New Program Proposal
Bachelor of Science in Cybersecurity
Winthrop University

Summary

Winthrop University requests approval to offer the program leading to the Bachelor of Science in Cybersecurity in Fall 2021. 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 unanimously to recommend approval of the proposal. The full program proposal and support documents are attached.

Stages of Consideration	Date	Comments
Program Proposal Received	09/30/20	Not Applicable.
Staff comments to the institution	11/06/20	Staff requested revision of the proposal.
Program Proposal Resubmitted	11/10/20	The revised proposal satisfactorily addressed the requested revision.
ACAP Consideration	11/19/20	Representatives from Winthrop University, citing the critical needs for cybersecurity professionals in the state and the nation, affirmed the proposed program would draw on existing infrastructure in Computer Science, and on its programmatic values of service, excellence, diversity, community, and leadership also. In addition, the demand is particularly high in SC metro areas and the I-77 corridor. Winthrop is uniquely positioned to address the gaps by increasing the supply of candidates eligible for hire not only in the state but also in Charlotte metro areas. Moreover, the proposed program will use existing courses that are part of other extant programs. The need for one full-time tenure-track faculty member with expertise in cybersecurity to teach new courses will be repurposed from an existing vacancy in the college. ACAP members inquired about the operation of a computer lab for the proposed program. Winthrop will upgrade the lab inventory and infrastructure. Additionally, the institution has had resources available by working with the local businesses to upgrade the lab, and the funding implementation rollout would cover the entire infrastructure over a five-year period. Further, ACAP members inquired about the plan to increase a diverse group of students to represent in the program. The institution remarked that the institution is positioned to address the lack of diversity in the cybersecurity talent pipeline, through plans such as boot camps and partnerships with local businesses to recruit and retain students from diverse backgrounds.

		Upon remaining discussion, ACAP voted unanimously to approve the program proposal.
CAAL Consideration	2/12/21	By unanimous consent, the Committee on Academic Affairs and Licensing (CAAL) favorably commended to the Commission five proposed programs, including the B.S. in Cybersecurity.

Review

During review the committee inquired about program development and need, curriculum development, faculty recruitment, general student recruitment, and online mode of delivery. Institutional representatives satisfactorily responded to committee inquiries.

Recommendation

The Committee on Academic Affairs and Licensing (CAAL) recommends the Commission approve the program leading to the Bachelor of Science in Cybersecurity at Winthrop University in Fall, 2021.

Winthrop University Undergraduate Student and Program Data

Undergraduate In-State/Out-of-State Enrollment, Fall 2018	4,438(90.81%) / 449(9.19%)
Number of Approved Programs in 10 Yrs. (FY 2010- 2019)	11
Number of Terminated Programs in 10 Yrs. (FY 2010- 2019)	8

Industry related Occupational Wages and Projections in South Carolina, 2016 – 2026*

Occupational Field[1]	2016 Median Income[2]	2016 Estimated Employment[3]	2026 Projected Employment	Total 2016-2026 Employment Change	2016-2026 Annual Avg. Percent Change	Total Percent Change
Computer and Mathematical	$66,270	39,597	45,397	5,800	1.38%	14.65%

[1] "Occupational Field" represents the closest related occupation category that includes the occupations aligned with the program proposal.
[2] SC Department of Employment & Workforce (DEW), Labor Market Information. (2019). Occupational Employment and Wage Rates (OES) for All Major Groups in South Carolina in 2016 [Data file]. Retrieved from https://jobs.scworks.org/vosnet/lmi/default.aspx?pu=1
[3] SC Department of Employment & Workforce (DEW), Labor Market Information. (2019). Occupational Projections (Long-term) for Multiple Occupations in South Carolina in 2016-2026 [Data file]. Retrieved from https://jobs.scworks.org/vosnet/lmi/default.aspx?pu=1
* Data downloaded September 16, 2019; Most recent data available.

NEW PROGRAM PROPOSAL FORM

Name of Institution: Winthrop University

Name of Program (include degree designation and all concentrations, options, or tracks): B.S. in Cybersecurity

Program Designation:

☐ Associate's Degree ☐ Master's Degree

X 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.)

Consider the program for supplemental Palmetto Fellows and LIFE Scholarship awards?

X Yes

☐ No

Proposed Date of Implementation: Fall 2021

CIP Code: 11.1003 Computer and Information Systems Security

Delivery Site(s): Winthrop University

Delivery Mode:

X Traditional/face-to-face ☐ Distance Education

*select if less than 25% online

☐ 100% online

☐ Blended/hybrid (50% or more online)

☐ Blended/hybrid (25-49% online)

☐ Other distance education (explain if selected)

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

Stephen Dannelly, PhD

Chair, Department of Computer Science and Quantitative Methods

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Winthrop University

Rock Hill, SC 29733

803-323-4811

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Institutional Approvals and Dates of Approval (include department through Provost/Chief Academic Officer, President, and Board of Trustees approval):

Department of Computer Science and Quantitative Methods - 2/15/2020

College of Business Administration Curriculum Committee - 2/25/2020

College of Business Administration Faculty Assembly - 3/6/2020

Dean, College of Business Administration - 3/12/2020

University Committee on Undergraduate Curriculum - 3/27/2020

University Academic Council - 4/3/2020

University Faculty Conference - 4/17/2020

Provost 9/18/2020

President 9/29/2020

Winthrop Board of Trustees 11/6/2020

Background Information

State the nature and purpose of the proposed program, including target audience, centrality to institutional mission, and relation to the strategic plan.

The B.S. in Cybersecurity will implement 21st century cybersecurity skills. The program is guided by the National Security Agency (NSA) curricular guidelines for National Centers of Academic Excellence in Cyber Defense and draws on Winthrop's existing strengths in Computer Science and its values of Service, Excellence, Diversity, Community and Leadership. The target audience of this program is traditional students who enter from high school with an anticipated career path in the Cybersecurity area such as: Information Security Officer, Penetration Tester, Cybersecurity Analyst, or Cybersecurity Engineer. The program would have a tangential effect on Winthrop's other technology focused

programs such as Computer Science, Computer Information Systems, Digital Information Design (Web App Track) by offering new courses which could serve directly in the major or as elective offerings for interested students.

