

Background Information

State the nature and purpose of the proposed program, including target audience and centrality to institutional mission. (1500 characters)

The MSCE is intended to meet the expressed needs of South Carolina industries, especially Charleston based companies. Nationally, Civil Engineering is broken out as a separate category by the Department of Labor which shows that Civil Engineers are the most hired group of engineers followed by electrical and mechanical engineers.

The engineering related job market in the Charleston area has exploded in recent years, especially as the Lowcountry has become a manufacturing hub. Employers include architectural-engineering firms, firms with specialties in multiple areas of civil engineering or even single area of civil engineering (construction management, environmental, geotechnical, water resources, structural, surveying, transportation), aviation, defense applications, power and energy firms, manufacturing, and many others. The growth in manufacturing leads to civil engineers designing/constructing facilities, maintaining facilities, and even designing/building airplanes as a number of structural engineers work at Boeing. The MSCE supports The Citadel's LEAD 2018 Objective 2 (academic programs of distinction), Objective 4 (expand enrollment in The Citadel Graduate College), and Objective 8 (provide outreach to the region and serve as a resource in its economic development) and is being developed at the request of a number of Charleston based companies. The desire to hire local talent and educate an existing workforce drives the need for a local graduate CE program to complement an existing undergraduate engineering program. Our ability to offer graduate courses within The Citadel MSCE is complementary to any other graduate courses being offered in the Lowcountry in providing graduate engineering education. Engineering problem solving is in increased demand and civil engineers are a necessary and diverse core engineering skill set that are primarily focused on designing and maintaining the built and natural environment.

List the program objectives. (2000 characters)

Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program. Graduates of the Master of Science degree program in Civil Engineering will, by the time of graduation:

- Outcome 1: Demonstrate breadth of knowledge in complimentary areas of civil engineering that promotes an awareness of and skill in interdisciplinary problem solving.
- Outcome 2: Demonstrate a depth of knowledge in a chosen focus area of civil engineering that allows the student to apply innovative techniques to solve problems.
- Outcome 3: Demonstrate knowledge in methods of advanced analysis appropriate for professional use when solving problems.
- Outcome 4: Demonstrate knowledge of contemporary issues in their chosen focus area.
- Outcome 5: Demonstrate the skills relevant to graduate level work to include the ability to formulate problems, synthesize and integrate information, work collaboratively, and to communicate effectively.

- Outcome 6: Demonstrate preparation for successful careers in industry or continued graduate work and an ethic for lifelong learning.

Assessment of Need

Provide an assessment of the need for the program for the institution, the state, the region, and beyond, if applicable. (1500 characters)

The number of students taking engineering courses at The Citadel has increased dramatically over the last few years. For example, the number of undergraduate engineering students within the Corps of Cadets has grown from 318 in 2012 to 379 students in 2014. The number of evening students has grown from 65 to 85 students. All of this growth is prior to the inclusion of the mechanical engineering undergraduate cadet and evening students who began to attend in fall 2014 (90 new students). The number of enrollments in our MS in Project Management has grown from 95 in 2011 to over 350 in 2013-2014. Many of the evening students in Project Management have asked when will we begin to offer more technical masters level courses and degrees. The arrival of Boeing and their survey of employee educational needs estimate nearly 1000 employees needing undergraduate degree completion, many in engineering. However, recent discussions with key leaders and news releases at Boeing and other companies in the Lowcountry have noted a desire for their current workforce to complete certificates that will show immediate skill attainment as well as master's level technical degrees.

The Charleston Regional Competitiveness Center forecasts there will be a 16.4% growth (7200 new jobs) in the engineering field in the area by 2018. This information follows closely to the Department of Labor statistics that show a 12 month growth rate for construction in South Carolina as 7.2% while in Charleston it was 16.2%, growth rate for manufacturing in South Carolina as 2.0% while in Charleston it was 25.4%, and the growth rate for trade, transportation, and utilities in South Carolina as 2.5% while in Charleston it was 3.1%. Many other areas were growing at a faster rate in Charleston than the state as a whole.

Employment Opportunities

Is specific employment/workforce data available to support the proposed program?

- Yes
 No

If yes, complete the table and the component that follows the table on page 4. If no, complete the single narrative response component on page 5 beginning with "Provide supporting evidence."

Employment Opportunities			
Occupation	Expected Number of Jobs	Employment Projection	Data Source

Provide additional information regarding anticipated employment opportunities for graduates.
(1000 characters)

Provide supporting evidence of anticipated employment opportunities for graduates, including a statement that clearly articulates what the program prepares graduates to do, any documented citations that suggests a correlation between this program and future employment, and other relevant information. Please cite specific resources, as appropriate. (3000 characters)

Note: Only complete this if the Employment Opportunities table and the section that follows the table on page 4 have not previously been completed.

