

**New Program Proposal  
 Master of Science in Electrical Engineering  
 The Citadel**

**Summary**

The Citadel requests approval to offer a program leading to the Master of Science in Electrical Engineering to be implemented in August 2016. The proposed program is to be offered through traditional instruction. 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 is attached.

<b>Stages of Consideration</b>	<b>Date</b>	<b>Comments</b>
Program Proposal Received	8/1/15	Not Applicable
Comments and suggestions from CHE staff sent to the institution	8/21/15	Staff requested the proposal be revised to: <ul style="list-style-type: none"> <li>• Identify the companies requesting the program</li> <li>• Revise the Curriculum by Category chart to show the core requirements, electives, and other requirements in addition to the focus area requirements.</li> <li>• Revise the language in the proposal to make it clear that the focus area is a collection of electives, but not an official concentration, option or track.</li> <li>• Explain that if the student is interested in earning a graduate certificate in one of the focus areas, the student will need to complete additional coursework to meet all of the requirements of the certificate program.</li> <li>• Provide the total FTE needed to support the program.</li> <li>• Provide an estimated hire date for the new faculty member.</li> <li>• Clarify the amount of funds spent on library resources for engineering.</li> <li>• Explain The Citadel's relationship with the Clemson Restoration Institute.</li> <li>• Provide the implementation date for the new BSME program in the Physical Resources section.</li> </ul>

Stages of Consideration	Date	Comments
		<ul style="list-style-type: none"> <li>• Describe the Taskstream software and provide more detail as programmatic assessment.</li> <li>• Identify the specific courses in which the particular Student Learning Outcome will be assessed.</li> </ul>
ACAP Consideration	9/10/15	<p>ACAP members discussed the need for the proposed program. Representatives from Academic Affairs, Clemson, Coastal Carolina University, USC Aiken, and Winthrop, requested the following explanations:</p> <ul style="list-style-type: none"> <li>• Source of faculty personnel (full-time or part-time via recruitment, re-assignment, or otherwise) needed to teach the new courseload</li> <li>• Total number of new courses and projected budget for new course implementation</li> <li>• Details about collaboration with Clemson</li> <li>• Capability to provide student support</li> <li>• A description of the proposed program certificates</li> </ul>
Revised Program Proposal Received	9/16/2015	The revised proposal and appendix satisfactorily addressed the requested revisions.

**Recommendation**

The staff recommends that the Committee on Academic Affairs and Licensing commend favorably to the Commission the program leading to the Master of Science in Electrical Engineering to be implemented in August 2016.

## NEW PROGRAM PROPOSAL

Name of Institution  
The Citadel

Name of Program (include concentrations, options, and tracks)  
Masters of Science in Electrical Engineering

### 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 2016

CIP Code  
14.1001

Delivery Site(s)  
Courses offered on-site and/or at the Low Country Graduate Center

### 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)  
Dr. Ronald Welch  
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Institutional Approvals and Dates of Approval  
Graduate Curriculum Committee: 17 Feb 2015  
Academic Board: 24 Feb 2015  
President: 10 April 2015

## NEW PROGRAM PROPOSAL

### Background Information

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

The MSEE is intended to meet the expressed needs of South Carolina industries, especially Charleston based companies. Nationally, Electrical Engineering is broken out as a separate category by the Department of Labor which shows that electrical engineers are the most hired group of engineers after civil 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 electrical engineering, aviation, defense applications, power and energy firms, manufacturing, and many others. The MSEE 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 such as Boeing, SC Electric and Gas, Santee Cooper, Daimler, etc. The desire to hire local talent and educate an existing workforce drives the need for a local graduate EE program to complement an existing undergraduate engineering program. Our ability to offer graduate courses within The Citadel MSEE 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 electrical engineers are a necessary and diverse core engineering skill set that are primarily focused on power and energy, controlling manufacturing processes and professional services.

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 Electrical Engineering will, by the time of graduation:

- **Outcome 1:** Demonstrate breadth of knowledge in complimentary areas of electrical 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 electrical 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.

## NEW PROGRAM PROPOSAL

### 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 2010-2011 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."

**NEW PROGRAM PROPOSAL**

<b>Employment Opportunities</b>			
<b>Occupation</b>	<b>Expected Number of Jobs</b>	<b>Employment Projection</b>	<b>Data Source</b>
Based on industry input noted above, a majority of students will be fully employed and part-time students. In-depth discussion in next section.			