Winthrop's mission aims to have students acquire and develop knowledge, skills, capabilities and values that enrich their lives and prepare them to meet the needs and challenges of the contemporary world. Few if any challenges of our modern world are greater than the need for a diverse and talented cybersecurity workforce. The B.S. in Cybersecurity also helps advance Winthrop's strategic plan in several ways. First, the B.S. in Cybersecurity will help Winthrop meet its enrollment growth targets. By the year 2025, Winthrop's strategic plan calls for an undergraduate enrollment of 7000 students. It will also increase the undergraduate placement rate as the job opportunities in this sector exceed the supply of new and existing talent. Winthrop's strategic plan specifically cites enriching our "academic program mix by developing new and innovative programs" to meet these goals.

Assessment of Need

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

There is a shortage of information security talent in both industry and government. Winthrop is well positioned both educationally and geographically to meet these needs. In 2017, IT-oLogy in cooperation with the SC Coordinating Council on Workforce Development and the SC Department of Commerce, issued a report on the state of South Carolina's IT workforce challenges and opportunities.[1] In it they discuss major concerns related to the supply of workers for the field. In the cybersecurity field alone they point to a Forbes statistic of over 200,000 unfilled cybersecurity jobs nationwide, and a Cisco statistic puts it at 1M globally. These jobs are well paid, with the average tech wage being $76,589.The inability to fill available jobs in this critical area has been directly attributed to the shortage of supply within the workforce. Similarly, a 2019 workforce study by the SC Chamber of Commerce cited a weekly workforce wage of $1,880 ($97,760/year) for Other Information Services within the Business & IT Services sector.[2] It also showed a projected 10-year growth of 48.4%. The B.S. in Cybersecurity program will prepare graduates who will be well suited to enter these high-demand and well paid jobs.

Five hundred SC companies from across the state and from a number of sectors were invited to participate in a workforce survey that resulted in the 2017 IT Workforce report. The output of this survey, which ultimately included 117 SC companies, identified six gaps, including the following four: a

[1] https://www.it-ology.org/wp-content/uploads/2018/08/SC-IT-Workforce-Report-2017.pdf

[2] https://issuu.com/southcarolinabusinessmagazine/docs/scc19_workforce-forweb-0325

limited supply of candidates in IT, lack of enough students currently in training, lack of diversity, and the demand for cybersecurity accelerating at a rate three times the rate of other IT jobs. Demand is particularly high in SC metro areas and the I-77 corridor. The report states: "An important consideration in calculating the demand for cybersecurity talent in SC is that substantial demand exists in the Charlotte metro area that includes York, Chester, and Lancaster counties from SC." Winthrop is uniquely positioned to address all these gaps by increasing the supply of candidates eligible for hire. Winthrop is geographically located in York County, where substantial demand exists, and is just an hour from the Columbia metro region. Winthrop is located just 25 minutes from downtown Charlotte, giving Winthrop students access to a wide variety of local companies for internships as well as job placement. Winthrop is also well positioned to address the lack of diversity in the cybersecurity talent pipeline, given that our student body represents SC demographics and is comprised of 32% African American students and 43% students from underrepresented groups.

Transfer and Articulation

Identify any special articulation agreements for the proposed program. Provide the articulation agreement or Memorandum of Agreement/Understanding.

There are no special articulation agreements for this program.

Employment Opportunities

Occupation	State		National		Data Type and Source
	Expected Number of Jobs	Employment Projection	Expected Number of Jobs	Employment Projection	
Information Security Analyst	1750 jobs in 2028	31.6% increase from 2018 to 2028	147,700 in 2028	32% growth from 2018 to 2028	SC Works / US BLS Occupational Outlook Handbook
Computer Network Architect	1290 in 2028	12.2% growth in 10 years	167,700 in 2028	5.3% ten year growth	US BLS Occupational Outlook Handbook
Computer Network Support Specialist	3090 in 2028	12.8% growth in 10 years	203,400 in 2028	6.3% ten year growth	US BLS Occupational Outlook Handbook

Computer and Information Systems Managers	3760 in 2028	15.7% growth in 10 years	461,100 in 2028	11.3% ten year growth	US BLS Occupational Outlook Handbook

Supporting Evidence of Anticipated Employment Opportunities

Provide supporting evidence of anticipated employment opportunities for graduates.

Career and employment websites are a good source of information regarding the demand for cybersecurity professionals. A September 16, 2020 search on **Indeed.com** for "cyber security" positions in South Carolina found **196 open positions**. Employers ranged from manufacturers to financial firms, technology companies, pharmaceuticals, and government agencies. These positions were spread across the entire state.

Cybersecurity is a relatively new discipline and career path. Thus, government employment data is sparse. **SC Works** and the **US BLS** track only one job title, **Information Security Analysts**, in this emerging field. A decade ago, Computer Network Administrators and Web Site Administrators gave little concern to security issues. Then those positions began increasing the amount of required cybersecurity knowledge and workload. Today, cybersecurity has emerged as its own job position in an organization. Because this emergence is so recent, there is little government tracking of these types of jobs. According to **SC Works**, in March 2020 there were 71 job openings for Information Security Analysts in South Carolina. On September 16, 2020 SC Works listed 27 open positions for that job category, with 151 openings expected annually.

Other than careers as "Information Security Analysts," graduates from the proposed program would be well suited for many positions, such as:

- security administrator
- information security engineer
- incident responder
- security auditor
- penetration tester
- vulnerability analyst

Description of the Program

Projected Enrollment			
Year	Fall Headcount	Spring Headcount	Summer Headcount
2021-2022	15	15	0
2022-2023	35	30	0
2023-2024	55	55	0
2024-2025	75	75	0
2025-2026	75	75	0

Explain how the enrollment projections were calculated.

With this being a new program, we would expect a modest enrollment of 15 students in the first year. The second year we expect to add 20 more students. By the third year we expect to have entering freshmen classes of about 25 students each fall. By the third year we also expect to have some attrition of sophomores into their junior year, similar to most computing degree programs.

