

RESOURCE GUIDE

PARTICIPANT INSTITUTIONS AND THEIR ARTICULATIONS WITH 4-YR INSTITUTION PARTNERS

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SFS Community College Pathways

Participant Institutions and their Articulations with 4-yr institution partners

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Table of Contents

SFS Comm	nunity College Pathways	i
Introductior	۱	ii
SFS 2-YR I	Participant Schools with Points of Contact:	. 1
School:	Anne Arundel Community College (AACC)	. 2
School:	Brookdale Community College	. 5
School:	Calhoun Community College	. 7
School:	Century College	. 9
School:	Community College of Baltimore County	11
School:	County College of Morris	13
School:	East Mississippi Community College	14
School:	Eastern New Mexico University – Ruidosio	16
School:	Forsyth Tech Community College	18
School:	Houston Community College	22
School:	Ivy Tech Community College	24
School:	Jackson State Community College	26
School:	Lake Superior Community College (LSC)	27
School:	Montgomery College	29
School:	Moraine Valley Community College	33
School:	Northern Virginia Community College	35
School:	Pellissippi State Community College	38
School:	Prince George's Community College	39
School:	Rose State	42
School:	Snead State Community College	44
School:	Tidewater Community College	47
School:	Volunteer State Community College	49
School:	Westchester Community College	51
Summary:		53

Introduction

SFS Pathways project description and objectives:

One of the objectives for the National CyberWatch Center Pathways project was to track the performance of the Scholarship for Service Pathways 2 and 4 year schools and provide the National Science Foundation with observations and suggestions for strengthening the program. Several measures were used to track performance: successes in graduation and transfer to the receiving program, summer internship engagement and faculty commentary on SFS program impact overall. Existing degree articulations or transfer agreements between the associate and bachelor degree programs were part of this data collection effort. This document contains a collection of course requirements associated with articulations and transfer agreements that have been shared with the researchers from all but one of the twenty-four (24) participating institutions, with the expectation that they might provide schools interested in duplicating the Pathways experiences with a roadmap to examples of linkages between Community Colleges and Universities.

Findings:

In terms of formal articulations, or the lack thereof, one institution explained that it was not their policy to enter into any legally binding agreements with schools or other organizations that would prevent them from maintaining the flexibility that they currently enjoy. In point of fact, this university has been the most flexible and creative in generating pathways to a Bachelor degree (BS), while retaining the academic rigor of their degree programs.

As was seen early on in this study, 80% of the 4-yr partners offer only a BS-Computer Science, into which students may transfer. Since Associate in Applied Science (AAS) degrees are, by nature, workforce-focused, and not considered "transfer programs", the effort to find workable pathways from an AAS in Cybersecurity to a BS in Computer Science (BS-CS) was like trying to fit the proverbial square peg into the round hole. Solutions typically placed the burden on the students, requiring as many as five additional courses to be completed prior to transfer.

For the remaining 4-yr schools that offer something other than a BS-CS, some are located in states that already have in place a state-level articulation or agreement stating that any graduate of a 2-yr program would automatically be accepted into any state university (e.g. New Mexico). However, while ensuring transfer, the student is not assured of entrance into specific degree programs. The "fine print" typically specifies that the transfer would be from an Associate in Science (AS) degree program to the matching BS program. Since most of the 2-yr pathways schools were sought out as partners because of their AAS in Cybersecurity and/or their CAE2Y status, what resulted was a very problematic transfer path. Matching required courses from the 2-yr degree programs with requirements stipulated in the 4-yr receiving program highlighted issues such as the need for higher level math courses and at least one science course with corresponding lab, prior to transfer.

For those pathway participants that entered into the partnership with only a "gentlemen's agreement", they quickly found out that work needed to be done on developing a realistic plan for what the AS or AAS course transfer package needed to contain. Those partners that invested the time to do so enabled their students to plan accordingly, with minimal unpleasant "surprises", and smoothed the path to transferring with full junior status.

In order to create a pathway for 2-yr AAS Cybersecurity programs into a BS-Computer Science, the receiving programs demand that students take upwards to six (6) computer science courses prior to transfer, including higher math courses. One solution was that the 2-yr school allowed the substitution of up to 3 or 4 courses required for the AAS degree, with the equivalent number of courses demanded by the receiving institution. This lessened the additional number of courses that had to be taken during summer sessions so that the students could transfer with junior status. The question left to be answered is how this alteration of cyber-specific course content within the AAS is offset by the fact that as far as the federal government is concerned, the awarding of a Bachelor's degree is more important that the actual educational content.

Another observation regarding connected degree programs is that that while the partners tried to create a pathway from an AAS to a BS-CS in the first year of this study, by the second year, they had dropped that idea, and reverted to selecting students from their AS-CS transfer program. However, these standard CS programs have no room for more than one or two cybersecurity courses. The follow-on, unanswered question is how can we call our BS-CS graduates a "CyberCorps" with little to no cyber content in their courses? (NOTE: Many of the 4-yr schools and some of the 2-yr schools have "cyber clubs", through which they acquire skills and knowledge in cyber topics, but this is only an informal route, rather than academically-grounded.)

An alternative to dropping the partnership between AAS degree schools and BS-CS receiving programs can be seen in the re-crafting of the AAS degree in Cybersecurity at Rose State. Their initial experience showed that even the "best and brightest" students needed up to five additional courses to be able to transfer into Tulsa's BS-CS program. So Rose State's approach has been to re-craft their AAS degree, replacing some of the courses with those that meet the demands (particularly higher math) of the CS degree program. As seen in the college-specific pages of this report, this approach not only provides the courses needed for transfer, but also retains the core of the original AAS degree in cybersecurity and digital forensics. This degree is probably one of the best examples of keeping student preparation in mind while not lessening the value of the AAS degree.

A few of the 2-yr/4-yr partner institutions do have formal articulation agreements, where the requirements for transfer are clearly laid out, eliminating any surprises for students. The most notable is the agreement between Tidewater Community College's AS-CS degree and Norfolk State University's BS-CS. Very few demands for specific courses are made of the Tidewater students, and all of the computer science courses are accepted into the receiving program at Norfolk. This is not always the case with BS-CS receiving programs, even when matched with an existing AS-CS degree.

One final example: In order to transfer the higher caliber students from the AAS programs into a 4-yr BS-CS program, one 2-yr school offered prospective students admittance to the SFS program to AAS graduates only. The effect was that their third year at the community college would be spent taking all the computer science and higher math courses demanded for entrance into the BS-CS program. With full knowledge of having to spend a third year at the community college, and five years in total to receive their Bachelor degree, students still applied for this coveted program.

In the following section, each participating 2-year college's curriculum that is part of the Pathways program is listed. As can be seen, while there is much similarity in the core cyber-competencies, each program has particular strengths in one or more of the specialty areas in cybersecurity. This may be more of a factor of faculty strengths, capabilities, and interests plus

previous departmental investments in program assets than intentional mapping to developing standards in cybersecurity.

Summary Data (from 23 respondents):

CAE2Y schools:	17
Schools offering both AAS and AS degrees:	13
Schools offering only AAS degree within transfer program	7
Schools offering only AS-CS degree within transfer program	3
4-yr schools (out of 15) offering only BS-CS transfer	13
4-yr schools offering transfer degrees in other than CS	8
(Degree Offerings: Cybersecurity (3), Information Technology (3),	
Computer Information Technology, College of Professional Studies,	
Information Systems)	
4-yr schools offering both CS and other related BS degrees	3
2-yr schools that partner with more than one 4-yr institution	3
(Forsyth Tech CC, Northern Virginia CC, Prince George's CC)	

4-yr Partner schools:

Institution	Partner 2-yr schools	Initial Year
Marymount University	Northern Virginia Community College	2016
Mississippi State University	East Mississippi Community College	2017
New Mexico Institute of Mining &Technology	East New Mexico University- Ruidoso Branch CC	2017
Norfolk State University	Tidewater Community College	2016
North Carolina A&T	Forsyth Tech Community College	2017
Pace University	Westchester Community College	2016
Purdue University	Ivy Tech Moraine Valley Community College	2017
St. Cloud State University	Century College Lake Superior Community College	2016
Stevens Institute of Technology	Brookdale Community College County College of Morris	2016
Tennessee Technology University	Pellissippi State Community College Jackson State Community College	2016
Texas A&M, College Station	Houston Community College	2017
The George Washington University	Prince George's Community College Anne Arundel Community College Northern Virginia Community College	2016
Towson University	Community College of Baltimore County	2017
University of Tulsa	Rose State	2016
University of Alabama Huntsville	Northeast Alabama Community College Snead State Community College	2016
University of Maryland Baltimore County	Prince George's Community College Montgomery College	2016
University of North Carolina at Charlotte	Forsyth Tech Community College	2017

SFS 2-YR Participant Schools with Points of Contact:

The following 2-yr schools were selected by the 4-yr Scholarship for Service awardees for the Pathways program, begun in the 2016-17 academic year. The faculty listed below took on the responsibility of marketing the program to their students, setting up interviews with applicants, and serving as the interface between the partner schools. Students joining the first year of the program are referred to as *Cohort 1*.

Schools noted with **joined the Pathways program in the 2017-18 academic year. Those with *** joined the program for the 2018-19 academic year. Students admitted in the 2017-18 academic year are referred to as *Cohort 2*.

Anne Arundel Community College -Brookdale Community College -Calhoun Community College *** -Century College -Community College of Baltimore County** -County College of Morris -East Mississippi Community College** -Eastern New Mexico University - Ruidosio** Forsyth Tech Community College** -Houston Community College*** -Ivy Tech Community College*** -Ivy Tech Community College*** -Jackson State CC - (2016-17 only) -Lake Superior Community College -Montgomery College -Moraine Valley Community College*** -Northern Virginia Community College -Northern Virginia Community College -Pellissippi State Community College -Prince George's Community College -Prince George's Community College -Rose State College -Snead State Community College -Tidewater Community College -Volunteer State Community College *** -Westchester Community College -

Prof. Carrie Leary Prof. Michael Qaissaunee Prof. Nisheeth Agrawal Prof. Dave Keller Prof. James Braman Prof. Patricia Tamburelli Prof. Andrew B. Sesser Dr. Stephen Miller Dr. Deanne Crawford-Weslev Prof. Douglas Hillman Prof. Valerie Golay Prof. Ben Marrero Dr. Thomas Pigg Prof. Valarie McLain Prof. Joe Roundy Dr. John Sands Dr. Margaret Leary Prof. Kevin Reed Prof. Sharon Burlingame Prof. Homayoun Sharafi Prof. Casey O'Brien Prof. Ken Dewey Prof. Greg Randall Prof. Kimberly Perez Prof. Patricia Anderson Prof. John C. Watkins

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School: Anne Arundel Community College (AACC)

Point of Contact: Partner School: **Receiving Degree Programs:** B.S. Computer Science

Prof. Carrie Learv The George Washington University

National Recognition:

- Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)
- National Centers of Digital Forensics Academic Excellence (CDFAE)

Degrees offered:

A.A.S. - Digital Forensics, Information Assurance and Cybersecurity (61 credits min.) A.A.S. - Networking, Information Assurance and Cybersecurity (61 credits min.) A.A.S. - Security, Information Assurance and Cybersecurity (61 credits min.) A.S. - Computer Science (60 credits min.)

Cohort 1 students transferred from AACC's Security, Information Assurance and Cybersecurity into GWU's BA in Computer Science program.

From Cohort 2, one student transferred from AACC's Computer Science AS degree into GWU's BS in Computer Science program.

Comments:

These partner schools have no formal articulation agreement in place. However, the AACC students completed the AACC programs, as stated in the college's catalog, and have made successful transfers, with Junior-level status at the receiving institution.

AAS.CIS.SECURITY Degree Requirements (From AACC College Catalog):

English: 3-6 credits

- ENG 111 Composition and Introduction to Literature 1 3 credit hours AND
- ENG 112 Composition and Introduction to Literature 2 3 credit hours • OR
- ENG 115 Composition and Introduction to Literature 1 for Non-Native Speakers 3 credit hours AND
- ENG 116 Composition and Introduction to Literature 2 for Non-Native Speakers 3 credit hours

OR

- ENG 121 Composition and Literature 3 credit hours
- Successful completion of ENG 121 fully satisfies the college English composition general education requirements.