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

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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. 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. 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 MSEE and its associated certificates will be existing mid-level employees with Lowcountry companies working to improve their current skill set. Our industry contacts as well as our robust departmental industry advisory board (list attached in the Appendix) have been asking for a number of years for engineering level master degrees 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 master's degree helps distinguish a candidate for promotion and advancement within the company and 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 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 MSEE degree. The new electrical 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 MSEE degree at The Citadel will support the needs of local students 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 BSEE 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

**NEW PROGRAM PROPOSAL**

**List of Similar Programs in South Carolina**

<b>Program Name</b>	<b>Institution</b>	<b>Similarities</b>	<b>Differences</b>
MSEE	Clemson University	Offering of courses in computer engineering, power and energy engineering, and electromagnetics (RF) engineering	The Citadel MSEE will only be a no thesis MS degree, only requires 6 EE courses and the other 4 courses can be Technical (ME, CE, EE, other) or non-technical (accounting, business, leadership, project management, etc.)
MSEE	The University of South Carolina	Offering of courses in computer engineering, power and energy engineering, and electromagnetics (RF) engineering	The Citadel MSEE will only be a no thesis MS degree, only requires 6 EE courses and the other 4 courses can be Technical (ME, CE, EE, other) or non-technical (accounting, business, leadership, project management, etc.)

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

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**Description of the Program**

<b>Projected Enrollment</b>						
<b>Year</b>	<b>Fall</b>		<b>Spring</b>		<b>Summer</b>	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
2016-2017	5	45	5	45	3	9
2017-2018	10	90	12	90	6	18
2018-2019	15	135	19	135	10	30
2019-2020	17	153	29	153	13	39
2020-2021	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)



## NEW PROGRAM PROPOSAL

### Notes:

The new electrical 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 MSEE 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 three main focus areas to meet the needs of the local industry in South Carolina: Computer engineering (in this submittal) and in the future power and energy engineering and electromagnetics (RF) engineering. The focus areas comprise a collection of electives, but not an official concentration, option, or track, and will not be recorded on a student's transcript. If the student is interested in earning a graduate certificate in one of the focus areas, the student will need to complete the necessary coursework to meet all of the requirements of the certificate program

Table 1: MS Electrical 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	33	30	30
Core / Focus Area Possibilities	Computer Engineering Power and Energy Engineering Electromagnetics Engineering	Communications Electromagnetics Mechatronics Electronics Photonics Computer Architecture Software Enabled Systems Renewable Energy Power Systems Engineering Advanced power Systems Engineering Minor outside of Engineering (2 courses – Math, Physics, Computer Science, or Industrial Engineering)		Power systems Power electronics Simulation environments for power electronics and interdisciplinary systems Microwave power amplifier and MOS devices based on wide bandgap semiconductors Growth device processing, and characterization of wide bandgap (SiC and GanN) semiconductors Nanoelectronics Electromagnetic scattering Wireless communication applications Outdoor and indoor wave propagation Millimeter-wave integrated circuits Microwave and antenna design Electronic packaging	
Other Tech	N/A	Advisor	Advisor	Advisor	Advisor
Other	12	Advisor	Advisor	Advisor	Advisor

Citadel MS in Electrical Engineering:

- 30 credit hours, non-thesis
- Require at least 6 courses (18 hours) in technical classes

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- 4 courses (12 hours) in technical or non-technical classes (Mechanical, Electrical, Civil, Mathematics, Science, Program Management, Business, Leadership)

Example Course Plan:

If a student, for example, has a focus in Computer Engineering, he/she must take the 4 Computer Engineering courses. The remaining technical courses must be a minimum combination of 2 from the Other Technical Courses. The Other 4 courses can be from non-technical (Business, Leadership, Program Management) or from technical programs (Mechanical, Electrical, or Civil, Mathematics, Science). See example in Table 2, below.

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

	Course # and Title	Credit Hours
MS EE Tech Courses	ELEC 675      Computer Architecture	3
	ELEC 645      Data Communications Networks	3
	ELEC 655      Digital Communications	3
	ELEC 635      Adaptive Signal Processing	3
	ELEC 605      Advanced Power Systems	3
	ELEC 615      Spectral Analysis	3
Other Courses	PMGT 650 Overview of Technical Project Management	3
	PMGT 651Tech Project Planning and Scheduling	3
	PMGT 671: Project Manager Leadership Development	3
	BADM 604 Foundation of Management and Organization	3
		30 Total

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**Course Descriptions for New Courses**

<b>Course Name</b>	<b>Description</b>
All courses above currently exist in The Citadel's graduate catalog as previous single offerings, most recently as electives within the MS in Project Management.	