There is not specific employment data beyond the fact that there is documented growth of current and new companies providing engineering support and/or products for the rapidly expanding manufacturing hub here in the Lowcountry. One example; Boeing has expanded its workforce to 7500 employees within the last year (many desiring additional skills through graduate certificates and MS degrees) and is currently bringing in a design center, a research center, and expanding the plant footprint. The lead engineer and the engineering lead of the liaison team at Boeing are both civil engineering undergraduates who are now part of building the newest Boeing airplane, the 787. This only scratches the surface of the numerous newspaper articles noting companies moving production of required aeronautical parts to decrease the shipping costs from Washington State. Each of these companies requires an engineering team to support design and production, but also of the facilities and the infrastructure supporting the company. The future deepening of the harbor heightens the desire for more companies to locate their production efforts here in the Lowcountry such as Continental Tire and the expansion of the Daimler Truck manufacturing center. Most of the students that will be taking the courses within the MSCE and its associated certificates will be existing mid-level employees with Lowcountry companies working to improve their current skill set.

The argument within the State House for many years is the need for a comprehensive university in the Lowcountry to be able to offer those already here the ability to obtain PhD level degrees. To support the long-term goal to offer engineering PhD's in the Lowcountry, The Citadel is positioned with its all PhD faculty team to offer an MSCE degree. The new civil engineering graduate program will closely resemble course offerings at Clemson University and USC to ensure ease of transfer for students desiring to transfer for a MS Thesis option or PhD. An MSCE degree at The Citadel will support the needs of local students who want face-to-face instruction but are unable to fully attend Clemson or USC for an MS degree, courses needed by PhD students conducting research in the lowcountry, employees of local companies, and the current students already taking a BSCE at The Citadel whether as a cadet or an evening student.

Will the proposed program impact any existing degree programs and services at the institution (e.g., course offerings or enrollment)?

Yes

No

If yes, explain. (500 characters)

n/a

List of Similar Programs in South Carolina

Program Name	Institution	Similarities	Differences
MSCE	Clemson University	Offering of courses in construction management, environmental, geotechnical, water resources, structural, surveying, transportation	The Citadel MSCE will only be a no thesis MS degree, only requires 6 CE courses and the other 4 courses can be Technical (ME, CE, EE, other) or non-technical (accounting, business, leadership, project management, etc.)
MSCE	The University of South Carolina	Offering of courses in construction management, environmental, geotechnical, water resources, structural, surveying, transportation	The Citadel MSCE will only be a no thesis MS degree, only requires 6 CE courses and the other 4 courses can be Technical (ME, CE, EE, other) or non-technical (accounting, business, leadership, project management, etc.)

Note:

There are no Masters of Science in Civil Engineering programs in the Lowcountry of South Carolina. There are MSCE programs at Clemson University and The University of South Carolina, but limited opportunity for local students in the heavily populated area of Charleston to attend face-to-face a Civil Engineering program without leaving the area as well as limited opportunity for local employees to further their education face-to-face in Civil Engineering. The Citadel has Bachelor of Science in Civil Engineering. Trident Technical College has an Associate in Science, Civil Engineering Transfer. Many students in the Associate in Science, Civil Engineering Transfer program at Trident Technical College matriculate into The Citadel's evening undergraduate Civil Engineering program. Many of these students desire to continue living in the Lowcountry and eventually obtain a MSCE degree face-to-face.

Description of the Program

Projected Enrollment						
Year	Fall		Spring		Summer	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
2016-17	5	45	5	45	3	9
2017-18	10	90	12	90	6	18
2018-19	15	135	19	135	10	30
2019-20	17	153	29	153	13	39
2020-21	25	225	39	225	18	54

Besides the general institutional admission requirements, are there any separate or additional admission requirements for the proposed program?

Yes

No

If yes, explain. (1000 characters)

Are there any special articulation agreements for the proposed program?

Yes

No

If yes, identify. (1000 characters)

Curriculum

Select one of the following charts to complete: Curriculum by Year **or** Curriculum by Category

