

NEW PROGRAM PROPOSAL

Name of Institution

The Citadel, Military College of South Carolina

Name of Program (include concentrations, options, and tracks)

Bachelor of Science in Cyber Operations

Program Designation

- | | |
|---|--|
| <input type="checkbox"/> Associate's Degree | <input type="checkbox"/> Master's Degree |
| <input checked="" type="checkbox"/> Bachelor's Degree: 4 Year | <input type="checkbox"/> Specialist |
| <input type="checkbox"/> Bachelor's Degree: 5 Year
(e.g., Ph.D. and DMA) | <input type="checkbox"/> Doctoral Degree: Research/Scholarship |
| <input type="checkbox"/> 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 Implementation Date:

August 2020

CIP Code:

111003

Delivery Site(s):

The Citadel Main Campus

Delivery Mode

- | | |
|--|---|
| <input checked="" type="checkbox"/> Traditional/face-to-face*
*select if less than 50% online | <input type="checkbox"/> Distance Education |
| | <input type="checkbox"/> 100% online |
| | <input type="checkbox"/> Blended (more than 50% online) |
| | <input type="checkbox"/> Other distance education |

Program Contact Information (name, title, telephone number, and email address)

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Department of Cyber and Computer Sciences

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Institutional Approvals and Dates of Approval:

Undergraduate Curriculum Committee: Sept 18, 2018

Faculty Senate and Provost: Sept 21, 2018

President and Board of Visitors: September 28, 2018

Background Information

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

Program Mission:

The mission of Bachelor of Science program in Cyber Operations is to develop the next generation of cyber leaders who can analyze the security of cyber systems, protect and defend cyber systems, investigate different types of attacks and incidents in cyber systems in the industry, government or military environment. The Citadel has been designated as National Center of Academic Excellence in Cyber Defense Education (CAE-CDE) by National Security Agency and Department of Homeland Security in 2016. The Citadel currently offers B.S. in Computer Science and a minor in Cybersecurity which is the academic path for CAE-CDE. The Citadel has established Center for Cyber, Intelligence, and Security Studies (CCISS), a multi-disciplinary center to foster education, research and outreach in cybersecurity and intelligence. From Fall 2017, The Citadel has been offering B. A. in Intelligence and Security Studies. The proposed B.S. in Cyber Operations will be a standalone major that will meet the academic standards of Center of Excellence in Cyber Operations program set by National Security Agency. This will be deeply technical and inter-disciplinary program grounded in computer science, computer engineering, and/or electrical engineering disciplines, with extensive opportunities for hands-on applications via labs and exercises. The major will be housed in the newly created Department of Cyber and Computer Sciences.

List the program objectives. (2000 characters)

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Program Objectives

Graduates of Bachelor of Science in Cyber Operations will be able to:

1. Apply security principles and practices to the design and implementation of the physical, software, and human component of the cyber systems,
2. Analyze and evaluate cyber systems with respect to security,
3. Identify, analyze, and mitigate threats in the cyber systems.

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)

According to cyberseek.org [08/31/2018], “from April 2017 through March 2018, there were 109,000 openings for Information Security Analysts, but only 105,000 workers currently employed in those positions – an annual talent shortfall of 5,000 workers for cybersecurity’s largest job”. The website also stated that currently there are 3063 job openings in cybersecurity in the State of South Carolina. With the presence of SPAWAR and growing number of Defense Contractors, there is a great demand for cybersecurity professionals in the Lowcountry. The proposed Bachelor of Science in Cyber Operations will address the demand of cyber professionals in the lowcountry, in the state of South Carolina and across the country. The design of the proposed major was presented at The Citadel Cybersecurity Industry Advisory Board Meeting in Fall 2018.

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Employment Opportunities			
Occupation	Job Openings	Avg. Salary	Data Source
Cybersecurity Analyst	22,544	\$89,000/year	https://www.cyberseek.org/pathway.html
Cybersecurity Consultant	17,565	\$107,000/year	https://www.cyberseek.org/pathway.html
Penetration and Vulnerability Tester	10,929	\$107,000/year	https://www.cyberseek.org/pathway.html
Cybersecurity Engineer	37,580	\$116,000/year	https://www.cyberseek.org/pathway.html

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.”

