New Program Proposal
Bachelor of Science in Construction Engineering
The Citadel

Executive Summary

The Citadel requests approval to offer the program leading to the Bachelor of Science in Construction Engineering to be implemented in Fall 2018. The proposed program is to be offered through traditional delivery. The following chart outlines the stages of approval for the proposal. The Advisory Committee on Academic Programs (ACAP) voted to recommend approval of the proposal. The full program proposal and support documents are attached.

Stages of Consideration	Date	Comments
Program Proposal Received	2/1/2017	Not Applicable
Program Proposal Withdrawn	3/6/2017	The Citadel withdrew the proposal upon discussion with Academic Affairs staff about program content.
Program Proposal Resubmitted	3/22/2017	Not Applicable
ACAP Consideration	9/14/2017	The Citadel institutional representatives introduced the proposed Bachelor of Science in Construction Engineering, detailing that the program addresses the areas of engineering design, business, and management. Institutional representatives stated the program is operated in conjunction with Trident Technical College via a 2+2 Memorandum of Understanding (MOU). Additionally, the need for the program is robust in the Charleston region due to increased and ongoing construction in the area. The aforementioned construction has led to local businesses expressing an interest in the skillset that would be provided from this degree. Commission staff inquired about the details of the enrollment chart, the availability of student support services for evening and part-time students, and the status of the Trident Technical College MOU. Institutional representatives responded favorably about sufficient student support services for evening and part-time students, student enrollment, and the partnership with Trident Technical College. ACAP members followed with discussion with representatives from The Citadel about the availability of practical experience within the curriculum. After remaining discussion, ACAP voted to approve the program proposal. Staff transmitted remaining questions for additional clarity.

Comments and suggestions from CHE staff sent to the institution		Staff requested the proposal be revised to address the following information: • The intended hire date of additional faculty as well as the degree to which existing faculty would be impacted by the addition of duties related to increased teaching and advising loads of the new program; • The ability of evening, part-time, and working professionals to access student support services; • Updating the curriculum chart that provides an anticipated course load for part-time students; • A budget justification that addresses the intended use of surplus dollars generated from the program; and • A revised curriculum chart that highlights the opportunities for practical experience.
Revised Program Proposal Received	9/28/2017	The revised proposal satisfactorily addressed the requested revisions.
CAAL Consideration	10/26/17	The Citadel representative described the development of and need for the program, explaining that both students and employers request that the institution offer the program. He cited one company, in particular, seeking to hire 22 employees with the experience and expertise this program would provide. The Citadel representative also described plans for the accreditation process, the development of required courses, and a recent faculty hire who will support the proposed program. Committee members asked about existing engineering programs offered by The Citadel and the institution's representative described the success of those programs and how existing resources will be leveraged to support all engineering programs, including the proposed program. He also explained how the proposed program may increase enrollment in existing master's degree programs. Committee members then commended the institution for its required study periods. In response, The Citadel's representative cited examples of other services provided to both cadet and evening students to help them succeed, including engineering and math labs for those students who need extra support. Committee members asked for and received clarification about the program objectives. In response to a question about project management content, The Citadel's representative explained the ways in which project management is included in the curriculum. Committee members requested an explanation of the projected enrollment. The Citadel's representative explained the projections and stated he is confident the institution will meet the projected enrollment. Committee members also asked whether there are any articulation agreements with the University of South Carolina and

		Clemson. The Citadel's representative explained how courses would transfer to and from these institutions. Committee members inquired if the military provides special services for STEM programs. The Citadel's representative mentioned ROTC scholarships for engineering students as well as services provided to veterans to help them transition to college. Committee members mentioned the recent national rankings and commended The Citadel for its ranking. With no further discussion, CAAL voted to approve the program.

Review

Proposal consideration focused on existing engineering programs at The Citadel, program objectives, enrollment projections, and articulation agreements. The Citadel representatives responded satisfactorily, addressing the inquiries throughout the proposal.

Recommendation

The Committee on Academic Affairs and Licensing recommends the Commission approve the program leading to the Bachelor of Science in Construction Engineering to be implemented in Fall 2018. The program will be reviewed three years after implementation.

Name of Institution
The Citadel

Name of Program (include concentrations, options, and tracks)
Bachelor of Science in Construction Engineering (BSCONE)

Program Designation

☐ Associate's Degree ☐ Master's Degree
☒ Bachelor's Degree: 4 Year ☐ Specialist
☐ Bachelor's Degree: 5 Year ☐ Doctoral Degree: Research/Scholarship (e.g., Ph.D. and DMA)
☐ Doctoral Degree: Professional Practice (e.g., Ed.D., D.N.P., J.D., Pharm.D., and M.D.)

Does the program qualify for supplemental Palmetto Fellows and LIFE Scholarship awards?
☒ Yes
☐ No

Proposed Date of Implementation
Aug 2018

CIP Code
14.3301

Delivery Site(s)
Courses offered on-site

Delivery Mode

☒ Traditional/face-to-face*
*select if less than 50% online

☐ Distance Education
☐ 100% online
☐ Blended (more than 50% online)
☐ Other distance education

Program Contact Information (name, title, telephone number, and email address)
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Institutional Approvals and Dates of Approval
Undergraduate Curriculum Committee: 29 November 2016
Faculty Senate: 12 Dec 2016
President: 3 January 2017
Board of Visitors: 9 January 2017

Background Information

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

The BSCONE is intended to meet the expressed needs of South Carolina construction industries, especially Charleston based companies. Nationally, Construction Engineering is broken out as a separate category by the Department of Labor which shows that employment of construction managers is projected to grow 5 percent annually from 2014 to 2024, about as fast as the average for all occupations. The Payroll Survey, Bureau of Labor Statistics (June 2016, Department of Labor) has noted that the total number of jobs has risen 2.3 % while the number of jobs in construction has risen 4.7%. Construction managers/engineers will be needed as overall construction activity increases/expands over the coming decade. Population and business growth will result in the construction of new residences, office buildings, retail outlets, hospitals, schools, restaurants, and other structures over the coming decade. Also, the need to improve portions of the national infrastructure will spur employment growth as roads, bridges, and sewer pipe systems are upgraded or replaced. Those with a bachelor's degree in construction science/engineering, coupled with construction experience, will have the best job prospects. Although employment growth will provide many new jobs, a substantial number of construction managers/engineers are expected to retire over the next decade, resulting in additional job openings. South Carolina Job Skills Gap Update by the scworkforceinfo.com noted construction as one area that did not have enough graduates to meet the job market demand for construction bachelor degreed graduates (6% of the overall skilled employee shortage in the Lowcountry).

