PROGRAM REVIEW
Fairmont State Board of Governors

☐ **Program with Special Accreditation**   ☒ **Program without Special Accreditation**

Date Submitted March 1, 2018

Program **Bachelor of Science in Computer Science**
Degree and Title

INSTITUTIONAL RECOMMENDATION

___ 1. **Continuation of the program at the current level of activity;**

___ 2. **Continuation of program with corrective action;**

_X_ 3. **Identification of the program for further development;**

___ 4.   **Development of a cooperative program with another institution, or sharing courses, facilities, faculty, and the like;**

___ 5. **Discontinuation of the Program**

Rationale for Recommendation:

I applaud the CS faculty for being involved in several new initiatives for fall 2018, including the new minors of Game Design and Automation & Robotics. The program is also seeking to make the Cyber Security concentration stand alone as a major. The curriculum was recently updated and a new experimental lab was added to one of their courses to facilitate student learning and increase retention. Enrollments are strong and have increased. There is strong demand for our graduates.

The Computer Science and the Cyber Security programs could expand with some aggressive marketing by the college and university. Additional faculty would be required to expand the program and also apply for ABET Accreditation.

M. Hossain

Signature of person preparing report	03/01/2018 **Date**
Signature of Dean	**Date**
Signature of Provost and Vice President for Academic Affairs	**Date**
Signature of President	**Date**
Signature of Chair, Board of Governors	**Date**

Table of Contents

Executive Summary for Program Review

Name and degree level of program

    Bachelor of Science in Computer Science

External reviewer(s)

    Dr. Don Adjeroh
    Professor, Associate Chair, and Graduate Coordinator of Computer Science
    West Virginia University

    Mr. Kenneth Rehm
    Associate Director, NASA IV&V Program

    Mr. Christopher Ryan
    Senior Applications Developer, Fusion Technology

    Mr. Jeff Tucker
    Enterprise Architect / Sr. Principal Systems Engineer, Leidos

Synopses of significant findings, including findings of external reviewer(s)

Students successfully completing this program gain an understanding of the concepts of computer science. Graduates are able to move immediately into entry level software development positions or can pursue graduate school with minimal additional coursework. One of the external reviewers has been very pleased with the curriculum. He believes that the curriculum is well thought out, has high level of maturity, and has been carefully implemented for progressive learning.

The enrollment in the CS program at FSU is expected to increase because of projected high demand for computing related jobs. The high-tech area in North Central WV has a high demand for computing professionals and a continuous growth of the computer science program at FSU can only benefit the community and reduce the dependency of the companies on out-of-state recruitment. One external reviewer found the increasing enrollment to be exciting. The CS faculty understand that the retention rate within the Computer Science program can be improved. The low retention is a national trend across CS programs that can be attributed to lack of math preparedness. The CS faculty has taken a few steps to improve retention and one of the reviewers was appreciative of that effort.

The computer science curriculum went through a major revision in 2017 with more flexibility in selecting upper level computer science and math classes. The purpose of this revision was to align the program more with the guidelines of Association for Computing Machinery (ACM) and Accreditation Board for Engineering and technology (ABET). One of the reviewers was pleased to see the continuous improvement effort for updating curriculum, increasing recruitment/retention, improving assessment, and increasing industry outreach.

Plans for program improvement, including timeline

- Improving the retention rate will be one of the major goals in the next five years. Those who switch majors, do it mostly by the end of the first year, after they have taken one or two semesters of programming. The second semester programming course COMP 1108 is being changed to a lab based course. Weaker students are expected to benefit from the collaborative learning environment and the readily available instructor assistance in the lab. Coding in the lab every week is also expected to help reinforce lecture material and provide consistency to learning which is essential for developing programming skills.
- The assessment data for all individual courses will be collected within two years.
- The employer satisfaction survey for this cycle will be completed within one year.
- A graduate satisfaction survey will be implemented within one year.
- The computer science program is planning to apply for Accreditation Board for Engineering and Technology (ABET) accreditation within the next five years.

Identification of weaknesses/ deficiencies from the previous review and the status of improvements implemented or accomplished

The CS faculty have participated in more recruitment activities in the past five years, including out of town recruitment events. The increased recruitment efforts have resulted in increased enrollment. There was some improvement in retention rates, driven by the Math support program and peer mentoring. The retention rates need to be improved more though. Regarding the assessment, the CS faculty has developed a viable programmatic assessment plan that includes assessing both program outcomes and individual course outcomes. Program goals and outcomes have been developed with direct assessment measures. Learning outcomes and assessment methods have also been developed for all individual courses. The assessment data is being collected every year for program outcomes and some courses. It is expected that CS faculty will start collecting assessment data for all individual courses within the next two years. This will prepare the program for external (ABET) accreditation.

Five-year trend data on majors enrolled and graduates

The number of computer science majors and the number of graduates over the past five academic years (2012-13 – 2016-17) increased from the previous five academic years (2007-08 – 2011-12). The following table shows the total number of students enrolled in the computer science program (at the end of Fall semester) over the past five academic years. The total enrollment count over the past five years (443) increased from the previous five academic years (432) by 2.5%. In the four years prior to 2016-17, CS enrollment at FSU remained relatively constant. Because of increasing job demand in the area and nationwide and increased recruitment efforts by the program faculty, there has been an increase in enrollment in the last two years.

Year	Computer Science	Cyber Security	Total
2012-13	63	25	88
2013-14	49	32	81
2014-15	49	35	84
2015-16	60	22	82
2016-17	71	37	108

The following table lists the number of graduates from the computer science program over the past five academic years. The number of graduates from the computer science program over the past five years (42) increased from the previous five academic years (39) by 7.7%. The average number of graduates from the computer science program in the past five academic years was 8.4 ($\pm$1.7). The graduation count is expected to increase in the coming years. There are many high-tech companies in the geographical area around FSU, and demand for CS graduates is high.

Year	Computer Science	Cyber Security	Total
2012-13	6	4	10
2013-14	4	2	6
2014-15	4	4	8
2015-16	9	1	10
2016-17	3	5	8

Summary of assessment model and how results are used for program improvement

Assessments and improvements of the computer science program are aligned with the recommendations of Computing Sciences Accreditation Board (CSAB) of Accreditation Board for Engineering and Technology (ABET) and Association for Computing Machinery (ACM). Assessments include both program and course level assessments. The assessment methods for program outcomes include the ETS major field test, course grades, and employer survey. The assessment methods for the individual courses are based on a wide range of activities; weekly quizzes, in-class activities, homework, exams, and programming assignments. Employer satisfaction surveys have been used to identify different target areas for improving the program curriculum.

Data on student placement

Most graduates of the computer science program at FSU find employment in a related field with attractive salaries or remain in school to pursue graduate degrees. Some students are even hired before they complete their degrees. A number of students obtain internships during their Junior and/or Senior year. Out of 42 graduates in the past 5 years, the faculty has been able to track 38. Of these graduates, one is currently pursuing graduate degree, one has come back to pursue a second BS degree, and the other 36 are employed in computing related positions. This is a 100% placement rate for students the faculty have been able to track.

Final recommendations approved by governing board

PROGRAM REVIEW

FAIRMONT STATE UNIVERSITY	
Program:	Bachelor of Science in Computer Science
School:	College of Science and Technology
Date:	March 1, 2018

Program Catalog Description

Computer Science is the study of the theoretical foundations of computing and their applications in computer systems. It involves the study and implementation of algorithmic processes that describe and transform information. Computer Science is intended for students with career objectives in a wide range of computing and computer-related professions, e.g., computer programmers, system analysts, software developers, database administrators, cybersecurity analysts, etc. Students interested in computer science has the option of choosing the Cybersecurity concentration.

Computer Science is a broad discipline that encompasses many areas of specialization, with an ever-growing array of opportunities. The B.S. in Computer Science at Fairmont State University has been designed to provide students with an understanding of the field that is broad enough for them to find employment in a wide spectrum of private companies or government agencies and make them competitive for graduate school and advanced study. In addition to receiving the necessary skills in computer science, the students also receive a well-balanced mathematics and general studies curriculum.

VIABILITY

Enrollments

Applicants

There are no special entrance requirements for the computer science program. The general admission requirements (http://www.fairmontstate.edu/admit/admissions-checklist) as required by FSU are enforced. The only caveat is that, to enroll in COMP-1102 *Principles of Programming I*, the student should be ready to take MATH-1540 *College Algebra*, i.e., he/she is required to have completed MATH-1400 *Foundations of Algebra* or have a Math ACT score of 21 or higher or Math SAT score 530 or higher.

The following table lists the average High School GPA, ACT composite score, ACT math score, and ACT science score of incoming freshmen in the CS program over the past five academic years. Most of the students coming to the CS program typically have a good background in math and science. Even though CS freshmen are well-prepared for university level study, some of them are not ready for Calculus I (with a required ACT Math score of 25), which is the first required math class for the computer science program. These students then take one or two semesters of prerequisite Math classes, typically College Algebra and Trigonometry. A good number of incoming students are found to have prior experience with programming and/or several software packages. It is worth mentioning that, in recent years, several presidential scholarship recipients have pursued the CS degree program.