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

There are other entry level positions with Cybersecurity Skills
 Cybersecurity Specialist (\$84,000 per year)

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Incident Analyst / Responder (\$86,000 per year)
IT Auditor (\$86,000 per year)

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)

Currently The Department of Cyber and Computer Sciences offers Bachelor of Science in Computer Science with a minor in Cybersecurity. This academic path is based on academic requirement of National Security Agency and Department of Homeland Security Center of Academic Excellence in Cyber Defense Education. The proposed Bachelor of Science in Cyber Operations will follow the academic requirement of National Security Agency Center of Excellence in Cyber Operations which is deeply technical and inter-disciplinary program grounded in computer science, computer engineering, and/or electrical engineering disciplines, with extensive opportunities for hands-on applications via labs and exercises.

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List of Similar Programs in South Carolina

Program Name	Institution	Similarities	Differences
Bachelor of Science in Cybersecurity	Charleston Southern University	Core coursework in computer science, plus additional courses in criminal justice.	The Citadel attracts a unique kind of undergraduate student compared to traditional colleges. These students will want this popular degree option available at The Citadel. Additionally, as a Senior Military College, The Citadel has a mandatory ROTC requirement for all cadet students. The proposed major in Cyber Operations at The Citadel follows the Academic Requirement of National Security Agency Center of Academic Excellence in Cyber Operations.
Cybersecurity Certificate	Piedmont Technical College	Courses in the area network security, ethical hacking, and forensics.	The proposed major will be a comprehensive standalone program that will be deeply technical courses with hands-on exercises offered by Cyber and Computer Sciences, Electrical and Computer Engineering, Mathematics, and Criminal Justice faculty.
Certificate in Applied Science – Cybersecurity	Trident Technical College	Courses in the area of data assurance, network security, forensics, network security.	The proposed major will be a comprehensive standalone program that will be deeply technical courses with hands-on exercises offered by Cyber and Computer Sciences, Electrical and Computer Engineering, Mathematics, and Criminal Justice faculty.

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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)

Description of the Program

Projected Enrollment			
Year	Fall Headcount	Spring Headcount	Summer Headcount
2019	15	15	15
2020	20	20	20
2021	30	30	30
2022	30	30	30
2023	30	30	30

Explain how the enrollment projections were calculated.

The program is slated to begin in Fall 2019 with 15 students. We are projecting 100% growth with three years and then steady enrollment. Since The Citadel received the designation of CAE-CDE by NSA and DHS, the enrollment in Computer Science program has increased significantly. Majority of the students in Computer Science want to pursue a minor in Cybersecurity. Currently 18 upperclassmen are pursuing a minor in Cybersecurity. The proposed major will attract this group of students. Since the proposed major will be deeply technical with hands-on exercises, some engineering majors will be attracted to this new program as well.

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Curriculum

B.S. Cyber Operations Plan						
	Fall			Spring		
Freshman						
	CSCI 201	Introduction to Computer Science I	4	CSCI 202	Introduction to Computer Science II	3
	M. Lang.		3	M. Lang		3
	MATH 131	Analytical Geometry and Calculus I	4	MATH 132	Analytical Geometry and Calculus II	4
	Health & Fitness		3	Freshman Seminar		3
	LDRS 101	First Year Seminar	1	Linked Comp.		3
	ROTC			ROTC		
	CSCI 227	Principles and Practices in Cybersecurity				
			18			16
Sophomore	ENGL XXX	Strand English	3	COMM 260	Technical Writing and Communication	3
	CSCI 305	Computer Organizations and Programming	3	CSCI 223	Data Structures and Algorithms	3
	Science		4	Strand History		3
	MATH 206	Discrete Structures	3	Strand Science		4