The construction engineering related job market in the Charleston area has exploded in recent years, especially as the Lowcountry has become a manufacturing hub with the associated housing boom. Employers include architectural-engineering firms, firms with specialties in multiple areas of civil engineering to include construction engineering and construction management, defense applications, power and energy firms, manufacturing, and many others. The growth in manufacturing leads to construction engineers constructing facilities, maintaining/renovating facilities, and even building many products to include airplanes, automobiles, cargo vans, tires, etc. The BSCONE 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 it is being developed at the request of a number of Charleston based construction companies such as Davis and Floyd, Trident construction, Hill Construction Corporation, etc. The desire to hire local talent and educate an existing workforce drives the need for a local undergraduate construction engineering program to complement the other existing undergraduate engineering programs in civil, electrical, and mechanical engineering. Our ability to offer undergraduate courses within The Citadel BSCONE is complementary to other undergraduate courses/programs being offered in the Lowcountry in providing a fuller undergraduate engineering education. Engineering problem solving coupled with construction management is in increased demand and construction engineers are a necessary and diverse core engineering skill set that are primarily focused on constructing and maintaining the built and natural environment.

<u>Centrality of the Program</u>
Given The Citadel's history, reputation, and affiliation with the military, federal, corporations,

and state agencies, it is strategically placed to take a prominent leadership role in this growing field. In addition to the outstanding academic preparation students receive, Citadel graduates are especially attractive in the construction engineering field for the following reasons:

- The Citadel's focus on Principled Leadership is highly valued in the engineering field;
- Citadel students learn and are expected to retain high ethical standards, as are licensed engineers; and
- The Citadel's rigid standards of conduct help ensure that graduates can pass the rigorous background checks required for construction management.

List the program objectives. (2000 characters)

Program Objectives:

- Success in the practice of construction engineering, by ethically and judiciously applying knowledge of science, mathematics, and engineering methods to solve problems facing a technologically complex construction process.

- Positions to apply and operate current engineering and analysis tools and equipment to conduct and/or lead construction operations.

- Self-Development to value and pursue lifelong learning, not only to keep current in the construction engineering field, but also to sustain awareness of engineering-related issues facing contemporary society through formal and informal opportunities.

- Graduate education and/or professional registration as desired or required.

- Roles as principled leaders with strong communications and team-building skills to lead people, manage resources, solve complex problems, communicate information, and influence decisions.

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 Bachelor of Science degree program in Construction Engineering will, by the time of graduation demonstrate:

- apply knowledge of mathematics, science, and engineering
- design and conduct experiments, as well as to analyze and interpret data
- design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- function on multidisciplinary teams
- identify, formulate, and solve engineering problems
- comprehend professional and ethical responsibility
- communicate effectively
- comprehend the impact of engineering solutions in a global, economic, environmental, and societal context through a broad education
- recognize the need for and engage in life-long learning
- apply knowledge of contemporary issues within solutions
- use the techniques, skills, and modern engineering tools necessary for engineering practice.

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 from 2012-2016. For example, the number of undergraduate engineering students within the Corps of Cadets has grown from 318 in 2012 to 370 students in 2014. 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 (200 new students). Currently, The Citadel has over 659 undergraduate engineering students in its day and evening programs. However, there is always 20-40 students each year arriving at The Citadel looking for a greater construction focused program than the current BSCE program can offer. The arrival of Boeing, Volvo, expansion at Mercedes, and all of the companies associated with these large manufacturing operations are leading a resurgence of construction and renovation of facilities. Many construction firms must rely on hiring business majors and try to train them to be construction engineers and managers or design engineers to be project managers. There is no other construction engineering program in the state, only an undergraduate construction science and management at Clemson. These companies desire the finance and accounting background of construction managers as well as the foundational engineering background of civil engineers to be able to not only manage the business side of construction, but also understand the importance of complying with design plans. Many companies have loyal construction employees who want to move into upper management, but without the ability to gain the necessary skills through education while working and living within the Lowcountry, they are prevented.

Student Type	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	* Fall 201
Active Duty Students	10	16	24	22	19	14	10	13	9
Evening Undergraduate Students	59	65	69	71	65	66	64	127	95
Fifth Year Students	12	18	13	17	12	16	22	21	26
SC Corps of Cadets	328	342	340	318	356	370	423	412	496
Veteran Students	2	1	12	16	20	42	43	37	33
Total	**411**	**442**	**458**	**444**	**472**	**536**	**562**	**610**	**659**

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 leading the demand for more construction focused graduates – construction engineers.

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**
Architecture /Construction	463 versus 135 produced each year	5.9% shortage in Lowcountry, 4.2% shortage throughout the state.	South Carolina Job Skills Gap Update 2015 by Business Intelligence Department (BID) of the South Carolina Department of Employment and Workforce (SCDEW).
Based on industry input noted above, a majority of students will be fully employed and part-time students.			

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

With limited specific data beyond the South Carolina Job Skills Gap Update 2015 by Business Intelligence Department (BID) of the South Carolina Department of Employment and Workforce (SCDEW), we have provided additional discussion here. However, page 17 of this report states:

Several observations can be made concerning the results. One is that there are over 29,500 more total graduates than job openings for the year. In the overwhelming number of cases, the number of graduates is greater than the number of openings for each of the cluster/degree combinations. A few notable exceptions are:

- More graduates with Bachelor's degrees are required in Architecture and Construction;
- Etc.