Year	HS GPA	ACT Comp	ACT Math	ACT Science
2012-13	3.20	20.8	21.4	21.7
2013-14	3.19	22.0	19.6	23.7
2014-15	3.21	20.7	20.7	21.3
2015-16	3.17	24.4	23.4	24.1
2016-17	3.17	22.3	21.4	23.1
Average	**3.19**	**22.0**	**21.3**	**22.8**

The following table lists the number of first-time freshmen enrolled in the computer science program over the past five academic years. There has been a 60% increase in total freshmen enrollment compared to the previous five years (225 over 141).

Year	Computer Science	Cyber Security	Total
2012-13	19	7	26
2013-14	28	19	47
2014-15	24	12	36
2015-16	38	18	56
2016-17	45	15	60

Program Courses

The following table presents the enrollment data for all computer science program courses over the past five academic years.

Course	2012-13	2013-14	2014-15	2015-16	2016-17	Total
COMP 1100 Introduction to Computing	54	64	52	57	56	283
COMP 1101 Applied Tech Programming	81	78	39	44	62	304
COMP 1102 Principles of Programming I	63	69	65	68	74	339
COMP 1108 Principles of Programming II	32	25	21	25	37	140
COMP 1199 Special Topics in Computer Science				2	1	3
COMP 2200 Object-Oriented Programming	18	17	16	17	16	84
COMP 2201 Machine Organization	15	18	12	13	23	81
COMP 2220 Fundamentals of Computer Security	14	16	14	10	16	70
COMP 2230 Network Programming	9	13	10	14	8	54
COMP 2270 Data Structures	18	19	13	14	22	86
COMP 3300 Computer Graphics	8	5				13
COMP 3310 Artificial Intelligence			11			11
COMP 3330 Analysis of Algorithms	6	14		12	7	39
COMP 3340 Operating Systems	9	8	13	6	10	46
COMP 3380 Cryptography	8		3	6	8	25
COMP 3390 Network Security Technology	9		3	7	11	30
COMP 3395 Ethical Issues in Computing	19	7	16	18	21	81
COMP 4400 Automata and Language Design	7	10	9		6	32
COMP 4410 Database Management	13	9	7	11	8	48
COMP 4415 Vulnerability Assessment	7		2	1	5	15
COMP 4420 Selected Advanced Topics				5		5
COMP 4421 Computer Science Special Project	4		6			10
COMP 4440 Software Engineering	8	5	12	8	7	40
COMP 4495 Comp Security Internship	6		3	2	8	19
COMP 4498 Undergraduate Research			3		4	7

Service Courses

Currently, two computer science courses are offered as service courses to other programs. The COMP 1101 *Applied Tech Programming* course is required for several BS programs in Technology and used to be required by the AS program in Information Systems Technology at PC&TC. The COMP 1102 *Principles of Programming I* course is required for the BS programs in Math and Math Education. On average, approximately 60 students enroll in COMP 1101 every year and 20 non-CS students enroll in COMP 1102 every year.

Course	Programs Supported	Required/ Elective
COMP 1101 Applied Tech Programming	BS in Electronics Engineering Technology	Required
	BS in Mechanical Engineering Technology	Required
	BS in Graphic Design Technology	Required
	AS in Information Systems Technology	Required
COMP 1102 Principles of Programming I	BS in Mathematics	Required
	BS in Math Education	Required
	BS in Electronics Engineering Technology	Elective
	BS in Mechanical Engineering Technology	Elective
COMP 1108 Principles of Programming II	BS in Electronics Engineering Technology	Elective
	BS in Mechanical Engineering Technology	Elective
COMP 2200 Object-Oriented Programming	BS in Electronics Engineering Technology	Elective
	BS in Mechanical Engineering Technology	Elective
COMP 2201 Machine Organization	BS in Electronics Engineering Technology	Elective
	BS in Mechanical Engineering Technology	Elective

BS: Bachelor of Science   AS: Associate of Science

Success Rates in Service Courses

The success rate of service courses is based on the number of students that successfully pass the course with a letter grade of D or better. The following table summarizes student success rates for the required computer science service courses as specified in the previous section. The last column in the table below provides the overall % success rate for each service course.

Course	Success Rate (%)					
	2012-13	2013-14	2014-15	2015-16	2016-17	**Overall**
COMP 1100 Introduction to Computing	76.1	79.4	94.3	78.3	92.7	84.2
COMP 1102 Principles of Programming I	82.4	74.1	80	62.8	92.7	78.4

Cost/Student Credit Hour

Financial support for the computer science program is primarily obtained via institutional funding. There are no special fees required of students in this program. Each CS course has an associated course fee. These fees return to the College of Science and Technology. The Computer Science program receives $4,000 every year as operational budget. The department of Computer Science and Math also receives approximately $12,000, roughly half of which can be used by the program when needs arise.

The direct cost per student-credit-hour for the Computer Science program at FSU in 2016-17 was approximately $193. This calculation was based on the total labor budget including overload and adjunct pay. This cost was $165 for the College of Science and Technology and $150 for the entire institutions.

In terms of the average number of majors enrolling for classes each semester in the past two academic years, the CS program was the 3rd highest (86) within the College of Science and Technology and 12th within FSU. In terms of the average number of credit hours enrolled by students from different programs, the CS program was the 3rd highest (1189 credit hours per semester in the past two academic years) within the College of Science and Technology and 16th within FSU.

General Studies Requirements

The CS program requires more than 30 hours of general studies coursework outside the major area and is in compliance with the degree definition policy of Fairmont State University. (Refer to Appendix I)

Assessment Requirements

Mission Statement

The mission of the computer science degree program is to provide the students with the knowledge and problem-solving skills required for graduate study and/or a successful career in the computing field. Graduates have the ability to communicate effectively, to teach themselves new skills and to adapt to an ever-changing technological environment. Graduates will be able to properly deal with the social, legal and ethical issues that will inevitably arise in their chosen profession.

Program Goals

Goals	Assessment Measures
1. The graduates of the Computer Science program will be well prepared to find employment in the computing profession and pursue graduate studies.	• Within one year of graduation, 80% of the program graduates will find employment in the computing profession or be admitted into graduate programs. • The average score in ETS Major Field Test in Computer Science is 150 or higher (max 200).
2. Program graduates will have familiarization of current technology/trends in computing and the ability to learn and use new languages and tools.	• 70% of the graduates will receive favorable ratings from the employers.
3. The Computer Science program will maintain a steady enrollment and graduation rate.	• The enrollment and graduation count will remain steady over a five-year period.

Program Outcomes

Outcomes	Assessment Measures
1. Develop a program to effectively solve a given real world problem using an appropriate programming language.	• The average programming project grade in COMP 2270 *Data Structures* is 72.5% or higher.
2. Develop object oriented programs using an object-oriented programming language and associated class libraries.	• The average programming project grade in COMP 2200 *Object Oriented Programming* is 72.5% or higher.
3. Demonstrate knowledge of theoretical concepts of computer science including algorithm analysis and automata theory.	• The average exam grades in COMP 3330 *Analysis of Algorithms* is 72.5% or higher. • The average exam grades in COMP 4400 *Automate Theory* is 72.5% or higher.
4. Demonstrate knowledge of computer organization and operating systems concepts.	• The average final exam grade in COMP 2201 *Machine Organization* is 72.5% or higher. • The average exam grade in COMP 3340 *Operating Systems* is 72.5% or higher.
5. Demonstrate knowledge of basic software engineering principles and be able to design, implement, and test a software system.	• The average programming project grade in COMP 2230 *Network Programming* is 72.5% or higher. • The average term project grade in COMP 4440 *Software Engineering* is 72.5% or higher.
6. Demonstrate a knowledge of core issues concerning professional, social, and ethical responsibilities in computing.	• The average exam/assignment grade in COMP 3395 *Ethical Issues in Computing* is 72.5% or higher.

The following table summarizes student success rates for all computer science courses (lecture based) required by the majors. The success rate is based on the number of students that successfully pass the course with a letter grade of C or better. Each column depicts the percentage of students that succeeded in the course per academic year. The last column in the table below provides the overall % success rate for each course.