Curriculum by Category*					
Geotechnical Focus Area				Structural Focus Area	
CIVL 730 Geotechnical Earthquake Engineering	3			CIVL 504 Designing for Natural and Manmade Hazards	3
CIVL 731 Geo-environmental Engineering	3			CIVL 608 Structural Loads and Systems	3
CIVL 732 Advanced Soil Mechanics	3			CIVL 610 Wood Design	3
CIVL 733 Advanced Foundations Design	3			CIVL 655 Masonry Structural Design	3
CIVL 734 Soil Behavior	3			CIVL 657 Indeterminate and Matrix Structural Analysis	3
				CIVL 711 Design of Masonry, Wood and Cold Formed Steel Structures	3
Transportation Focus Area				CIVL 712 Design of Coastal Structures and Bridges	3
CIVL 506 Geographic Information Systems	3			CIVL 713 Design of Civil Engineering Systems for Natural and Manmade Hazards	3
CIVL 575 Traffic Engineering Operations	3			CIVL 714 Advanced Steel Design	3
CIVL 576 Roadway Geometric Design	3			CIVL 715 Advanced Reinforced Concrete Design	3
CIVL 612 Urban Transportation Planning	3			CIVL 716 Analysis and Design of Prestressed Concrete Members	3
CIVL 640 Urban Mobility Infrastructure Policy and Planning	3			CIVL 718 Matrix and Finite Element Analysis	3
CIVL 642 Public Health, Physical Activity, and Design of the Built Environment	3			CIVL 719 Elastic Stability of Structures	3
CIVL 740 Transportation Safety Engineering	3			CIVL 720 Dynamic Analysis of Structures	3
CIVL 741 Travel Demand Forecasting	3			CIVL 721 Earthquake Engineering for Structural Engineers	3

* Add category titles to the table (e.g., major, core, general education, concentration, electives, etc.)

Total Credit Hours Required 30

Curriculum Notes:

The new civil engineering graduate program will closely resemble course offerings at Clemson University and USC to ensure ease of transfer for students desiring to transfer for a MS Thesis option or PhD. A comparison of the degree with those at Clemson University and the University of South Carolina is provided below in Table 1. The Citadel MSCE will require 30 credit hours where 18 credit hours will be technical while 12 credit hours can be non-technical (finance, accounting, leadership, program management, etc.). As shown in Table 1, there will be the opportunity to complete individual graduate certificates in four main focus areas to meet the needs of the local industry in South Carolina: Geotechnical, Structures, Transportation, and Built Environment, Planning and Design for Public Health.

Table 1: MS Civil Engineering Comparison to Other Institutions

	Citadel	Clemson		USC	
	MS Non Thesis	MS Thesis	MS Non Thesis	MS Thesis	ME Non Thesis
Total Hrs	30	30	30	30	30
Core / Focus Area Possibilities	Geotechnical Structural Transportation Built Environment, Planning and Design for Public Health	Applied Fluid Mechanics Construction Materials Geotechnical Construction Eng and Management Structural Engineering Transportation systems		Environmental Geotechnical Structural Transportation Water Resources	
Other Tech	N/A	Advisor	Advisor	9 max	12 max
Other	12	Advisor	Advisor	Advisor	Advisor

Citadel MS in Civil Engineering:

- 30 credit hours, non-thesis
- Require at least 6 courses (18 hours) in technical classes
- 4 courses (12 hours) in technical or non-technical classes (Mechanical, Electrical, Civil, Program Management, Business, Leadership)

Example Course Plan:

If a student, for example, has a focus in Structures, he/she must take 4 Structures courses. The remaining technical courses must be a minimum combination of 2 from the Other Technical Courses (from available focus areas such as geotechnical, structures, or transportation – chose two more structures courses). The Other 4 courses can be from non-technical (Business, Leadership, Program Management) or from technical programs (Mechanical, Electrical, or Civil). See example in Table 2, below.

Table 2: Sample Course Plan for Structures Focus in MSCE Program

	Course # and Title	Credit Hours
MS CE Tech Courses	CIVL 657: Indeterminate and Matrix Structural Analysis	3
	CIVL 718: Matrix and Finite Element Analysis	3
	CIVL 712: Design of Coastal Structures and Bridges	3
	CIVL 711: Design of Masonry, Wood and Cold Formed steel Structures	3
	CIVL 714: Advanced Steel Design	3
	CIVL 715: Advanced Reinforced Concrete Design	3
Other Courses	PMGT 650 Overview of Technical Project Management	3
	PMGT 651 Tech Project Planning and Scheduling	3
	PMGT 671: Project Manager Leadership Development	3
	BADM 604 Foundation of Management and Organization	3
		30 Total