The fact that there is documented growth of current companies providing engineering construction support for the rapidly expanding manufacturing hub here in the Lowcountry is undeniable. One example; Boeing has expanded its footprint numerous times (design center, a research center, and expanding the plant footprint) over the last five years and is continuing to purchase land for additional growth. This only scratches the surface of the numerous newspaper articles noting companies moving production of required aeronautical parts to decrease the shipping costs and strengthen supply lines from Washington State. Each of these companies requires a construction and engineering team to support design and construction, but also of the maintenance and renovation of 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, the expansion of the Mercedes Truck manufacturing center, and the new Volvo manufacturing plant. Many of the students that will be taking the courses within the BSCONE will be desiring to be construction engineers, but attend a military focused school (day program) or live in the Lowcountry and cannot afford to relocate elsewhere to gain their education, or current Lowcountry construction company employees working to improve their current skill set and add additional responsibilities and financial resources (evening Undergraduate program). Our industry contacts as well as our robust departmental industry advisory board have been asking for a number of years for a construction engineering level bachelor's degree in the Lowcountry to support not only improved technical competence and company advancement, but also promotion opportunities for the current workforce. As noted in many locations to include Forbes Magazine, the bachelor's degree helps distinguish a candidate for promotion and advancement within the company and construction industry. 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 MS/PhD level degrees, but also a fuller set of undergraduate degrees in fields not currently available, such as construction engineering. To support the long-term goal to offer more engineering BS/MS/PhD's in the Lowcountry, The Citadel is positioned with its all PhD faculty team to offer a BSCONE degree.

Currently the Dean of Engineering and the Chair of the Civil Engineering Department are the faculty leads for this new program. Each has had construction experience prior to their current academic careers. There are a number of CE/ME faculty that also have had significant construction careers prior to returning to school for their PhD. There are 16 new courses associated with the Construction Engineering BS degree. Current faculty education and experiences provide the expertise to develop 9 of these new courses. The presentation that 9 of the 16 courses can be taught by existing faculty was provided to demonstrate the breath of talent on the existing team that would/could augment the two new faculty. We anticipate the new program will grow in popularity due to its direct link to construction (project management, scheduling, estimating, etc.) and business (finance, accounting, etc.). Just as the inclusion of any new program, the desires of the students as to which major they decide to pursue directs internal resources. We view the faculty team as a whole to meet teaching requirements through the School of Engineering. Additionally, we need to show for ABET we have faculty duplication in coverage of all topics to be taught within this degree. The teaching load for faculty at The Citadel is 8 courses per academic year or 24 credit hours. The 16 construction engineering courses then are the equivalent of 2 faculty hires as outlined in our proposal. Initially, advising will be done by civil engineering faculty as we build out the program to hire the first construction engineering faculty who will take on the advising role. With a finite number of cadets in the Corps, we expect some increase in advising overall for the day program to mirror the overall growth in engineering within the Corps during the

last 5 years. Once the program is approved, we have located a space that is used for larger gatherings of students for club activities which will be converted using donor funds to a classroom and 3 offices. Current labs space is not fully used during the day because of the specificity of certain labs. The primary growth in students is seen within the evening (2+2) program and we have the capacity in both classroom and lab space.

If we only start with freshmen students fall 2018, we will not need to hire the first faculty member until the start of the third year (summer 2020) when the junior level courses are offered. If the current fund raising efforts for the first two years of salary are successful, the evening program would start next fall and we would hire the first construction engineering faculty member in the summer of 2018.

Specific data is provided directly from a sampling of the companies visiting our campus during the engineering career fair, hiring Civil Engineering students across the country to try and fill the gap, or provided data as we reached out through contractor societies that represent and support the construction industry and companies in the Lowcountry. Most of these companies have from 1-10 Citadel alumni working for them in numerous capacities.

Name	Size	Revenue	Location	Number of hires	Other Notes
Edwards Electric (part of Yates Group of Affiliates)	Medium	$220m	Phoenix to Miami to Charleston and all points in-between	6-8 per year	

Name	Size	Revenue	Location	Number of hires	Other Notes
C.R. Hipp Construction, Inc.	Mid-sized		Charleston Area for 50 years	1-2 per year	We have employed many degreed engineers in both civil and mechanical disciplines. Many of these choose to move to design firms after a short time. Those with construction management degrees tend to stay in construction but do not necessarily have the technical training needed for our work
Sanders Brothers Construction CO.	Mid-sized	$50-75m	Tri-county area	2-3 per year	With a success rate of 50% on our internal project management training. Your proposed program would well-prepare individuals entering this program and provide them a jump-start on other fields entering with less real world experience.
Metromount-precast/ prestressed concrete manufacturer	Mid-sized	$300m	5 plants across the Southeast in Atlanta, Orlando, Greenville, Charlotte and Richmond	5 new hires yearly	Our industry will have spots for these graduates before we ever meet them! Big companies like Brasfield and Gorrie, J.E. Dunn, Holder etc. will scoop these graduates up immediately.

TIC – The Industrial Company (part of Kiewit Corporation)	Small to mid-sized	$60m (Kiewit Corp $900m)	Savannah office (GA, FL, SC)	8-10 interns 10 full time per year	

Name	**Size**	**Revenue**	**Location**	**Number of hires**	**Other Notes**
Choate Construction Company	Mid-sized	$900m	Atlanta, Charlotte, Raleigh, Charleston, and Savannah	3-6 project/ const. engineers each year	CE's are lacking skills unless they have done so during internships. Do they want to be a builder or go get their PE? We construct most all types of buildings throughout the Southeast with mostly negotiated work and repeat clients. Difficult to find young folks that want to be a Superintendent (boots on the ground at the project site) and Preconstruction Managers/ Estimators
O.L. Thompson Construction Co. Inc.	Small – 300 employees. 12 Eng/ Project Mgmt team members.		Charleston	1-2 per year	I do like the approach you have chosen. It provides the core fundamentals of Engineering (and the critical thinking that comes with that educational path) but also adequately prepares a student for the business / management path that is probably in more demand than a true PE.
Miller-Valentine Group: MV Commercial Construction LLC	Medium	$250m	SC, NC, GA, OH, TX, IN, KY, WI, WV, IL, IA, OK, KS	5-10/year	Shortage of candidates with Construction related experience.