Course	Success Rate (%)					
	2012-13	2013-14	2014-15	2015-16	2016-17	**Overall**
COMP 1100 Introduction to Computing	61.2	64.3	61.2	73.3	70.2	66.0
COMP 1102 Principles of Programming I	56.1	54.8	44.6	62.9	60.0	55.7
COMP 1102 Principles of Programming II	53.6	62.5	52.6	62.5	75.7	61.4
COMP 2200 Object-Oriented Programming	43.8	64.7	62.5	68.8	31.3	54.2
COMP 2201 Machine Organization	46.7	52.9	82.3	66.7	69.6	63.6
COMP 2220 Fundamentals of Computer Security	83.3	81.3	100.0	77.8	86.7	85.8
COMP 2230 Network Programming	100.0	83.3	50.0	78.6	87.5	79.9
COMP 2270 Data Structures	31.3	68.4	61.5	64.3	68.2	58.7
COMP 3300 Computer Graphics	75.0	75.0				75.0
COMP 3310 Artificial Intelligence			90.9			90.9
COMP 3330 Analysis of Algorithms	100.0	71.4		91.7	100.0	90.8
COMP 3340 Operating Systems	100.0	87.5	92.3	100.0	90.0	94.0
COMP 3380 Cryptography	100.0		100.0	100.0	100.0	100.0
COMP 3390 Network Security Technology	88.9		100.0	100.0	100.0	97.2
COMP 3395 Ethical Issues in Computing	78.9	100.0	93.8	100.0	100.0	94.5
COMP 4400 Automata and Language Design	100.0	80.0	88.9		100.0	92.2
COMP 4410 Database Management	84.6	44.4	85.7	100.0	100.0	82.9
COMP 4415 Vulnerability Assessment	85.7		100.0	100.0	100.0	96.4
COMP 4440 Software Engineering	75.0	100.0	100.0	100.0	100.0	95.0

Educational Testing Service's (ETS) major field test (computer science) is administered to graduating seniors every spring. The following table summarizes the last five tests. The score range for the test is 120-200. The area subscores are the percentage of questions answered correctly for each of three areas; the areas are Programming and Software Engineering (Area#1), Discrete Structures and Algorithms (Area#2), and Systems (Architecture/Operating Systems/Networking/ Database) (Area#3) respectively. The results of 2013 and 2014 were combined in a single cohort and the results of 2016 and 2017 were combined in a single cohort. The average of the mean scores over the past five academic years (153) increased from the previous five academic years (149.5) by 2.3%.

Year	# of Students	Mean	% Correct		
			Area#1	Area#2	Area#3
2012-13 2013-14	9	151 (±11)	52	42	41
2014-15	8	156 (±15)	56	50	44
2015-16 2016-17	11	152 (±11)	57	44	50

Learning outcomes have also been developed for all individual courses. The assessment methods for the individual courses are based on a wide range of activities; weekly quizzes, in-class activities, homework, exams, and programming assignments. The assessment data is being collected now.

Employer satisfaction surveys have been used to identify target areas for improving the program. Data is still being collecting for the current review cycle. The data generally indicates that the graduates receive satisfactory ratings from employers regarding their preparedness.

Even though no formal graduate satisfaction survey has been performed yet, informal contacts with graduates after they have several months of work experience indicates an overall satisfaction with their education. A formal graduate satisfaction survey is in the works.

Adjunct Use

Adjunct faculty are used occasionally, primarily to teach the service course COMP 1101.

Graduation/Retention Rates

The number of graduates from the computer science program over the past five years (42) increased from the previous five academic years (39) by 7.7%. The average number of graduates from the computer science program in the past five academic years was 8.4 (±1.7). The graduation count is expected to increase in the coming years.

Even though there was some improvement in the retention rates over the ones reported in the last program review report, the CS faculty understand that improving the retention rate is one of the major challenges that lie ahead. The improvement in retention rates can be attributed to several measures; the math support program, using peer mentors, and identifying and advising at-risk students.

The following table summarizes the graduation rates for four freshmen classes (entering the CS program) starting Fall 2006. The last column represents the graduation rate of the freshmen who started in the CS program but eventually graduated with another FSU degree.

Freshman Semester	Cohort Size	% Graduation Rate (within 150% of Normal Time)	
		CS Degree	Another Degree
Fall 2006	13	30.8	30.7
Fall 2007	17	35.3	17.6
Fall 2008	33	27.3	18.2
Fall 2009	38	15.8	31.6
Fall 2010	29	17.2	20.7
Fall 2011	40	17.5	20
Fall 2012	22	22.7	27.3
Fall 2013	33	24.2	15.2

The CS program loses some majors to other programs. This can mostly be attributed to two factors; failure to develop coding skills and lack of math preparedness. In order to improve coding skills of students by providing a collaborative learning environment and direct instructor assistance, the second semester programming course COMP 1108 is being changed to a lab based course. Regarding math, the CS faculty members have been getting involved with early advising efforts.

Previous Program Review Results

The institutional recommendation was for "Continuation of the program at the current level of activity", which was approved by the BOG.

Comments from the Dean

The faculty involved with the teaching of computer science and computer security have continued to make improvements in their curriculum and in fostering undergraduate student research. Upon securing an additional terminal degreed faculty, the program should be able to move forward with ABET accreditation.

These programs of study continue to have increases in their enrollment, and graduates are able to obtain positions within business and industry or continue their education within the state of West Virginia. These are indicators of a successful program. The program faculty need to continue with the collection of assessment data on a yearly basis. The continuation of these programs is highly recommended by the Dean of the College of Science and Technology.

Program Requirements

The Computer Science major requires 43-46 hours of computer science courses, 17-21 hours of math courses, and 8-10 hours of science courses, for a total of 71-74 hours in computer science, math, and science. It requires 35-36 hours of general studies courses. The computer science course requirement is based on a strong programming sequence (12 hours) and advanced courses like Operating Systems, Ethical Issues, Database Management, Analysis of Algorithms, and Automata. A student is also required to take a Software Engineering capstone course. The Cybersecurity concentration option requires 51-54 hours of computer science and cybersecurity courses, 10-14 hours of math courses, 4-5 hours of science, a 3-hour information systems course, and a 3-hour criminal justice course. It requires 32-33 hours of general studies courses. There are 34 hours of core computer science courses and 10 hours of math courses in both the degree options (with/without the Cybersecurity concentration).

	Program Hours	
	Computer Science	**Cybersecurity**
Major	71-74	74-76
General Studies	35-36	32-33
Free Electives	10-14	11-14
TOTAL	120	120

A minor in computer science requires 18-19 hours of computer science and math courses, among which 9 hours are required and 9-10 hours are elective. The curricula for the Computer Science degree option, Cybersecurity concentration option, and the Computer Science minor are listed in Appendix I.

Faculty Data

There are four faculty members that are teaching within the computer science program. Three of them hold tenure, one holds a Ph.D. in computer science. One faculty member gets half release for Department Chair responsibilities, one of the faculty members teaches one-fourth of his course load within the math program, and one of them teaches half of his course load within the math program. All the CS faculty members have significant experience in teaching CS courses. Some of them are actively involved in research. They mentor undergraduate students in different research projects. They participate in professional development activities on a regular basis including attending conferences/workshops. The faculty members are dedicated and they try to ensure student success by assisting them on a one-on-one basis. There is no dependency on adjunct faculty to teach any CS course required for the degree. The faculty data is presented in Appendix II.

It is worth mentioning that one of the previous faculty members, who served the CS program for almost ten years, left in 2013. There was some difficulty in the following two years to find a suitable replacement and temporary full-time and part-time faculty were used to teach some classes. The new hire is expected to finish his PhD within one year.

Accreditation/National Standards

The national accreditation agency for Computer Science programs is Accreditation Board for Engineering and Technology (ABET). The two major professional organizations for Computer Science are Association for Computing Machineries (ACM) and Institute of Electrical and Electronic Engineers (IEEE) Computer Society. The recent curriculum modifications were done based on ACM and IEEECS guidelines and in accordance with ABET requirements. The CS program has identified several improvement areas to meet ABET requirements including completing a few assessment cycles.

The Computer Science program has a program advisory committee. As of now, the committee consists of (1) Dr. Donald Adjeroh, Professor of Computer Science, WVU, (2) Mr. Brandon Ludwick, Senior Programmer Analyst, Dominion Energy, (3) Mr. Brian McKibben, IT Specialist, CJIS/FBI, (4) Mr. Kenneth Rehm, Associate Director, NASA IV&V, (5) Mr. Christopher Ryan, Senior Applications Developer, Fusion Technology, and (6) Mr. Jeff Tucker, Principle Systems Engineer, Leidos.

In its last meeting held on 02/27/18, the committee has made several recommendations. These include (1) incorporating cloud computing into the curriculum, (2) using open source tools from Amazon and Google in capstone course, (3) exposure to Web development, (4) incorporating human-computer interaction, (5) introducing the basic software engineering concepts in freshman level programming classes, (6) exploring the possibility of switching to Java for freshman programming courses, (7) requiring probability and statistics for the program, (8) designing programming language paradigm and compiler design courses, (9) tracking the progress of students who leave the program, (10) offering remedial Math courses in the summer to better prepare incoming freshmen, (11) facilitating mentorship relationship between upper- and lower-level students, (12) exploring the possibility of using industrial mentors for student projects, (13) starting a CS student club, (14) marketing at the high school level to let students know there are programs that they can participate in while still in high school that could help increase their math skills in order to help set them up for success once they reach college, and (15) using the Science Fair as a marketing tool for the CS program.