Course Descriptions for New Courses

Course Name	Description
CIVL 730: Geotechnical Earthquake Engineering	Fundamentals of soil dynamics, plate tectonics and earthquakes; application of the concepts to seismic ground response, design ground motions, soil liquefaction, site response analysis, seismic slope stability, dynamic lateral earth pressure, and soil improvement. Prerequisites: CIVL 402, 409, and 410.
CIVL 731: Geo-environmental Engineering	Geo-environmental engineering is a multi-disciplinary area of study that involves various aspects of geotechnical engineering, environmental engineering, hydraulics/hydrology, and groundwater engineering. The course focuses on the following two specific technical issues: (1) characterization and remediation of contaminated soil and groundwater; (2) design of waste containment barriers (e.g., liners, covers, vertical barriers) used for waste remediation. Prerequisites: CIVL 322, 402, and 409.
CIVL 732: Advanced Soil Mechanics	Study of stresses in soils, stress-strain and shear strength properties of soil, plastic equilibrium of soil masses, failure conditions, earth pressures, with applications to geotechnical engineering design. Prerequisites: CIVL 402 and 409.
CIVL 733: Advanced Foundations Design	The engineering design process is demonstrated through use of practical problem-solving methods for public infrastructure and built environment projects. Analysis and design of deep foundations, earth slopes, retaining walls, sheet-pile walls, and braced excavations, anchored bulkheads, reinforced earth, and underpinning. Prerequisites: CIVL 410.
CIVL 734: Soil Behavior	Detailed study of physiochemical aspects of soil behavior, stabilization of soils, and engineering properties of soils. Prerequisites: CIVL 402, 409, and 410.
CIVL 504: Designing for Natural and Manmade Hazards	Engineering and science applications and socio-economic impacts of natural hazards on historic structures. Course provides thorough overview of design, rehabilitation, and other socio-economic decisions related to natural hazards and historical structures. Prerequisites: Admission to partner graduate degree programs; BS in math, science or engineering; or permission from professor
CIVL 608: Structural Loads and Systems	Structural engineering applications of analysis methodologies used to determine loads in accordance with ASCE 7. In-depth discussion of minimum design loads and load combinations. Includes overview of various steel and concrete systems. Discusses practical selection and design issues and design of proprietary building materials and components such as steel joists, diaphragms, engineered wood products, etc. Prerequisites: CIVL 309.
CIVL 610: Wood Design	Design of wood framed structures in accordance with the NDS Specification. Course provides thorough overview of practical member and connection design and real world applications. Introduction to wood design and engineering; properties of wood and wood-based materials; design of beams, columns, walls, roofs, panel systems, and connections. Prerequisites: CIVL 309.

CIVL 655: Masonry Structural Design	Introduction to design of structural elements for masonry buildings. Lintels, walls, shear walls, columns, pilasters, and retaining walls are included. Reinforced and unreinforced elements of concrete or clay masonry are designed by allowable stress and strength design methods. Introduction to construction techniques, materials, and terminology used in masonry. Prerequisites: CIVL 309.
CIVL 657: Indeterminate and Matrix Structural Analysis	Analysis of indeterminate structures using moment distribution, energy methods such as virtual work and Castigliano's Theorem. Matrix displacement method derived and simplified to a form suitable for structural engineering applications. Truss and frame applications with modifications for symmetry, internal releases, and support settlements. SAP2000 and other structural engineering software is used to compare with analytical solutions. Prerequisites: CIVL 309.
CIVL 711: Design of Masonry, Wood and Cold Formed Steel Structures	Design of masonry structures in accordance with ACI specifications, wood framed structures in accordance with NDS specifications, and Cold Formed Steel Structures in accordance with AISI specifications. Course provides thorough overview of practical member and connection design and real world applications. Prerequisites: CIVL 309.
CIVL 712: Design of Coastal Structures and Bridges	AASHTO based design of bridge structures and foundation elements. Design of piers and seawalls for coastal applications. Prerequisites: CIVL 309.
CIVL 713: Design of Civil Engineering Systems for Natural and Manmade Hazards	Design of infrastructure for hurricanes, earthquakes, floods, tornadoes, and man-made or accidental explosions. Focus on design philosophy and practical examples. Structural design, site layout, and economics discussed in detail. Prerequisites: CIVL 309.
CIVL 714: Advanced Steel Design	Advanced design of structural steel buildings emphasizing the relationship between design and response of the structural system; theoretical basis of building code provisions; limit state and plastic design; beam-columns; plate girders and composite sections and connections. All design provisions in accordance with AISC 360. Prerequisites: CIVL 406
CIVL 715: Advanced Reinforced Concrete Design	Second course in design of reinforced concrete structures; advanced concepts in analysis and design of beams, columns, and slabs; introduction to prestressed concrete. All design provisions in accordance with ACI 318. Prerequisites: CIVL 404.
CIVL 716: Analysis and Design of Prestressed Concrete Members	This course covers the analysis and design of prestressed concrete flexure loads; axial loaded; and diagonal tension using both the allowable stress procedure and the ultimate strength methodology. Construction techniques are discussed. Evaluation of serviceability requirements such as deflection and cracking are also discussed. Prerequisites: CIVL 309.
CIVL 718: Matrix and Finite Element Analysis	Finite element method derived and simplified using matrix approach to truss, beam, plate, and shell structures. Solid elements also discussed. Mesh layout and refinement, convergence characteristics, and solution accuracy proven. SAP2000 and other structural engineering software is used to compare to analytical solutions. Prerequisites: CIVL657: Indeterminate and Matrix Structural Analysis.
CIVL 719: Elastic Stability of Structures	Stability of elastic structural components under conservative loads. Precise definitions of stability; energy approaches; Rayleigh-Ritz and Galerkin methods utilized with primary applications to frame structures. SAP2000 and other structural engineering software is used to compare to analytical solutions. Prerequisites: CIVL 309.