Arts and Humanities: 3 credits

CTP 194 - Ethics and the Information Age 3 credit hours

Biological and Physical Sciences: 3 credits

BIO 135 - Principles of Nutrition 3 credit hours

Computer Technology: 4 credits

CTP 103 - Theories and Applications of Digital Technology 4 credit hours

Mathematics: 3 credits

• MAT 137 - College Algebra 3 credit hours Or more advanced level if qualified

Social and Behavioral Sciences: 3 credits

See <u>General Education Social and Behavioral Sciences Requirements</u> for a list of approved courses.

Common Program Requirements: (39-42 credits)

Requirements for all three security areas of concentration. Students must complete all of these courses with a grade of C or better.

- <u>CTS 105 Microcomputer Operating Systems</u> 3 credit hours
- CTS 110 Network Essentials 4 credit hours
- CTS 120 Introduction to UNIX/LINUX 4 credit hours
- CTS 140 Network Security Fundamentals 4 credit hours
- CTS 234 Windows Server 4 credit hours
- STM 103 Professional Skills for STEM 1 credit hour

Security Area of Concentration Requirements: (19-22 credits)

- CTS 130 Networking 1 4 credit hours
- CTS 131 Networking 2 4 credit hours
- CTS 240 Advanced Network Defense 4 credit hours
- CTS 242 Network Intrusion Detection and Penetration Testing 4 credit hours
- CTS 170 Digital Forensics 1 3 credit hours
 OR
- CTS 222 UNIX/LINUX System Administration 4 credit hours
- 0-3 Elective credits can be taken to achieve the 61 credits required for the award of this degree.

AS.CPS.COMP-SCI Degree Requirements (From AACC College Catalog):

English: 3-6 credits (same as above)

Arts and Humanities: 6 credits

Two different disciplines required. See <u>General Education Arts and Humanities Requirements</u> for a *list of approved courses.*

Biological and Physical Sciences: 8 credits

Two lab sciences required. See <u>General Education Biological and Physical Sciences Requirements</u> for a list of approved courses. Students should check with their transfer institutions for specific course requirements.

Computer Technology: 4 credits

• CTP 103 - Theories and Applications of Digital Technology 4 credit hours

Health/Fitness/Wellness: 3 credits

See Health/Fitness/Wellness for a list of approved courses.

Mathematics: 4 credits

• MAT 191 - Calculus and Analytic Geometry 1 4 credit hours

Social and Behavioral Sciences: 6 credits

Two different disciplines required. See <u>General Education Social and Behavioral Sciences</u> <u>Requirements</u> for a list of approved courses. Students should check their transfer institutions for specific course requirements.

Program Requirements: 12 credits

Transfer institutions require a B or better in both <u>CTP 150</u> and <u>CTP 250</u>.

- <u>CTP 115 Introductory Object-Oriented Program Analysis and Design 4 credit hours</u>
- <u>CTP 150 Computer Science 1</u> 4 credit hours
- <u>CTP 250 Computer Science 2</u> 4 credit hours

Area of Concentration Requirements: 11-15 credits

- MAT 192 Calculus and Analytic Geometry 2 4 credit hours
- MAT 202 Linear Algebra 4 credit hours
- MAT 250 Introduction to Discrete Structures 3 credit hours
- Electives: 0-4 credit hours

Diversity Requirement

All students in associate degree programs must satisfy the <u>diversity requirement</u>. In many cases, students may satisfy this requirement simultaneously as they satisfy a general education course requirement or with an elective.

School: Brookdale Community College

Point of Contact: Partner School: Receiving Degree Program: Prof. Michael Qaissaunee Stevens Institute of Technology B.S. – Cyber Security

National Recognition:

• CAE-2Y in development

Degrees offered:

A.A.S. - Networking, Information Assurance and Cybersecurity (not articulated) A.S. - Computer Science (65-66 credits)

Comments:

No formal articulation exists between Brookdale and Stevens. In the past, Brookdale has examined successful transfers and used those "accepted courses" as a model for what their current SFS students needed to take to qualify for admission as juniors at Stevens. For Cohort 1 student, his A.S.-CS degree needed to be augmented by the following courses: COMP 166 WEB Design Using HTML (taken at Brookdale), Discrete Math, Probability and Statistics, and Algorithms (all taken at Stevens during the summer between Sophomore and Junior year). The student also had to repeat two courses (Operating Systems, Databases) because, although the content was the same, the courses were 200-level at Brookdale, but 400-level at Stevens.

Degree Content:

Semester 1 - Fall Term

- COMP126 Computer Logic and Design Credits: 3
- COMP171 Programming I Credits: 3
- MATH171 Calculus I Credits: 4 *
- ENGL121 English Composition: The Writing Process Credits: 3
- Social Sciences Credits: 3

Total Credits: 16

Semester 2 - Spring Term

- COMP135 Computer Architecture Using Assembly Language Credits: 3
- COMP271 Programming II Credits: 3
- MATH172 Calculus II Credits: 4 **
- ENGL122 English Composition: Writing and Research Credits: 3
- Social Sciences or Humanities Credits: 3

Total Credits: 16

Semester 3 - Fall Term

- COMP225 Operating Systems Technology Credits: 3
- COMP226 System Analysis and Design Credits: 3
- COMP269 Database Concepts Credits: 3
- MATH273 Calculus III Credits: 4
- PHYS121 General Physics I Credits: 4

Total Credits: 17

Semester 4 - Spring Term

- COMP228 Data Structures Credits: 3
- COMP296 Advanced Software Project Credits: 3
- PHYS122 General Physics II Credits: 4
- General Education Credits: 3 (1)
- Humanities Credits: 3

Total Credits: 16

School: Calhoun Community College

Point of Contact:
Partner School:
Receiving Degree Program

Prof. Nisheeth Agrawal University of Alabama at Huntsville B.S. – Computer Engineering, Computer Science, and Management of Information System

National Recognition:

• Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)

Degrees offered:

AS – General Education (Computer Science) AAS – Cybersecurity

Comments:

Calhoun Community College and University of Alabama at Huntsville (UAH) developed a transfer pathway that allows Calhoun SFS graduates to transfer after sophomore year at Calhoun. These students receive 60 credits that transfer to UAH. Our program maps to three different BS programs at UAH, Computer Engineering, Computer science, and MIS. Students transfer to one of the three programs with cybersecurity as their concentration. Students are selected based on the courses they have already completed, GPA, student interest in cybersecurity, and student desire to attend UAH. Student must have completed 30-36 hours already prior to applying for SFS. If a student receives SFS they will complete one more year at Calhoun before transferring to UAH. Students who have taken more than 30 hours of required transfer courses at Calhoun already may take courses in cybersecurity AAS degree program during the two semesters they are at Calhoun (one year).

Degree Content:

GENERAL EDUCATION CORE REQUIREMENTS

Total	42 credit hours
Social/Behavioral Science Electives	6-9
*History Electives	
MTH 112 Pre-calculus Algebra or higher	3
Natural Science Sequence	8
Humanities Electives	3-6
Fine Arts Elective	3
*Literature Electives	3-6
ENG 102 English Composition II	3
ENG 101 English Composition I	3
ORI 110 Freshman Seminar	1

CONCENTRATION REQUIREMENTS

Total Credit	61-62 credit hours
Total	19-20 credit hours
General Electives	5-6
CIS 251 C++ Programming	
MTH 126 Calculus II	4
MTH 125 Calculus I	4
MTH 113 Pre-calculus Trigonometry	3

School: Century College

Point of Contact: Partner School: Receiving Degree Program: Prof. Dave Keller St. Cloud State University B.S. Informaton Technology Security

National Recognition:

National Center of Digital Forensics Academic Excellence

Degrees offered:

A.S. – Computer Science

- A.A.S. Cloud Computing & Virtualization Security, Cloud Computing Track (60 credits)
- A.A.S Enterprise Computing Technology

A.A.S – Information Technology & Telecommunication

Comments:

<None submitted>

Degree Content: (Suggested)

Semester 1

- ITT 1000 Information Technology Career Planning Credits: 2
- ITT 1031 Introduction to Networks (CCNA-1) Credits: 3
- ECT 1013 Installing and Configuring Windows Server 2012 Credits: 3

Select one

- COMM 1021 Fundamentals of Public Speaking Credits: 3
- COMM 1031 Interpersonal Communication Credits: 3
- COMM 1041 Small Group Communication Credits: 3
- COMM 1051 Intercultural Communication Credits: 3
- ENGL 1020 Composition I *Credits:* 4
- OR_
- ENGL 1021 Composition I Credits: 4

Total Credits: 15

Summer

• CVF 1092 - Information Storage Management and Security Credits: 3

Total Credits: 3

Semester 2

- ECT 1030 Linux Operating System Credits: 3
- ITT 1032 Routing and Switching Essentials (CCNA-2) Credits: 3
- CVF 1091 Cloud Computing and Virtualization Forensics Credits: 3
- CVF 1083 System Security and Network Auditing Credits: 3
- ECT 1003 Desktop Client Virtualization and Mobile Device Support Credits: 3

- OR -

• CVF 2093 - VMware Sphere ICM (Install, Configure, Manage) Credits: 4

Total Credits: 15

Semester 3

- ITT 2031 Scaling Networks (CCNA-3) Credits: 3
- ITT 2020 Advanced Network Security Credits: 3
- ITT 2099 IT Capstone Credits: 3
- MnTC Goal 3: Natural Sciences / MnTC Goal 4: Math/Logical Reasoning Credits: 3
- MnTC Goal 5: History/Social/Behavioral Sciences Credits: 3

Total Credits: 15

Semester 4

- ITT 2032 Connecting Networks (CCNA-4) Credits: 3
- CVF 2120 Cloud Infrastructure: Deployment and Management Credits: 3
- ITT 2049 Advanced Routing and Switching Credits: 3
- MnTC Goal 6: Humanities/Fine Arts Credits: 3

Total Credits: 12

School: Community College of Baltimore County

Point of Contact: Partner School: Receiving Degree Program: Prof. James Braman Towson University B.S. – Computer Science

National Recognition:

• Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)

Degrees offered:

A.A.S. – Cybersecurity (60 credits min.) A.S. – Computer Science (60 credits min.)

Comments:

The partner school has no formal articulation agreement in place. However, CCBC students have made successful transfers, with Junior-level status at the receiving institution. However, articulations are being worked on currently for the Computer Science, Information Management and Information Technology programs. Typically, students transferring to Towson do achieve junior status, based on the number of credits earned. However, with the Cybersecurity program, they may need to take a few extra programming classes prior to their junior year transfer.

Degree Content:

CCBC Computer Science

General Education Requirements and Electives - 29-30 Credits General Education Requirements:

- <u>CSIT 111 Logic and OO Design</u>
- ENGL 101 College Composition I
- MATH 251 Calculus I

General Education Electives:

Choose a course in each category from the list of approved <u>General Education courses</u>. One course must be a Diversity course.

- Arts and Humanities 6 Credit(s).
- Social and Behavioral Sciences 6 Credit(s).
- Biological and Physical Sciences (one course must include a lab) 7-8 Credit(s).**

Program Requirements and Electives - 31-32 Credits

Program Requirements:

- <u>CSIT 210 Introduction to Programming</u>
- CSIT 211 Advanced Programming
- CSIT 214 C++ Programming
- MATH 243 Discrete Mathematics
- MATH 252 Calculus II
- MATH 257 Linear Algebra

Program Electives:

Choose two of the following courses. At least one must be a 4-credit course.

- <u>CSIT 212 Visual Basic Programming</u>
- CSIT 241 Applied Systems Analysis & Design
- CSIT 267 iOS Application Development
- CSIT 268 Android Application Development
- CSIT 269 Mobile Application Security
- DCOM 142 Introduction to Linux/UNIX
- DCOM 150 Digital Forensics I
- ENGL 102 College Composition II
- MATH 153 Introduction to Statistical Methods **
- MATH 165 Precalculus **

CCBC Cybersecurity

General Education Requirements and Electives - 18-20 Credits General Education Requirements:

- <u>CSIT 111 Logic and OO Design</u>
- ENGL 101 College Composition I

General Education Electives:

Choose a course in each category from the list of approved <u>General Education Courses</u>. One course must be a Diversity course.

- Arts and Humanities (<u>CMNS 101</u> recommended) **3 Credit(s)**.
- Biological and Physical Sciences 3-4 Credit(s).
- Mathematics 3-4 Credit(s).
- Social and Behavioral Sciences 3 Credit(s).