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.

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
BS Construction Science and Management	Clemson University	Offering of courses in classes in calculus, physics, economics and business, and management, structures, materials and methods, contract documents, estimating, scheduling, safety and project management.	The Citadel BSCONE will provide a strong focus on foundational engineering analysis and design (structures, soils, mechanical and electrical systems, etc.) while integrating these students within civil engineering courses through analysis, include a design and management focused capstone experience and include the business and management skills included in purely construction management programs.
BA in Management, MS in Engineering Management	The University of South Carolina	• Offering of courses in management, • Supervise other engineers using effective people management and negotiation skills, • Organize the team to deliver on-time and on-budget results through proper project management and engineering economics, • Recognize product liability issues with the design from both the manufacturer and customer perspectives, and • Successfully communicate the benefits and obstacles associated with a project to upper management and marketing team to better sell the product.	The Citadel BSCONE will provide a strong focus on foundational engineering analysis and design (structures, soils, mechanical and electrical systems, etc.) while integrating these students within civil engineering courses through analysis, include a design and management focused capstone experience and include the business and management skills included in purely construction management programs, even though a MS in Engineering Management program.

Note:

There are no Bachelor's of Science in Construction Engineering or Construction Management programs in the Lowcountry of South Carolina. There is a BS in Construction Science and Management at Clemson University and only an MS in Engineering Science at The University of South Carolina, which limits the opportunity for local students in the heavily populated area of Charleston to attend face-to-face a Construction Engineering/Management programs without leaving the area as well as limited opportunity for local employees to further their education face-to-face in Construction Engineering/Management. 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. Trident will be able to provide the required freshman and sophomore courses for the Construction Engineering degree as they do now for the other engineering or business programs at The Citadel. Many of these students desire to continue living in the Lowcountry and eventually obtain a BS degree face-to-face.

There are 17 ABET Accredited Construction Engineering programs in other states, including North Carolina State University, Virginia Tech, and the University of Central Florida.

NEW PROGRAM PROPOSAL

Curriculum

Description of the Program

Projected Enrollment						
Year	Fall		Spring		Summer	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
2018-19	25	300	25	300	4	12
2019-20	35	420	35	420	6	18
2020-21	40	480	40	480	10	30
2021-22	45	540	45	540	13	39
2022-23	50	600	50	600	18	54

The projected enrollment includes both evening students (estimated at six credit hours) and Corps of Cadets (estimated at 18 credit hours). The enrollment chart is aggregate. Based on the number of students and lowcountry workers waiting for this type of program, 25 percent attrition in engineering during the freshman year and the addition of new students each year, the aggregated table represents our lower bound estimate for students during the first five years of the program.

Projected Enrollment in Evening Program Only						
Year	Fall		Spring		Summer	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
2017-18	10	90	12	108	4	12
2018-19	15	135	18	162	6	18
2019-20	20	180	24	216	10	30
2020-21	25	225	29	261	13	39
2021-22	30	270	39	351	18	54

The projected numbers for the evening program only is above to support the financial table added below.

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)

Once the program is approved, the articulation agreement with Trident Technical College for Civil, Electrical, and Mechanical engineering will be executed (includes Construction Engineering - - the updated MOU is provided as an attachment).

Curriculum

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

Curriculum by Year					
Course Name	**Credit Hours**	**Course Name**	**Credit Hours**	**Course Name**	**Credit Hours**
Year 1					
Fall		**Spring**		**Summer**	
Core: Western or World Civilizations	3	Core: Western or World Civilizations	3		
Core: Composition and Literature I	3	Core: Composition and Literature II	3		
Core: Precalculus	4	Core: Analytic Geometry and Calculus I	4		
Core: First Year Seminar	1	Core: Physics with Calculus I Lab	3		
Major: Introduction to Civil Engineering	1	Core: Physics with Calculus I Lab	1		
Core: Biology for Engineers	3	Major: Engineering Drawing	2		
Core: Biology for Engineers Lab	1	Core: Required Physical Education	2		
Core: Required Physical Education	2	Core: First Year Seminar	0		
Total Semester Hours	18	Total Semester Hours	18	Total Semester Hours	
Year 2					
Fall		Spring		**Summer**	
Major: Computer Appl for Civil/Env	3	Major: Business Statistics I	3		
Major: Surveying	3	Major: Geospatial Representation	3		
Major: Surveying I Laboratory	1	Major: Geomatics Laboratory	1		
Major: Principles of Microeconomics	3	Major: Statics	3		
Core: General Chemistry I	3	Core: General Chemistry II	3		
Core: General Chemistry I Lab	1	Core: General Chemistry II Lab	1		
Major: Analytic Geometry and Calculus II	4	Core: Technical Writing	3		
Core: Sophomore Seminar/ Lab	1	Core: Required Physical Education	0		
Total Semester Hours	19	Total Semester Hours	17	Total Semester Hours	
Year 3					

Fall		Spring		**Summer**
Major: Mechanics of Materials	3	Major: Structural Analysis and Design	4	

Curriculum by Year					
Course Name	**Credit Hours**	**Course Name**	**Credit Hours**	**Course Name**	**Credit Hours**
Major: Engineering/Commercial Law/Ethics/Safety/Contracts	4	Major: Commercial Construction and Engineer Equipment	3		
Major: Resource Estimating	3	Major: Soils and Foundations (& Lab)	3		
Major: Engineering Materials & Methods (& Lab)	3	Major: Intro to Financial Acct & Reporting	3		
Major: Quality Management/Labor Relations	3	Major: Advanced Estimating	3		
Core: Junior Ethics Enhancement Seminar	0	Major: Engineering Economy	2		
	16	Core: Required Physical Education	0		
Total Semester Hours		Total Semester Hours	18	Total Semester Hours	
Year 4					
Fall		Spring		**Summer**	
Major: Construction Methods & Temporary Structures Design	3	Core: Social Science Core Course	3		
Major: Project Scheduling	3	Major: Facilities Operations and Maintenance (BIM)	3		
Major: Project Management & Engineering Administration	3	Core: British/American/World Literature	3		
Major: Senior Design I	2	Major: Senior Design II	3		
Major: Mechanical and Electrical Systems	3	Major: Production Processes and Rapid Development	3		
Core: Senior Leadership Integration Seminar	0				
Total Semester Hours	14	Total Semester Hours	15	Total Semester Hours	
Year 5					
Fall		**Spring**		**Summer**	