CIVL 720: Dynamic Analysis of Structures	Analysis and design of structures subjected to dynamic loading; response of lumped and distributed parameter systems of one or many degrees of freedom; approximate design methods; introduction to earthquake analysis and design. Prerequisites: CIVL 309.
CIVL 721: Earthquake Engineering for Structural Engineers	Effects of earthquake-induced forces on buildings, bridges, and other structures; development of design codes and their application to the design of structures to resist seismic forces; fundamental structural dynamics and analysis techniques used to compute the response of structures or obtain design forces. Prerequisites: CIVL 309.
CIVL 506: Geographic Information Systems	Instruction in Geographic Information Systems (GIS) focusing on data analysis and spatial application methods, for engineers, planners, scientists and related professions. Fundamental topics include spatial analysis, geostatistical analysis, 3-D analysis/display, and vector/raster data. The focus of the course is on gaining an essential knowledge of spatial data structures in GIS, geo-spatial data acquisition, geoprocessing, geostatistical methods; visualization, exploration of spatial data; network analysis, terrain mapping, and spatial analysis. The course will include specific emphasis on land use evaluation methods and transportation network analysis. Prerequisites: BS in mathematics, science, or engineering, or permission from instructor.
CIVL 575: Traffic Engineering Operations	Basic characteristics of motor-vehicle traffic, highway capacity, applications of traffic control devices, traffic design of parking facilities, engineering studies, traffic safety, traffic laws and ordinances, basic statistical analysis, components of traffic systems, measurement of traffic data, characterizing traffic system performance, analysis of existing traffic facilities, and design of traffic facilities for achieving desired system performance. Prerequisites: CIVL 305, Transportation Engineering, or permission from professor
CIVL 576: Roadway Geometric Design	Geometric design of roadways, at-grade intersections, and interchanges, using software programs, in accordance with conditions imposed by driver ability, vehicle performance, safety sustainability, and economic constraints. Prerequisites: CIVL 305, Transportation Engineering, or permission from professor
CIVL 612: Urban Transportation Planning	A systems approach to the transportation planning process focusing on policy issues and the decision making process. Topics include: 1.) Trip generation modeling –variables influencing trip generation, regression analysis and category analysis; 2.) Trip distribution – modeling factors governing trip distribution, growth-factor methods and gravity models, calibration of gravity models; 3.) Mode split modeling – factors influencing mode choice, discrete choice models; 4.) Route selection – traffic assignment; and 5.) Transportation surveys; transport related land use models, urban structure, urban goods transport. Use of popular transportation planning software will also be covered. Prerequisites: CIVL 302, Highway Engineering, or permission from professor
CIVL 640: Urban Mobility Infrastructure Policy and Planning	Foundation for understanding transportation systems' relationship to cities and people and managing urban transportation systems, including: 1.) multi-faceted understanding of the historical, spatial, economic, social, and environmental factors affecting transportation issues, 2.) transportation and land use relationships, 3.) transportation as a tool of economic development and growth, 4.) transportation political influences and finance, and 5.) regional, state and federal governmental structure of committees, agencies and oversight. Prerequisites: Admission to partner graduate degree programs; BS in math, science or engineering; or permission from professor

<p>CIVL 642: Public Health, Physical Activity, and Design of the Built Environment</p>	<p>Multidisciplinary evaluation of cities, suburban communities and neighborhoods to identify positive and adverse effects of the built environment on levels of physical activity and measures of public health, with an emphasis on adoption of approaches for improving desirable outcomes. The course focuses on establishing basis of need and potential benefits from implementation of optimal solutions to the challenging dilemma of built environment, urban mobility, transportation infrastructure networks, economics, sustainability, livability, and community wellness. Interconnections between the fields of public health, public policy and engineering design are identified. Students are equipped with proficiencies needed to create more healthy communities through an emphasis on physical activity. Prerequisites: Admission to partner graduate degree programs; BS in math, science or engineering; or permission from professor</p>
<p>CIVL 740: Transportation Safety Engineering</p>	<p>Methodology for conducting transportation accident studies, accident characteristics as related to operator, facility, and mode, statistical applications to accident data, current trends and problems in transportation safety. Prerequisites: CIVL 305, Transportation Engineering, or permission from professor</p>
<p>CIVL 741: Travel Demand Forecasting</p>	<p>In-depth coverage of travel-demand forecasting theory and the four-step process, site traffic impact analysis, and disaggregate travel demand models. Theory and method of forecasting travelers' choices of route, mode, destination, departure time, trip frequency and origin location in congested transportation networks. Prerequisites: CIVL 305, Transportation Engineering, or permission from professor</p>