Program Requirements and Electives - 42 Credits

Program Requirements:

- DCOM 101 Introduction to Data Communications
- DCOM 142 Introduction to Linux/UNIX
- DCOM 211 Introduction to Firewalls
- DCOM 212 Introduction to Intrusion Detection/Prevention Systems
- DCOM 214 Operating Systems Security
- DCOM 215 Ethical Hacking and Systems Defense
- DCOM 217 Cisco I: Introduction to Networks
- DCOM 218 Cisco II: Routing and Switching Essentials
- DCOM 219 Cisco III: Scaling Networks
- DCOM 220 Cisco IV: Connecting Networks
- DCOM 252 Advanced TCP/IP
- DCOM 258 Introduction to Information Security

School: County College of Morris

Point of Contact: Partner School: Receiving Degree Program: Prof. Patricia Tamburelli Stevens Institute of Technology B.S. – Cyber Security

National Recognition:

• Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)

Degrees offered:

A.A.S. – Information Technology (5 tracks) (62 credits) A.S. – Computer Science (63 credits)

Comments:

County College of Morris has developed a transfer pathway with Stevens Institute of Technology that allows CCM SFS graduates to transfer with full junior status. CCM students receive 63 credits that will transfer to Stevens. CCM students need to participate in the Summer Bridge Program at Stevens to take mandatory pre-requisite courses that allow them to achieve full junior status in the fall semester. CCM students that wish to pursue a degree in Information Technology must take additional Math courses that are required by Stevens before enrolling in their junior year.

COURSE NUMBER	NAME OF COURSE	Transferable Credits
CMP 128 (Java)	Computer Science I	3
CMP 129	Computer Science II	3
CMP 230	Data Structures and Algorithms (CS III)	3
CMP 246	Operating Systems	3
CMP 280	Software Engineering	3
CMP 233	Computer Architecture &Assembly Language	3
MAT 225	Discrete Mathematics	4
	Calculus I	3
	Calculus II	3
	Calculus III	3
ENG 111/112	Comp I & II	6
	Humanities Elective	3
XXX XXX	Social Science Elective	3
XXX XXX	Lab Science I	4
XXX XXX	Lab Science II	4
CMP 239	Internet & Web Page Design	3
CMP 120	Foundations of Information Security	3
CMP 124	Network Security	3
CMP 125	Management of Information Security	3
TOTAL		63

Degree Content:

School: East Mississippi Community College

Point of Contact: Partner School: Receiving Degree Program: Prof. Andrew Sesser Mississippi State University B.S. Computer Science

National Recognition:

None currently

Degrees offered:

A.A.S. - Cybersecurity Technology

Comments:

Currently, there is not a 100% articulation agreement between the partner schools, although they continue to work towards that goal. Both partners continue to explore common ground between the programs, and are working towards more integration between East Mississippi and Mississippi State University.

Degree Content:

Freshman | First Semester | 17 Semester Hours IST 1143 Principles of Information Security - 3 Semester Hours IST 1134 Fundamentals of Data Communication - 4 Semester Hours IST 1124 IT Foundations - 4 Semester Hours Programming Elective - 3 Semester Hours Humanities/Fine Arts Elective - 3 Semester Hours

Freshman | Second Semester | 15 Semester Hours IST 1244 Network Administration, Using Win Server - 4 Semester Hours IST 1224 Network Components - 4 Semester Hours IST 1624 Network Security Fundamentals - 4 Semester Hours Social/Behavioral Science Elective - 3 Semester Hours

Sophomore | First Semester | 15-16 Semester Hour IST 1163 Database and SQL Concepts - 3 Semester Hours IST 1633 Wireless Security & Privacy - 3 Semester Hours Math/Science Elective - 3-4 Semester Hours Security Elective - 3 Semester Hours

Sophomore | Second Semester | 14 Semester Hours IST 1643 Network Defense and Countermeasures - 3 Semester Hours LLS 1711 Job Search Skills - 3 Semester Hours SPT 1113 Public Speaking I - 3 Semester Hours Security Elective - 3 Semester Hours Career Technical Elective - 4 Semester Hours

Security Electives:

IST 1613 Computer Forensics - 3 Semester Hours

IST 2623 Linux/Unix Security - 3 Semester Hours

IST 2613 Windows Security - 3 Semester Hours

Career Technical Electives:

IST 1254 Computer Forensics - 3 Semester Hours

IST 2623 Linux/Unix Security - 3 Semester Hours

IST 2254 Advanced Network Administration Using Windows - 3 Semester Hours

IST 2264 Advanced Network Administration Using Linux - 3 Semester Hours

Programming Electives:

IST 1154 Web and Programming Concepts - 4 Semester Hours

IST 1433 Web Development using HTML & CSS - 3 Semester Hours or any other approved programming elective

School: Eastern New Mexico University – Ruidosio

Point of Contact:	Dr. Steven Miller
Partner School:	New Mexico Institute of Mining and Technology
Receiving Degree Programs:	B.S. – Information Technology
	B.S. – Computer Science

National Recognition:

• Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)

Degrees offered:

A.A.S. - Information Systems - With Computer and Network Security Certificate

Cohort 1 students transferred from ENMU-Ruidoso A.A.S. – Information Systems – With Computer and Network Security Certificate into New Mexico Institute of Mining and Technology in Computer Science or Information Technology program. (See Articulation Agreements attached).

Comments:

ENMU-Ruidoso Branch Community College has an articulation agreement with New Mexico Institute of Mining and Technology for the A.A.S. – Information Systems – With Computer and Network Security Certificate to the Computer Science or Information Technology program. Unfortunately, the original articulation did not correspond to the latest NM Tech changes to their Information Technology program. From the 2-yr perspective, the issue is the NM Tech program is structured more like a computer science degree than an Information Technology degree. The new requirements added 10 to 16 more credits to the ENMU-Ruidoso Information Systems program. This has been a burden on the cohorts, requiring summer school following both freshman and sophomore years so that they have the required courses to transfer with full junior status.

As one remedy to these issues, since the CAE2Y curriculum maps to the A.A.S. Information Systems Cybersecurity program, ENMU faculty are working with NM Tech to add a new program that would articulate as a pure 2+2.

Current Articulation Degree Content (60 credits for ENMU Associates, plus 10-16 additional credits required by NM Tech):

ENMU Ruidoso AAS Information Systems 1. Communications (6 credit hours)

			Credits
ENG 102	English Compositio	n	3
ENG 104	English Compositio	n & Research	3
2. Mathematics	s (7 credit hours)		
MATH 124	Calculus 1		4
MATH 132	Calculus 2		4
NOTE: College	Algebra (MATH 119) and	Trigonometry (MATH 1	20) are prerequisites

3. Basic Laboratory Sciences (26 credit hours)

el Buelle Euserate		
CHEM 151/151L	General Chemistry I / Lab	4
CHEM 152/152L	General Chemistry II / Lab	4
PHYS 151/151L	Physics with lab (NM TECH additional requirement)	5
PHYS 152/152L	Physics with lab (NM TECH additional requirement)	5
See technical requir	ements below	8 credits
4. Social Sciences	s (6 credit hours)	
ECON 221	Principles of Macroeconomics	3
ECON 222	Principle of Microeconomics	3
PSCI 101	Introduction to Political Science	3
PSCI 102	American National Government	3
PSY 101	Introductory Psychology	3
SOC 101	Introductory Sociology	3
BUS 151	Introduction to Business	3
ANTH 243	Introduction to Cultural Anthropology	3
5. Humanities (6 c	redit hours)	
ART 165	Art History	3
ENG 221	Introduction to Literature	3
MUS 113	Music Appreciation	3
HIST 101	Survey of American History to 1877	3
HIST 102	Survey of American History since 1877	3
SPAN 101	Beginning Spanish	4
SPAN 102	Cont. of Beginning Spanish	4
SPAN 201	Intermediate Spanish	3
SPAN 202	Cont. of Intermediate Spanish	3

6. Additional courses from 4 or 5 above (none required for AAS; additional required for NM tech.)

7. Technical Requirements (21 credit hours)

· · ·		~
CS 123	Programming Fundamentals	3
CS 123L	Programming Fundamentals Lab	1
CS 222	Systems Programming	3
CS 236	Intro to Object-Oriented Programming	3
IS 153	Introduction to Information Systems	3
IS 160	Overview of Operating Systems & Utilities	3
IS 257	Ethical Hacking, Network Defense, Counter Measures	3
IS 270	Data and Information Management	3

Computer & Network Security Certificate (18 credits)

IS 131	Network Security Fundamentals	3
IS 136	Guide to Disaster Recovery	3
IS 253	Firewalls and How They Work	3
IS 257	Ethical Hacking, Network Defense, Counter Measures	3
IS 258	Cyber Ethics, Professionalism, and Career Develop.	3

School: Forsyth Tech Community College

Point of Contact:	Dr. Deanne Cranford-Wesley
Partner School:	University of North Carolina at Charlotte
Receiving Degree Program:	North Carolina Agriculture and Technical State Univ. UNC-Charlotte: BS-Comuter Science, minor in cybersecurity
	NCA&T: BS-Comuter Science

National Recognition:

- Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)
- CAE Regional Resource Center (CRRC)

Degrees offered:

A.A.S. – Information Technology – Systems Security A.A.S. – Information Technology – Cyber Security

Comments:

Forsyth Tech is in their second year of the Pathways program. Their recruiting program has been so successful that they now have a waiting list of potential SFS applicants.

Degree Content – Systems Security:

Fall Semester

	Course	Class	Lab	Credit
Course	Title	Hours	Hours	Hours
CIS 110	Introduction to Computers [A][R]	2	2	3
CTI 110	Web, Programming, and Database Foundation	2	2	3
CTI 120	Network and Security Foundation	2	2	3
NET 125	Introduction to Networks	1	4	3
NOS 130	Windows Single User [R]	2	2	3
	Total:	9	12	15

Spring Semester

	Course	Class	Lab	Credit
Course	Title	Hours	Hours	Hours
NET 126	Routing Basics [R]	1	4	3
SEC 110	Security Concepts	2	2	3
SEC 150	Secure Communications [R]	2	2	3
SEC 160	Security Administration 1 [R]	2	2	3
Select one:				
MAT 110	Mathematical Measurement and Literacy- 2018FA [R]	2	2	3
MAT 143	Quantitative Literacy – 2018FA [A][U][G][R]	2	2	3
MAT 171	Pre-calculus Algebra – 2018FA [A][U][R]	3	2	4
	Total:	9-10	12	15-16

Summer Semester

Course	Course Title	Class Hours	Lab Hours	Credit Hours
CTS 115	Info Sys Business Concepts [A][R]	3		3
###	Social/Behavioral Science Elective	3		3
Select one:				
ENG 110	Freshman Composition [R]	3		3
ENG 111	Writing and Inquiry [A][U][G][R]	3		3
	Total:	9		9

Fall Semester

Course	Course Title	Class Hours	Lab Hours	Credit Hours
CCT 231	Technology, Crimes and Law	3		3
SEC 175	Perimeter Defense [R]	1	4	3
SEC 210	Intrusion Detection	2	2	3
SEC 258	Security Compliance	2	3	3
	Total:	8	9	12

Spring Semester

	Course	Class	Lab	Credit
Course	Title	Hours	Hours	Hours
CCT 250	Network Vulnerabilities [R]	2	2	3
SEC 285	Systems Security Project [R]	1	4	3
###	Humanities/Fine Arts Elective [A]	**	**	3
###	Elective(List 1)	**	**	1
Select one:				
COM 120	Intro to Interpersonal Communications [A][G][R]	3		3
CPM 231	Public Speaking [A][U][G][R]	3		3
ENG 114	Prof Research & Reporting [A][G][R]	3		3
ENG 116	Technical Report Writing [R]	3		3
	Total:	6	6	13
	Total Credit Hours:			64-65

Legend:

[A]: Comprehensive Articulation Agreement - This course is recommended for students transferring to a four-year university.