Total Semester Hours		Total Semester Hours		Total Semester Hours	

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

Total Credit Hours Required 135

The Citadel engineering programs have had 2+2 programs in engineering since the mid 1980's. The Citadel will utilize the same process we have for our CE, EE, and most recently ME 2+2 programs (attached letter of support from Trident Technical college with proposal) and provide the program for only the last two years while the first two years are taken at Trident Technical College or similar schools. We have numerous working adults in our evening programs competing the last two years in two years (example table below) or over three or four years as their work and family schedules allow. They complete the first two years in the same fashion before transferring to The Citadel, completing courses as their schedule allows. Our department heads advise these evening students to ensure, based on their schedules, they take the right course in the right sequence to ensure they can take as large of a load as they desire each semester. Normally the last two years starts with courses in the summer they transfer in or take one course with us, four in the fall and spring, one or two in the following summer (depending on the program), and four in the fall and spring to complete in two years after matriculation. Our working adults are each on their own journey based on the life requirements they have. Trident Technical College offers all of the required courses within the first two years of the Construction Engineering program.

Fall		Spring		**Summer**	
Curriculum by Year					
Course Name	**Credit Hours**	**Course Name**	**Credit Hours**	**Course Name**	**Credit Hours**
				Major: Mechanics of Materials	3
Total Semester Hours		Total Semester Hours		Total Semester Hours	3
Fall		Spring		**Summer**	
Curriculum by Year					
Course Name	**Credit Hours**	**Course Name**	**Credit Hours**	**Course Name**	**Credit Hours**

Major: Engineering/Commercial Law/Ethics/Safety/Contracts	4	Major: Structural Analysis and Design	4	Major: Advanced Estimating	3
Major: Resource Estimating	3	Major: Commercial Construction and Engineer Equipment	3	Major: Engineering	2
Major: Engineering Materials & Methods (& Lab)	3	Major: Soils and Foundations (& Lab)	3		
Major: Quality Management/Labor Relations	3	Major: Intro to Financial Acct & Reporting	3		
Total Semester Hours	13	Total Semester Hours	13	Total Semester Hours	5
Year 4					
Fall		Spring		**Summer**	
Major: Construction Methods & Temporary Structures Design	3	Major: Project Management & Engineering Administration	3		
Major: Project Scheduling	3	Major: Facilities Operations and Maintenance (BIM)	3		
Major: Senior Design I	2	Major: Senior Design II	3		
Major: Mechanical and Electrical Systems	3	Major: Production Processes and Rapid Development	3		
Total Semester Hours	11	Total Semester Hours	12	Total Semester Hours	

Course Descriptions for New Courses

Course Name	Description
CONE 302 Engineering/Commercial Law/Ethics/Safety/Contracts	Introduction to basic contract and tort issues and their application in the construction industry; delineation of the various types of contracts and remedies available to parties involved in a construction project; additional related topics including bidding, delays, mechanics liens, site conditions, warranties and the Uniform Commercial Code as it relates to the construction industry. Examine the application of OSHA 29CFR 1926 for the construction industry along with applicable state and federal construction safety laws pertaining to construction, altercations, or repair work at construction site.
CONE 311 Resource Estimating	Systems approach to determining required quantities of construction materials; quantification of various types of foundation systems, structural systems and building envelope systems using excerpts of contract documents from a variety of different building projects.
CONE 320 Engineer Materials & Methods (& Lab)	Materials, methods and sequences of the construction process; emphasis on design, specification, purchase and use of concrete, steel, masonry and timber. An understanding of the uses of construction materials.
CONE 330 Quality Management/Labor Relations	Investigate and apply quality management techniques to improve quality of products and services through implementation of continuous improvement using the Certified Quality Process Analyst (CQPA) Body of Knowledge (BOK), the Certified Six Sigma Green Belt (CSSGB) Body of Knowledge (BOK), and other quality management tools focused on time, money, and quality. These same principles will be applied to labor relations considering labor relations law, contract language and interpretation, and basic collective bargaining and negotiation skills.
CONE 340 Structural Analysis and Design	Application of statics and strength of materials for construction of steel buildings, reinforced concrete structures, reinforced masonry structures, and timber structures with computer analysis and design of specific topics.
CONE 350 Commercial Construction and Engineer Equipment	Prepare students to enter the commercial construction sector through consideration of design, bidding/estimating, value engineering, contracts/negotiation, subcontractor relations, cost controls, management during construction, close out, post-construction requirements and the engineering equipment used during horizontal and vertical construction.
CONE 360 Soils and Foundations (& Lab)	Introduction to soil types found on construction projects; testing, properties and classification of soil; embankment control, dewatering, excavation, foundations, piers, and pilings.

CONE 312 Advanced Estimating	Quantification and pricing of direct field costs and general condition costs from construction documents; the preparation of complete lump sum bid package ready for project execution; utilization of entire set of required contract documents.