Faculty

Faculty and Administrative Personnel				
Rank	Full- or Part-time	Courses Taught or To be Taught, Including Term, Course Number & Title, Credit Hours	Academic Degrees and Coursework Relevant to Courses Taught, Including Institution and Major	Other Qualifications and Comments (i.e., explain role and/or changes in assignment)
Professor	Full-time	<ul style="list-style-type: none"> • CIVL 506 Geographic Information Systems, 3 Credit Hours • CIVL 575 Traffic Engineering Operations, 3 Credit Hours • CIVL 576 Roadway Geometric Design, 3 Credit Hours • CIVL 612 Urban Transportation Planning, 3 Credit Hours • CIVL 640 Urban Mobility Infrastructure Policy and Planning, 3 Credit Hours • CIVL 642 Public Health, Physical Activity, and Design of the Built Environment, 3 Credit Hours • CIVL 740 Transportation Safety Engineering, 3 Credit Hours • CIVL 741 Travel Demand Forecasting, 3 Credit Hours 	PhD from Georgia Tech and MS from Auburn University both with a Transportation Engineering focus	<p>Registered Professional Engineer in Alabama 2003-2008, founding member of a community partnership with Berkeley Charleston Dorchester Council of Governments, to obtain and administer “Active Living by Design” grant from the Robert Wood Johnson Foundation, for improved land policies, programs and facilities to support healthy life styles.</p> <p>Fellow, ENO Center for Transportation Leadership Development, Washington, DC, 1996</p>
Professor	Full-time	<ul style="list-style-type: none"> • CIVL 504 Designing for Natural and Manmade Hazards, 3 Credit Hours • CIVL 608 Structural Loads and Systems, 3 Credit Hours • CIVL 610 Wood Design, 3 Credit Hours • CIVL 655 Masonry Structural Design, 3 Credit Hours • CIVL 657 Indeterminate and Matrix Structural Analysis, 3 Credit Hours 	PhD and MS both with a Structural Engineering focus from North Carolina State University	Registered Professional Engineer in South Carolina

		<ul style="list-style-type: none"> • CIVL 711 Design of Masonry, Wood and Cold Formed Steel Structures, 3 Credit Hours • CIVL 713 Design of Civil Engineering Systems for Natural and Manmade Hazards, 3 Credit Hours • CIVL 714 Advanced Steel Design, 3 Credit Hours • CIVL 715 Advanced Reinforced Concrete Design, 3 Credit Hours • CIVL 716 Analysis and Design of Prestressed Concrete Members, 3 Credit Hours • CIVL 718 Matrix and Finite Element Analysis, 3 Credit Hours • CIVL 719 Elastic Stability of Structures, 3 Credit Hours • CIVL 720 Dynamic Analysis of Structures, 3 Credit Hours • CIVL 721 Earthquake Engineering for Structural Engineers, 3 Credit Hours 		
Associate Professor	Full-time	<ul style="list-style-type: none"> • CIVL 504 Designing for Natural and Manmade Hazards, 3 Credit Hours • CIVL 608 Structural Loads and Systems, 3 Credit Hours • CIVL 610 Wood Design, 3 Credit Hours • CIVL 655 Masonry Structural Design, 3 Credit Hours • CIVL 657 Indeterminate and Matrix Structural Analysis, 3 Credit Hours • CIVL 711 Design of Masonry, Wood and Cold Formed Steel Structures, 3 Credit Hours • CIVL 712 Design of Coastal Structures and Bridges, 3 Credit Hours 	<p>PhD with a Structural Engineering focus from Virginia Polytechnic Institute and State University</p> <p>Master's thesis in coastal engineering.</p> <p>Ph.D. dissertation focused on finite element modeling and earthquake engineering.</p> <p>Practical experience includes 15 years of structural design including the design of award</p>	Registered Professional Engineer in South Carolina

		<ul style="list-style-type: none"> • CIVL 713 Design of Civil Engineering Systems for Natural and Manmade Hazards, 3 Credit Hours • CIVIL 714 Advanced Steel Design, 3 Credit Hours • CIVL 715 Advanced Reinforced Concrete Design, 3 Credit Hours • CIVL 716 Analysis and Design of Prestressed Concrete Members, 3 Credit Hours • CIVL 718 Matrix and Finite Element Analysis, 3 Credit Hours • CIVL 719 Elastic Stability of Structures, 3 Credit Hours • CIVL 720 Dynamic Analysis of Structures, 3 Credit Hours • CIVL 721 Earthquake Engineering for Structural Engineers, 3 Credit Hours 	<p>winning buildings and marine structures.</p>	
Associate Professor	Full-time	<ul style="list-style-type: none"> • CIVL 504 Designing for Natural and Manmade Hazards, 3 Credit Hours • CIVL 608 Structural Loads and Systems, 3 Credit Hours • CIVL 610 Wood Design, 3 Credit Hours • CIVL 655 Masonry Structural Design, 3 Credit Hours • CIVL 657 Indeterminate and Matrix Structural Analysis, 3 Credit Hours • CIVL 713 Design of Civil Engineering Systems for Natural and Manmade Hazards, 3 Credit Hours • CIVIL 714 Advanced Steel Design, 3 Credit Hours • CIVL 716 Analysis and Design of Prestressed Concrete Members, 3 Credit Hours 	<p>PhD and MS both with a Structural Engineering focus from Clemson University</p>	