[L]: Local Requirement

[I]: Instructional Service Agreement

[U]: Universal General Education Transfer Component (UGETC)

[G]: Global Distinction

[R]: Requisite(s)

Elective – Select 1 credit hour: CCT 110, CIS 115, NET 225, NOS 120, NOS 230, WBL 111, WBL 121, WBL 131 Humanities/Fine Arts Elective – Select one: ART 111, HUM 110, HUM 115, MUS 110, <u>PHI 240</u> Social/Behavioral Science Elective – Select one: ECO 151, ECO 251, ECO 252, PSY 118, PSY 150, SOC 210

Degree Content – Cyber Security:

Fall Semester

Course	Course Title	Class Hours	Lab Hours	Credit Hours
CCT 110	Intro to Cyber Crime	3		3
CIS 110	Introduction to Computers [A][R]	2	2	3
CJC 111	Introduction to Criminal Justice [A]	3		3
CTI 110	Web, Programming, and Database Foundation	2	2	3
CTI 120	Network and Security Foundation	2	2	3
	Total:	12	6	15

Spring Semester

	Course	Class	Lab	Credit
Course	Title	Hours	Hours	Hours
CCT 112	Ethics and High Technology	3		3
CCT 121	Computer Crime Investigations	3	2	4
CJC 112	Criminology [R]	3		3
CTS 120	Hardware/Software Support [R]	2	3	3
SEC 110	Security Concepts	2	2	3
	Total:	13	7	16

Summer Semester

	Course	Class	Lab	Credit
Course	Title	Hours	Hours	Hours
CTS 115	Info Sys Business Concepts [A][R]	3		3
Select one:				
ENG 110	Freshman Composition [R]	3		3
ENG 111	Writing and Inquiry [A][U][G][R]	3		3
Select one:				
MAT 110	Mathematical Measurement and Literacy- 2018FA [R]	2	2	3
MAT 143	Quantitative Literacy – 2018FA [A][U][G][R]	2	2	3
MAT 171	Pre-calculus Algebra – 2018FA [A][U][R]	3	2	4
	Total:	8	2	9

Fall Semester

	Course	Class	Lab	Credit
Course	Title	Hours	Hours	Hours
CCT 231	Technology, Crimes and Law	3		3
CIS 115	Intro to Programming and Logic [A][R]	2	3	3
CJC 131	Criminal Law	3		3
###	Elective(List 1)	**	**	3
	Total:	8	3	12

Spring Semester

	Course	Class	Lab	Credit
Course	Title	Hours	Hours	Hours
CCT 250	Network Vulnerabilities [R]	2	2	3
CCT 289	Capstone Project [R]	1	6	3
###	Humanities/Fine Arts Elective [A]	**	**	3
###	Elective(List 2)	**	**	1
###	Social/Behavioral Elective	3		3
Select one:				
COM 120	Intro to Interpersonal Communications [A][G][R]	3		3
CPM 231	Public Speaking [A][U][G][R]	3		3
ENG 114	Prof Research & Reporting [A][G][R]	3		3
ENG 116	Technical Report Writing [R]	3		3
	Total:	9	8	16
	Total Credit Hours:			68

Elective List 1 – Select 3 credit hours: CTS 220, DBA 110, NET 125, NOS 120, NOS 130

Elective List 2 - Select 1 credit hour: CSC 139, CSC 151, CSC 153, SEC 150, WBL 111, WBL 121, WBL 131

Humanities/Fine Arts Elective - Select one: ART 111, HUM 110, HUM 115, MUS 110, PHI 240

Social/Behavioral Science Elective – Select one: ECO 151, ECO 251, ECO 252, PSY 118, PSY 150, SOC 210

School: Houston Community College

Point of Contact:	Prof. Douglas Hillman
Partner School:	Texas A&M University, College Station
Receiving Degree Program:	B.S. Engineering and/or Technology Management

National Recognition:

- Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)
- Center of Excellence Digital and Information Technology

Degrees offered:

A.A.S. – Computer Systems Networking - Cybersecurity

Comments:

HCC and TAMU will consider course swaps, additions, and deletions, that need to be made to this program for SFS students to meet the requirements to transfer into TAMU as juniors on an individual basis as needed.

Degree Content:

FIRST YEAR			
SEMESTER 1			
	EDUC 1300	Learning Framework	3
	ENGL 1301	Composition 1	3
	MATH 1314	College Algebra	3
	BCIS 1305 ITMT 1358	Computer Business Applications OR Windows Client Operating Systems	3
	ITSC 1307	UNIX Operating System I	3
		TOTAL CREDITS	15

SEMESTER 2			
	XXXX #3##	Humanities/Fine Arts/General Education Elective	3
	XXXX #3##	Social/Behavioral Sciences Elective	3
	ITNW 1425 ITCC 1414	Fundamentals of Networking Technologies OR CCNA 1: Introduction to Networks	4
	ITSY 1342	Information Technology Security	3
	COSC 1436	Programming Fundamentals	4
		TOTAL CREDITS	17

SEMESTER 3			
	ITMT 1357	Administering a Windows Server Operating System	3
		TOTAL CREDITS	3

SECOND YEAR			
SEMESTER 1			
	XXXX #3##	Social/Behavioral Sciences/General Education Elective	3
	ITNW 1313	Computer Virtualization	3
	ITSY 2330	Intrusion Detection	3
	ITSY 2401	Firewalls and Network Security	4
		TOTAL CREDITS	1:

SEMESTER 2			
	ITSY 2443	Computer System Forensics	4
	ITSY 1491	Special Topics in Computer Systems – Network & Telecommunications	4
	ITSY 2471	Cyber Competitions (Capstone course)	4
		TOTAL CREDITS	12
		TOTAL DEGREE CREDITS	60

- A. Student Success Course: Students are required to complete EDUC 1300 within their first 12 semester credit hours of instruction. Students enrolled at HCC with 12 or more hours completed should consult with an academic advisor to select an appropriate course substitution.
- B. Humanities/Fine Arts: May choose from ARTS 1301, 1303,1304, COMM 2366, DANC 1305, 2303, DRAM 1310, 2316, 2366, ENGL 2322, 2323, 2327, 2328, 2332, 2333, 2342, 2343, 2351, HIST 1301,1302, 2311, 2312, 2321, 2322, 2301, 2327, 2328, 2381, HUMA 1301, 1305, 1311, 2319, 2323, MUSI 1306, 1307, 1310, PHIL 1301, 1304, 2306, 2307, 2316, World Languages (ARAB 1411, 1412, CHIN 1411, 1412, FREN 1411, 1412, GERM 1411, 1412, JAPN 1411, 1412, KORE 1411, 1412, SPAN 1411, 1412.)
- C. Social/Behavioral Sciences: *May choose from* ANTH 2346, 2351, ECON 1301, 2301, 2302, EDUC 1300, GEOL 1302, 1303, GOVT 2305, 2306, PSYC 2301, 2314, 2316, 2319, SOCI 1301, 1306, 2301, 2336, TECA 1354.
- D. General Education :*May choose from* ANTH 2301 (with or without 2101 lab), 2302, 2346, 2351, ARTS 1301, 1303, 1304, ASTR 1303,1304, 1403, 1404, BIOL 1306, 1308, 1309, 1322, 1407, (2301, 2302 restricted to Engineering, Science, and Health Science majors, CHEM 1305, 1311, 1405, 1412, COMM 2366, COSC 1436, DANC 1305, 2303, DRAM 1310, 2316, 2366, ECON 1301, 2301, 2302, EDUC 1300, ENGL 2322, 2323, 2327, 2328, 2332, 2333, 2342, 2343, 2351, GEOG 1301, 1302, 1303, GEOL 1301, 1305, 1345, 1347, 1403, 1404, GOVT 2305, 2306, HIST 1301,1302, 2311, 2312, 2321, 2322, 2301, 2327, 2328, 2381,HUMA 1301, 1305, 1311, 2319, 2323, MATH 1314, 1316, 1324, 1325, 1332, 1342, 1350, 2318, 2320, 2412, 2413, 2414, 2415, MUSI 1306, 1307, 1310, PHIL 1301, 1304, 2306, 2307, 2316, PHYS 1305, 1401, 1402, 2325 (with or without 2125 lab), 2326 (with or without 2126 lab), PSYC 2301, 2314, 2316, 2317, 2319, SOCI 1301,1306, 2301, 2336, TECA 1354, World Languages (ARAB 1411, 1412, CHIN 1411, 1412, FREN 1411, 1412, GERM 1411, 1412, JAPN 1411, 1412, KORE 1411, 1412, SPAN 1411, 1412).

School: Ivy Tech Community College

Point of Contact:

Prof. Valerie Golay Prof. Ben Marrero Purdue Northwest Univers

Partner School: Receiving Degree Program: Purdue Northwest University B.S. - Computer Information Technology

National Recognition:

 Center of Academic Excellence in Information Assurance 2-Year Education (CAE/IAE 2Y)

Degrees offered:

A.A.S. – Cyber Security / Information Assurance (60 Credits) A.S. – Computer Science (not articulated)

Comments:

According to the plan developed by Purdue Northwest University, Ivy Tech students enrolled in the AAS Cyber Security degree program need to also take SDEV120 (Computer Logic) *prior to the summer* of their Sophomore year. In that summer session, need to take SDEV140 (Introduction to Software Development, which serves as the prerequisite for course sequence SDEV 200 and SDEV 240. In the fall sophomore semester, students need to take DBM 110 (Database using SQL), SDEV 153 (Website Development), and SDEV 200 (Java programming). To finish out the courses required for transfer to Purdue Northwest as Juniors, in their Spring semester, transferring SFS students must take MS 205 (Discrete Math - suggested to be taken at PNW), and SDEV 240 (C# Programming.) In total, seven additional courses are needed in order to complete the requirements for entrance to Purdue's program.

As a note of interest, Ivy Tech offers two free courses to all students enrolled in the college: Introduction to Cyber Security (15 hrs.)

Cybersecurity Essentials (30 hrs.)

Degree Content:

SEMESTER 1						Replacement Course
	ENGL 111	English Composition	3			
	IVYT 115	Student Success in Computing and Informatics	1			
	INFM 109	Informatics Fundamentals	3			
	ITSP 135	Hardware/Software Support	4			
	NETI 105	Network Fundamentals	3			
	SDEV 120	Computing Logic	3			
				SEMESTER TOTAL:	17	

SEMESTER 2							
	CSIA 105	Introduction to Cyber Security/Information Assurance	3				
	CSIA 210	Network Protocol Analysis	3				
	ITSP 136	Workforce Preparation: CompTIA A+ Certification	1				
	MATH 136	College Algebra or higher	3	-	4		
	NETI 115	Routing and Switching	3				
	SVAD 111	Linux and Virtualization Technologies Fundamentals	3				
				SEMESTER TOTAL:	16		
SEMESTER 3							
	COMM 101	Fundamentals of Public Speaking	3				
	CSIA 106	Workforce Preparation: CompTIA Security+ Certification	1				
	CSIA 135	Digital Forensics	3				
	CSIA 215	Perimeter Defense	3				
	XXXX XXX	Life/Physical Sciences Elective	3	-	5		
	XXXX XXX	Cyber Security/Information Assurance Selective I	1				
				SEMESTER TOTAL:	14		
SEMESTER A							
	CPIN 269	Computing and Informatics Project Management	3				
	CPIN 279	Computing and Informatics Exploration and Evaluation	1				
	CSIA 225	Ethical Hacking	3				
	XXXX XXX	Humanities/Social & Behavioral Sciences Elective	3	-	4		
	XXXX XXX	Cyber Security/Information Assurance Selective II	3				
				SEMESTER			
				TOTAL:	13		
						TOTAL	
						HOURS:	60
		SYMBOL KEY	-				
		^Capstone Course					

School: Jackson State Community College

Point of Contact:	Dr. Thomas Pigg
Partner School:	Tennessee Technological University
Receiving Degree Program:	B.S. – Computer Science

National Recognition:

• Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)

Degrees offered:

A.A.S. – with 4 areas of focus (Cyber Defense, Networking, Programming, Information Systems (61 credits) A.S. – Information Systems

Comments:

Jackson State participated in the 2016-17 academic year only. While their student successfully transferred to Tennessee Tech, because of family health issues, the student had to withdraw from the SFS program. No students were selected for the 2017-18 academic year. However, since the program fit between the A.A.S and B.S. degrees was problematic, JSCC has added a new A.S. degree option in Computer Science and are in the process of finalizing the program. Once completed, JSCC will approach Tennessee Tech to review the program content in hopes of creating a workable articulation agreement.

Proposed AS-CS Degree Content:

COMPUTER SCIENCE	(Major)	ASSOCIATE OF SCIENCE	(Degree)
	•	•	•
PROGRAM REQUIREMENTS			
SEMESTER & COURSES	CREDIT	SEMESTER & COURSES	CREDIT
	HOURS		HOURS
Semester 1 (Fall)		Semester 2 (Spring)	
English 1010: Composition I		English 1020: Composition II	3
Humanities/Fine Arts		Speech	3
MATH 1910: Calculus I	4	MATH 1920: Calculus II	4
Computer Science I	4	Computer Science II	4
	3	B Humanities/Fine Arts	3
Subtotal Semester 1	14	Subtotal Semester 2	17
Semester 3 (Fall)		Semester 4 (Spring)	
Assembly & Computer Organization	3 or 4	Literature	3
MATH 2010: Linear/Matrix Algebra	3	Social/Behavioral Science	3
Natural Science (lab)*	4	Natural Science (lab)*	4
Social/Behavioral Science	3	B History	3
History		General Elective	0 or 1
Subtotal Semester 3	16 or 17	Subtotal Semester 4	13 or 14
			-
		Total Credit Hours	61
			-
NOTES:			
*Select one eight-hour sequence from	the following	: BIOL 1110, 1120; CHEM 1110,	1120; PHYS
2010, 2120. Students planning to trans	fer to the Uni	versity of Tennessee Knoxville r	nust
complete PHYS 2110, 2120, Calculus-ba	sed Physics I	& II.	

