>	1	CE Track Elective	3
Geotechnical/Transportation Laboratory		<u>CGN 4122</u> Professional and Ethical Issues in Engineering	1
<u>EGN 3373</u> Introduction to Electrical Systems I	3	CE Track Elective	3
		Semester Hours:	13
	Semester Hours:		13

### **GPA Requirements**

Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

### **Grading Requirement**

Unless otherwise stated, the minimum acceptable grade in all BSCE required math, science, engineering, and specialization courses is a C- or higher.

### **Residency Requirement**

Transfer students must complete a minimum number of approved specialization courses in the major at USF. The minimum number of USF specialization credit hours required is established by the respective academic department. In no case will this be less than 18 hours. Basic engineering courses are not considered specialization courses. The University residency requirement must also be met.

A dual degree student must meet the requirements of each major and have a minimum of 18 approved specialization hours taken in the degree granting department beyond those specialization hours required for the first degree.

### **Gordon Rule Requirement**

The Writing (Communication) and Mathematics (Computation) Requirement, formerly known as Gordon Rule, is fully met through the mathematics courses required for the major, ENC1101, ENC1102, ENC 3246 and by selecting one technical or Foundation of Knowledge and Learning General Education course that is an approved Writing (Communication) and Mathematics (Computation), formerly known as Gordon Rule, course or by completing an AA degree at a Florida College System institution.

### **Foundations of Knowledge and Learning (FKL) Requirement**

The math and science courses required for this major fully meet the math and science requirements of the Foundations of Knowledge and Learning core curriculum.

Students in the College of Engineering may substitute a second "Physical Science" course for the required "Life Science" course. The credits earned for chemistry required by this major may count toward the FKL science requirement.

### **Foundations of Knowledge and Learning (FKL) Exit Requirement**

- ENC 3246 Communication for Engineers (WRIN)
- CES 4750 Capstone Structural/Geotechnical/Material Design (CPST) or CEG 4850 Capstone Geotechnical/Transportation Design (CPST) or CWR 4812 Capstone Water Resources/Environmental Design (CPST).

### **Graduate Degree Requirements:**

#### **Total Minimum Hours - 30 hours**

Coursework – 24 hours

Thesis – 6 hours

The program consists of a minimum of 24 credit hours of coursework and 6 credit hours of thesis. For students pursuing a Concentration area (as detailed below), the 24 credit hours of coursework will include at least 12 credit hours of Concentration Requirements, with remaining credit hours to consist of technical electives as approved by the Department. For students pursuing no Concentration area, the 24 credit hours of coursework will consist wholly of technical electives as approved by the Department, but with a minimum of 15 credit hours taken within the Department of Civil and Environmental Engineering.

#### **Concentration Requirements-12 hours minimum**

The Department supports M.S.C.E. concentration areas in Engineering for International Development (EFD), Geotechnical Engineering (GTL), Materials Engineering and Science (MTL), Structures Engineering (STR),



Transportation Engineering (TPT), and Water Resources (WRS). Students may select from one of these Concentrations, or may select no concentration.

### **Engineering for International Development (EFD)**

This concentration acknowledges coursework and international field experience in the area of engineering for international development that considers issues of sustainability, environment, health, gender, and society. Students must take the following four courses, and must engage in an extended international engineering field experience, which in most cases will form the basis of the Master's thesis.

ENV 6510 Sustainable Development Engineering

A minimum of 1 course (3 credits) from the following anthropology courses:

ANG 6766 3 Research Methods in Applied Anthropology  
ANG 6730 3 Socio-cultural Aspects of HIV/AIDS  
ANG 6469 3 Health, Illness and Culture

A minimum of 1 course (3 credits) from the following global public health courses:

PHC 6764 3 Global Health Principles & Contemporary Issues  
PHC 6761 3 Global Health Assessment Strategies

3 additional credit hours of coursework in international development engineering or closely related areas.

Students engaged in full-time global training and service as part of the EFD concentration (e.g., in the U.S. Peace Corps or equivalent) may register for CST 6990 for 0 credit hours while in their country of service.

### **Geotechnical Engineering (GTL)**

CEG 5115 Foundation Engineering  
CES 6118 Applied Finite Elements

6 additional credit hours of coursework in Geotechnical engineering or closely related areas.

### **Materials Engineering and Science (MTL)**

At least 2 courses (6 credit hours) from the following list:

CGN 6933 Advanced Construction Materials  
CGN 6720 Electrochemical Diagnostic Techniques  
CES 6010 Structural Life Prediction  
EMA 5326 Corrosion Control  
EMA 6510 Characterization of Materials

6 additional credit hours of coursework in Materials Engineering and Science or closely related areas.

### **Structures Engineering (STR)**

At least 1 course (3 credit hours) from the following list of design courses:

CES 6706 Advanced Concrete  
CES 6835 Design of Masonry Structures  
CES 5715C Pre-Stressed Concrete

At least 1 course (3 credit hours) from the following list of analysis courses:

CES 6118 Applied Finite element  
CES 6144 Advanced Structural Analysis  
CES 6230 Advanced Structural Mechanics  
CES 5209 Structural Dynamics

6 additional credit hours of coursework in Structures Engineering or closely related areas.

### **Transportation Engineering (TPT)**

TTE 5205 Traffic Systems Engineering  
TTE 5501 Transportation Planning and Economics  
TTE 6507 Travel Demand Modeling

3 additional credit hours of coursework in Transportation Engineering or closely related areas.

### **Water Resources (WRS)**

4 courses (12 credit hours) from the following list:

CWR 6235 Free Surface Flow

CWR 6239	Waves and Beach Protection
CWR 6305	Urban Hydrology
CWR 6534	Coastal and Estuary Modeling
CWR 6535	Hydrologic Models
CGN 6933	Vadose Zone Hydrology
CGN 6933	Groundwater Hydraulics
CGN 6933	Advanced Computational Fluid Mechanics
GLY 6836	Numerical Modeling of Hydrogeologic Systems
GLY 6827C	Advanced Hydrogeology
CWR 6820	Coastal Waves and Structures
CWR 6538	Advanced Hydrologic Model

### **Comprehensive Exam**

The thesis and defense are used in lieu of a comprehensive exam.

### **Thesis - 6 hours minimum**

Students pursuing the M.S.C.E. are required to complete at least six (6) credits of Thesis. Students must conduct a suitable research project under the guidance of their thesis advisor, write an original thesis based upon the results of the research project, and defend the thesis to a committee that must subsequently approve the completed thesis. For students in the EFD Concentration, the thesis must be associated with research in a developing-world context.

### **Other Requirements**

- A maximum of 9 credits taken outside the CEE department may be applied to meet the degree requirements.
- A maximum of 6 credits of independent study may be applied to meet the degree requirements.