		<ul style="list-style-type: none"> • CIVL 718 Matrix and Finite Element Analysis, 3 Credit Hours • CIVL 720 Dynamic Analysis of Structures, 3 Credit Hours 		
Assistant Professor	Full-time	<ul style="list-style-type: none"> • CIVL 506 Geographic Information Systems, 3 Credit Hours • CIVL 575 Traffic Engineering Operations, 3 Credit Hours • CIVL 576 Roadway Geometric Design, 3 Credit Hours • CIVL 612 Urban Transportation Planning, 3 Credit Hours • CIVL 640 Urban Mobility Infrastructure Policy and Planning, 3 Credit Hours • CIVL 740 Transportation Safety Engineering, 3 Credit Hours • CIVL 741 Travel Demand Forecasting, 3 Credit Hours 	PhD and MS both with a Transportation Engineering focus from University of Florida	
Assistant Professor	Full-time	<ul style="list-style-type: none"> • CIVL 730: Geotechnical Earthquake Engineering, 3 Credit Hours • CIVL 731: Geo-environmental Engineering, 3 Credit Hours • CIVL 732: Advanced Soil Mechanics, 3 Credit Hours • CIVL 733: Advanced Foundations Design, 3 Credit Hours • CIVL 734: Soil Behavior, 3 Credit Hours 	PhD and MS both with a Geotechnical Engineering focus from Arizona State University	4 years of Geotechnical Engineering Design Experience

Note: Individuals should be listed with program supervisor positions listed first. Identify any new faculty with an asterisk next to their rank.

Total FTE needed to support the proposed program (i.e., the total FTE devoted just to the new program for all faculty, staff, and program administrators):

Faculty	1	Staff	0	Administration	0
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Faculty /Administrative Personnel Changes

Provide a brief explanation of any additional institutional changes in faculty and/or administrative assignment that may result from implementing the proposed program. (1000 characters)

Faculty are required to teach a full load – 12 credit hours each semester. Each faculty member may consult one day per week and can gain teaching release time for successful research proposals. Additionally, The Citadel has a foundation grant that provides funding (\$2500 each area/year) in the following three areas: research seed funding, result presentations at conferences, and/or participate in faculty development opportunities. The new MSCE program will start with current faculty teaching courses as an add pay in the summer while leveraging the ability for students to take up to 4 non-technical courses already being offered throughout the year. As the demand increases beyond the ability for faculty to cover courses with add pay, faculty positions will be requested or reallocated. Current estimates would allow the program to cover 8 graduate courses per semester and one additional FTE faculty member. The staff and administration positions supporting the BSCE will also support the MSCE program.

Library and Learning Resources

Identify current library/learning collections, resources, and services necessary to support the proposed program and any additional library resources needed. (1000 characters)

The 2011 Standards for College Libraries does not address Civil Engineering specifically beyond recommending that a comparison of our holdings should occur with a group of peer institutions. The Citadel's holdings were compared with those of Clemson and USC (PASCAL members), VMI, UT-Chattanooga, Western Carolina, and University of North Florida. The Citadel library catalog holdings are small for civil engineering; however, the current ebook package, Academic Complete from ebrary, yields 3,521 hits from the same phrase search. These ebooks are available from on and off campus to currently-enrolled students.

The top 5 U.S. journals in civil engineering are: *Journal of Composites for Construction* (access through Business Source Complete); *Journal of Structural Engineering* (access through Academic Search Complete); *ACI Materials Journal* (access through interlibrary loan); *Mechanical Systems and Signal Processing* (access through ScienceDirect); and *ACI Structural Journal* (access through interlibrary loan).

The new BSME program has purchased a print version of the entire ASTM package. We expect many fully employed students will be using company resources to complete assignments. The Citadel currently spends approximately \$40,000 per year on engineering.

Student Support Services

Identify academic support services needed for the proposed program and any additional estimated costs associated with these services. (500 characters)

The Citadel currently has strong student support services for existing undergraduate programs, graduate programs and veterans. These same services would provide support for the evening students who would be taking courses within the MSCE degree or associated certificates. It is expected that a majority of the students will be either full time employed or completing research degrees through Clemson's Restoration Institute.