School: Lake Superior Community College (LSC)

Point of Contact:	P
Partner School:	St
Receiving Degree Program:	B.

Prof. Valarie McLain St. Cloud State University (SCSU) S.S. – Cybersecurity

National Recognition:

• Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)

Degrees offered:

A.A.S.- Network Administration and Cybersecurity (72 Credits)

Comments:

LSC students in the AAS program transfer to SCSU with junior status provided they have taken the prerequisites first. This includes Calculus I, at a minimum. Of note are the many AAS graduates that have not only completed BS at SCSU, but have gone on to complete a Masters as well.

Degree Content:

Transfer Agreement between SCSU Cybersecurity and LSC Network Administration And Cybersecurity Contact: Vickie McLain (LSC)			
First Semester	Second Semester		
CNA 425-Data Communications (3 credits) CNA 426-Computer Networks (3 credits) CSCI 201-Fundamentals of Computer Science (4 credits) MATH 271-Discrete Mathematics I (3 credits) Liberal Ed – 3 credits	CNA 473- Operational Software Safeguards (3 credits) CNA 430-Firewall and Penetration Testing (3 credits) CSCI 220-Computer Architecture I (4 credits) ENGL 332-Writing in the Professions (4 credits) or CMST 341 (3 credits) – Communications in Workplace Liberal Ed – 3 credits		
Major credits: 13 (total: 16) Fall	Major credits: 13/14 (total: 16/17) Spring Liberal Ed – 4 credits – taken in summer		
Third Semester	Fourth Semester		
STAT 417-Applied Probability & Simulation (3 credits) CNA 432-OSI Layers Security (3 credits) CNA 465 – Wireless Networks (3 credits) CNA 433 – Security Principles and Laws (3 credits) IS 443 – Database (3 credits) Liberal Ed – 3 credits	CSCI 332 – Ethics (3 credits) CNA 438-Applied Cryptography (3 credits) IS 472-Security Management and IT Risk Assessment (3 credits) CNA 431 – Offensive and Defensive Security (3 credits) CNA 435 - Offensive and Defensive Security Lab (1 credit) Liberal Ed – 3 credits		
Major credits: 15 (total: 18) Fall	Major credits: 13 (total: 16) Spring		

Notes:

- Courses waived/transferred (from LSC): two major electives (CIS 2814, 2976, 2980, 2987), one major elective (6 credits out of CIS 2560, 2973, 2974), one major elective (CIS 2811, 2812, 2813)
- Beginning Programming will be taken at LSC
- Calculus will be taken at LSC
- Take CNA 397 or equivalent in summer before transferring at SCSU
- **15 credits of Liberal Ed taken at LSC +9 credits of Lib Ed in Summer before they join SCSU**, 16 credits taken at SCSU
- Total 40 credits of Liberal Ed courses needed.
- Total 40 credits of upper division coursework at SCSU required.
- If the student is awarded CyberCorps scholarship, they will be paid up to 30 credits of tuition per year

School: Montgomery College

Point of Contact:Joe RoundyPartner School:University of Maryland Baltimore CountyReceiving Degree Program:B.S. – Computer Science

National Recognition:

• Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)

Degrees offered:

A.A.S. – Cybersecurity A.A.S. – Networking A.S. – Computer Science Certificate – Advanced Network Security

Cohorts 1 & 2 (seven students total) students transferred from Montgomery College's Computer Science A.S. program into UMBC's Computer Science program.

Comments:

UMBC has a formal articulation agreement with Montgomery College's Computer Science program.

Degree Content:

Cybersecurity AAS Degree requirements:

- <u>CMSC 135 Introduction to Scripting</u> 3 semester hours
- CMSC 253 UNIX/LINUX System Administration 4 semester hours
- ENGL 101 Introduction to College Writing 3 semester hours *
- NWIT 127 Microcomputer Essentials 3 semester hours
- <u>NWIT 151 Introduction to Networking</u> 3 semester hours
- <u>NWIT 173 Network Security</u> 3 semester hours
- NWIT 203 Microsoft Windows Server 3 semester hours
- NWIT 245 Defending the Network 3 semester hours
- NWIT 246 Attacker Tools and Techniques 3 semester hours
- <u>NWIT 247 Introduction to Incident Response</u> 3 semester hours
- <u>NWIT 252 Cisco Networking 2</u> 3 semester hours
- <u>NWIT 263 Introduction to Digital Forensics</u> 3 semester hours
- <u>NWIT 275 Wireless Security</u> 3 semester hours
- <u>NWIT 291 Cybersecurity Capstone</u> 1 semester hour

Total Credit Hours: 60

General Education Requirements

- English Foundation 3 semester hours (ENGF)
- Mathematics foundation 3 semester hours (MATF)

Distribution Courses

- Arts or humanities distribution 3 semester hours (ARTD or HUMD)
- Behavioral and social sciences distribution 3 semester hours (BSSD)
- Natural science distribution with lab 4 semester hours (NSLD)

General Education Elective

- PHIL 140 Introduction to the Study of Ethics 3 semester hours(GEEL)
- ENGL 101 /ENGL 101A, if needed for ENGL 102 /ENGL 103, or NWIT or CMSC elective.

Network and Information Technology AAS Degree requirements:

- <u>CMSC 253 UNIX/LINUX System Administration</u> 4 semester hours
- ENGL 101 Introduction to College Writing 3 semester hours *
- NWIT 101 Introduction to the Internet of Things (IoT) 3 semester hours
- NWIT 105 Introduction to Cloud Computing 3 semester hours
- <u>NWIT 127 Microcomputer Essentials</u> 3 semester hours
- NWIT 130 Network Cabling Technology 3 semester hours
- NWIT 151 Introduction to Networking 3 semester hours
- NWIT 170 Network Operating Systems 3 semester hours
- NWIT 173 Network Security 3 semester hours
- NWIT 203 Microsoft Windows Server 3 semester hours
- NWIT 204 Network Virtualization and System Administrator 4 semester hours
- <u>NWIT 264 Network Forensics</u> 3 semester hours
- NWIT or CMSC elective 3 semester hours

Total Credit Hours: 60

General Education Requirements

Foundation Courses

- English foundation 3 semester hours (ENGF)
- Mathematics foundation 3 semester hours (MATF)

Distribution Courses

- Arts or humanities distribution 3 semester hours (ARTD or HUMD)
- Behavioral and social sciences distribution 3 semester hours (BSSD)
- Natural sciences distribution with lab 4 semester hours (NSLD)

General Education Elective

- <u>COMM 108 Foundations of Human Communication</u> 3 semester hours(GEEL)
- *OR*
- <u>COMM 112 Business and Professional Speech Communication</u> 3 semester hours(GEEL)
- * ENGL 101/ENGL 101A, if needed for <u>ENGL 102</u> /<u>ENGL 103</u>, or NWIT or CMSC elective.

Computer Science Track, Computer Science and Technologies AS Degree requirements:

General Education Requirements

Foundation Courses

- English Foundation 3 semester hours (ENGF)
- <u>MATH 181 Calculus I</u> 4 semester hours(MATF)

Distribution Courses

- Arts distribution 3 semester hours (ARTD)
- Behavioral and social sciences distribution 3 semester hours(BSSD) **
- Behavioral and social sciences distribution 3 semester hours(BSSD) **
- Humanities distribution 3 semester hours (HUMD)
- Natural science distribution with lab 4 semester hours (NSLD)
- Natural sciences distribution 3 semester hours (NSND)

General Education Institutional Requirements

- <u>COMM 108 Foundations of Human Communication</u> 3 semester hours(GEIR)
- OR
- <u>COMM 112 Business and Professional Speech Communication</u> 3 semester hours(GEIR)

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• Arts or humanities distribution 3 semester hours (GEIR) ⁺⁺

Program Requirements

- <u>CMSC 140 Introduction to Programming</u> 3 semester hours
- <u>CMSC 203 Computer Science I</u> 4 semester hours
- CMSC 204 Computer Science II 4 semester hours
- <u>CMSC 207 Introduction to Discrete Structures</u> 4 semester hours
- ENGL 101 Introduction to College Writing 3 semester hours *
- MATH 182 Calculus II 4 semester hours
- Program electives 6 semester hours †

Total Credit Hours: 60

* <u>ENGL 101/ENGL 101A</u>, if needed for <u>ENGL 102/ENGL 103</u>, or otherwise any program elective (CMSC Courses, <u>MATH 117</u>, <u>MATH 165</u>) or <u>MATH 282</u> or <u>MATH 284</u>. Please consult an advisor or transfer institution for assistance with course selection.

Advanced Network Security Certificate requirements:

All students should review the Advising Worksheet and consult an advisor.

- <u>NWIT 173 Network Security</u> 3 semester hours
- <u>NWIT 245 Defending the Network</u> 3 semester hours
- <u>NWIT 246 Attacker Tools and Techniques</u> 3 semester hours
- NWIT 290 Information Security Capstone 3 semester hours
- <u>NWIT 275 Wireless Security</u> 3 semester hours
- MGMT 288 Disaster Recovery and Risk Management 3 semester hours

Total Credit Hours: 18

School: Moraine Valley Community College

Point of Contact:	Dr. John Sands
Partner School:	Purdue Northwest University
Receiving Degree Program:	B.S. – Computer Information Technology

National Recognition:

• Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)

Degrees offered:

A.A.S. – IT Security A.S. – Computer Science (not included in transfer agreement)

Comments:

Moraine Valley, in conjunction with Purdue Northwest, has developed a transfer pathway that allows MVCC SFS graduates to transfer with full junior status. MVCC students receive 54 credits that will transfer to Purdue, with nine credits flagged as not transferable. The agreement is further based on MVCC students taking three additional courses, over and above the credits needed for the AAS in IT Security. Additionally, MVCC has agreed to replace three program-required courses with three higher level courses that are specifically needed within the receiving program. While this pathway demands additional work and expense to be borne by the MVCC students, it is clearly and graphically laid out so that there are no surprises for SFS candidates.

Course #	Name of Course	Transferable Credits
LAN111	IT Essentials A+	3
LAN220 / 230	Managing Unix Environments / Managing Windows Servers	3
LAN 246	Routing and Switching - CCNA	3
COM 101	Composition I	3
LAN 233	Managing Database Services	3
LAN 253	Manage Network Security	3
LAN 273	Network Security Design	3
LAN 121 / LAN 122	Network Fundamentals / Routing and Switching	3
COM 103	Speech Fundamentals	3
LAN 103 / LAN 153	Security Awareness / IT Security Essentials	3
LAN 163	IT Security Practices	3
ХХХ	Humanities/Social & Behavioral Science Elective	3
ХХХ	Life / Physical Sciences Elective	3
ХХХ	Humanities/Social & Behavioral Science Elective	3
LAN 143	Digital Forensics	3
LAN 112	Managing IT A+	3
LAN 243	Mobile Forensics	3
LAN 221	Scripting and Security	3
MAT 205	Discrete Mathematics (Purdue prerequisite.)	3
ITS 240	Fundamentals of Programming – C (Purdue prerequisite.)	3
ITS 245	Integrative Programming – OOAD (Purdue prerequisite.)	3

Degree Content:

Course #	Name of Course	Transferable Credits
MIS 105 or CSC 140	Programming Principles or Introduction to Computer Science	
	(Purdue prerequisite.)	3
MIS 154 or MIS 176	Programming in C# I or Java I (Purdue prerequisite.)	3
MIS 254 or MIS 276	Programming in C# II or Java II (Purdue prerequisite.)	3
	TOTAL:	72

School: Northern Virginia Community College

Points of Contact:	Dr. Margaret Leary
	Prof. Kevin Reed
Partner Schools:	Marymount University
	The George Washington University
Receiving Degree Programs:	B.S. – College of Professional Studies (GWU)
	B.S. – Information Technology (MU)

National Recognition:

• Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)

Degrees offered:

A.A.S. – Cybersecurity (65 Credit) A.S. – Computer Science (63 Credits)

Comments:

The AAS Cybersecurity degree transfers to both Marymount University and George Washington University. Marymount accepts all courses taken in the AAS Cybersecurity degree, but needs SFS students to also take ENG 112 (3 credit course).