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**Faculty**

<b>Faculty and Administrative Personnel</b>				
<b>Rank</b>	<b>Full- or Part-time</b>	<b>Courses Taught or To be Taught, Including Term, Course Number &amp; Title, Credit Hours</b>	<b>Academic Degrees and Coursework Relevant to Courses Taught, Including Institution and Major</b>	<b>Other Qualifications and Comments (i.e., explain role and/or changes in assignment)</b>
Professor	Full-time	ELEC 635, Adaptive Signal Processing, 3 credit hours, <i>to be taught</i>	BS, MS and PhD, Electrical Engineering MS, Acoustics Engineering	Fundamental research in Wavelet Theory/Signal Analysis, Extensive graduate and undergraduate teaching in area.
Professor	Full-Time	ELEC 605, Advanced Power Systems, 3 credit hours, <i>to be taught</i>	BS, MS and PhD, Electrical Engineering	Fundamental research in advanced power systems. Extensive undergraduate teaching in area.
Professor	Full-time	ELEC 665, Fundamentals of Advanced Energy Conversion, 3 credit hours, <i>initially taught</i> - spring 2011	BS, MS and PhD, Electrical Engineering	Fundamental research in photovoltaic energy conversion, Graduate and undergraduate teaching experience in area.
Associate Professor	Full-time	ELEC 675, Computer Architecture, 3 credit hours, <i>initially taught</i> - summer 2012	BS in Computer Science, MS and PhD in Electrical Engineering	Fundamental research in computer hardware architecture. Graduate and undergraduate teaching experience in area.
Associate Professor	Full-Time	ELEC 645, Data Communications Networks, 3 credit hours, <i>to be taught</i> ELEC 655, Digital Communications, 3 credit hours, <i>to be taught</i>	BS, MS and PhD, Electrical Engineering	Fundamental research in wireless networks. Extensive undergraduate teaching in area.
Associate Professor	Full-time	ELEC 615, Spectral Analysis, 3 credit hours, <i>to be taught</i>	BS, MS and PhD, Electrical Engineering	Fundamental research in digital filtering. Extensive undergraduate teaching in area.
Assistant Professor	Full-time	ELEC 625, RF Systems, 2 credit hours, <i>initially taught</i> – summer 2011	BS, MS and PhD, Electrical Engineering	Fundamental research in RADAR systems. Focused undergraduate teaching experience in RF Systems.

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

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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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**Expect to hire the new FTE in 2016-2017. Request position within 2016-2017 budget build.**

### 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 MSEE 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 4 graduate courses per semester with one additional FTE faculty member in 2017. The staff and administration positions supporting the BSEE will also support the MSEE 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 Electrical 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 electrical and electronic engineering are *IEEE Wireless Communications*; *IEEE Journal of Solid-State Circuits*; *IEEE Communications and Tutorials*; *IEEE Journal on Selected Areas in Communications*; and *International Journal of Robotics Research* (access through Sage). The Citadel has access to all of them.

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 library resources for engineering.

## **NEW PROGRAM PROPOSAL**

### **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 MSEE 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. The Citadel and Clemson support credit (up to five courses) for each other's masters programs and The Citadel courses and faculty could support the research and associated courses at 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 started in fall 2014 as well as the equipment used within the BSCE and BSEE programs will support any physical demonstrations needed within MSEE level courses. Since the MSEE degree requires only 10 courses and no thesis, the lab equipment needs will be limited to support for displaying theoretical concepts within a given course. The focus areas: computer engineering, power and energy engineering and electromagnetics (RF) engineering follow the focus areas within the BSEE 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)

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**Financial Support**

<b>Estimated New Costs by Year</b>						
<b>Category</b>	<b>1<sup>st</sup></b>	<b>2<sup>nd</sup></b>	<b>3<sup>rd</sup></b>	<b>4<sup>th</sup></b>	<b>5<sup>th</sup></b>	<b>Total</b>
<b>Category</b>	<b>1<sup>st</sup></b>	<b>2<sup>nd</sup></b>	<b>3<sup>rd</sup></b>	<b>4<sup>th</sup></b>	<b>5<sup>th</sup></b>	<b>Total</b>
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
<b>Total</b>	<b>6,500</b>	<b>12,500</b>	<b>105,500</b>	<b>105,500</b>	<b>117,500</b>	<b>347,500</b>
<b>Sources of Financing</b>						
<b>Category</b>	<b>1<sup>st</sup></b>	<b>2<sup>nd</sup></b>	<b>3<sup>rd</sup></b>	<b>4<sup>th</sup></b>	<b>5<sup>th</sup></b>	<b>Total</b>
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
<b>Total</b>	<b>19,500</b>	<b>45,000</b>	<b>72,000</b>	<b>109,500</b>	<b>147,000</b>	<b>393,000</b>
<b>Net Total</b> (i.e., Estimated New Costs Minus Sources of Financing)	<b>13,000</b>	<b>32,500</b>	<b>(33,500)</b>	<b>4,000</b>	<b>29,500</b>	<b>45,500</b>