As mentioned earlier, the CS program is preparing to apply for ABET accreditation. The advisory committee is expected to provide valuable advice regarding curriculum, student expectations, and the implementation of a continuous improvement plan. The committee will provide guidance in order for the Computer Science program to reflect the needs of the business, industry, and the regional community. The expertise of the committee members will be important to the effective growth of the program.

Facilities

Several classrooms are available for priority scheduling for CS lectures. All of these classrooms provide instructional technology support. Students have access to several campus-wide computer labs. All these computers are loaded with different software development tools. There are two dedicated labs for the computer science program. Both classrooms are used exclusively for either computer science or cybersecurity classes. In one lab, each computer is set up by Operating Systems students every year to dual-boot both Kali Linux and Windows 10 operating systems. Additionally, the systems are equipped with Nvidia video cards for parallel processing experiments and video game programming. To create virtualized networking environments, the computers also have increased memory to run multiple virtual machines simultaneously. There is also a 16 node Beowulf cluster of machines setup for high performance computing experiments and multiple Android tablets for mobile application development projects. Cybersecurity students are also trained to setup and secure networks using a state of the art wireless router and a Cisco ASA 5505 Adaptive Security Appliance.

The CS program has a yearly subscription for Microsoft Development software. Under this license, all students enrolled in a CS course have access to a wide collection of Microsoft Software. The computer science program also possesses a Linux server. With all these computing facilities, the students gain software development experience on multiple platforms. The CS faculty members have their own offices equipped with modern computing facilities.

The computer science program employs a tutor every semester. The tutor is selected from a pool of CS undergraduate students. The tutor helps students with programming projects.

Strengths/Weaknesses

The computer science program at FSU emphasizes computer science concepts which enable a graduate to succeed in graduate school or a multitude of employment areas. The program is intended to provide students with the ability to adapt quickly to different programming environments and to grow into more advanced positions of employment. Students with a relatively strong high school background in problem solving fields are generally more successful than students lacking such a background. Students lacking problem solving skills must work to overcome this deficiency early in the program. Faculty have connections to both graduate schools and industry, and experience in both practical applications and theoretical studies, and are thus able to steer a student into their area of interest. The program has the advantage of being located in the High-Tech Corridor, and having a low student/instructor ratio.

The computer science program has been trying to build a good partnership with the local high-tech industry and maintain close contacts with leading software professionals in the area. The goal of this endeavor is to create more internship/employment opportunities for students/graduates and this partnership has started benefiting the program.

One of the strengths of the CS program is to have undergraduate students involved in faculty-mentored research. This provides them with a valuable opportunity to apply the skills they learn in classrooms. Working in a research project allows them to fill the gaps in their understanding of current topics and foster their creativity. The college of science and technology fund several undergraduate research projects every year, some in collaboration with NASA, and computer science students have earned these competitive awards on a regular basis. Many of these projects have resulted in publications at different regional, national, and international levels.

One of the major weaknesses of the program is low retention. As mentioned earlier, several actions have been taken to improve retention, which are expected to be effective.

Even though the program has dedicated and experienced faculty members, currently there is only one who holds a Ph.D. Also, out of the four faculty members in the CS program, one teaches one math course every semester and one teaches two math courses every semester. That leaves the program with 3.25 full time faculty members. The program should have at least one more faculty member with a Ph.D. in computer science. This will be required for ABET accreditation.

NECESSITY

Placement and Success of Graduates

The computer science program is one of the top-ranked programs in the College of Science and Technology at FSU in terms of steady student enrollment, steady graduation rate, student research, collaboration with the local High-Tech industry, and a very successful history job placement.

Students successfully completing this program gain an understanding of the concepts of computer science required for entry level software development positions. Students are able to move immediately into such positions and have the flexibility to enhance their skills. Students choosing to pursue graduate school can do so with no or minimal additional background course work.

Most of the program graduates find employment before they graduate. A good number of them start working on a part-time basis while they are students. Many of the graduates are employed in the local High-Tech companies in the Fairmont, Clarksburg, and Morgantown area. Students/graduates have recently found employment/internship with Google, Los Alamos National Lab, NASA, Lockheed Martin, Northrop Grumman, FBI, Department of Energy, Leidos, and Dominion. Starting salaries for those employed locally have ranged from $45,000-55,000 with additional benefits provided (based on informal contacts with graduates). Some graduates have moved into the Washington, D.C. area, Pittsburgh, California, and other distant places. Few graduates have also been accepted into graduate school at Arizona State University, West Virginia University, Australian National University, University of North Carolina at Wilmington, etc.

Out of 42 graduates in the past 5 years, the faculty has been able to track 38. Of these graduates, one is currently pursuing graduate degree, one has come back to pursue a second BS degree, and the other 36 are employed in computing related positions. This is a 100% placement rate for students the faculty have been able to track.

There are many high-tech companies in the geographical area around FSU, and demand for CS graduates still remains high. This trend is expected to continue for the next several years. The table in the following page describes wages and employment trends at the national and state levels for computer science related jobs that require a bachelor degree. The data was obtained from the Bureau of Labor Statistics webpage (http://www.bls.gov/) and Occupational Information Network webpage (http://online.onetcenter.org/). The attractive wages and the increasing demand in the computing occupations are expected to have a positive impact on the computer science program at FSU.

Occupation	Median Wage (2016)		Employment (2016)		Expected Increase (2016-2026)	
	US	WV	US	WV	US	WV*
Software Developers - Applications	$100,080	$84,870	794,000	880	30.7%	
Software Developers - Systems	$106,860	$73,370	409,820	580	11.1%	
Computer Programmers	$79,840	$59,030	294,900	630	-7.2%	
Information Security Analysts	$92,600	$74,490	96,870	170	28.5%	
Computer Systems Analysts	$87,220	$67,910	568,960	860	9.1%	
Database Administrators	$84,950	$65,300	113,730	430	11.5%	

* State level projection not available

Similar Programs in WV

West Virginia University, which is geographically the nearest institution from FSU, offers a BS degree in Computer Science. Fairmont State University offers courses with smaller class size. Students appreciate this smaller classroom setting, since this gives them more opportunity to connect with faculty on a one-on-one basis. The CS program at FSU has great commitments to non-traditional students. The faculty members work closely with these students and strive to meet their needs. It is worth mentioning that many of FSU's students come from rural West Virginia, and they are more comfortable on this campus. Also, a good number of FSU students commute from south of Fairmont, which gives them a shorter commute distance compared to Morgantown. Within the past five years, a few students have transferred from WVU to FSU to complete their BS degrees and have found suitable employment.

FSU Computer Science also has been offering a Cybersecurity concentration since 2005, which was the first of its kind WV. It was originally intended to be a separate major (in Computer Security), but due to some paperwork and procedural issues, it was not registered as a separate major with HEPC. Currently, the Computer Science program is working towards getting an approval from HEPC for the Cybersecurity major. As of now, there are a few Cybersecurity type programs in WV at other institutions, but their curricula are more IT centric. FSU's Cybersecurity program is primarily a Computer Science program, i.e., the students graduate with software development skills along with skills to design and implement secured networks and software systems and analyze vulnerabilities in various computing systems and platforms.

The following table presents the number of Computer Science graduates from different WV institutions (source: HEPC website). Several institutions do not offer a Bachelor degree in CS. Of those that do, FSU is among the top institutions after WVU and Marshall University, in terms of graduation count. The demand for CS professionals is much higher than the total number of CS graduates in the state. Strengthening the CS program at FSU will certainly help meet the increasing demand of software professionals in the state, particularly in the High-Tech Corridor.

	2012-13	2013-14	2014-15	2015-16	2016-17	Institution Total
Bluefield State College	9	7	5	6	8	**35**
Fairmont State University	12	6	6	11	7	**42**
Marshall University	23	13	21	11	18	**86**
Shepherd University	14	18	13	16	17	**78**
West Virginia State University			2	3	4	**9**
West Virginia University	35	33	43	42	53	**206**
WVU Institute of Technology	9	3	3	2	1	**18**
Alderson Broaddus University	3	2	1	6	5	**17**
Bethany College		3	3	2	1	**9**
Davis and Elkins College	2	4	4	4	1	**15**
Mountain State University	2					**2**
West Virginia Wesleyan College				3	8	**11**
Wheeling Jesuit University	5	5	5	10	4	**29**
Yearly Total for WV	**114**	**94**	**106**	**116**	**127**	

CONSISTENCY WITH MISSION

A central theme in the mission of FSU is to provide students with an education enabling them to be productive within their domain. Certainly, computer science expertise would be a significant enhancement of such an education. Students in this program are exposed to problems which might be encountered in various fields. The courses offered by the program supplement the curricula of other 4-year programs. Computer facilities are shared by students in this program with students in many of the other programs on campus. The Computer Science and Business Information Systems Management faculty members have collaborated for the IBM academic initiative program, on Software Engineering and Project Management classes, etc. The CS faculty members interact with local High-Tech industry--an interaction that is beneficial to both.