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	Strand Social Science		3	STAT 261	Probability and Statistics	3
	LDRS 201		1	RPED		0
	ROTC			LDRS 211	Sophomore Seminar Service Learning Lab	0
				ROTC		
			17			16
Junior	CSCI 327	Computer Security	3	CSCI 317	Computer Networks and Internets	3
	CRMJ 465	Cyber Policy, Law and Ethics	3	CSCI 320	Database Design	3
	Elective		4	CSCI 427	Advanced Cybersecurity	3
	Strand Elective		3	MATH XXX	Applied Cryptography	3
	Elective		3	LDRS 371		3
	LDRS 311	Junior Ethics Enrichment Experience	0	ROTC		
	ROTC					
			16			15
Senior	CSCI 405	Operating Systems	3	CSCI 499	Capstone	3
	CSCI 4XX	Cyber Operations I	3	CSCI 4XX	Cyber Operations II	3
	ELEC 311		3	CSCI XXX	Software Security	3
	CSCI XXX	Cyber Forensics	3	ELEC 330		3
	Elective		3	*Approved Cyber Elective		3
	ROTC			ROTC		

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	LDRS 411	Senior Leadership Integration Seminar	0	LDRS 371	
			15		15
Total	128			(excludes ROTC)	

***Approved Cyber Electives:**

- CRMJ 392 Cyber Crime
- CRMJ 331 Cyber Investigations
- CSCI 490 Special Topics: Cyber Warfare
- INTL 465 Special Topics: Cyber Intelligence

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Faculty /Administrative Personnel Changes

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

Rank	Full Time or Part Time	Courses taught or to be taught	Academic Degrees	Other qualifications/responsibilities
Professor	Full Time	CSCI 201, CSCI 202, CSCI 305, CSCI 320, CSCI 355, CSCI 370, CSCI 495	PhD in Mathematics, University of South Carolina, MS in Computer Science, Georgia Institute of Technology	
Professor	Full Time	CSCI 227, CSCI 317, CSCI 327, CSCI 405, CSCI 427	PhD in Computer Science, University of Oklahoma	Graduate Program Director for Computer Science, Co-Director for Citadel Center for Cyber, Intelligence and Security Studies
Associate Professor	Full Time	CSCI 201, CSCI 202, CSCI 216, CSCI 217, CSCI 320, CSCI 405	PhD in Computer Science, University of Nebraska, Lincoln	
Associate Professor	Full Time	CSCI 201, CSCI 202, CSCI 223, CSCI 420, CSCI 421	PhD in Computer Science, Arizona State University	Internship Coordinator
Assistant Professor 1 Anticipated for Fall 2019	Full Time	CSCI 327, CSCI 427, Cyber Forensics, Cyber Operations I & II	PhD (Expected in Spring 2019) in Computer Science	
Assistant Professor 2 Anticipated for Fall 2019	Full Time	CSCI 201, CSI 202, CSCI 223, CSCI 320, Software Security	PhD (Expected in Spring 2019) in Computer Science	

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Library and Learning Resources

Total FTE needed to support the proposed program:

Faculty: 4.5 existing faculty FTE will support the program

Staff: .25 existing

Administration: .25 FTE existing administrator will support the program

Faculty, Staff, and Administrative Personnel

Discuss the Faculty, Staff, and Administrative Personnel needs of the program.

Unless the program grows beyond the projected enrollment, there will not be any additional faculty or personnel needed to support the program.

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

Daniel Library at The Citadel will offer robust support with its current online resources—both in eBooks and in digital journal access. Currently, the library maintains sufficient subscriptions to professional scientific and academic journals and magazines in its computer science, intelligence, and cyber security collection. In addition, excellent online resources in related fields in national security, cyber and intelligence, and international affairs have already been developed for the Department of Political Science and the Department of Criminal Justice. The Citadel also uses online Virtual Labs for training students in Network and Systems Security, and Ethical Hacking Exercises. Students access these virtual labs through a web browser and perform activities such as port scanning, writing rules in firewall to allow or deny traffic, and penetration testing in this virtual environment that consists of virtual machines running different flavors of Windows and Linux. The access codes for the labs are bought with the donations from the Citadel Alumni through The Citadel Foundation. Information Technology Services at The Citadel has created a Cyber Range for the students where they practice cyber offense and defense skills in a closed network.