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

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### 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 (EE 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 MSEE 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 MSEE will track employment data in a similar way, but will also track from where students are initiating their MSEE (full-time employment, research, full-time schooling by continuing their education after a BSEE, etc.). External indicators such as surveys from employers and continuing education institutions, along with professional registration (PE) success rates will be part of the post-graduation assessment data. Additionally, internal indicators such as, course evaluations, student surveys, and imbedded course indicators will be used to assess the program.

## NEW PROGRAM PROPOSAL

### Student Learning Assessment

<b>Expected Student Learning Outcomes</b>	<b>Methods of/Criteria for Assessment</b>
Demonstrate breadth of knowledge in complimentary areas of electrical engineering that promotes an awareness of and skill in interdisciplinary problem solving	Exams, design projects Courses: ELEC 605, ELEC 615, ELEC 625, ELEC 665,
Demonstrate a depth of knowledge in a chosen focus area of electrical engineering that allows the student to apply innovative techniques to solve problems	Exams, design projects Courses: ELEC 635, ELEC 645, ELEC 655, ELEC 675
Demonstrate knowledge in methods of advanced analysis appropriate for professional use when solving problems	Exams, design projects, homework Courses: ELEC 605, ELEC 615, ELEC 625, ELEC 635, ELEC 645, ELEC 655, ELEC 665, ELEC 675
Demonstrate knowledge of contemporary issues in their chosen focus area	Papers, presentations Courses: ELEC 635, ELEC 645, ELEC 655, ELEC 675
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 Courses: ELEC 605, ELEC 615, ELEC 625, ELEC 635, ELEC 645, ELEC 655, ELEC 665, ELEC 675
Demonstrate preparation for successful careers in industry or continued graduate work and an ethic for lifelong learning	Surveys, work placement tracking Courses: ELEC 635, ELEC 645, ELEC 655, ELEC 675

Program Specific Accreditation:

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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)

n/a

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)

n/a

### 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

n/a

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

Electrical Engineering  
Appendix – Additional Questions from CHE

**1. How are we going to fund the new degree when we have asked for no money and placed none in the table?**

The new electrical engineering (EE) degree will start slowly allowing the administration to gage interest and demand, and at the same time, not strain any existing resources. We anticipate the majority of the initial students to be part-time since they will be full-time employed within the Low Country. The new degree requires no new infrastructure, laboratory facilities, or services since the new master's degree is an evening program and a majority of our undergraduate courses and laboratories are completed by 5 PM each day; therefore, we have the infrastructure to support the new MS degree which begins after 5 PM.

Initially, full time PhDs at The Citadel will teach the MSEE courses and will be compensated with add pay. In subsequent years, adjuncts will be used to fill teaching opportunities within the undergraduate degree to allow PhD credentialed faculty to teach within the graduate degree as the demand increases. Currently the program only utilizes 1-2 adjuncts per year teaching one course to support the undergraduate program. A full time faculty member will be hired when the demand for full time graduate courses grows to justify a full time position. The administration of the program will initially be handled by the Department Head with the addition of a program director (course reduction for an existing faculty member) once the work load and revenue generation allow for that increase

**2. How we plan to roll-out the new programs.**

Summary: The electrical engineering (EE) program has selected the Computer Engineering focus area to offer to the first cohort of students. In the first cohort (2-3 years), we expect the current faculty to be able to develop and teach two courses over the summer term. Students will be able to take non-technical graduate level courses in Program Management, Business, Leadership or technical graduate level courses in other engineering departments such as mechanical and civil. In addition and based on availability, students will be able to take technical classes offered at Clemson. Students must complete at least six technical courses. The remaining four courses can be technical or non-technical.