We expect the program to grow to about 75 students. This would give the proposed cybersecurity program about half the enrollment of Winthrop's traditional computer science degree.

We list summer headcounts as zero because Winthrop traditionally offers fewer courses in summer semesters. Summer is when cybersecurity students should be working as interns to build their resumes.

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

☐ Yes

X No

Curriculum

New Courses

List and provide course descriptions for new courses.

CSCI 224 - Foundations and Principles of Cybersecurity

Description: This course develops fundamental concepts of the cybersecurity discipline. The course also introduces students to the vocabulary of the cybersecurity field, the principles of cybersecurity and the different information technology components typically encountered as well as the cyber threats that exist.

CSCI 324 - Enterprise System Administration and Security

Description: This course introduces students to the management and configuration of both windows and Linux enterprise systems. Students will learn to perform basic operations in both environments including: configuring accounts, authentication, auditing, backups and restoration, patch management, reviewing security logs, and preventing network based cyber threats.

CSCI 421 - Cyber Forensics

Description: This hands-on course introduces students to forensics techniques used to investigate and analyze media, hosts and devices. Topics include imaging, filtering, legal compliance and digital investigations process. Students will use at least one common forensic tool.

CSCI 424 - Ethical Hacking

Description: This course introduces students to ethical hacking. Students will learn to apply tools and techniques for finding vulnerabilities that exist in systems and understand when and how to disclose those vulnerabilities. Students will also learn common techniques that are used to escalate privileges on a system once breached. Finally, students in this course will plan, organize and perform penetration testing on simple networks.

CSCI 453 - Special Topics in Cybersecurity

Description: This course covers emerging issues related to cyber security.

CSCI 469 - Cloud Computing

Description: This course introduces students to the management and use of cloud related infrastructure. Students will build projects that are deployed to the cloud.

Total Credit Hours Required: 120

Curriculum by Year					
Course Name	**Credit Hours**	**Course Name**	**Credit Hours**	**Course Name**	**Credit Hours**
Year 1 (* Must be taken in year 1)					
Fall		**Spring**		**Summer**	
CSCI101B	.5	*CSCI207	4		
ACAD101	1	*MATH261	3		
WRIT101	3	*CSCI210	1		
PESH	1	HMXP102	3		
*Gen Ed (Nat Sci/with lab)	4	ACCT280	3		
Gen Ed (Social Science/Hum Arts)	3	Elective	3		
*MATH 105 or 201	3-4				
Total Semester Hours	14.5-15.5	Total Semester Hours	17	Total Semester Hours	0
Year 2					
Fall		**Spring**		**Summer**	
QMTH205	3	CSCI311	4		
CSCI208	4	CSCI243	3		
CSCI224	3	CSCI324	3		
ACCT281	3	CSCI271	4		
CRTW201	3				
Total Semester Hours	16	Total Semester Hours	14	Total Semester Hours	0

Curriculum by Year					
Course Name	**Credit Hours**	**Course Name**	**Credit Hours**	**Course Name**	**Credit Hours**
Year 3					

Fall		Spring		Summer	
CSCI355	3	CSCI411	3		
CSCI466	3	CSCI327 (Oral/IW Gen Ed)	3		
Gen Ed (Global)	3	CSCI424	3		
Gen Ed (Historical/Constitution)	3	Gen Ed (Social Science/Hum Arts)	3		
Elective	3	Elective	3		
Total Semester Hours	15	Total Semester Hours	15	Total Semester Hours	0
Year 4					
Fall		**Spring**		**Summer**	
CSCI421	3	CSCI453	3		
CSCI469	3	Elective	3		
Gen Ed (Social Science/Hum Arts)	3	Elective	3		
Gen Ed	3-4	Elective	.5		
Elective	3	ACCT521	3		
Total Semester Hours	16	Total Semester Hours	12.5	Total Semester Hours	0

Bachelor of Science in Cybersecurity

General Education Courses Semester Hours

ACAD 101	Principles of the Learning Academy	1

Shared Skills and Proficiencies

Writing and Critical Thinking (A grade of C- or better is required in these courses)

WRIT 101	Composition: Introduction to Academic Discourse	3
HMXP 102	The Human Experience: Who Am I?	3
CRTW 201	Critical Reading, Thinking and Writing	3
Oral Communication	Met in major (CSCI 327)	0

Technology	Met in major (CSCI 207/327)	0
Intensive Writing	Met in major (CSCI 327)	0
*Constitution Requirement (course may also be used for another requirement)		0-3
Physical Activity (choose from approved list)		1

Thinking Critically Across Disciplines

Global Perspectives ("choose from approved list" or specify restriction)	3
Historical Perspectives ("choose from approved list" or specify restriction)	3

Introducing Students to Broad Disciplinary Perspectives

Social Science ("choose from approved list" or specify restriction) (2 designators)	6
Humanities & Arts ("choose from approved list" or specify restriction) (2 designators)	6
Quantitative Skills and Natural Sciences	
Quantitative Skills (met in major with (MATH 105 or MATH 201) and QMTH 205)	0
Natural Science with lab	3-4
TOTAL	**32-36**

Requirements for the Major

ACCT 280	Introduction to Financial Accounting	3
ACCT 281	Introduction to Managerial Accounting	3
ACCT 521	Fraud and Forensics	3
MATH 105	Applied Calculus or MATH 201 Calculus 1	3-4
MATH 261	Foundations of Discrete Mathematics	3
CSCI 101B	Using Microsoft Excel	.5
CSCI 207	Introduction to Computer Science I	4
CSCI 208	Introduction to Computer Science II	4
CSCI 210	Programming Tools	1
CSCI 224	Foundations and Principles of Cybersecurity	3
CSCI 243	Web Programming	3
CSCI 271	Algorithm Analysis and Data Structures	4
CSCI 311	Computer Architecture and Organization	4
CSCI 324	Enterprise System Administration and Security	3
CSCI 327	Social Implications of Computing	3

CSCI 355	Database Processing	3
CSCI 411	Operating Systems	3
CSCI 421	Cyber Forensics	3
CSCI 424	Ethical Hacking	3
CSCI 453	Special Topics in Cybersecurity	3
CSCI 466	Network Processing	3
CSCI 469	Cloud Computing	3
QMTH 205	Applied Statistics	3

TOTAL in major	**68.5-69.5**
General Electives	**14.5-19.5**
TOTAL	**120**

Similar Programs in South Carolina offered by Public and Independent Institutions

Identify the similar programs offered and describe the similarities and differences for each program.