For GWU, the articulations depend on the college into which they articulate. For instance, the College of Professional Studies, into which 30% of all of our cyber-students transfer, accepts the entire AAS degree. However, the students need to add on a science with lab. At a Master's level, GWU transfers the entire AAS Cybersecurity into the online Master's program, but requires additional programming and math courses for students going into the Graduate program at Foggy Bottom.

NOVA has expended considerable energy in reaching out to multiple receiving institutions and developing transfer agreements. As an example the AAS Cybersecurity articulates to the following programs at present, with more being developed:

- American Women's College of Bay Path University B.S. Cybersecurity
- Capitol Technology University B.S. Cybersecurity
- ECPI University Guaranteed Admission Program
- Excelsior University B.S. Information Technology (Cybersecurity concentration)
- George Mason University Bachelors of Applied Science, Cybersecurity
- George Washington University, College of Professional Studies, Bachelor's in Integrated Information, Science, and Technology and Bachelor's of Cybersecurity (Note: the latter is taught onsite at the NVCC Campus in NOVA)
- Marymount University B.S. in Networking and Cybersecurity
- Old Dominion University B.S. in IDS-Cybersecurity
- University of Maryland, University College (UMUC) B.S. in Network and Security (NAS) and Cybersecurity Management and Policy

Most of these institutions take all of NOVA's credits in the AAS degree, with several of them accepting additional credits as well to shorten the time at the senior institution. For example, Old Dominion University will accept up to 85 credits from NOVA, with then only needing to complete 30 at ODU for the Bachelor's degree. The BAS Cybersecurity degree at George Mason University was developed specifically for NOVA and other Virginia CAE2Y colleges and accepts the AAS Cybersecurity degree in full, additionally accepting a Science as well as English 125 for a total of 70 credits that will transfer. Approximately 30% of NOVA's students have indicated a desire to transfer to George Washington University's College of Professional Studies B.S. Cybersecurity

degree, which accepts all of NOVA's IT and Cyber AAS degrees as full satisfaction of the first two years. Students do need to complete a science course with a lab before transferring. NOVA teaches the 3rd and 4th years of this GWU CPS B.S. Cybersecurity at their campus in Woodbridge.

At a Master's level, GWU at Foggy Bottom transfers the entire AAS Cybersecurity, coupled with an unrelated prior Bachelor's degree, into a couple of different Master's program; however, if the student seeks to attend the GWU Computer Science-oriented Cybersecurity Masters, it will require additional programming and math courses. NOVA has successfully transferred 3 students into various SFS programs at Foggy Bottom. NOVA and Marymount University also have a strong SFS partnership and articulation agreement, with more than 12 students transferred into both the undergraduate and graduate programs at Marymount. Marymount accepts all courses taken in the AAS Cybersecurity degree, but needs transfer students to also take ENG 112 (3 credit course). A full list of articulations and requirements is maintained at https://www.nvcc.edu/cybersecurity/transfer.html.

Degree Content - Found at:

http://www.nvcc.edu/catalog/cat2017/academics/programs/programdetail.aspx?prog_id=1410&subprog_id=0&level=1

		Two Years	Credits
		1st Semester	
ENG	111	College Composition I	3
ITE	115	Intro to Computer Applications and Concepts	3
ITN	101 100	Intro to Network Concepts or Intro to Telecommunications	3
ITP	100	Software Design	3
¹ MTH	151	Mathematics for the Liberal Arts I	3
² SDV	100	College Success Skills	1
Total			16

¹May substitute a higher-level mathematics course. Consult with an academic advisor for appropriate selection.

² Students may substitute the SDV 101 Orientation section related to this program.

2nd Semester			
3		Humanities/Fine Arts Elective	3
ITN	106	Microcomputer Operating Systems	3
ITN ITE	107 221	Personal Computer Hardware and Troubleshooting or PC Hardware and OS Architecture	3
ITN	260	Network Security Basics	3
4		Social Science Elective	3
Total			15

³ See humanities/fine arts courses listed under General Education Electives. Electives should be selected with advice of a counselor or academic advisor to meet the requirements of the transfer institution.

3rd Semester			
⁵CST		Elective	3
ITN	200	Administration of Network Resources	3
⁶ ITP		Programming Elective	4
ITN	171 170	Unix I or Linux System Administration	3
ITN	261	Network Attacks, Computer Crime and Hacking	4
Total			17

⁴ See social/behavioral science courses listed under General Education Electives.

⁵ Select from the following: CST 100, CST 110, CST 115, CST 126, CST 227, and CST 229.

⁶ Select from the following: ITP 112, ITP 120, ITP 130, ITP 132, ITP 136, or ITP 225.

4th Semester			
ITN	262	Network Communication, Security and Authentication	4
ITN	263	Internet/Intranet Firewall and E-Commerce	4
ITN	266	Network Security Layers	3
ITN	276	Computer Forensics I	3
7		IT Security Elective	3
Total			17

⁷ Select from the following: ITN 267, ITN 277, ITN 290 - Coordinated Internship, or ITN 295. Students not transferring to a Bachelor's program are encouraged to enroll into an internship or participate in a Cybersecurity competition and should discuss options with their academic advisor

School: Pellissippi State Community College

Point of Contact: Partner School: Receiving Degree Program: Prof. Sharon Burlingame Tennessee Technological University B.S. – Computer Science

National Recognition:

None at present

Degrees offered:

A.S. – Computer Science (61 credits)

Comments:

The A.S. in Computer Science articulates seamlessly with the transfer program at Tennessee Tech. Additionally, as stated in their catalog, Tennessee Transfer Pathways program has formalized articulations between 2-yr and 4-yr State colleges and universities, "confirming that community colleges courses meet major preparation requirements and guaranteeing that all community college courses taken will be accepted at the Tennessee college/university and will count toward completion of the specific major."

Degree Content:

FALL Semester 1	Hours
CISP 1010 Computer Science 1	4
ENGL 1010 English Composition 1	3
HUM Humanities and/or Fine Arts Elective ¹	3
MATH 1910 Calculus 1 ²	4

1	
FALL Semester 3	Hours
CISP 2410 Assembly & Computer Organization	4
HIST History Elective ³	3
MATH 2010 Introduction to Linear Algebra	3
NS Natural Sciences Sequence Elective ⁴	4
SBS Social/Behavioral Sciences Elective ⁵	3

HUM	Chosen from ARTH 2010, 2020; ENGL 2110, 2120,
	2210, 2220, 2310, 2320, 2331, 2510, 2520, 2530, 2810;
	MUS 1030; PHIL 1030, 1300, 1500, 2010, 2400; PHO
	1200; THEA 1030.

²MATH Enrollment in MATH 1910 requires completion of high school algebra 1 and algebra 2 and geometry and precalculus/trigonometry and an ACT math score of at least 26 and an ACT reading score of at least 19 or equivalent math and reading scores or MATH 1710 and MATH 1720 or MATH 1730. Enrollment in MATH 1920 requires completion of MATH 1910.

SPRING Semester 2	Hours
CISP 1020 Computer Science 2	4
ENGL 1020 English Composition 2	3
HUM Humanities and/or Fine Arts Elective ¹	3
MATH 1920 Calculus 2 ²	4
SPCH 2100 Public Speaking	3

SPRING Semester 4	Hours
ENGL Literature Elective ⁶	3
HIST History Elective ³	3
NS Natural Sciences Sequence Elective ⁴	4
SBS Social/Behavioral Sciences Elective ⁵	3
Total Credit Hours Needed for Degree	61

private universities must check requirements and complete the appropriate courses.

- Select sequence from BIOL 1110, 1120; CHEM 1110, 1120; PHYS 2010, 2020; 2110, 2120. PHYS 2110 and PHYS 2120 are required for transfer to UTK.
- ⁵SBS Chosen from ANT 1300; ECON 2100, 2200; GEOG 1000; HIST 2040; PHED 1100; POLS 1020, 1030; PSYC 1030, PSYC 2100, 2120, 2130; SOCI 1010, 1020; WMN 2200.
 ⁶ENGL Chosen from ENGL 2110, 2120, 2210, 2220, 2310, 2320, 2331, 2510, 2520, 2530.

4NS

³HIST Chosen from HIST 1010, 1020, 1110, 1120, 2010, or 2020. Students planning to transfer to out-of-state or

School: Prince George's Community College

Points of Contact:	Prof. Casey O'Brien
Partner Schools:	The George Washington University
Receiving Degree Program:	B.S. – Computer Science (GWU)
	B.S. – Computer Science (UMBC)
	B.S. – Information Systems (UMBC)

National Recognition:

• Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)

Degrees offered:

A.S. – Computer Science A.A.S. – Cybersecurity A.A.S. – Information Technology A.A.S. – Computer Engineering Technology

Comments:

No articulations exist between PGCC and GWU. The AS-CS program aligns well with the BS-CS at both receiving institutions. For SFS students enrolled in the AAS-Cybersecurity and transferring to UMBC in the BS-IS program, most of the cybersecurity courses transfer as electives. The required course on Operating Systems at PGCC is not transferrable.

Degree Content- A.S.-Computer Science:

- <u>EGL-1010 Composition I: Expository Writing</u> 3 Credits (English General Education Requirement)
- <u>INT-1111 Programming Logic and Design</u> 3 Credits (Program Requirement)
- <u>MAT-2410 Calculus I</u> 4 Credits (Mathematics General Education Requirement; Critical Course)
- <u>SOC-1010 Introduction to Sociology</u> 3 Credits (Social Science General Education Requirement)
- <u>PAS-1000 First Year Experience</u> 1 Credit (Institutional Requirement)
- <u>INT-2200 Programming in Java</u> 4 Credits (Not Offered Summer) (Program Requirement)
- <u>MAT-2420 Calculus II</u> 4 Credits (Program Requirement)
- <u>NTR-1010 Introductory Nutrition</u> 3 Credits (General Education Elective Science, No Lab)
- EGL-1340 Composition II: Writing About Technical Topics 3 Credits (English General Education Requirement)
- <u>PHL-1090 Introduction to Logic</u> 3 Credits (Arts/Humanities General Education Requirement)
- <u>INT-2210 Computer Science I</u> 4 Credits (Fall Only) (Program Requirement; Critical Course)
- <u>MAT-2430 Calculus III</u> 4 Credits (Program Requirement)
- <u>PHL-1330 Ethics</u> 3 Credits (Arts/Humanities General Education Requirement)
- <u>PSY-1010 General Psychology</u> 3 Credits (Social Science General Education Requirement)
- INT-2220 Computer Science II 4 Credits (Spring Only) (Program Requirement)
- INT-2130 Programming in C++ 4 Credits (Not Offered Summer) (Program Elective) or
- INT-2030 Programming in Visual Basic 4 Credits (Not Offered Summer) (Program Elective) or
- INT-2240 Introduction to Python 3 Credits (Not Offered Summer) (Program Elective) or
- INT-2050 Starting Mobile Application Development (Not Offered Summer) (Program Elective)
- INT-2721 Linux Operating System I 3 Credits (Program Requirement)
- <u>PHY-1010 Introductory Physics I</u> 4 Credits (Science w/ Lab General Education Requirement)