Example: Students would earn a MSEE selecting the following sequence of courses:

Table 1: Example MSEE Sequence

Term	Technical Courses	Non-Technical Courses
<b>Academic Year 1</b>		
Summer	ELEC 675: Computer Architecture	
	ELEC 645: Data Communications Networks	
Fall	Potential for Clemson Transfer Class	PMGT <i>or</i> BADM 600/700 level
		Note: PMGT and BADM courses are currently offered fall, spring, and summer and can support additional enrollment.
Spring	Potential for Clemson Transfer Class	PMGT <i>or</i> BADM 600/700 level
<b>Academic Year 2</b>		
Summer	ELEC 655: Digital Communications	
	ELEC 635: Adaptive Signal Processing	
Fall	Potential for Clemson Transfer Class	PMGT <i>or</i> BADM 600/700 level
Spring	Potential for Clemson Transfer Class	PMGT <i>or</i> BADM 600/700 level
<b>Academic Year 3</b>		
Summer	ELEC 605: Advanced Power Systems	
	ELEC 625: RF Systems	

Priority: The following table lists the initial priority of focus areas with the course development sequence within each.

Table 2: MSEE Course Priority for Development

Computer Engineering	Courses	Development / Offering
	ELEC 675: Computer Architecture ELEC 645: Data Communications Networks	Year 1
	ELEC 655: Digital Communications ELEC 635: Adaptive Signal Processing	Year 2
	ELEC 605: Advanced Power Systems ELEC 625: RF Systems	Year 3
	ELEC 665: Fundamentals of Advanced Energy Conversion ELEC 615: Spectral Analysis	Year 4

**3. How our relationship with Clemson at the restoration center will influence funding and/or roll-out of the new programs.**

An articulation agreement (ref TIGE, The Institute for Graduate Education) between The Citadel and Clemson is in effect for the new MS programs. The Citadel and Clemson support credit (up to five courses) for each other’s masters programs. This is above the typical limit of 9-12 transfer hours or 3-4 courses from another institution. Under the agreement, The Citadel’s courses and faculty could support the research and associated courses (graduate level) at Clemson’s Restoration Institute. This relationship will help to provide additional students and course offering that neither institution would have individually. The Citadel currently has one faculty member and two students working with Clemson’s Restoration Institute.

**4. Complete list of current faculty, adjunct, and staff supporting the program. We are in the process of adding additional adjuncts once the MS program is approved.**

Faculty Name	Highest Degree Earned- Field and Year	Rank <sup>1</sup>	FT or PT <sup>3</sup>	Years of Experience			Professional Registration/ Certification
				Govt./Ind. Practice	Teaching	This Institution	
Barsanti	PhD- EE 2001	P	FT	15	17	12	None
Hayne	PhD- EE 1999	ASC	FT	12	12	8	None
Mazzaro	PhD- EE 2009	AST	FT	4	1	1	None
McKinney	PhD- EE 1999	ASC	FT	8	16	16	None
Peeples	PhD- EE 1978	P	FT	30	17	15	P.E. (SC)
Potisuk	PhD- EE 1995	ASC	FT	2	21	9	None
Skinner	PhD- EE 2005	ASC	FT	5	9	9	P.E. (SC)
Askins	PhD- EE 1972	P	PT	20	40	34	P.E. (SC)
Weatherford	PhD-EE 2011	I	PT	15	3	3	None
Rabb	PhD- ME 2007	ASC	FT	19	7	1	P.E. (MO)

5. As can be seen below, we have a robust and very active in the lowcountry set of industry advisors for our program. They have been voicing a need for face-to-face MS degrees for years to ensure the continuous improved technical competence, company advancement, and promotion opportunities.

<b>Name</b>	<b>Organization</b>	<b>Education</b>
<b>Harold (Bud) Askins, Jr., Ph.D., P.E.</b>	The Citadel Professor Emeritus of Electrical and Computer Engineering	B.S. Electrical Engineering, The Citadel, 1961 M.S. Electrical Engineering, Clemson University, 1963 Ph.D. Electrical Engineering, Purdue University, 1972
<b>James (Buddy) Black, <i>Past Chair</i></b>	Nova Technologies, President and CEO Panama City, FL	B.S. Electrical Engineering, The Citadel, 1978  M.S. Electrical Engineering, Clemson University, 1979
<b>Joseph (Joe) Busby, Ph.D., P.E., <i>Past Chair</i></b>	Optiquet Technologies, LLC, Principle Greenville, SC	B.S. Electrical Engineering, The Citadel, 1961  M.S. Electrical Engineering, Clemson University  Ph.D. Engineering, Clemson University
<b>Tina DeFelice, <i>Past Chair</i></b>	Intel Corporation, Server Development and Processor Validation, 2004-2013	B.S. Electrical Engineering, University of Florida, 1978  M.E. Electrical Engineering, University of South Carolina, 1987
<b>Steven (Steve) DiTullio</b>	Charles Stark Draper Laboratories Vice President, Strategic Systems Programs Cambridge, MA	B.S. Electrical Engineering, The Citadel, 1979  M.B.A., Northeastern University, 1992
<b>Bill Eisenman</b>	NCR Corporation, Senior Vice President (retired) Worldwide Customer Services Dayton, OH	B.S. Mathematics, US Air Force Academy, 1968  M.S., Computer Science, Georgia Institute of Technology, 1974

