West Virginia State University Board of Governors
Academic Policies Committee
Erickson Alumni Center, Weisberg Lounge
March 16, 2017
10:30 a.m. – 11:30 a.m.
Agenda

1.	Call to Order and Roll Call – Committee Chair Gail Pitchford presiding		
2.	Verification of Appropriate Notice of Public Meeting	Action	2
3.	Review and Approval of Agenda	Action	1
4.	Review and Approval of Minutes of Previous Meeting	Action	3
5.	University Recommendations and Reports		
	5.1 Return on investment of 4 programs with low graduation numbers	Information	6
	5.2 Intent to plans		
	5.2.1 BS in Engineering	Action	7
	5.2.2 MS in Computer Science	Action	16
	5.2.3 MS in Sports Studies	Action	20
	5.3 Program Reviews		
	5.3.1 Mathematics, B.S.	Action	27
	5.3.2 Computer Science, B.S.	Action	98
6.	Next Meeting Date – *April 27, 2017*		
7.	Adjournment		

West Virginia State University
Academic Policies Committee

Date/Time: 3/16/2017 -- 10:30 AM

Location:

West Virginia State University
Erickson Alumni Center
Weisberg Lounge
Institute, WV

Purpose: To conduct the regular business of the Committee in preparation for the March 16, 2017 Board of Governors meeting.

Notes:

This is a compliant meeting.

Meeting was approved: 3/6/2017 8:23:18 AM

West Virginia State University Board of Governors
Academic Policies Committee
Erickson Alumni Center, Weisberg Lounge
Minutes
January 26, 2017

1. Call to Order and Roll Call

Mr. Konstanty called the meeting of the West Virginia State University Board of Governors Academic Policies Committee to order at 10:35 a.m.

Present: Dr. Guetzloff, Mr. Kelley, Mr. Konstanty, Ms. Shafer, and Dr. Thralls. Several members of the administration, faculty, and staff were also present.

2. Verification of Appropriate Notice of Public Meeting

Mr. Konstanty announced the Verification of Appropriate Notice of Public Meeting.

3. Review and Approval of Agenda

Mr. Konstanty asked for approval of the agenda. Dr. Thralls made the motion, and it was seconded by Dr. Guetzloff. The motion passed.

4. Review and Approval of Minutes of Previous Meeting

Mr. Konstanty asked for approval of the minutes from the November 10, 2016 meeting. Mr. Kelley made the motion, and it was seconded by Ms. Shafer. The motion passed.

5. University Recommendations and Reports

1. Dr. Sherri Shafer and Ms. Kim Cobb of the Communications Department were present for the follow-up reviews of the Communications, B.A. and Media Studies, M.S programs.

Dr. Jayasuriya explained that the new assessment protocols have changed. There is a new Institutional Research Director, Mrs. Vicky Morris-Dueer, whom has helped the assessment procedures improve. Dr. Jayasuriya mentioned that the Communications department has a new chair and better results in assessment are being seen under the new leadership.

Dr. Shafer met with Mrs. Morris-Dueer and they have been working on a five-year plan for assessment. Mrs. Morris-Dueer confirmed that she had been working with the Communications department for their assessment. Dr. Shafer assured the committee that they will have hard data for assessment when it is time for their next Program Review. Dr. Shafer mentioned that they were working on recruitment, trying to obtain funds for various things, and looking into grant writing. The department is working on introducing to the EPC next semester a 4 + 1 Master's Program for Media Studies. Dr. Jayasuriya called upon Mrs. Morris-Dueer to speak about the assessment process. She stated that she has seen improvement in reports since taking over the position. Dr.

Jayasuriya stated for the record that he and Mrs. Morris-Dueer have worked closely together.

Ms. Cobb stated that there is a 4 + 1 Master's Degree program in the works for Media Studies. They are in the process of making courses available for this program. The assessment will reflect this program as well. Dr. Guetzloff inquired if the individual student would earn two degrees with this program. Dr. Jayasuriya explained that the student would receive both a bachelor's degree and a Master's degree in five years. He also explained that some senior level classes in the undergraduate program would count towards the Master's program and that is why it is a 4 + 1 program.

Dean Wallace stated he felt some of the projects in the Communications department would be hard to assess, for example the Stephen King project from fall 2016. He said the department is very strong in their General Education, for example their Speech Communication classes. Dr. Shafer mentioned that the student organizations were thriving, and Ms. Cobb agreed and added that the Communications department had the most student organizations on campus. She also stated that despite budget cuts they still have a presence with West Virginia Broadcasting.