Grey shading indicates similar B.S. program

Program Name and Designation	Total Credit Hours	Institution	Similarities	Differences
B.A. Cybersecurity	56 hours (120 to graduate)	Anderson University	Similar networks course and focus on statistical/ quantitative skills.	Our program has less focus on policy and more focus on technical skills.
B.S. Cybersecurity	60 hours (128 to graduate)	Benedict College	Some similar cybersecurity courses	Our program has less focus on cryptography and more focus on security in cloud and web computing.
B.S. in Cyber Operations	131 hours	Citadel Military College of South Carolina	Some similar courses such as data structures, databases, intro to cyber security.	Our program is more focused on security in cloud and web computing.

B.S. Cybersecurity	65 (125 to graduate)	Charleston Southern University	Both programs have some technical skills, knowledge of networks and operating systems.	Their program has a criminal justice focus Those hours in our program are directed towards technical skills.
B.S. Cybersecurity - Computer Information Systems Emphasis	55-59 hours (120 to graduate)	Lander University	Similar programming, and forensics requirements.	Their program has a focus on cryptography and management. Ours focuses on security in cloud and web computing.
B.S. in Computer Science - Computer and Information Systems Security	45-48 hours (120 to graduate)	Limestone College	Similar intro level programming.	More focus on ethical hacking, web, and cloud. Less focus on policy.
B.S. Computer Science - Concentration in Cybersecurity	125	South Carolina State University	Similar grounding in Computer Science.	Our program has a focus on Linux and Windows systems. Additionally, our program focuses on security in cloud and web computing.
B.S. Applied Computer Science - Concentration in Cybersecurity	120	University of South Carolina – Aiken	Both programs offer grounding in computer science, e.g. data structures, algorithms, software engineering, networks, and OS. Both programs have similar ethical hacking and digital forensics.	Winthrop's program focuses more on forensics (particularly forensic accounting) and cloud technologies as well as cloud and web related security issues.
B.S. Cybersecurity	121	University of South Carolina Upstate	Similar core courses including, programming,	Our program will focus more heavily on the web and cloud computing

			hardware, forensics and networks.	than this program does.
Graduate Certificate in Cybersecurity	12	Citadel Military College of South Carolina	N/A	We propose to offer an undergraduate degree. Students may wish to pursue this graduate program upon completion.
M.S. Computer and Information Sciences - Cybersecurity Specialization	33	Citadel Military College of South	N/A	We propose to offer an undergraduate degree. Students may wish to pursue this graduate program upon completion.
M.S. in Computer Engineering - Cybersecurity	30	Clemson	N/A	We propose to offer an undergraduate degree. Students may wish to pursue this graduate program upon completion.
Minor - Cybersecurity	15	Clemson	Similar ethics courses, principles of cyber security course.	Clemson is offering a minor for undergraduates, but we are proposing a bachelor's degree.
Graduate Certificate in Cybersecurity	12	College of Charleston	N/A	We propose to offer an undergraduate degree. Students may wish to pursue this graduate program upon completion.
M.S. Computer and Information Systems - Concentration in Cybersecurity	33	College of Charleston	N/A	We propose to offer an undergraduate degree. Students may wish to pursue this graduate

				program upon completion.
Certificate in Cybersecurity	30	Horry Georgetown Technical College	Similar forensics course.	Our program will focus more on ethical hacking, web and cloud security.
Certificate in Cybersecurity	27	Piedmont Technical College	Similar introduction to principles of information security.	Their program has more of a focus on forensics than ours and also a focus on risk. Our program focuses more on ethical hacking, infrastructure, and web/cloud security.
Associate Degree/Certificate in Applied Cybersecurity	63	Trident Technical College	Similar focus on entry level programming, probability/stats, and Linux.	Our program also introduces a windows focus as well as web and cloud focus. In addition, our program includes a focus on forensics.
Cybersecurity: Information Assurance Specialization	9	University of South Carolina	Similar coursework in forensics, networks, intro to computer security/IS principles.	This specialization applies to a variety of programs, most relevant is Computer Science. Our program is a B.S. focused in Cybersecurity.
Certificate in Information Assurance and Security	12	University of South Carolina	N/A	We propose to offer an undergraduate degree. Students may wish to pursue this graduate program upon completion.

Faculty

Rank and Full- or Part-time	Courses Taught for the Program	Academic Degrees and Coursework Relevant to Courses Taught, Including Institution and Major	Other Qualifications and Relevant Professional Experience (e.g., licensures, certifications, years in industry, etc.)
Associate Professor, full-time	CSCI 224 Foundations of Cyber Security CSCI 355 Database CSCI 424 Ethical Hacking	PhD Information Technology UNC - Charlotte 2013	7 years in higher education Several years of part-time work in IT, Intern with Google Security Team SEED Cybersecurity Workshop
Associate Professor & Dept Chair, full-time	CSCI 327 Social Implications of Computing	PhD Computer Sci & Engineering Auburn University 1995	25 years in higher education
Associate Professor, full-time	CSCI 207 CS1 CSCI 466 Networking	PhD Information Technology UNC - Charlotte 2010	10 years in higher education 20 years at IBM SEED Cybersecurity Workshop
Instructor,full-time	CSCI 311 Computer Architecture	Master of Science, Electrical Engineering, Massachusetts Institute of Technology, 1980	17 years in higher education, plus 26 years in industry
Assistant Professor; Digital Information Design, Program Director; full-time	CSCI 243 Web Programming	PhD Computing and Info Systems UNC - Charlotte PhD Education Administration	18 years in higher education, plus multiple temporary positions as a researcher in industry

		Southern Illinois-Carbondale	

Total FTE needed to support the proposed program:

Faculty: 2.0

Staff: 0.5

Administration: 0.3

The university already supplies staff to support equipment and facilities for the other three computing degrees. The department does not have dedicated IT staff.