Currently, the CS faculty are collaborating with Graphics Technology faculty to develop a minor in Game Design, with Mechanical and Electronics faculty to develop a concentration in Automation and Robotics, and with Behavioral Science faulty to develop a concentration in Data Analytics in Behavioral Science.

Program of Study
BS in Computer Science

Courses Required in Major	Total Hours
COMP 1100 Introduction to Computing (3) COMP 1102 Principles of Programming I (3) COMP 1108 Principles of Programming II (3) COMP 2200 Object-Oriented Programming (3) COMP 2201 Machine Organization (3) COMP 2230 Network Programming (3) COMP 2270 Data Structures (3) COMP 3330 Analysis of Algorithms (3) COMP 3340 Operating Systems (3) COMP 3395 Ethical Issues in Computing (3) COMP 4400 Automata Theory (3) COMP 4410 Database Management (3) COMP 4440 Software Engineering (4) MATH 1561 Introduction to Math Reasoning (3) MATH 2562 Discrete Mathematics (3) MATH 2501 Calculus I (4) MATH 2502 Calculus II (4) Any 3 from the following with at least one COMP and at least one MATH course: COMP 3300 Computer Graphics (3) COMP 3310 Artificial Intelligence (3) COMP 3380 Introduction to Cryptography (3) COMP 4420 Selected Advanced Topics (3) COMP 4450 Introduction to Data Mining (3) MATH 2510 Mathematical Logic (3) MATH 3503 Calculus III (4) MATH 3504 Differential Equations (3) MATH 3520 Linear Algebra (3) MATH 3540 Numerical Analysis (3) MATH 3550 Probability and Statistics (3) Any 2 from the following: BIOL 1105 Biological Principles I (4) BIOL 1106 Biological Principles II (4) CHEM 1105 Chemical Principles (5) CHEM 2200 Foundational Biochemistry (4) PHYS 1101 Introduction to Physics I (4) PHYS 1102 Introduction to Physics II (4) PHYS 1105 Principles of Physics I (5) PHYS 1106 Principles of Physics II (5)	**71-74**
General Studies	**35-36**
Free Electives	**10-14**
Total for Degree	**120**

Professional society that may have influenced the program offering and requirements:

Association for Computing Machineries (ACM)
Institute of Electrical and Electronic Engineers (IEEE) Computer Society

Program of Study
BS in Computer Science (Cybersecurity Concentration)

Courses Required in Major	Total Hours
COMP 1100 Introduction to Computing (3) COMP 1102 Principles of Programming I (3) COMP 1108 Principles of Programming II (3) COMP 2200 Object-Oriented Programming (3) COMP 2201 Machine Organization (3) COMP 2220 Fundamentals of Computer Security (3) COMP 2230 Network Programming (3) COMP 2270 Data Structures (3) COMP 3340 Operating Systems (3) COMP 3380 Introduction to Cryptography (3) COMP 3390 Network Security (4) COMP 3395 Ethical Issues in Computing (3) COMP 4410 Database Management (3) COMP 4415 Vulnerability Assessment (4) COMP 4440 Software Engineering (4) COMP 4495 Comp Security Internship (3) BISM 2600 Introduction to Networking Administration (3) CRIM 2250 Cybercrime (3) MATH 1561 Introduction to Math Reasoning (3) MATH 2562 Discrete Mathematics (3) MATH 2501 Calculus I (4) Any 1 from the following: COMP 3310 Artificial Intelligence (3) COMP 3330 Analysis of Algorithms (3) COMP 4400 Automata Theory (3) COMP 4420 Selected Advanced Topics (3) COMP 4450 Introduction to Data Mining (3) MATH 2502 Calculus II (4) MATH 2510 Mathematical Logic (3) <u>Any 1 from the following:</u> BIOL 1105 Biological Principles I (4) BIOL 1106 Biological Principles II (4) CHEM 1105 Chemical Principles (5) PHYS 1101 Introduction to Physics I (4) PHYS 1105 Principles of Physics I (5)	**74-76**
General Studies	**32-33**
Free Electives	**11-14**
Total for Degree	**120**

Professional society that may have influenced the program offering and requirements:

Association for Computing Machineries (ACM)
Institute of Electrical and Electronic Engineers (IEEE) Computer Society

Program of Study
Minor in Computer Science

<u>**Required Courses (9 Hours)**</u>

COMP 1102 Principles of Programming I (3)
COMP 1108 Principles of Programming II (3)
COMP 2200 Object-Oriented Programming (3)

<u>**Elective Courses (9 Hours)**</u>

COMP 2201 Machine Organization (3)
COMP 2220 Fundamentals of Computer Security (3)
COMP 2230 Network Programming (3)
COMP 2270 Data Structures (3)
COMP 3300 Computer Graphics (3)
COMP 3395 Ethical Issues in Computing (3)
COMP 4440 Software Engineering (4)
MATH 2562 Introduction to Discrete Mathematics (3)

Total Hours: 18-19

Name Randall Baker   Rank Assistant Professor

    Full-time X   Part-time __   Adjunct __   Graduate Asst. __

Highest Degree Earned M.S. in Mathematics   Date Degree Received August, 1985

Conferred by West Virginia University

Area of Specialization Applied Mathematics, Combinatorics, Numerical Analysis

Professional registration/licensure _____   Years of employment at present institution   32

Years of employment in higher education 33   Years of related experience outside higher education 1

Non-teaching experience   1

(a) Courses taught in the last two years:

Year/Semester	Course Number & Title	Enrollment
2017 / Spring	COMP 1102 – Principles of Programming I	26
2017 / Spring	COMP 3380 – Cryptography in Comp Security	8
2017 / Spring	MATH 1107 – Fundamental Concepts of Mathematics	25
2017 / Spring	MATH 1107 – Fundamental Concepts of Mathematics	12
2016 / Fall	COMP 1102 – Principles of Programming I	18
2016 / Fall	COMP 2270 – Data Structures	15
2016 / Fall	MATH 1012 – College Algebra Support	15
2016 / Fall	MATH 1012 – College Algebra Support	17
2016 / Fall	MATH 1170 – Intro to Math Analysis	24
2016 / Spring	COMP 1102 – Principles of Programming I	26
2016 / Spring	COMP 3380 – Cryptography in Comp Security	6
2016 / Spring	MATH 1107 – Fundamental Concepts of Mathematics	14
2016 / Spring	MATH 3335 Probability and Statistics	14
2015 / Fall	COMP 1102 – Principles of Programming I	21
2015 / Fall	COMP 2270 – Data Structures	14
2015 / Fall	MATH 1115 – Trigonometry and elementary Functions	25
2015 / Fall	MATH 1170 – Intro to Math Analysis	18

(b) Professional development activities during the last five years:

I participated in several training sessions dealing with the use of Microsoft Surface Pro in the classroom. I also participated in several webinars regarding Maple mathematical software.

(c) Awards/honors or special recognition in last five years: None

(d) Activities that have contributed to effective teaching:

I do a great deal of reading and independent study for my courses. This is especially the case for the upper-level COMP courses. I created new course materials for COMP 3380, MATH 1190, and MATH 1561.

(e) Professional books/papers published during the last five years: None

(f) Externally funded research (grants and contracts) during last five years. None

Name Thomas Devine   Rank Temporary Assistant Professor

 Full-time X   Part-time __   Adjunct __   Graduate Asst. __

Highest Degree Earned M.S. in Computer Science Date Degree Received May, 2013

Conferred by West Virginia University

Area of Specialization Data Science, High-Performance Computing, Cybersecurity

Professional registration/licensure ____   Years of employment at present institution   3

Years of employment in higher education   8   Years of related experience outside higher education 5

Non-teaching experience   10

(a) Courses taught in the last two years:

Year/Semester	Course Number & Title	Enrollment
2017 / Spring	COMP 3390 – Network Security	11
2017 / Spring	COMP 3395 – Ethical Issues in Computing	21
2017 / Spring	COMP 4440 – Software Engineering	7
2017 / Spring	COMP 4495 – Comp Security Internship	5
2016 / Fall	COMP 1108 – Principles of Programming II	14
2016 / Fall	COMP 2220 – Fundamentals of Computer Security	16
2016 / Fall	COMP 3340 – Operating Systems	10
2016 / Fall	COMP 4415 – Vulnerability Assessment	5
2016 / Fall	COMP 4495 – Comp Security Internship	2
2016 / Spring	COMP 3390 – Network Security	7
2016 / Spring	COMP 3395 – Ethical Issues in Computing	18
2016 / Spring	COMP 4415 – Vulnerability Assessment	1
2016 / Spring	COMP 4440 – Software Engineering	8
2016 / Spring	COMP 4495 – Comp Security Internship	2
2015 / Fall	COMP 1108 – Principles of Programming II	9
2015 / Fall	COMP 2220 – Fundamentals of Computer Security	10
2015 / Fall	COMP 3340 – Operating Systems	6

(b) Professional development activities during the last five years:

- Attended the CISSE Cybersecurity Education conference in Las Vegas, NV, 2017.
- Attended the SIGCSE Computer Science Education conference in Seattle, WA, 2017.
- Redesigned COMP 1108 under a Title III grant in August, 2017.
- Led a student team to NASA's Wallups Island Flight Facility to participate in the RockSat-C collaborative rocket launch in June 2017.
- Accompanied two students to present at the Undergraduate Research Day at the Capitol in Charleston, WV on February 24, 2017.
- Represented FSU at the Harrison Chamber and the Harrison County Board of Education's first All-County 8th Grade Career Connections Day on November 16, 2016.
- Presented on Cybersecurity to the Fayette County Gifted Program on November 7, 2016.