Degree Content - A.A.S.- Cybersecurity

- <u>INT-1010 Introduction to Information Technology</u> 3 Credits (Computer Literacy Institutional Requirement)
- INT-1700 Understanding Operating Systems 3 Credits (Program Requirement)
- <u>MAT-1130 Mathematical Ideas</u> 3 Credits (Mathematics General Education Requirement)
- EGL-1010 Composition I: Expository Writing 3 Credits (English General Education Requirement)
- <u>SOC-1010 Introduction to Sociology</u> 3 Credits (Social Science General Education Requirement)
- <u>PAS-1000 First Year Experience</u> 1 Credit (Institutional Requirement)
- <u>INT-1450 CCNA 1: Introduction to Cisco Networking</u> 4 Credits (Not Offered Summer) (Program Requirement; Critical Course)
- INT-1460 CCNA 2: Routing and Switching Essentials 4 Credits (Program Requirement)
- INT-1620 Computer Security: Security+ Preparation 3 Credits (Program Requirement; Critical Course)
- <u>PHL-1330 Ethics</u> 3 Credits (Arts/Humanities General Education Requirement)
- <u>EGL-1340 Composition II: Writing About Technical Topics</u> 3 Credits (English General Education Requirement)
- INT-2681 Ethical Hacking Certification Prep 4 Credits (Program Requirement)
- INT-2300 Windows Desktop Client 3 Credits (Program Elective) or
- INT-2450 CCNA 3: Scaling Networks 4 Credits (Program Elective) or
- INT-2721 Linux Operating System I 3 Credits (Program Elective) or
- FOS-2600 Computer Forensics I 3 Credits (Program Elective) or
- INT-2690 CISSP Preparation 3 Credits (Program Elective) or
- INT-2470 CCNA Security 4 Credits (Program Elective)
- <u>INT-1111 Programming Logic and Design</u> 3 Credits (Program Requirement)
- INT-2310 Windows Server Administration 3 Credits (Not Offered Summer) (Program Requirement; Critical Course)
- <u>NTR-1010 Introductory Nutrition</u> 3 Credits (General Education Requirement Science, No Lab)
- INT-2240 Introduction to Python 3 Credits (Program Requirement)
- <u>INT-2761 Linux Operating System II</u> 3 Credits (Not Offered Summer) (Program Elective) or
- INT-2460 CCNA 4: Connecting Networks 4 Credits (Not Offered Summer) (Program Elective) or
- <u>BMT-2860 Cyber Law</u> 3 Credits (Not Offered Summer) (Program Elective) or
- <u>BMT-2880 Emergency Management</u> 3 Credits (Not Offered Summer) (Program Elective)
- INT-2840 Systems Analysis and Project Management 4 Credits (Not Offered Summer) (Program Requirement)
- INT-2910 Cooperative Education 1-3 Credits (Program Elective) or
- Choose from "Program Electives" 2 or more Credits (Program Elective) (Program Requirement)

Degree Content - A.A.S.- Information Technology

INT-1010 Introduction to Information Technology 3 Credits (Institutional Requirement, General Education Requirement) MAT-1130 Mathematical Ideas 3 Credits (Mathematics General Education Requirement; Critical Course)

- <u>EGL-1010 Composition I: Expository Writing</u> 3 Credits (English General Education Requirement)
- PHL-1330 Ethics 3 Credits (Arts/Humanities General Education Requirement)
- <u>PAS-1000 First Year Experience</u> 1 Credit (Institutional Requirement)
- <u>SOC-1010 Introduction to Sociology</u> 3 Credits (Social Science General Education Requirement)
- INT-1111 Programming Logic and Design 3 Credits (Program Requirement; Critical Course)
- INT-2150 Introduction to Database Management Systems 3 Credits (Program Elective; Critical Course) or
- INT-2140 Problem Solving with Spreadsheets 3 Credits (Program Elective; Critical Course)
- Choose from "Program Electives" 3 Credits (Program Elective)
- <u>EGL-1340 Composition II: Writing About Technical Topics</u> 3 Credits (English General Education Requirement)
- <u>NTR-1010 Introductory Nutrition</u> 3 Credits (General Education Requirement Science, No Lab)

- Use the online catalog for the following:
 - <u>http://catalog.pgcc.edu/content.php?catoid=13&navoid=1095</u>
- Choose from "Program Electives" 4 Credits (Program Elective)
- Choose from "Program Electives" 3 Credits (Program Elective)
- Choose from "Program Electives" 3 Credits (Program Elective)
- 2000-level course from "Program Electives" 3 Credits (Program Elective)
- 2000-level course from "Program Electives" 4 Credits (Program Elective)
- 2000-level course from "Program Electives" 3 Credits (Program Elective)
- 2000-level course from "Program Electives" 3 Credits (Program Elective)
- <u>INT-2920 Cooperative Education</u> 1-3 Credits (Program Elective) or
- Choose from "Program Electives" 2 or more Credits (Program Elective)
- INT-2840 Systems Analysis and Project Management 4 Credits (Not Offered Summer) (Program Requirement)

Degree Content - A.A.S.- Computer Engineering Technology

- <u>INT-1010 Introduction to Information Technology</u> 3 Credits (Computer Literacy Institutional Requirement)
- <u>INT-1111 Programming Logic and Design</u> 3 Credits (Program Requirement; Critical Course)
- <u>EGL-1010 Composition I: Expository Writing</u> 3 Credits (English General Education Requirement)
- <u>PAS-1000 First Year Experience</u> 1 Credit (Institutional Requirement)
- <u>SOC-1010 Introduction to Sociology</u> 3 Credits (Social Science General Education Requirement)
- <u>MAT-1130 Mathematical Ideas</u> 3 Credits (Mathematics General Education Requirement; Critical Course)
- <u>INT-1700 Understanding Operating Systems</u> 3 Credits (Program Requirement)
- <u>PHY-1570 Technical Physics for Engineering Technology</u> 4 Credits (Not Offered Summer) (Science w/ Lab General Education Requirement)
- <u>COM-1010 Foundations of Communication</u> 3 Credits (Arts/Humanities General Education Requirement)
- <u>ENT-1710 Circuits and Measurement Techniques</u> 3 Credits (Not Offered Summer) (Program Requirement; Critical Course)
- <u>EGL-1340 Composition II: Writing About Technical Topics</u> 3 Credits (English General Education Requirement)
- ENT-1720 Circuit Analysis and Design 3 Credits (Not Offered Summer) (Program Requirement)
- <u>ENT-1850 Circuit Evaluation and Repair</u> 2 Credits (Not Offered Summer) (Program Requirement)
- ENT-2740 Digital Circuits 4 Credits (Not Offered Summer) (Program Requirement)
- INT-1550 Introduction to Networks: Network+ Preparation 3 Credits (Program Requirement)
- <u>INT-1540 Computer Hardware I: A+ Preparation</u> 4 Credits (Program Requirement; Critical Course)
- <u>ENT-2810 CPU Architecture</u> 4 Credits (Not Offered Summer) (Program Requirement)
- INT-2540 Computer Hardware II: A+ Preparation 4 Credits (Not Offered Summer) (Program Requirement)
- INT-2840 Systems Analysis and Project Management 4 Credits (Not Offered Summer) (Program Requirement)
- <u>INT-2540 Computer Hardware II: A+ Preparation</u> 4 Credits (Not Offered Summer) (Program Requirement)
- <u>INT-2840 Systems Analysis and Project Management</u> 4 Credits (Not Offered Summer) (Program Requirement)

School: Rose State

Point of Contact:	Prof. Ken Dewey
Partner School:	University of Tulsa
Receiving Degree Program:	B.S. – Computer Science

National Recognition:

- Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)
- Cyber Patriot Center of Excellence by the Air Force Association

Degrees offered:

A.A.S. – CyberScience option / Digital Forensics (66-68 credits)

Comments:

After two years of experience in the SFS Pathways program, the AAS degree is being modified to provide clarity for those students that desired to transfer to the University of Tulsa. This new version of the degree program ensures that students will satisfy the BS-CS degree requirements for transferring into Tulsa with junior status. Additionally, the degree provides a full foundation in cybersecurity / digital forensics. Of interest is the requirement that to be approved for either the Cybersecurity or the Digital Forensics program, the student must sign an ethics agreement, prior to entry into the program.

Degree Content:

GENERAL EDUCATION REQUIREMENTS (27 hours minimum)

Communications (6 hours)

ENGL 1113 English Composition ENGL 1213 English Composition II+ MCOM 1213 Public Speaking

U.S. History/U.S. Government (6 hours)

HIST 1483 U.S. History to 1877 - or -HIST 1493 U.S. History Since 1877 POLS 1113 American Federal Government

General Education (15 hours minimum)

MATH 1715 Pre-Calculus MATH 2113 Calculus and Analytic Geometry MATH 2103 Discrete Math ECON 2103 Personal Finance

PROGRAM REQUIREMENTS (27 hours) Students must earn a "C" or better in these courses

Must earn a C or better in this section to be eligible for graduation.

CIT 1503 Networking

CIT 1523 Computer Hardware and Operating Sys

CIT 1533 Principles of Cyber Security

CIT 2053 Network Administration

CIT 2243 UNIX/Linux

CIT 2323 Network Security

CIT 2533 Ethics in Information Technology

Must earn a B or better in this section to be eligible for graduation.

CIT 2553 Digital Forensics+ CIT 2563 Cryptography and Trusted Systems+

Cyber Science Option (12 hours)

CIT 1613 Java CIT 2613 Advanced Java CIT 2143 Data Structures

Must earn a "B" or better in this section to be eligible for graduation CIT 2603 Security Auditing and Penetration Test+

School: Snead State Community College

Point of Contact:	Prof. Greg Randall
Partner School:	University of Alabama at Huntsville
Receiving Degree Program:	B.S. – Computer Science

National Recognition:

- Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)
- EC Council Accredited Training Center for the Certified Ethical Hacker (C|EH)
- EC Council Authorized Exam Center

Degrees offered:

A.A.S. – Computer Science – Cybersecurity Track A.A.S. – Computer Science – IT Administration Track A.S. – Computer Science

Comments:

Currently, Snead State Community College (SSCC) and the University of Alabama at Huntsville (UAH) do not have or maintain an articulation agreement for complete transfer of the A.A.S. in Computer Science with the Cybersecurity track to junior status. The A.A.S. in Computer Science is considered a terminal two-year degree. UAH does, however, provide students with elective transfer credit for courses taken in the Cybersecurity training track.

SSCC and UAH do maintain a statewide transfer articulation agreement that provides the students an opportunity to transfer an A.S. in Computer Science. The A.S. degree allows the student to transfer to UAH with junior status.

Degree Content:

A.A.S. Degree- Computer Science with the Cybersecurity Track

Academic Transfer courses: **Area I- Written Composition 3 Credit Hours** ENG 101 **Area II- Humanities and Fine Arts 6 Credit Hours** HUM/FA, ART, FRN, MUS, PHL, REL, SPH, SPA, THR **Area III- Natural Science and Mathematics 9-10 Credit Hours** MTH 100, 110, 112, 113, 116, 125 CIS 146 Microcomputer Applications Elective MTH 100, BIO, CHM, AST, GEO 101, PHS, PHY **Area IV- History, Social, and Behavioral Sciences**3 Credit Hours ANT, ECO, GEO 100, HIS, POL, PSY, SOC 3

* Courses that are candidates for elective credit transfer from Snead State terminal degree program to UAH:

CIS 214 Security Analysis (Pen Testing) 3 Credit Hours CIS 245 Cyber Defense 3 Credit Hours CIS 246 Ethical Hacking 3 Credit Hours CIS 280 Network Security3 Credit Hours CIS 282 Computer Forensics 3 Credit Hours

ENG101	Area I	: Written	Composit	ion*	2	6
ENGIOI		3	ENGIOZ	Whiteh composition in	3	0
*ENG093 and	l/or RDG 085 may be required bas	ed on ACT/	COMPASS Sco	res		
	Area II:	Humanit	ies and Fin	e Arts		12
		Choose C)ne:			3
ART100	Art Appreciation	3	ART203	Art History I	3	
ART204	Art History II	3	MUS101	Music Appreciation	3	
THR120	Theater Appreciation	3				
		Choose up t	to Two			3-6
ENG251	American Literature I	3	ENG252	American Literature II	3	
ENG261	English Literature I	3	ENG262	English Literature II	3	
ENG271	World Literature I	3	ENG272	World Literature II	3	
*Students mu	st complete one series in either histo	ory or literat	ure			
	Choose up to tw	vo more fro	om above or b	elow:		3-6
FRN101	Introductory French I	4	FRN102	Introductory French II	4	
FRN201	Intermediate French I	3	FRN202	Intermediate French II	3	
SPA101	Introductory Spanish I	4	SPA102	Introductory Spanish II	4	
SPA201	Intermediate Spanish I	3	SPA202	Intermediate Spanish II	3	
PHL106	Introduction to Philosophy	3	PHL206	Ethics and Society	3	
REL100	World Religions	3	REL151	Survey of the Old Testament	3	
REL152	Survey of the New Testament	3	HUM299	Phi Theta Kappa Honors	3	
SPH106*	Fundamentals of Oral Comm.	3	SPH107*	Fundamentals of Public Speaking	3	
*Some institu	tions require a speech course. Check	with the tro	insfer institutio	n.		
	Area III: Nat	ural Scie	nce and M	athematics		11
Choose Two: 8				8		
BIO103	Principles of Biology I	4	BIO104	Principles of Biology II	4	
CHM104	Intro To General Chemistry	4	CHM105	Intro to Organic Chemistry	4	
CHM111	College Chemistry I	4	CHM112	College Chemistry II	4	
GEO101	Principles of Geography I	4	GEO102	Principles of Geography II	4	
PHS111	Physical Science I	4	PHS112	Physical Science II	4	
PHY201	Physics I	4	PHY202	Physics II	4	
PHY213*	Physics with Calculus I	4	PHY214*	Physics with Calculus II	4	
*Some institu	tions require PHY213 &214 which ha	ive MTH 125	5 &126 prerequ	isites respectively.		
		Choose O	ne:*			3
MTH112	Pre-calculus Algebra	3	MTH113**	Pre-calculus Trigonometry	3	
MTH120	Calculus and its Applications	3	MTH125	Calculus I	4	
MTH126	Calculus II	4	MTH227	Calculus III	4	
MTH237	Linear Algebra	3	MTH238	Applied Differential Equations	3	
*MTH 091, M	TH 098, and/or MTH 100 may be rea	quired based	on ACT/COM	PASS Scores		
**Requires M	TH 112 prerequisite.					
	AREA IV: Histor	ry, Social	and Behav	vioral Sciences		12
Choose up to Two:*			3-6			

Computer Science Transfer Plan 2-Year A. S.