CONE 440 Construction Methods & Temporary Structural Design	Common construction methods are introduced and building details are explored considering material applications and detailing in structural and non-structural building components and physical processes lying behind the design of a building's envelope and interior. A set of prints and specifications will structure our discussion of the building process. Study of the materials, methods and techniques associated with temporary structures utilized in various construction operations, such as concrete formwork, scaffolding, falsework/shoring, cofferdams, underpinning, diaphragm/slurry walls, earth-retaining structures, construction dewatering systems, and storm water/retaining pond systems.
CONE 410 Project Scheduling	An introduction to construction project scheduling covering concepts of project selection and scheduling, utilizing the estimate to predict the schedule, scheduling subcontracting, cost controls, project documentation, construction bonds, insurance, payments and the elements of close out.
CONE 415 Project Management & Engineering Administration	Project planning, cost controls, and construction related financial documents including: schedule of values, labor and operations cost reports, income statements, balance sheets and construction budgets; emphasis on the development of techniques required to ethically and effectively monitor the financial aspects of a construction project.
CONE 481 Senior Design I	This course is the first in the Construction Engineering capstone series and provides project definition, project planning, scheduling, and results in a presentation and plan for a 35% presentation.
CONE 460 Mechanical/Electrical Systems	Mechanical and electrical systems with a major emphasis on the estimate and installation, design and control of the electrical, heating, ventilation and cooling system, site planning and acoustical treatments.
CONE 450 Facilities Operations. and Maintenance (BIM)	Each facility has distinct operations, maintenance and capital project delivery needs. Leaders must leverage facility data created throughout the design and construction process and lifecycle to provide safe, healthy, effective and efficient work environments for their clients. The maintenance of this data will create greater efficiencies such as: having accurate as-built information to reduce the cost & time required for renovations; increasing customer satisfaction; and optimizing the operation and maintenance of our building systems to reduce energy usage. Building Information Modelling (BIM) is about ensuring teams have the relevant knowledge and capabilities to achieve best practice and effectively manage information across all stages of your construction projects.
CONE 482 Senior Design II	Utilize information from all previous courses to prepare construction engineering documents for a given project. Respond to an RFP announcement or bid.

CONE 470 Production Processes/Rapid Development	This course is an introduction to manufacturing processes and manufacturing systems including assembly, machining, injection molding, casting, thermoforming, and more. Emphasis on the physics and randomness and how they influence quality, rate, cost, and flexibility. Attention to the relationship between the process and the system, and the process and part design. Project (in small groups) requires fabrication (and some design) of a product using several different processes

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)**
Assistant Professor	Full-time	• CONE 320 Engineer Materials & Methods (& Lab) • CONE 340 Structural Analysis and Design • CONE 440 Construction Methods & Temporary Structural Design	PhD and MS with Structural Focus at Clemson University	Registered Professional Engineer in South Carolina 7 years' experience in light construction
Professor	Full-time	• CONE 320 Engineer Materials & Methods (& Lab) • CONE 340 Structural Analysis and Design • CONE 440 Construction Methods & Temporary Structural Design	PhD with a Structural Engineering focus from Virginia Polytechnic Institute and State University Master's thesis in coastal engineering. Ph.D. dissertation focused on finite element modeling and earthquake engineering. Practical experience includes 15 years of structural design including the design of award winning buildings and marine structures.	Registered Professional Engineer in South Carolina
Associate Professor	Full-time	• CONE 320 Engineer Materials & Methods (& Lab) • CONE 340 Structural Analysis and Design	PhD and MS both with a Structural Engineering focus from Clemson	

		• CONE 440 Construction Methods & Temporary Structural Design	University	
Assistant Professor	Full-time	• CONE 360 Soils and Foundations (& Lab) • CONE 320 Engineer Materials & Methods (& Lab)	PhD and MS both with a Geotechnical Engineering focus from Arizona State University	4 years of Geotechnical Engineering Design Experience. Professional Engineer in SC.
Assistant Professor	Full-time	• CONE 360 Soils and Foundations (& Lab) • CONE 320 Engineer Materials & Methods (& Lab) • CONE 320 Engineer Materials & Methods (& Lab) • CONE 340 Structural Analysis and Design • CONE 440 Construction Methods & Temporary Structural Design	PhD and MS in Civil Engineering from Texas Tech University	Passed FE. Will become EIT registered in SC on way to future PE exam and registration
Associate Professor	Full-time	• CONE 302 Engineering/Commercial Law/Ethics/Safety/Contracts 3 Credit Hours • CONE 311 Resource Estimating • CONE 330 Quality Management/Labor Relations • CONE 350 Commercial Construction and Engineer Equipment • CONE 312 Advanced Estimating • CONE 410 Project Scheduling • CONE 415 Project Management & Engineering Administration • CONE 481 Senior Design I • CONE 450 Facilities Operations. and Maintenance (BIM) • CONE 482 Senior Design II • CONE 470 Production Processes/Rapid Development	PhD and MS in Construction Management at Clemson University	4 years industry construction management experience, Registered Professional Engineer in South Carolina
Assistant/Associate Professor * New – hire Spring 2017	Full-time	• CONE 302 Engineering/Commercial Law/Ethics/Safety/Contracts 3 Credit Hours • CONE 311 Resource Estimating • CONE 330 Quality Management/Labor Relations • CONE 350 Commercial construction and Engineer Equipment	PhD/MS in Civil Engineering/Project Management or Engineering/Project Management Experience	

		• CONE 312 Advanced Estimating • CONE 410 Project Scheduling • CONE 415 Project Management & Engineering Administration • CONE 481 Senior Design I • CONE 450 Facilities Operations. and Maintenance (BIM) • CONE 482 Senior Design II • CONE 470 Production Processes/Rapid Development		
Assistant Professor * New – Hire after approval…Aug 2020	Full-time	• CONE 302 Engineering/Commercial Law/Ethics/Safety/Contracts 3 Credit Hours • CONE 311 Resource Estimating • CONE 330 Quality Management/Labor Relations • CONE 350 Engineer Equipment • CONE 312 Advanced Estimating • CONE 410 Project Scheduling • CONE 415 Project Management & Engineering Administration • CONE 481 Senior Design I • CONE 450 Facilities Operations. and Maintenance (BIM) • CONE 482 Senior Design II • CONE 470 Production Processes/Rapid Development	PhD/MS in Civil Engineering/Construction	
Assistant Professor * New – Hire after approval…Aug 2021	Full -time	• CONE 302 Engineering/Commercial Law/Ethics/Safety/Contracts 3 Credit Hours • CONE 311 Resource Estimating • CONE 330 Quality Management/Labor Relations • CONE 350 Engineer Equipment • CONE 312 Advanced Estimating • CONE 410 Project Scheduling • CONE 415 Project Management & Engineering Administration • CONE 481 Senior Design I	PhD in Construction or Construction Management	