The College of Business Administration does not dedicate staff to individual degree programs. Across all programs offered by the college, there are 3 full-time staff for advising, 3 for administrative support, and an internship coordinator.

Faculty, Staff, and Administrative Personnel

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

Faculty : As much as possible, the proposed degree uses existing courses that are part of other degree programs. The CS Department currently supports four other degree programs

- BS in Computer Science - CAC/ABET accredited
- Computer Information Systems concentration of the BS in Business degree - AACSB accredited
- BS in Applied Software Development - very recently approved program for students that hold an Associate's Degree
- Web App Design concentration of the BS in Digital Information Design degree

The faculty are well accustomed to offering coursework in support of a variety of programs. The CS faculty are also accustomed to working with faculty in other departments. The CS program has a good relationship with the Accounting faculty, which are also in the College of Business Administration.

The CS Department will need to hire an additional PhD tenure-track faculty member with expertise in Cybersecurity in order to offer the proposed new courses. The line will be repurposed from an existing vacancy in the college. We will search for this position in AY 2021-2022, with a plan for the new faculty member to begin in Fall 2022, which is expected to be the second year of the new program. The first year's coursework is primarily introductory CS courses that we already offer each semester. Dr. Andrew

Besmer, Associate Professor, is an expert in Cybersecurity and will also teach some of the new Cybersecurity courses.

Staff and Administrative Personnel: The existing degree programs have grown in enrollment, stretching the ability of the university's current IT staff to support existing instructional hardware and infrastructure. The proposed program will require additional equipment and the university will need to address overall IT staffing appropriately.

Resources

Library and Learning Resources

Explain how current library/learning collections, databases, resources, and services specific to the discipline, including those provided by PASCAL, can support the proposed program. Identify additional library resources needed.

The Ida Jane Dacus Library is an integral part of the university's instructional program. The primary goal of the Winthrop University Library is to support the instructional and research activities of the Winthrop University academic community. The Winthrop Library is the primary provider on campus of scholarly information in all forms from print to electronic. In affirming its belief in the mission and goals of the university, the library is pledged to provide the information quickly, efficiently, and in sufficient depth to promote the excellence of all academic programs offered by the university.

In addition to the traditional reference assistance available in Dacus, material can be requested from other institutions through interlibrary loan. The Library is constantly reviewing and upgrading its resources, especially the electronic indexes and databases, which are upgraded frequently. New courses and programs, accreditation standards as well as courses dropped from the curriculum are reviewed.

A portion of the library's annual book budget is allocated to the Computer Science department for the purpose of purchasing books and instructional materials. The department selects a person to serve in the capacity of departmental liaison. The liaison's responsibility is to monitor departmental expenditures and make sure the teaching and research needs of the university are being supported. Departmental faculty are encouraged to submit requests for needed material.

The library receives over 100 indexes and databases in paid electronic subscriptions. Relating to computing, the library maintains electronic subscriptions to the *ACM Portal: The ACM Digital Library*, *MathSciNet*, and *ScienceDirect*. The library has an institutional subscription to IEEE publications.

Student Support Services

Explain how current academic support services will support the proposed program. Identify new services needed and provide any estimated costs associated with these services.

All new students are required to participate in orientation. A primary topic of orientation is coursework, including general education and degree requirements. Before a computing student takes his/her first course at Winthrop, they have met with a CS faculty member about their first semester's coursework. All existing Winthrop students are assigned a faculty advisor. Students must meet with their faculty advisor before they are allowed to sign up for the next semester's classes. (The registration system locks out a student until their advisor lifts the student's advising flag.) Therefore, all students must meet with their faculty advisor at least once a semester. All faculty members have student advisees. Effectiveness of advising is a specific item on the faculty annual report and the annual faculty performance evaluation. If a student has a question about coursework at any time throughout the semester, they can go see their advisor, the department chair, or any CS faculty member. All faculty maintain at least 8 hours of Office Hours each week.

Students may also go to the college's Student Services Office to ask staff questions during regular working hours. That office has two full-time advisors as well as Graduate Assistant advisors. The current system advises over 900 students in the college, and has the capability to support the proposed program without a negative impact on academic support effectiveness.

Physical Resources/Facilities

Identify the physical facilities needed to support the program and the institution’s plan for meeting the requirements.

Winthrop University has 31 computer labs. Of those, 16 are instructional labs and the rest are general access or mixed use. Five of the labs are entirely Mac while the other 26 are heavily PC. This represents a total of 475 PCs and 75 Macs. While computing students may use any of the 15 general access computer labs on campus, Thurmond 114, Thurmond 115, and Carroll 215 are exclusively reserved for computing majors. These students use their university ID card to access these labs. No instruction is scheduled in these labs - they are for students to use when the students want to use them. These rooms contain approximately 20 Linux machines, a few Windows machines, a student-built 32-node Beowulf cluster, networking equipment (switches and a router), industrial 3D printers, and a large monitor for group work. Equipment is managed centrally by the university’s Division of Computing and Information Technology, which has 23 FTE employees. Course fees on upper-division CSCI courses are used to purchase specialized equipment, such as computer workstations with extra memory and graphics cards.

Equipment

Identify new instructional equipment needed for the proposed program.

The new program shares many assets with the other computing focused programs at Winthrop: Computer Science, Computer Information Systems, Digital Information Design, and Data Science. With continued investment from the university in this hardware we expect the costs to scale with any increased enrollment. Indeed, some initial growth may be possible with no additional cost over existing investments in these machines. There are new hardware and software requirements specific to this program that will be necessary. Specifically to support forensics courses, software licensing and hardware for EnCase or a similar forensic product are necessary. Each USB Forensic bridge is approximately $500, and an academic license for 10 users is approximately $1,500 with $145 for each additional student. The bridges are a periodic replacement item which we would expect to be on the same replacement cycle as the workstations that will control them. The academic license is a yearly license fee. Similarly, licenses for software such as Metasploit are necessary. Those are currently free for academic institutions, but this may change in the future. Miscellaneous hard drives and mobile devices will need to be periodically replaced on the same cycle. Hard drives have continued to fall in price as have mobile devices that would be suitable for forensic work, requiring $3,000 over a 5 year period. Note: The focus on EnCase is because we are targeting the ability to become a NSA Designated Center of Academic Excellence in Cyber Defense. The knowledge units for Digital Forensics say that students should "Use one or more common DF tools, such as EnCase, FTK, ProDiscover, Xways, SleuthKit." Many of these tools have similar pricing models. This is why other proposals for Cyber programs in the state similarly request specific use of EnCase/FTK/etc.