- Recruited at the WVU College fair at the WVU Coliseum on October 20, 2016.
- Mentored an undergraduate student in a summer research project, 2016.
- Mentored an undergraduate student developing software for the Solar Army Project, 2016.
- Attended the Teaching Professor Conference, Washington, DC, 2016.
- Represented FSU at the FBI Industry Day in May, 2016.
- Panelist for WV Congressman David McKinley's Cybersecurity forum on August 18, 2016.
- Mentored FSU teams at a problem solving competition (Mylan Hackathon) held in Cannonsburg, PA on March 1, 2015.

(c) Awards/honors or special recognition in last five years: None

(d) Activities that have contributed to effective teaching:

I am constantly working to keep the curriculum in my classes current with the cutting edge of technology. I have performed independent study in addition to attending teaching conferences to help refine my teaching methods. For example, I have integrated "Capture the Flag" activities into my Vulnerability Assessment class, introduced GPU parallel programming to my Operating Systems class, and created a lab using Cisco ASA security appliances for my Network Security class.

(e) Professional books/papers published during the last five years:

- T. Kyanko, T. Devine, R. Reddy, S. Reddy, "A personal knowledge advantage machine for knowledge workers in data-intensive domains," International Conference on Engineering, Technology and Innovation (ICE/ITMC), Portugal, June 2017, 63-67.
- Thomas Devine, Katerina Goseva-Popstajanova, Maura McLaughlin, "Detection of Dispersed Radio Pulses: A machine learning approach to candidate identification and classification," Monthly Notices of the Royal Astronomical Society 459 (2), pp 1519-1532, 2016.
- Thomas Devine, Katerina Goseva-Popstajanova, Sandeep Krishnan, Robyn Lutz, "Assessment and cross-product prediction of software product line quality: accounting for reuse across products, over multiple releases," Automated Software Engineering, pp 1-50, 2014.
- Thomas Devine, Katerina Goseva-Popstajanova, Sandeep Krishnan, Robyn Lutz, and J. Jenny Li, "An empirical study of pre-release software faults in an industrial product line," Presented at the 5th International Conference on Software Testing, Verification, and Validation, Montreal, 2012.

(f) Externally funded research (grants and contracts) during last five years.

- NASA Space Grant student research, Spring 2017.
- Title III Course Redesign of COMP 1108, Summer 2017.

Name Mahmood Hossain   Rank Associate Professor

   Full-time X   Part-time __   Adjunct __   Graduate Asst. __

Highest Degree Earned Ph.D. in Computer Science   Date Degree Received December, 2006

Conferred by Mississippi State University

Area of Specialization Data Mining, Database Systems, Artificial Intelligence

Professional registration/licensure _____   Years of employment at present institution   12

Years of employment in higher education 20   Years of related experience outside higher education 1

Non-teaching experience   1

(a) Courses taught in the last two years:

Year/Semester	Course Number & Title	Enrollment
2017 / Summer	COMP 1100 – Introduction to Computing - Online	8
2017 / Summer	COMP 1101 – Applied Tech Programming	18
2017 / Spring	COMP 1102 – Principles of Programming II	23
2017 / Spring	COMP 1108 – Data Structures	7
2017 / Spring	COMP 3330 – Analysis of Algorithms	7
2016 / Fall	COMP 1101 – Applied Tech Programming	21
2016 / Fall	COMP 4400 – Automata and Language Design	6
2016 / Fall	COMP 4410 – Database Management	8
2016 / Fall	COMP 4498 – Undergraduate Research	1
2016 / Summer	COMP 1100 – Introduction to Computing - Online	9
2016 / Spring	COMP 1101 – Applied Tech Programming	25
2016 / Spring	COMP 1102 – Principles of Programming II	16
2016 / Spring	COMP 4420 – Advanced Topics (Data Mining)	5
2015 / Fall	COMP 3330 – Analysis of Algorithms	12
2016 / Fall	COMP 4410 – Database Management	11

(b) Professional development activities during the last five years:

- ACM Technical Symposium on Comp. Sc. Education (SIGCSE 2017), Seattle, Mar 8-11, 2017.
- Banner Training, Fairmont State University, Sep 15, 2016.
- Cyber Security Panel Discussions on Cyber Threats in Energy and Business Sectors, WV High Tech Foundation, Fairmont, Aug 18, 2016.
- WV Academy of Science Meeting, Huntington, Apr 9, 2016.
- WV Academy of Science Meeting, Shepherdstown, Apr 12, 2014.
- SecKnit Faculty Development Workshop for Integrating Security into Traditional Computer Science Courses, Tennessee Tech University, Cookeville, Jun 3-4, 2013.
- WV Academy of Science Meeting, Davis, Apr 6, 2013.
- IBM Enterprise Systems Faculty Training Session, Fairmont, Jul 9-13, 2012.
- International C* Conference on Computer Science & Software Engineering (C3S2E 2012), Montreal, Jun 27-29, 2012.

(c) Awards/honors or special recognition in last five years:

- Co-PI, Establishing the Viability of the PACE Project for the Community of Monongah through Agent-Based Computational Modeling Simulations, FSU and Marion County Commission Research Grant, Spring 2016.
- Summer undergradute research grant, 2015.
- Summer undergradute research grant, 2015.
- Tennessee Tech University Fellowship (NSF) for attending SecKnitKit Faculty Development Workshop, Summer 2013.
- Summer undergradute research grant, 2013.
- Summer undergradute research grant, 2012.

(d) Activities that have contributed to effective teaching:

- New course design.
- Designing online courses.
- Utilizing active learning in teaching programming courses.
- Undergraduate research mentorship.
- Attending and presenting at conferences.

(e) Professional books/papers published during the last five years:

- M. Hossain, S. Bridges, Y. Wang, and J. Hodges. An effective ensemble method for hierarchical clustering. *Proc. of International C* Conference on Computer Science & Software Engineering, Montreal, Jun 27-29, 2012,* pages 18-26.
- H. Mirza, M. Hossain, and T. Kato. Analyzing psychophysiological effects of music using coherency of multichannel EEG. Proceedings of 91st WV Academy of Science Meeting, Huntington, Apr 9, 2016.
- P. Kahly and M. Hossain, A data mining approach for analyzing dependencies between course learning outcomes. Proceedings of 89th WV Academy of Science Meeting, Shepherdstown, Apr 12, 2014.
- M. Hossain, T. Kato, and M. Sink, Frequency spectrum analysis of multichannel EEG using auditory stimuli of varying fractal dimensions. Proceedings of 88th WV Academy of Science Meeting, Davis, Apr 6, 2013.

(f) Externally funded research (grants and contracts) during last five years. None

Name Theodore LaRue   Rank Assistant Professor

     Full-time X   Part-time ___   Adjunct ___   Graduate Asst. ___

Highest Degree Earned M.S. in Mathematics   Date Degree Received January, 1982

Conferred by West Virginia University

Area of Specialization Object-oriented Programming, Software Design, Mathematics

Professional registration/licensure _____ Years of employment at present institution   36

Years of employment in higher education 36   Years of related experience outside higher education ___

Non-teaching experience _____

(a) Courses taught in the last two years:

Year/Semester	Course Number & Title		Enrollment
2017 / Spring	COMP 1100	Introduction to Computing	24
2017 / Spring	COMP 1199	ST: NASA Internship - Honors	1
2017 / Spring	COMP 2201	Machine Organization	24
2017 / Spring	COMP 2230	Network Programming	18
2017 / Spring	COMP 4998	Undergrad Research - Honors	1
2017 / Spring	MATH 1112	College Algebra	19
2016 / Fall	COMP 1100	Introduction to Computing	29
2016 / Fall	COMP 1102	Principles of Programming I	24
2016 / Fall	COMP 2200	Object-Oriented Programming	18
2016 / Fall	COMP 4998	Undergrad Research - Honors	1
2016 / Fall	MATH 1112	College Algebra-Honors	17
2016 / Spring	COMP 1100	Introduction to Computing	24
2016 / Spring	COMP 1199	ST: NASA Internship Honors	1
2016 / Spring	COMP 2201	Machine Organization	18
2016 / Spring	COMP 2230	Network Programming	18
2016 / Spring	MATH 1112	College Algebra	16
2016 / Spring	MATH 1112	College Algebra - Honors	15
2016 / Spring	MATH 2200	Mathematical Logic	21
2016 / Spring	MATH 4998	Undergraduate Research -Honors	1
2015 / Fall	COMP 1100	Introduction to Computing	24
2015 / Fall	COMP 1102	Principles of Programming I	18
2015 / Fall	COMP 2200	Object-Oriented Programming	18
2015 / Fall	MATH 1112	College Algebra	21
2015 / Fall	MATH 1112	College Algebra - Honors	10

(b) Professional development activities during the last five years:

- Developed Java application for practicing vocabulary for GRE preparation.
- Improved efficiency for a complex machine control program for a sawmill.
- Developed Java application for maintaining and viewing scaled grades.