Physical Resources

Identify any new instructional equipment needed for the proposed program. (500 characters)

The equipment being purchased as part of the new BSME program as well as the equipment used within the BSCE and BSEE programs will support any physical demonstrations needed within MSCE level courses. Since the MSCE degree requires only 10 courses and no thesis, the lab equipment needs will be limited to support for showing theoretical concepts within a given course. The four focus areas: geotechnical, structures, and transportation, and built environment, planning and design for public health follow the five focus areas within the BSCE (geotechnical, structures, transportation, water resources, environmental) and associated equipment being purchased.

Will any extraordinary physical facilities be needed to support the proposed program?

Yes

No

Identify the physical facilities needed to support the program and the institution's plan for meeting the requirements, including new facilities or modifications to existing facilities. (1000 characters)

Financial Support

Estimated New Costs by Year						
Category	1st	2nd	3rd	4th	5th	Total
Program Administration	0	0	0	0	0	0
Faculty and Staff Salaries	6,000	12,000	105,000	105,000	117,000	345,000
Graduate Assistants	0	0	0	0	0	0
Equipment	0	0	0	0	0	0
Facilities	0	0	0	0	0	0
Supplies and materials	500	500	500	500	500	2500
Library Resources	0	0	0	0	0	0
Other*	0	0	0	0	0	0
Total	6,500	12,500	105,500	105,500	117,500	347,500
Sources of Financing						
Category	1st	2nd	3rd	4th	5th	Total
Tuition Funding	19,500	45,000	72,000	109,500	147,000	393,000
Program-Specific Fees	0	0	0	0	0	0
State Funding (i.e., Special State Appropriation)*	0	0	0	0	0	0
Reallocation of Existing Funds*	0	0	0	0	0	0
Federal Funding*	0	0	0	0	0	0
Other Funding*	0	0	0	0	0	0
Total	19,500	45,000	72,000	109,500	147,000	393,000
Net Total (i.e., Estimated New Costs Minus Sources of Financing)	13,000	32,500	(33,500)	4,000	29,500	45,500

*Provide an explanation for these costs and sources of financing in the budget justification.

Budget Justification

Provide a brief explanation for the other new costs and any special sources of financing (state funding, reallocation of existing funds, federal funding, or other funding) identified in the Financial Support table. (1000 characters)

Note: Institutions need to complete this budget justification *only* if any other new costs, state funding, reallocation of existing funds, federal funding, or other funding are included in the Financial Support table.

n/a

Evaluation and Assessment

Programmatic Assessment: Provide an outline of how the proposed program will be evaluated, including any plans to track employment. Identify assessment tools or software used in the evaluation. Explain how assessment data will be used. (3000 characters)

The Citadel is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools. The undergraduate engineering programs are accredited by ABET (CE just completed their reaccreditation visit in Nov 2014 and expects official reaccreditation in July 2015). The MS in Project Management has requested accreditation through the Project Management Institute Global Accreditation Center. The MSCE program will track accomplishment of Program Outcomes through the Taskstream software. All programs within the School of Engineering track employment or employment changes after completion of each degree. The MSCE will track employment data in a similar way, but will also track from where students are initiating their MSCE (full-time employment, research, full-time schooling by continuing their education after a BSCE, etc.).

Student Learning Assessment

Expected Student Learning Outcomes	Methods of/Criteria for Assessment
Demonstrate breadth of knowledge in complimentary areas of civil engineering that promotes an awareness of and skill in interdisciplinary problem solving	Exams, design projects
Demonstrate a depth of knowledge in a chosen focus area of civil engineering that allows the student to apply innovative techniques to solve problems	Exams, design projects
Demonstrate knowledge in methods of advanced analysis appropriate for professional use when solving problems	Exams, design projects, homework
Demonstrate knowledge of contemporary issues in their chosen focus area	Papers, presentations
Demonstrate the skills relevant to graduate level work to include the ability to formulate problems, synthesize and integrate information, work collaboratively, and to communicate effectively	Exams, design projects, homework, presentations
Demonstrate preparation for successful careers in industry or continued graduate work and an ethic for lifelong learning	Surveys, work placement tracking

Will the proposed program seek program-specific accreditation?

Yes

No

If yes, provide the institution's plans to seek accreditation, including the expected timeline for accreditation. (500 characters)

Will the proposed program lead to licensure or certification?

Yes

No

If yes, explain how the program will prepare students for licensure or certification. (500 characters)

Teacher or School Professional Preparation Programs

Is the proposed program a teacher or school professional preparation program?

Yes

No

If yes, complete the following components.

Area of Certification

Please attach a document addressing the South Carolina Department of Education Requirements and SPA or Other National Specialized and/or Professional Association Standards.