Routers/switches/cabling and other equipment is necessary to use with workstations involved in penetration testing/ethical hacking, networking and the course on enterprise infrastructure. Over a 5 year period, $10,000 is expected to be used for these items. While virtualization (e.g. SEED Labs) can provide simulations of many security concepts, not all can be done virtually. Through strategic reuse of hardware cycled out of service and destined for surplus, used as a complement to the routers/switches/etc., we can maintain an experimental network/systems suitable for security at low cost. For example, as Winthrop replaces the ultrabooks used in classroom COWs (Computer on Wheels) carts, we can repurpose these machines for practice network configurations, setups, and so on.

New Equipment Costs				
	Year 1	Year 2	Year 3	Year 4

Amount required	$0	$7,000 of $10,000	Remaining $3,000 of $10,000	$9,500
Purpose	Existing courses, only expected increases would be proportional to existing costs for existing students (e.g. existing Linux infrastructure)	Routers, switches, cabling, retired COW machines, hardware, licenses etc. for Enterprise Infrastructure course.	Remaining equipment and licenses for Ethical Hacking. Reuse of year 2 equipment is expected.	Forensic bridges, academic license for encase or similar, initial seed of hard drives/mobile devices for forensics.
Recurring costs: 5 year replacement cycles will require saving roughly $4,800* a year in student program/course fees across all students in the program. This works out to roughly $32 dollars per student per semester once the projected enrollment is achieved towards continuing to fund these new equipment costs. * This number factors in the yearly EnCase license @ 10 students.				

Impact on Existing Programs

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

x Yes

☐No

There will likely be impact on existing programs in a few ways. First, students majoring in technology focused majors like Computer Science may choose to leave the degree for this new degree. Given the shortage of supply and excess of jobs available we do not envision this to be large enough to warrant concern. Second, we expect that existing programs such as Computer Ccience will become more flexible in terms of elective offerings since CS majors may choose to take a number of these upper division courses as their electives. Finally, we expect an overall net gain of students to the institution through new recruitment. Not all of these students will stay majors in the Cybersecurity program and there may be attrition to the other technology focused programs or the university programs as a whole.

Financial Support

Sources of Financing for the Program by Year												
	1st		2nd		3rd		4th		5th		Grand Total	
Category	**New**	**Total**	**New**	**Total**	**New**	**Total**	**New**	**Total**	**New**	**Total**	**New**	**Total**
Tuition Funding	229590	229590	497445	497445	841830	841830	1157950	1157950	1147950	1147950	3864765	3864765
Program-Specific Fees	1500	1500	3250	3250	5500	5500	7500	7500	7500	7500	25250	25250
Special State Appropriation	0	0	0	0	0	0	0	0	0	0	0	0
Reallocation of Existing Funds	0	0	0	0	0	0	0	0	0	0	0	0
Federal, Grant, or Other Funding	0	0	0	0	0	0	0	0	0	0	0	0
Total	231090	231090	500695	500695	847330	847330	1155450	1155450	1155450	1155450	3890015	3890015
Estimated Costs Associated with Implementing the Program by Year												
	1st		2nd		3rd		4th		5th		Grand Total	
Category	**New**	**Total**	**New**	**Total**	**New**	**Total**	**New**	**Total**	**New**	**Total**	**New**	**Total**
Program Administration and Faculty/Staff Salaries	0	0	126000	126000	126000	126000	126000	126000	126000	126000	504000	504000
Facilities, Equipment, Supplies, and Materials	1500	1500	10250	10250	8500	8500	17000	17000	7500	7500	44750	44750

Marketing	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	10000	10000
Library Resources	0	0	0	0	0	0	0	0	0	0	0	0
Institutional Overhead	91836	91836	198978	198978	336732	336732	459180	459180	459180	459180	1545906	1545906
Total	95336	95336	337228	337228	473232	473232	604180	604180	594680	594680	2104656	2104656
Net Total (Sources of Financing Minus Estimated Costs)	135754	135754	163467	163467	374098	374098	551270	551270	560770	560770	1785359	1785359

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 an explanation for all costs and sources of financing identified in the Financial Support table. Include an analysis of cost-effectiveness and return on investment and address any impacts to tuition, other programs, services, facilities, and the institution overall.

Tuition revenue is estimated based on the enrollment projections and the per-semester tuition rate of $7,653. Course fees will depend on the courses taken during the term but are estimated at $50 per student.

There are no new costs for Administration or staff as existing resources will be able to support the program.

New faculty costs are calculated based on the anticipated hiring of a new faculty member to start in the Fall of 2022 as the program enters the second year. The amount includes both the salary and the fringe benefit costs.

Supplies and materials are based on the yearly lab fees, which pay for appropriate software licenses and lab materials and the equipment needs as outlined in the discussion on equipment as noted in the prior section.

Institutional overhead is calculated at 40% of the tuition revenue and represents the program's share of general institutional costs such as utilities, facilities, and general administration.

Evaluation and Assessment

Program Objectives	Student Learning Outcomes Aligned to Program Objectives	Methods of Assessment
Graduates will be able to communicate ideas and concepts effectively.	Students will be able to communicate effectively in written form.	Writing assignment in CSCI327.
	Students will be able to communicate effectively in oral forms.	Research presentation in CSCI327

Graduates will create applications using secure programming practices.	**Students will be able to create a program using secure programming practices.**	**Programming assignment in CSCI243.**
	Students will be able to describe common attack vectors used to break programs.	**Lab work in CSCI424.**
Graduates will demonstrate understanding of fundamental cybersecurity concepts and principles.	**Students will properly use the vocabulary associated with cybersecurity.**	**Assignment in CSCI224.**
	Students will describe potential system attacks and the actors that might perform them.	**Assignment in CSCI224.**
Graduates will be able to configure and maintain secure systems.	**Students will evaluate systems for risks to confidentiality, integrity, and availability.**	**Assignment in CSCI224.**
	Students will design a basic network architecture given a specific need and set of hosts/clients.	**Lab work in CSCI324.**
	Students will evaluate how network operational procedures relate to network security.	**Lab work in CSCI324.**

Explain how the proposed program, including all program objectives, will be evaluated, along with plans to track employment. Describe how assessment data will be used.