(c) Awards/honors or special recognition in last five years: None

(d) Activities that have contributed to effective teaching:

Reading current literature and experimenting with new languages and other new software; building microcontroller circuits.

(e) Professional books/papers published during the last five years: None

(f) Externally funded research (grants and contracts) during last five years. None

Name Abdelrahman Desoky   Rank Temporary Assistant Professor

       Full-time X   Part-time __   Adjunct __   Graduate Asst. __

Highest Degree Earned Ph.D. in Computer Engineering   Date Degree Received 2009

Conferred by The University of Maryland, Baltimore County

Area of Specialization Cyber Security, Steganography, Cryptography

Professional registration/licensure   Years of employment at present institution   1

Years of employment in higher education 3   Years of related experience outside higher education 20

Non-teaching experience   17

(a) Courses taught in the last two years:

Year/Semester	Course Number & Title	Enrollment
2015 / Spring	COMP 3380 – Cryptography	3
2015 / Spring	COMP 3395 – Ethical Issues in Computing	16
2015 / Spring	COMP 4415 – Vulnerability Assessment	2
2014 / Fall	COMP 2220 – Fundamentals of Computer Security	14
2014 / Fall	COMP 3340 – Operating Systems	13
2014 / Fall	COMP 3390 – Network Security	3
2014 / Fall	COMP 4495 – Comp Security Internship	2

(b) Professional development activities during the last five years:

(c) Awards/honors or special recognition in last five years: None

(d) Activities that have contributed to effective teaching:

(e) Professional books/papers published during the last five years:

(f) Externally funded research (grants and contracts) during last five years.

Name Gary Edwards   Rank Adjunct Instructor

      Full-time __   Part-time __   Adjunct X   Graduate Asst. __

Highest Degree Earned Masters in Business Admin   Date Degree Received July, 1991

Conferred by WV Wesleyan College

Area of Specialization Business Administration

Professional registration/licensure   0   Years of employment at present institution   28

Years of employment in higher education 28   Years of related experience outside higher education 38

Non-teaching experience   38 years

(a) Courses taught in the last two years:

Year/Semester	Course Number & Title	Enrollment
2017 / SPRING	COMP 1101 – Management Information Systems	23
2017 / SPRING	BISM 3200 – Management Information Systems	31
2017 / SPRING	BISM 3200 – Management Information Systems	16
2016 / FALL	BISM 2200 – Business Information Tools	14

(b) Professional development activities during the last five years:

- Attended SIGCSE in 2018 presenting at Teaching Theater for Google booth on the use of Google Cloud Platform for DBMS class.

(c) Awards/honors or special recognition in last five years: None

(d) Activities that have contributed to effective teaching:

- Created cloud based full DBMS systems for individual students to populate and manage. Each student had his/her own cloud instance.
- Created cloud based full HRIS systems for student teams to populate and manage. Each team of 4-5 students had their own system to manage.

(e) Professional books/papers published during the last five years: None

(f) Externally funded research (grants and contracts) during last five years. None

Name Rodney Kuhn   Rank Adjunct Instructor

   Full-time ___   Part-time ___   Adjunct X   Graduate Asst. ___

Highest Degree Earned BS in Physics   Date Degree Received 1974

Conferred by Miami University, Oxford, Ohio

Area of Specialization Software Development, Software Testing

Professional registration/licensure   0   Years of employment at present institution   1

Years of employment in higher education 1   Years of related experience outside higher education 34

Non-teaching experience   34 years

(a) Courses taught in the last two years:

Year/Semester	Course Number & Title	Enrollment
2014 / Spring	COMP 3395 – Ethical Issues in Computing	7
2013 / Fall	COMP 2220 – Fundamentals of Computer Security	16
2013 / Fall	COMP 3340 – Operating Systems	8

(b) Professional development activities during the last five years: None

(c) Awards/honors or special recognition in last five years: None

(d) Activities that have contributed to effective teaching: None

(e) Professional books/papers published during the last five years: None

(f) Externally funded research (grants and contracts) during last five years. None

Name Christopher M Ryan   Rank Adjunct Instructor

      Full-time ___   Part-time ___   Adjunct X   Graduate Asst. ___

Highest Degree Earned B.S. in Computer Science   Date Degree Received 2010

Conferred by Fairmont State University

Area of Specialization Computer Science / Software Engineering

Professional registration/licensure _____   Years of employment at present institution   1

Years of employment in higher education 1   Years of related experience outside higher education 9

Non-teaching experience   9

(a) Courses taught in the last two years: Not applicable, left institution in 2013.

Year/Semester	Course Number & Title	Enrollment
2015 / Fall	COMP 1101 – Applied tech Programming	19

(b) Professional development activities during the last five years: Resume

- Senior Applications Developer / Internship Director, Fusion Technology LLC, Bridgeport, WV, Aug 2016 - Present
- Senior Java Developer, OnWire Consulting Group, Bridgeport, WV, Aug 2015 - Aug 2016
- ITIM Specialist / Consultant, OnWire Consulting Group, Rockville, MD, June 2015 - Aug 2015
- Security System Sales / Software Engineer, OnWire Consulting, Fairmont, WV, July 2014 - Aug 2015
- Software Engineer at OnWire Consulting, Bridgeport, WV, Apr 2012 - July 2014

(c) Awards/honors or special recognition in last five years: Not applicable

(d) Activities that have contributed to effective teaching: Not applicable

(e) Professional books/papers published during the last five years: Not applicable

(f) Externally funded research (grants and contracts) during last five years.   Not applicable

Name Aaron Saas   Rank Adjunct Instructor

        Full-time __   Part-time __   Adjunct X   Graduate Asst. __

Highest Degree Earned M.S. in Software Engineering   Date Degree Received 2004

Conferred by West Virginia University

Area of Specialization Computer Science / Software Engineering

Professional registration/licensure _____ Years of employment at present institution 1

Years of employment in higher education 1   Years of related experience outside higher education 1

Non-teaching experience   1

(a) Courses taught in the last two years:

Year/Semester	Course Number & Title	Enrollment
2015 / Spring	COMP 1102 – Principles of Programming II	13
2015 / Spring	COMP 4440 – Software Engineering	12
2014 / Fall	COMP 1101 – Applied Tech Programming	15
2014 / Spring	COMP 4440 – Software Engineering	4

(b) Professional development activities during the last five years:

(c) Awards/honors or special recognition in last five years:

(d) Activities that have contributed to effective teaching:

(e) Professional books/papers published during the last five years:

(f) Externally funded research (grants and contracts) during last five years.

Name Donald L. Tobin Jr.   Rank Assistant Professor

      Full-time X   Part-time ___   Adjunct ___   Graduate Asst. ___

Highest Degree Earned M.S. in Computer Science   Date Degree Received 1987

Conferred by Boston University

Area of Specialization Computer Security, Artificial Intelligence, Systems, Systems Dev. and Testing

Professional registration/licensure _____   Years of employment at present institution   10

Years of employment in higher education 16   Years of related experience outside higher education 20

Non-teaching experience   20

(a) Courses taught in the last two years: (left institution in 2013)

Year/Semester	Course Number & Title	Enrollment
2013 / Spring	COMP 3390 – Network Security	9
2013 / Spring	COMP 3395 – Ethical Issues in Computing	20
2013 / Spring	COMP 4415 – Vulnerability Assessment	7
2013 / Spring	COMP 4440 – Software Engineering	8
2013 / Spring	COMP 4495 – Comp Security Internship	6
2012 / Fall	COMP 2220 – Fundamentals of Computer Security	14
2012 / Fall	COMP 3340 – Operating Systems	9
2012 / Fall	COMP 3380 – Cryptography	8
2012 / Fall	COMP 4400 – Automata and Language Design	7

(b) Professional development activities during the last five years: Not applicable

(c) Awards/honors or special recognition in last five years: Not applicable

(d) Activities that have contributed to effective teaching: Not applicable

(e) Professional books/papers published during the last five years: Not applicable

(f) Externally funded research (grants and contracts) during last five years.   Not applicable

Dr. Don Adjeroh
Professor and Associate Chair
Graduate Coordinator of Computer Science
West Virginia University, Morgantown, WV 26506
(304) 293-9681
Donald.Adjeroh@mail.wvu.edu

Thanks for organizing the Board meeting and for the presentations outlining the progress over the past 5 or 6 years, and the status of the computer science program at Fairmont State.