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	Choc	ose up t	o Two:*			3-
HIS101	History of Western Civilization I	3	HIS102	History of Western Civilization II	3	
HIS121	World History I	3	HIS122	World History II	3	
HIS201	United States History I	3	HIS202	United States History II	3	
*****			4			

*Students must complete one series in either history or literature

	AREA IV: History, Soc	ial and	Behaviora	l Sciences (continued)		
	Choose up to Th	nree from	n above or bel	ow:* 3-9		
ECO231	Principles of Macroeconomics	3	ECO232	Principles of Microeconomics	3	
ANT200	Intro to Anthropology	3	GEO100	World Regional Geography	3	
POL200	Intro to Political Science	3	POL211	American National Government	3	
PSY200	General Psychology	3	PSY210*	Human Growth and Development	3	
SOC200	Intro to Sociology	3	SOC210	Social Problems	3	
*Requires PS	Y200 prerequisite.					
	AREA V: Program Sp	ecific C	ourses & El	ectives		19
MTH113	Pre-calculus Trigonometry	3	MTH125	Calculus I		4
MTH126	Calculus II	4	CIS251	C++Programming		3
	Cho	oose five	or more hours	s from below:		
BIO103*	Principles of Biology I	4	BIO104*	Principles of Biology II		4
CHM111	College Chemistry I	4	CHM112	College Chemistry II		4
CIS146*	Microcomputer Applications	3	CIS212*	Visual Basic Programming		3
MTH227**	Calculus III	4	MTH237**	Linear Algebra		3
PHL106	Introduction to Philosophy	3	PHL206	Ethics and Society		3
PHY201*	Physics I	4	PHY202*	Physics II		4

PHY214**

4

Physics with Calculus II

SPH106**Fundamentals of Oral Comm.3SPH107**Fundamentals of Public Speaking*Some institutions will not accept certain courses. Check the Area V page of the transfer institution.

**Some institutions require certain courses. Check the Area V page of the transfer institution.

Total Hours

PHY213**

Physics with Calculus I

60

4

3

School: Tidewater Community College

Point of Contact:	Prof. Kimberly Perez
Partner School:	Norfolk State University
Receiving Degree Program:	B.S. – Computer Science – IA track

National Recognition:

• Center of Academic Excellence in Information Assurance Two-Year Education (CAE2Y)

Degrees offered:

A.S. – Computer Science

Comments:

During the first year of the SFS Partnership program, Tidewater and Norfolk tried to build a transfer package between Tidewater's AAS-Cybersecurity program and the BS-CS, but found that far too many courses demanded of junior status in the BS-CS program remained obstacles to the transfer. Efforts in year selected candidates from the AS-CS program which aligned with the BS-CS receiving program. The full articulation results in a very seamless transfer.

Degree Content:

SEMESTER 1

Course No.	Course Title	Credits	Prerequisites
CSC 110	Introduction to Computing	3	Placement into MTH 263 (or MTH 173)
ENG 111	College Composition I	3	Qualifying Placement Test score, ENF 1, ENF 2 or equivalent
MTH 263	Calculus I	4	MTH 162, MTH 164, MTH 166, or MTH 167 with a grade of C or better, or qualifying placement score
SDV 101	Orientation to Computer Science and Information Technology	1	None
	Humanities Elective ¹	3	
	Semester Total	14	-

SEMESTER 2

Course No.	Course Title	Credits	Prerequisites
CSC 201	Computer Science I	4	CSC 110
ENG 112	College Composition II	3	ENG 111 or equivalent and ability to use word processing software
MTH 264	Calculus II	4	MTH 173 or MTH 263 with a grade of C or better
	History Elective ²	3	Placement into ENG 111
	Semester Total	14	-

SEMESTER 3

Course No.	Course Title	Credits	Prerequisites
CSC 205	Computer Organization	3	CSC 110
CSC 210	Programming With C++	4	CSC 201 or EGR 125
	Health/Physical Education Elective ⁴	2	
	Science with Lab Elective ¹	4	
	Social Science Elective ¹	3	
	Semester Total	16	-

SEMESTER 4

Course No.	Course Title	Credits	Prerequisites
CSC 215	Advanced Computer Organization	3	CSC 205
	Approved Elective ³	3	
	History Elective ²	3	
	Humanities Elective ¹	3	
	Science with Lab Elective ¹	4	
	Semester Total	16	-
1	Total Minimum Credits	60	

- ¹ Eligible courses are listed on page 15 in the 2018-2019 catalog. Students should consult with an academic advisor or counselor to choose the appropriate course(s). Sequenced lab courses are required in natural and physical sciences. ENV 121-122 and BIO 106 are not acceptable courses for this program.
 - ² Students may select any of the following courses to meet this requirement: HIS 101, 102, 111, 112, 121, or 122.
 - ³ The "Approved Electives" may be satisfied with any mathematics, natural science, social science, humanities, or foreign language electives listed on page 15 of the 2018-2019 catalog. Additional course options are provided on the advising transcript in the Student Information System and/or through consultation with a counselor or academic advisor.
 - ⁴ Students may select any of the following courses to meet this requirement: DIT 121, 125; HLT 100, 105, 106, 110, 116, 121, 130, 138, 141, 150, 160, 200, 204, 215; PED (any activity course).

School: Volunteer State Community College

Point of Contact: Partner School: Receiving Degree Program: Prof. Patricia Anderson Tennessee Technological University B.S. – Computer Science w/ concentration-Cyber Defense/Security

National Recognition:

• none

Degrees offered:

A.A.S. – Computer Information Technology with concentration in Cyber Defense A.S. – Computer Science with concentration in Cyber Defense/Cyber Security

Comments: The A.S. in Computer Science follows the TTP (Tennessee Transfer Pathway) which provides any student who follows the required coursework listed with a guarantee that their credits will transfer to a Tennessee public university and certain private colleges and universities, if they choose one of 50 different majors offering transfer pathways. This is the plan which provides the pathway from an A.S. from Volunteer State to the successful transfer of all courses listed in the TTP for C.S. to TN Tech for a B.S. in Computer Science – concentration in Cyber Defense/ Cyber Security.

Degree Content:

https://catalog.volstate.edu/preview_program.php?catoid=27&poid=3386&returnto=985

Transfer Options

The Tennessee Transfer Pathway (TTP) degree is designed to create a smooth transition to all public universities offering a Baccalaureate degree in this major by guaranteeing the transferability of all courses. For transfer to other four-year institutions, contact an advisor at the senior institution. Note: There are to be no course substitutions in this program.

General Education Requirements - Credits (42)

- <u>History</u> Credits: (6)
- <u>Humanities and/or Fine Arts</u> (Must include at least one Literature course) Credits: (9)
- <u>Social/ Behavioral Sciences</u> Credits: (6)
- ENGL 1010 English Composition | Credits:(3)
- ENGL 1020 English Composition II Credits:(3)
- MATH 1910 Calculus I Credits:(4)
- •
- <u>COMM 2045 Public Speaking</u> Credits:(3)OR
- <u>COMM 2025 Fundamentals of Communication</u> Credits:(3)
- •
- Natural Science: (Select One 8 Hour Sequence From the Following)
- BIOL 1110 General Biology I Credits:(4)and
- BIOL 1120 General Biology II Credits:(4)

- or
- <u>CHEM 1110 General Chemistry I</u> Credits:(4)and
- CHEM 1120 General Chemistry II Credits:(4)
- or
- PHYS 2010 Non-Calculus Based Physics I Credits:(4)and
- PHYS 2020 Non-Calculus Based Physics II Credits:(4)
- or
- PHYS 2110 Calculus-Based Physics I Credits:(4)and
- PHYS 2120 Calculus-Based Physics II Credits:(4)1
- •
- ¹Students planning to attend the University of Tennessee, Knoxville must complete PHYS 2110 and PHYS 2120 Calculus-based Physics I and II

Area of Emphasis Requirements - Credits (19)

- <u>CISP 1010 Computer Science I</u> Credits:(4)
- CISP 1020 Computer Science II Credits:(4)
- CISP 2410 Assembly and Computer Organization Credits:(4)
- MATH 1920 Calculus II Credits:(4)
- MATH 2010 Introduction to Linear Algebra Credits:(3)

Total Degree Requirements - Credits (61)

School: Westchester Community College

Point of Contact:	Prof. John Watkins
Partner School:	Pace University
Receiving Degree Programs:	B.S. – Information Technology

National Recognition:

• In process for filing CAE-2Y application

Degree offered:

A.A.S. – Cybersecurity (62 credits minimum)

Comments:

Westchester Community College has a fully-executed transfer agreement with Pace University for their AAS degree in Cybersecurity. This degree fully transfers into Pace's Information Technology Bachelor program, assuming that courses taken at Westchester received a minimum grade of C or better. The articulation document further notes that those entering with Junior status have an additional 58 credits needed towards their BS-IT.

Degree Content:

General Education Requirements - 26 Credits

Students are required to fulfill a certain number of credits within the specific categories shown below. Where specific courses are not listed within these categories, courses must be selected from the list of <u>SUNY General Education Courses</u>.

Basic Communication (3 credits)

• ENG 101 - Writing and Research

Humanities (6 credits)

- ENG 102 Writing and Literature
- PHIL 160 Ethics

Mathematics (7 credits)

- <u>MATH 140 Statistics</u> and ONE of the following courses:
- MATH 130 College Algebra: Functions & Models
- MATH 135 College Algebra with Trigonometry

Natural Sciences (4 credits)

Natural Sciences - LAB course required - see <u>SUNY General Education Courses</u>

Social Sciences (3 credits)

Social Sciences - see <u>SUNY General Education Courses</u>

American History or Western Civilization (3 credits)

 Select a course from ONE of the following categories: American History – see <u>SUNY General Education Courses</u> Western Civilization – see <u>SUNY General Education Courses</u>

Degree Requirements - 36 Credits

- CIS 110 Computer Information Systems
- CIS 120 Object-Oriented Programming Logic
- CIS 130 Computer Hardware
- CIS 135 PC Operating Systems
- CIS 140 Networking for Business
- CIS 225 Database Management Systems
- CIS 235 Server Administration
- CIS 240 Network Security (CIS)
- CIS 245 Computer Penetration Testing
- CIS 270 Computer Forensics
- OFTEC 240 Business Communications
- POL 203 Principles of Investigation

Minimum Total Credits - 62

Summary:

Clearly, there is no shortage of Pathways program degree models. However, while each 2-yr program has a consistent core of cybersecurity courses that give the students marketable skills desired by employers, it remains true that for most employers, and definitely for the Federal Government, the Bachelor degree is the "door-opener" to employment. This Pathways program allows the "best and brightest" who started their post-high school educational experience at a community college to be offered the opportunity to continue their studies, leading to the coveted Bachelor degree.

The transferability issues between the 2-yr AAS degree programs and the receiving institutions are being worked out, although it is also clear that the 4-yr schools are in control of that process. Until that time when the 4-yr schools offer a variety of programs into which the 2-yr AAS students can transfer, with less impeding requirements, the burden will continue to be on the community college students to take additional and higher level courses than demanded for the 2-yr degree program. As the career area of cybersecurity moves through its own maturation process, it is expected that degree offerings at the 4-yr schools will also evolve.



CYBERSECURITY EDUCATION SOLUTIONS FOR THE NATION

National CyberWatch Center Prince George's Community College Room 129B 301 Largo Road Largo, MD 20774

www.nationalcyberwatch.org