Assessment and continuous improvement are built into every aspect of the department. It is standard practice for faculty to gather assessment data. Each September the faculty review the previous year's data to determine what curriculum improvements are needed. Part of the annual evaluation of faculty is their participation in the program evaluation process. Graduating seniors are surveyed for their opinions, suggestions for program improvement, and information on their employment status. Additionally, the department has an industry advising board who provide input into the degrees' curriculum. Those long established assessment and program improvement processes will be employed for the proposed program.

Assessment Overview

Winthrop University executes an outcome-based programmatic assessment effort that allows for continuous improvement of academic programs, to include student learning outcomes. Part of a cyclical process, these assessment efforts are designed to determine the extent to which identified outcomes are met and findings used for continuous improvement efforts. The process of identifying outcomes, collecting and analyzing data, and using results for improvement of the academic programs supports the assessment of the University's overall institutional effectiveness. The institution functions on the premise that assessment of academic programs maintains and strengthens the programs, while allowing the institution to achieve its stated outcomes.

Two goals of *The Winthrop Plan*, the University's strategic plan, are supported by the assessment of academic programs, specifically to "support inclusive excellence by expanding our impact on students" and to "continually enhance the quality of the Winthrop experience for all students." The process of student learning assessment, although focused at the program level, is informed by University structures and expectations.

Outcomes of individual academic programs are assessed through three major processes: (1) student learning outcomes assessment, focusing on what students know, think, and can do as a result of completing a program; (2) academic program review, a comprehensive evaluation of all areas of an academic program, including curriculum, faculty, students, and resources; and (3) professional accreditation review for specific disciplines. Assessment findings inform programmatic decisions, document student achievement, and improve the quality of learning for all students. The academic review system focuses on developing an institutional culture, with continual improvement at the core of assessment work.

Student Learning Outcomes Assessment

Each academic program within Winthrop University's four degree-granting colleges is required to implement an annual assessment plan that clearly articulates student learning outcomes and program outcomes, identifies appropriate methodology, measures the extent to which students achieve the outcomes, analyzes the findings, and uses the results to make curricular and programmatic enhancements or adjustments.

Accreditation and Licensure/Certification

Will the institution seek program-specific accreditation (e.g., CAEP, ABET, NASM, etc.)? If yes, describe the institution's plans to seek accreditation, including the expected timeline.

X Yes

☐ No

The National Security Agency has a designation for National Centers of Excellence in Cyber Defense. We are aligning ourselves to be capable of pursuing this designation; however, first eligibility would not be for several years due to the requirements of having a certain number of graduates from the program prior to applying.

Will the proposed program lead to licensure or certification? If yes, identify the licensure or certification.

☐ Yes

x No

Explain how the program will prepare students for this licensure or certification.

No, however, we are looking closely at where there may be potential overlap between coursework and the ability to gain certifications such as Security+, Certified Ethical Hacker, and so on. We consider these secondary objectives to the NSA designation.

If the program is an Educator Preparation Program, does the proposed certification area require national recognition from a Specialized Professional Association (SPA)? If yes, describe the institution's plans to seek national recognition, including the expected timeline.

☐ Yes

x No

Winthrop University responses to questions posed by Commissioners

Bachelor of Science in Cybersecurity

February 8, 2021

1. **Why opted not to involve local businesses for internship or co-op opportunities into the program, and/or offer some type of certification upon completion?**

Winthrop University has existing relationships with local businesses and, in our estimation, many students will take advantage of potential internship and/or part-time employment opportunities. While we are not requiring the completion of an internship, we believe that most students will take advantage of these opportunities. Historically, the computer science department has had more requests for interns than students looking for internships. This is because not all students can do an internship due to financial hardship, family demands, etc. And, while many students take advantage of summer employment, some of them do not earn academic credit for the experience.

Computer Science faculty are looking closely at the overlap between coursework and certifications, such as Security+, Certified Ethical Hacker and others. Successful completion of courses in ethical hacking and networking should allow students to be prepared for the Certified Ethical Hacking (CEH) certification. However, it should be noted that several certifications have secondary requirements such as minimum work experience, etc. We have initiated the process with some organizations like the EC-Council, which offers the CEH certification, to discuss becoming an "Academic Partner." This will allow us to bypass some eligibility requirements.

2. **Clarify if all computer lab upgrades and recurring costs are covered by industry partners.**

The Computer Science department has received a donation of forensic computing equipment. We have also received funds from a donor to support improvements to our computing infrastructure and capacity. Winthrop has also begun re-imagining the future of computer labs which will impact the availability of resources. That plan has many aspects, such as upgrading high performance workstations and increasing network capacities, which will benefit the proposed Cyber program and the newly approved Data Science program, as well as our Computer Science and Digital Information Design programs.

3. **What other programs in SC hold the national certification that Winthrop intends to pursue. Would there not be a benefit to students to obtain individual certification at the end of the program?**

The NSA National Center of Academic Excellence in Cyber Defense is a designation, not a certification. Currently, the designation provides funding opportunities in the form of grants which may be used to recruit students to our program and, most importantly, to provide an opportunity for our students to find employment with the federal government as they recruit from Cyber programs. At present, designated institutions in South Carolina include Clemson, SCSU, The Citadel, Trident Technical College, and USC. It will take us five years to obtain the designation. We have already started the process by engaging in program development conversations. It will take this time to achieve the designation since it requires the program have a certain number of graduates. Individual certification alignments are being pursued, however they will be secondary to NSA CAE-CD.