<b>Name</b>	<b>Organization</b>	<b>Education</b>
<b>Larry Hargrove, P.E., Past Chair</b>	Life Cycle Engineering, Senior Vice President North Charleston, SC	B.S. Civil Engineering, The Citadel, 1966
<b>John Matthews, Ph.D., P.E.</b>	John Matthews and Associates, President Cookeville, TN	B.S. Electrical Engineering, Tennessee Tech University  M.S. Electrical Engineering, Tennessee Tech University  Ph.D., Electrical Engineering, Tennessee Tech University
<b>Victor McCrary, Ph.D.</b>	Morgan State University, Vice President Research and Economic Development	B.A. Chemistry, Catholic University, 1978  Ph.D. Physical Chemistry, Howard University, 1985  M.S., Science and Engineering, University of Pennsylvania, 1995
<b>Tonia Morris, Ph.D.</b>	Intel Corporation, Senior Staff Architect Columbia, SC	B.S. Electrical Engineering, University of South Carolina, 1991  M.S. Electrical Engineering, Georgia Institute of Technology, 1993  Ph.D. Electrical Engineering, Georgia Institute of Technology, 1996
<b>Harold (Hal) Pastrick, Ph.D., P.E</b>	Pastrick Engineering & Management Consulting, Retired	B.S. Electrical Engineering, Carnegie-Mellon University, 1958

<b>Name</b>	<b>Organization</b>	<b>Education</b>
<b>Jason Pittman, Esq., Chairman</b>	McAngus Goudelock and Courie Attorney Columbia, SC	B.S. Electrical Engineering, The Citadel, 2004  J.D., Charleston School of Law, 2007
<b>James (Jim) Reaves, Jr</b>	Centurum, Inc. Director of Systems Engineering Charleston, SC	B.S. Electrical Engineering, The Citadel, 1973
<b>William (Bill) Rixon, P.E.</b>	Duke Energy Director of Government Affairs (retired), Charlotte, NC	B.S. Civil Engineering, The Citadel, 1967
<b>Carl Rust</b>	Georgia Institute of Technology Strategic Partners Officer Atlanta, GA	B.S. Electrical Engineering, The Citadel, 1984
<b>Charles Schley, Ph.D.</b>	Chroma Corporation San Bruno, CA	B.S. Electrical Engineering, The Citadel, 1963  M.S. Electrical Engineering, Rensselaer University, 1965  Ph.D. Electrical Engineering, Rensselaer University, 1969
<b>Richard Shirer, P.E</b>	Albemarle Corporation E&I Superintendent Orangeburg, SC	B.S. Electrical Engineering, The Citadel, 1990  M.S. Electrical Engineering, North Carolina State University, 1991  M.B.A., University of South Carolina, 1999

<b>Name</b>	<b>Organization</b>	<b>Education</b>
<b>Will Snelgrove</b>	Trident Technical College Program Coordinator, Electrical Engineering Charleston, SC	B.S. Electrical Engineering, University of South Carolina, 1975  M.E. Electrical Engineering, University of South Carolina, 1983 M.B.A., University of South Carolina, 1983
<b>Claudius (Bud) Watts, IV</b>	The Carlyle Group, Managing Director Charlotte, NC	B.S. Electrical Engineering, The Citadel, 1983  M.B.A., Harvard University, 1994
<b>Harry Weatherford, Ph.D</b>	Nucor Steel, Senior Automation and Control Engineer Charleston, SC	B.S. Electrical Engineering, The Citadel, 2001  M.S. Electrical Engineering, University of South Carolina, 2004  Ph.D. Electrical Engineering, University of South Carolina, 2011
<b>Guy White, III, P.E</b>	GW&A, Founder and Senior Consultant Columbia, SC	B.S. Electrical Engineering, The Citadel, 1956  M.S. Electrical Engineering, Clemson University, 1975