		• CONE 450 Facilities Operations. and Maintenance (BIM) • CONE 482 Senior Design II • CONE 470 Production Processes/Rapid Development		
Associate Professor	Full-Time	• CONE 430 Mechanical/Electrical Systems	PhD. And MS in Mechanical Systems at The University of Texas at Austin	Professional Engineer (MO)
Professor	Full-Time	• CONE 430 Mechanical/Electrical Systems	PhD and MS in Electrical Engineering Systems at Naval Post Graduate School	

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	2	Staff	0	Administration	0

Expect to hire the first new FTE in 2019-2020. Request position within 2018-2019 budget build. Expect to hire the second new FTE in 2020-2021. Request position within 2019-2020 budget build. Already have one faculty member and hiring another in Jan 2017 as part of the MS in Project Management that will also teach within this new program. They will be able to develop initial courses.

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 for individual faculty members) in the following three areas: research seed funding, result presentations at conferences, and/or participate in faculty development opportunities. Last year, the majority of Citadel faculty received this funding support. The new BSCONE program will start with current available faculty teaching courses within the first two years of the program and the first new FTE teaching the third year along with existing faculty and the second new FTE teaching within the program's first class taking senior courses and the second class taking junior level courses. There are existing faculty with required skills for all existing and many new courses within the civil, electrical, and mechanical engineering BS and MS programs and the project management MS program as shown in the faculty table. **The staff and administration positions supporting the BSCE will initially support the BSCONE program. Based on program demand, the determination of splitting into a separate department or keeping it a part of an existing department will be made.**

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 (construction 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). These also support Construction Engineering.

The new BSME program has purchased a print version of the entire ASTM package. The Citadel currently spends approximately $40,000 on library resources 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 day and evening students who would be taking courses within the BSCONE degree. The Corps of Cadets size is currently limited by beds and dining facility size (full residential model). Cadets (day) students moving into construction engineering will decrease the students in other majors on campus during the day; i.e., current student support services are sufficient. It is expected that a majority of the evening students will be full time employed.

There are no academic support services required for this program beyond the already robust services The Citadel offers to all students and no additional fees are anticipated. The Citadel's numerous student support programs, services, and activities are highlighted in the academic catalog. These services include The Citadel Academic Support Center, Academic Advising, Office of Multicultural Student Services, Student Activities, the Krause Center for Leadership and Ethics, and the Study Abroad Office. Two offices are dedicated to supporting students with academic projects or assignments that require the use of technology or training in oral presentations. Multimedia Services helps students with such things as video and audio production, web page design, and graphics production. The Oral Communications Lab offers support services for students who wish to improve their presentation skills. The Academic Support Center is open in the evening and is available for all of our students. Also all of our Supplemental Instruction (SI) which is student led tutoring occurs in the evening after 8:30 PM. Our evening courses start at 5:30 and end between 8:30 and 9 PM depending if the course is a lab or lecture only. These SI sessions are available for all of our students, day or evening.

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 (first graduates 2016) as well as the equipment used within the BSCE and BSEE programs will support all physical demonstrations/laboratories needed within BSCONE level courses.

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)

N/A – requires 2 offices for the two new faculty. The current lab space in CE and ME areas are sufficient to support labs through scheduling. The academic unit currently has an extra office space. The academic unit has determined a room that once could be split in half for small groups. It is currently used for club meetings. Once the construction engineering program is approved, the academic unit will renovate this space to convert to a new classroom as well as 3 faculty offices to support this new program. The new faculty will be hired as the first cohort of students are entering their junior (fall 2020) and then senior year (Fall 2021); thereby providing the time necessary to renovate the space. This renovation plan has been in place for over two years when we initiated the discussions on adding construction engineering to our program offerings.

NEW PROGRAM PROPOSAL

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	10,000	10,000	103,000	206,000	206,000	535,000
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	10,500	10,500	103,500	206,500	206,500	537,500

Sources of Financing						
Category	**1st**	**2nd**	**3rd**	**4th**	**5th**	**Total**
Tuition Funding	534,405	717,940	734,140	750,340	766,540	3,503,365
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	534,405	717,940	734,140	750,340	766,540	3,503,365
Net Total (i.e., Estimated New Costs Minus Sources of Financing	523,905	707,440	630,640	543,840	560,040	2,965,865

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

** Aggregate for our day and evening UG programs.

Estimated New Costs by Year***						
Category	**1st**	**2nd**	**3rd**	**4th**	**5th**	**Total**
Program Administration	0	0	0	0	0	0
Faculty and Staff Salaries	10,000	10,000	103,000	206,000	206,000	535,000
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	10,500	10,500	103,500	206,500	206,500	537,500

Sources of Financing						
Category	**1st**	**2nd**	**3rd**	**4th**	**5th**	**Total**
Tuition Funding	95,760	143,640	194,256	239,400	307,800	980,836
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	95,760	143,640	194,256	239,400	307,800	980,836
Net Total (i.e., Estimated New Costs Minus Sources of Financing	85,260	133,140	90,756	32,900	101,300	443,356

*** Evening UG students only.

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.

The budget includes $10,000 in adjunct costs for the first two years, with a new faculty line added in the third year and a second faculty line added in year four of the program.

The $3 million surplus is if we consider the aggregate; however, the cadets are a finite number based on beds in our fully residential day program. We are at capacity with our day program. The surplus is actually $445,000 based on estimated evening enrollments where true growth in possible. The table for only the evening program is above. The increased revenue (beyond the cost of instruction) will go to the E&G fund of the college to support the overall costs related to the academic experience such as academic support, library services, career services, admissions and marketing.