From your presentations, one can see a steady progress over the period, with a general upward trend in enrollment and graduation rate. I also liked that you have long identified Cybersecurity as a key area of emphasis, especially given the surrounding tech companies. Cybersecurity is problem that is going to stay with us for a long time to come, and the need for specialists in this area will be growing over the next few years. Even though some other universities in the state are starting to plan offerings in this area, we anticipate that the number of graduates from these programs will still be far less than the industry need.

You also discussed your efforts in data science, which you anticipate will be a collaborative effort with Psychology department. This is clearly the direction that is being taken by most computer science departments, where they partner with certain domain-specific area to offer certificate or even degrees in certain growing areas.

You have already started keeping information on employer needs, and expanding your effort to keep more tracking for those that complete the program could help in shaping the direction of the program in the feature. Another Board member also suggested the idea of keep track of those that left the program before they could complete a degree, to see if there is something that may require attention – whether immediate or longer term.

The course offerings are generally adequate, given the faculty size, and available resources. Your graduates should not have difficulty in getting into graduate schools in computer science. They may take some few undergraduate prerequisite courses, when they enroll in a graduate program, but that is not too unusual.

Overall, I would say that your program has done quite well, given the faculty size, and resources available.

Mr. Kenneth Rehm
Associate Director, NASA IV&V Program
100 University Drive, Fairmont, WV 26554
(304) 367-8317
Kenneth.D.Rehm@nasa.gov

Overall, I feel the program is in line with the expectations of a Computer Science and Cybersecurity Degree. The curriculum is well thought out and the 4-year plan for students has been carefully implemented for progressive learning. I appreciate the mathematics focus and would encourage the department to be aware of the NASA AST education requirements I have included below. I am encouraged to see how many similarities there still exists between the program I went through to receive my degrees and the program you are offering. The level of maturity is high for your program as evidenced of the core courses presented. The faculty present demonstrated an excellent understanding of the basics that need to be taught as opposed to the latest shiny computer science "fad" that some colleges get trapped into. I would encourage you to continue the basics.

Congratulations on a successful program!

Mr. Christopher Ryan
Senior Applications Developer
Fusion Technology
(304) 625-2175
chris.ryan@fusiontechnology-llc.com

So I feel like the program is very good at making hire-able resources. I've been doing hiring for the companies I have worked for or helping people get jobs ever since I graduated and the FSU graduates always seem to have a practical leg up on other graduates. The WVU students may have had more classes devoted to theory, but they also seem more "lost" when it comes to adapting to regular work life than FSU graduates do. Ted does a great job giving people a solid foundation with OO and Network Programming (which is more like OO part 2), and the later courses like database and software engineering put some polish on people.

But I do think there are some areas where the program can improve. This is kind of a list of the problem areas I have found that I am trying to address with our internship program with Fusion.

I think we need to be careful about the involvement of other schools with the software engineering projects. I was fortunate enough to work in a small team on ours with no interference from outside the program and I walked away with a very strong understanding of requirements, testing, and the documentation necessary to do both because I had to maintain those as well as do the development. When I was acting as the customer for a team of students years later, I got the feeling that the requirements and testing documentation was kind of offloaded on the non-CS students and I think that does them a disservice. I understand what kind of opportunity these kinds of projects bring to the other majors but we need to be careful about not sacrificing the CS students' chance to build marketable skills in the process. What would be amazing is if those other programs had a bit of an overhaul that would better prepare their students for working with the CS students, if the graphics technology students understood spring MVC and bootstrap and were mainly responsible for the front end then they would have a better understanding of development and both be more ready to absorb development experience from the CS students and vice versa. This would make both majors much more valuable to employers. Same kind of goes for the business and information systems majors. A lot of them I spoke to thought they would be going into program management out of college, and their almost non-existent exposure to the software development lifecycle is more of a bottleneck for a capstone class. They may get something marginal out of it, but it doesn't help the CS students, and it doesn't really accurately model a real work environment where the Project Managers have 20 years experience and 10-15 of it was as a developer, DBA, tester, or requirements analyst. If they had classes devoted to software testing and requirements/quality control of software systems that would help give them a better bird's eye view of the SDL as well as give them a path to become a tester or requirements analyst. I would encourage CS students to take those courses as well.

It would be nice to see more emphasis put on developing "business" skills from the CS students. We have to spend a lot of time on working on their communication skills. I can't tell you how many cringe inducing emails I get, and it's a good thing they come to me now instead of going to their boss later. If the business school doesn't have an "office etiquette 101" kind of course already, we should really think about developing one and making it a requirement for the CS major. A lot of students don't even know how to write a good resume, they are scared to death of "reply-all" when it comes to emails even when the discussion is about project or team based items, they require a lot of interview coaching, etc. It would bring a lot of value to the program and do them a great personal service if FSU had a class that would help them build those skills.

So to sum up:

- Need more web development for CS students.
- Need a business etiquette class for CS students.
- I think breaking the Software Engineering course into 3 courses, one for sophomores, one for juniors, and one for seniors would be a great idea. There are so many topics to cover and it would provide a way for B&IS, IS, and GT majors a chance to dip into the process and quality assurance portions of the SDL in the sophomore level course (hypothetically). The question that I would ask is... is there enough information to convey about software development WITHOUT coding? And I would say that is a very big YES. The junior level course could go deeper into those ideas by introducing unit tests (JUnit), project management software like Trello or Jira, and then applying all of that in a semester ending small project, THEN when they hit the senior level course they can just begin and probably do some major damage on some very fun projects. This would also help in "passing the baton" to the next team if one class does not finish a project. Having good documentation in Conlfuence/Jira could see legacy projects become more viable. How cool would that be to have someone start working on the documentation portion of an existing project in their second year? Walk out of FSU with 3 years of experience with the kind of tools we use in the working world? That would be so huge!

I could go on and on about stuff I would like to see, but I think these ideas would do a great service to CS and non-CS students and maybe even help with retention or ferrying the ones who are interested in CS but do not have strong math skills into the other majors and get them on a track to become a tester or requirements analyst, both of which are good careers and we need them in the area locally. We can talk more when I make it down to FSU.

Mr. Jeff Tucker
Enterprise Architect / Sr. Principal Systems Engineer, Leidos
1000 Technology Drive, Suite 3120, Fairmont WV 26554
(304) 816-0769
jeffrey.tucker@leidos.com

I enjoyed getting to see the program review of the CS program at the Advisory Board Meeting. It was exciting to see your enrollment numbers increasing. Coming from the IT Industry perspective that is very important to us, as you are helping generate our next generation IT workforce. I was also excited to see the possible addition of some CS minors as I think that is another step in the right direction to getting students interested in Computer Science related initiatives.

It was encouraging to hear that you are starting to look at metrics and trends in order to better understand the dynamics of student enrollments compared to retention and graduation rates. From an industry perspective, we not only want to see the increasing enrollment numbers but we also need the students to graduate with their CS degree.

I thought the dialogue was good at the meeting between the faculty and the board members and I would encourage you and the faculty to leverage your board members to help you with things like support for CS campus events, sponsorships of CS related activities, and continued support of internships.

In regard to rapidly changing technologies, I would encourage the CS program to look for opportunities to embed topics like Cloud Computing, Automated Testing, Agile Software Development and DevOps into the course content. These are topics we encounter on a daily basis while supporting Federal IT projects here at Leidos.

I would recommend the FSU CS programs look at other external university programs to identify good ideas that could be leveraged into your programs without requiring large budgets. For example, the potential use of Raspberry Pi computing devices or cloud computing as a way to get kids hands on experiences, without requiring the university to spend funding setting up additional computer labs. I would also recommend the faculty look for opportunities like the RedHat Developers Network, which is a Free resource from RedHat, and an opportunity for the students to get a free copy of the Enterprise level RedHat operating system. This is just one example where students and faculty can leverage industry resources to help strengthen the CS program without requiring additional funding or additional student expense.

I would like to see the department look for ways that the upperclassman can mentor or interact with the underclassman as a way to help improve student retention rates in the programs.

I also think that FSU has some resources already in place that probably could benefit from some marketing at the high school level to let students know there are programs that they can participate in while still in high school that could help increase their math skills in order to help set them up for success once they reach college.

Overall, I was excited for the updates that were presented and the possible additions to the CS program. Please feel free to reach out at any point if you need perspective from industry.

Keep up the good work!