Student Support Services

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

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The Citadel maintains excellent student support services accessible to undergraduates, veteran students, and graduate students. Those support services can be utilized by potential students in the proposed program. 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 Career Center, 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.

Physical Resources

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

Current instructional equipment and technology will fully support the implementation of this proposed degree program.

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) Current physical facilities and technology will fully support the implementation of this proposed degree program.

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Financial Support

Sources of Financing for the Program by Year												
Category	1st		2nd		3rd		4th		5th		Grand Total	
	New	Total	New	Total	New	Total	New	Total	New	Total	New	Total
Tuition Funding	0	330,000	0	440,000	0	660,000	0	660,000	0	660,000	0	2,750,000
Program-Specific Fees												
Special State Appropriation												
Reallocation of Existing Funds												
Federal, Grant, or Other Funding												
Total	0	330,000	0	440,000	0	660,000	0	660,000	0	660,000	0	2,750,000
Estimated Costs Associated with Implementing the Program by Year												
Category	1st		2nd		3rd		4th		5th		Grand Total	
	New	Total	New	Total	New	Total	New	Total	New	Total	New	Total
Program Administration and Faculty/Staff Salaries	0	180,000	0	180,000	0	180,000	0	180,000	0	180,000	0	900,000
Facilities, Equipment, Supplies, and Materials		100,000		100,000		100,000		100,000		100,000		500,000
Library Resources		20,000		20,000		20,000		20,000		20,000		100,000
Other (specify)												
Total		300,000		300,000		300,000		300,000		300,000	0	1,500,000
Net Total (Sources of Financing Minus Estimated Costs)	0	30,000	0	140,000	0	360,000	0	360,000	0	360,000	0	1,005,500

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Note: New costs - costs incurred solely as a result of implementing this program. Total costs - new costs; program's share of costs of existing resources used to support the program; and any other costs redirected to the program.

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 Citadel does not anticipate any new costs or revenue from this program, as students will shift from other majors within the Corps of Cadets.

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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)

We will actively assess our Student Learning Outcomes as they contribute directly to our Program Objectives. Student learning outcomes will be assessed by a combination of direct and indirect methods, including surveys to track employment. Taskstream software, currently used to track and assess institutional general education learning outcomes, will be leveraged to track program objectives and student learning outcomes. Assessment data will be used as a part of a continuous improvement plan.

The Citadel is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools. The 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.

Consistent with SACS accreditation standards, student learning outcomes at the degree program level will be assessed in multiple ways. All course objectives will be aligned with the learning objectives for the degree program. Assessment methods will include several performance indicators, many of which will be assessed at three levels of performance (introduce, develop, reinforce).

Assessment measures (performance indicators):

- Skill questions: Embedded within exam questions and course assignments, skill questions are pre-determined programming exercises given at various parts of the program.
- Ethics exam: All juniors are required to take an ethics exam in CRMJ 465, to be evaluated by faculty using a rubric.
- Written presentations: written communication is assessed in sophomore English, technical writing, and senior seminar courses, using the AAC&U Written Communication Rubric.
- Oral presentations: Oral presentations are required course (CSCI 427), where they are assessed by faculty using a rubric.
- Tools and group reports: A survey on the use of various tools and technologies related to the discipline will be given at three points during the program, where progression of exposure is expected. Courses requiring group activity will be recorded.
- Senior satisfaction survey: All seniors are required to complete a senior satisfaction survey during the spring of their senior year. The survey asks questions related to program outcomes, advising, and facilities. It is done anonymously. Seniors also complete a Senior Information Survey that asks for contact information and future plans.

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- **Alumni survey:** An alumni survey is solicited every other year. The survey asks questions related to program outcomes, advising, facilities, graduate school attendance, and job history. The survey results are anonymous.

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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)

NSA Center of Excellence in Cyber Operations (Target Fall 2021)

ABET Accreditation (Target Fall 2021)

Will the proposed program lead to licensure or certification?

Yes

No

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

Teacher or School Professional Preparation Programs

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

Yes

No

If yes, complete the following components.

Area of Certification

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