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/EE completed their official reaccreditation in July 2015). The new ME program had its initial accreditation visit in Nov 2016 with final results in July 2017. The BSCONE program will track accomplishment of Program Outcomes through the Taskstream software. Taskstream's platforms provide a centralized information and communication hub for assessment, accreditation, and planning activities across an institution. These include academic and non-academic outcomes assessment, planning, and program review. Taskstream offers specialized tools that enable users to document learning outcomes, align outcomes to institutional goals and standards, develop assessment plans, create curriculum maps, manage faculty credentials, and improve education based on findings. Taskstream's suite of tools facilitates the collection of student work, student reflections on the learning process, and faculty or peer rubric-based assessment. Rubrics, which are used to clarify expectations and scoring criteria, may also be aligned with established learning outcomes, standards, and competencies. The software provides reporting capabilities to support the aggregation and analysis of student performance data for the review of program and institutional effectiveness, as well as for reporting to accrediting agencies and other external stakeholders.

All programs within the School of Engineering track employment or employment changes after completion of each degree. The BSCONE will track employment data in a similar way, but will also track from where students are initiating their BSCONE (full-time students,

evening full-time or part-time students). Surveys from employers will be part of the post- graduation assessment data. Additionally, Fundamental Engineer (FE) and Professional Engineering (PE) success rates will be used to assess the program.

Student Learning Assessment

Expected Student Learning Outcomes	Methods of/Criteria for Assessment
apply knowledge of mathematics, science, and engineering	Exams, design projects, homework Courses: CONE 340, CONE 360, CONE 440, CONE 481, CONE 460, CONE 482, CONE 470
design and conduct experiments, as well as to analyze and interpret data	Exams, design projects, homework Courses: CONE 320, CONE 360, CONE 470
design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	Exams, design projects, homework Courses: CONE 302, CONE 340, CONE 350, CONE 360, CONE 312, CONE 440, CONE 410, CONE 481, CONE 460, CONE 450, CONE 482, CONE 470
function on multidisciplinary teams	Exams, design projects, homework Courses: CONE 330, CONE 340, CONE 360, CONE 440, CONE 410, CONE 415, CONE 481, CONE 460, CONE 482,
identify, formulate, and solve engineering problems	Exams, design projects, homework Courses: CONE 340, CONE 350, CONE 360, CONE 312, CONE 440, CONE 410, CONE 415, CONE 481, CONE 460, CONE 450, CONE 482, CONE 470

comprehend professional and ethical responsibility	Exams, design projects, homework, presentations Courses: CONE 302, CONE 311, CONE 320, CONE 330, CONE 340, CONE 350, CONE 360, CONE 312, CONE 440, CONE 410, CONE 415, CONE 481, CONE 460, CONE 450, CONE 482, CONE 470

communicate effectively	Papers, design projects, homework, presentations Courses: CONE 302, CONE 311, CONE 320, CONE 330, CONE 340, CONE 350, CONE 360, CONE 312, CONE 440, CONE 410, CONE 415, CONE 481, CONE 460, CONE 450, CONE 482, CONE 470
comprehend the impact of engineering solutions in a global, economic, environmental, and societal context through a broad education	Exams, design projects, homework, presentations Courses: CONE 302, CONE 320, CONE 330, CONE 340, CONE 350, CONE 360, CONE 312, CONE 440, CONE 410, CONE 415, CONE 481, CONE 460, CONE 450, CONE 482, CONE 470
recognize the need for and engage in life-long learning	Exams, design projects, homework, presentations Courses: CONE 302, CONE 320, CONE 330, CONE 340, CONE 350, CONE 360, CONE 312, CONE 440, CONE 410, CONE 415, CONE 481, CONE 460, CONE 450, CONE 482, CONE 470
apply knowledge of contemporary issues within solutions	Exams, design projects, homework, presentations Courses: CONE 302, CONE 330, CONE 350, CONE 360, CONE 312, CONE 440, CONE 410, CONE 415, CONE 481, CONE 460, CONE 450, CONE 482, CONE 470
use the techniques, skills, and modern engineering tools necessary for engineering practice	Exams, design projects, homework, presentations Courses: CONE 311, CONE 340, CONE 350, CONE 360, CONE 312, CONE 440, CONE 410, CONE 415, CONE 481, CONE 482, CONE 470

NEW PROGRAM PROPOSAL

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)

The program will seek ABET EAC accreditation after its first graduate which is expected in May 2020 if the program begins in fall 2018. With three ABET accredited programs at The Citadel and a fourth receiving its initial accreditation visit in Nov 2016 (accreditation granted in Aug 2017), The Citadel has the processes and systems in place to achieve accreditation. Construction Engineering will be using the same assessment methods and systems.

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)

The program does not lead directly to engineering licensure by simple completion of the degree, but graduates will be prepared and required to take the Fundament Engineering (FE) exam prior to graduation. They will be encouraged to apply for Engineer-in-Training (EIT) registration upon passing the FE and graduating as well as apply to take the Professional Engineering (PE) exam four years after passing the FE and becoming an EIT.

There are several opportunities for students to gain practical experience. Here is a summary of a few significant examples:

Two- Semester Capstone Experience – The construction engineering curriculum culminates in senior capstone experience. The plan is to model this from the existing capstone experience in the civil engineering curriculum. The two-semester course focuses on a current major project in the Charleston Area and brings together professionals, faculty, and students to model the life of the project in the classroom. Student, working in teams, are stretched to apply all they have learned through the curriculum to accomplish the scope of the project. Professional are involved in all phases of the experience and it culminates in the students giving formal presentations of their project to a board of professionals. The Civil Engineering program experience has been recognized nationally multiple times by NCEES (National Council of Examiners for Engineering and Surveying) with an Engineering Award given to school for incorporating practicing engineers and practical experiences in the education of undergraduates.

Internships – The Civil Engineering Department currently has a robust relationship with companies interested in hiring students for both summer and during the school year internship experiences. Last summer for example, the department had 100% of the rising seniors and over 90% of the rising juniors who were seeking this type of experience employed in internships. Many of these opportunities were in the construction area from companies who would hire both civil engineering students as well as construction engineering student.

Full Time Employment – Many companies are interested in hiring student from our evening program to work full time during the day. The Citadel helps to make these connections as student leave summer internship opportunities and companies still have workforce demands during the school year. There is historically more opportunities than students who wish to take advantage of them.

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.