4. **Five other state institutions offer the similar program. The projected graduation is 15/yr. with 75 enrolled … does our state need an additional 15 such degrees/year … what is the impact to the five other schools of enrolling 75 in Winthrop? If Winthrop did not have this program where would these students go (into other Winthrop majors, to other schools, not go to school)?**

Based on the demonstrated need for professionals in the field, and the current enrollment in the various programs across the state, South Carolina and the greater Charlotte region have a growing need for additional cybersecurity graduates. As noted in the proposal, jobs in

information security are predicted to increase by 31% in South Carolina in the next 10 years. Other areas in computing also are growing by more than 10%. There is a continual need for additional graduates in this field.

There is incredible societal, governmental, and business need for computing and information security professionals. As a society, we need to protect ourselves from hacking, intrusions, and data breaches, which occur with astonishing regularity. With such a gap in the talent pipeline between students graduating from programs and the need for graduates, with a gap that is only forecast to grow, we need to focus on building more talent in the state and region.

Winthrop's location near Charlotte and the growing region of South Carolina in York and Lancaster counties gives our program access to many local businesses and established fields of banking and finance that also need information security professionals.

Winthrop also has been successful in recruiting and retaining underrepresented students in our computer science programs and we believe that one of one of our strengths continues to be the support we provide our students that results in very good persistence and graduation rates. Our experience in this area makes Winthrop an attractive option for students in this field. Specifically, Winthrop is one of only 15 universities selected in 2020 to participate in the National Center for Women in Technology's (NCWIT) Learning Circles (LC). NCWIT LC assists academic computing departments with the development and implementation of strategic initiatives to increase gender diversity in their undergraduate programs in a collaborative, communal environment. Activities include Winthrop faculty receiving NCWIT training on recruitment strategies, an assessment by NCWIT experts of Winthrop's recruiting activities, and implementation of improved recruitment plans.

If Winthrop did not have the Cybersecurity program, some of these projected students would still come to our campus and major in another field, while some would go to other campuses or to online for-profit institutions. The impact on other institutions would likely depend on their program capacity and existing students and faculty. There are many programs available on multiple campuses as there is significant demand for graduates in those fields and there is regional need for those students tied to this part of the state.

5. **What's Plan B if face to face is not yet possible in fall 2021?**

Winthrop is already planning for fall 2021 as a mix of in-person, hybrid and online options for the entire campus as we are not certain how the pandemic will evolve over the next several months. The first year of the program is mostly general education and basic courses that are not specific to Cybersecurity. By the time students finish their first year, we hope to be back to more normal course offerings. Our faculty have successfully navigated the pandemic by being flexible and adjusting course teaching modes, as needed, to accommodate our students.

6. **Will there be some effort to address the growing concern with the politics of addressing the need for cybersecurity to address the remarkable increase of home-grown terrorists creating problems and with hacking of US sites by foreign countries?**

While our program primarily focuses on the technical side of cybersecurity, the program will also cover the following legal and ethical components through two different courses; Principles of Cyber Security and Social Implications of Computing:

Federal Laws and Authorities, Computer Security Act, Sarbanes – Oxley, Gramm – Leach – Bliley, Privacy (COPPA) HIPAA / FERPA, USA Patriot Act, Americans with Disabilities Act, Section 508, Federal laws and regulations, State, US and international standards / jurisdictions, Payment Card Industry Data Security Standard (PCI DSS), BYOD (bring your own device) issues, Ethical Codes and Frameworks, Ethics and Cyberspace, Ethical Issues: Property, Availability, Rights of others, Respect and principles of community, Resource use, allocation, and abuse, Censorship, Ethics-based decision tools, social responsibility

This program will also follow recommendations for updates to curriculum from the NSA and the needs of employers in the field. The principles of our technical program in cybersecurity will apply to hacking and infiltration of computing networks from any entity – domestic, foreign, and even internal to the organization or company.

7. **Is there an effort to work with York Tech regarding transfer possibilities?**

Yes, we are working directly with York Tech on a new transfer pathway project with the intention to have detailed course plans for students in several programs to transfer seamlessly into Winthrop programs. The BS in Cybersecurity is part of that project.

8. **The question is asked: How did you calculate enrollment projections. The projections are enumerated but not the <u>calculation</u> of those projections**

Our calculations are based on course capacity, current faculty numbers, technology infrastructure, and facilities available at Winthrop. This program has the capacity to enroll additional students, however, we have intentionally been conservative in our initial projections, particularly given the current pandemic.

9. **Will the content of your Gen Ed/Constitution course satisfy the General Assembly?**

Yes, our constitution course requirement meets the content as outlined in the current law and is in alignment with recent versions of proposed changes to the law. Our faculty regularly review these courses to ensure they meet the content expectations as outlined in the law if additional changes occur.

10. **Does your course CRTW help students learn to assess the credibility of AV sources? (Librarians vet the quality all print materials that make it to the library shelves, but how are students instructed in the proper evaluation of the sources they use on the internet?)**

Our course in Critical Reading, Thinking and Writing does include a unit on "Thinking Critically about Media Sources" and includes strategies on evaluating news and social media articles. The

recommended curriculum includes readings, discussion topics, and a writing assignment to use skills and techniques in evaluating the reliability and accuracy of an article or news source. The coordinator of the program and library faculty developed and update this topic for the various faculty that teach the course.

11. **Please consider embedding certificates and badges. These types of embedded designations place graduates in a stronger employment position than those who graduate without such designation.**

12. **Embedding these add-on's in the curriculum is wise and will increase demand for the major as well as place your program in an excellent position for demand from business and industry.**

Our response to these questions are provided in answer to question 1, on page 1 of this document. We will continue to reach out to various organizations that offer external certifications that align with our curriculum and for those that can be added without significant additional time or cost to the students and the university.

13. **Is there an accreditation body for this program?**

Our BS in Computer Science is accredited by CAC/ABET, which also has an accreditation for cybersecurity programs. Our determination is that the NSA designation is more valuable than ABET accreditation in this field. The NSA is the primary authority on the expected content and knowledge that a cybersecurity professional needs to know. Our program likely would meet the ABET standards as they were written to align with the NSA expectations.