Mr. Konstanty made a general comment on the Communications, B.S. follow-up review. He explained that Dr. Woodard, when he was the Dean of the College of Arts and Humanities, had brought to the board a sports broadcasting program that was never implemented. Mr. Konstanty was inquiring as to why this has not happened, especially since it affects retention. Dr. Shafer and Ms. Cobb both explained that some equipment they received through a donation did not match their hardware. Also, the new equipment they have will do minimal as it is large and bulky and has to be carried around. Dr. Jayasuriya suggested that a conversation take place after the meeting with the appropriate staff and faculty about this project.

Dr. Thralls commented that he is impressed with the spirit of willingness from the Communications department and encouraged by all the prospects that are coming about from the department.

Dean Wallace commented that the Communications and Media Studies programs are helping move the University along and feels they should be fully supported. Dr. Jayasuriya said the University has not been able to obtain the equipment needed for the department but assured the committee when funding is available they will build upon it. Dean Wallace mentioned that the Communications department was trying to diversify its program and look into other areas such as healthcare communications and marketing. Dr. Jayasuriya explained the different programs that need funding, as well, and that the University has had to make hard decisions faced with budget cuts. Dr. Guetzloff commented that Title III funds were taken out of Academic Affairs three years ago and that is also one reason funding has not been available to all programs.

Dr. Guetzloff inquired if there were lab fees for the Communications department that could be used to help with funding. Dr. Shafer explained that there were fees but they were not adequate to purchase the necessary equipment and software. Dr. Thralls asked if there were any avenues to obtain equipment grants for the department. Ms. Cobb explained that many grants they have found are for classroom equipment and not broadcasting equipment. Dr. Shaffer explained that it is difficult to find grant money in the Arts and Humanities of academia.

Mr. Konstanty inquired if there was an option to partner with any local television networks or ad agencies to help with equipment. Dean Wallace commented that was an excellent idea. Mr. Konstanty suggested using some of the committee contacts to use as resources to help in this situation.

6. Next Meeting Date

March 16, 2017

7. Adjournment

With there being no further business, a motion to adjourn the meeting was made by Dr. Thralls and seconded by Mr. Konstanty. The motion passed. The meeting adjourned at 11:22 a.m.

Respectfully submitted,

Betsy L. Allen

Agenda Item 5.1. **Action**
March 16, 2017

Return on Investment of 4 Programs with Low Graduation Rates

Materials are still being developed and will be presented at the meeting.

INTENT TO PLAN (§133-11-5.2)

Institution:	West Virginia State University
Date:	March 2017
Category of Action:	Implementation Plan (Section 5 of Series 11)
Title of Degree:	Bachelor of Science in Engineering
Location:	WVSU, Institute, WV 25112

Projected Date for Full Proposal: June 2017

Projected Program Implementation Date: Spring 2018

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§Section 5.2.a: Program Objectives and Institutional Mission

The main objective is to prepare students for lifetime careers as productive and innovative engineers in a rapidly changing world. Graduates of the Bachelor of Science in Engineering with a major in Chemical Engineering program at West Virginia State University (WVSU) will demonstrate the ability to effectively communicate and work in a team environment and also exhibit the commitment for pursuit of professional development.

The Mission of WVSU reads "West Virginia State University will meet the higher education and economic development needs of the state and region through innovative teaching and applied research". As engineering is one of the main engines of the economy, an engineering program at WVSU will produce graduates well prepared for the needs of the state and the region.

Special features of West Virginia State University that make it suitable for such a program are: First, WVSU is a historically black college, and, hence, has always had a mission to educate minorities and other underrepresented populations. Second, West Virginia State University (WVSU) was established as a land-grant institution on March 17, 1891, under the Second Morrill Act of 1890. As a land-grant University, WVSU is charged with providing educational opportunities for students, citizen and surrounding communities via its tripartite mission of research, teaching and outreach. Third, the University, "a living laboratory of human relations," is a community of students, staff, and faculty committed to academic growth, service, and preservation of the racial and cultural diversity of the institution. Fourth, WVSU offers flexible course schedules in traditional classrooms and online to facilitate financially challenged students to continue their full-time/part-time study concurrently with their job.

§Section 5.2.b: Program Description

This program will emphasize the fundamental applied roots of engineering with a heavy emphasis on practical/experimental/hands-on learning. Our students will learn the basics of problem-solving in required mathematics, science, and engineering courses and learn the fundamentals of chemical engineering in upper level courses and technical electives. The program will contain university-required general education courses. Students enrolled in our program will be proficient in various state-of-the-art computer software applications related to chemical engineering, and work in teams to complete laboratory, field, and design assignments. The proposed CIP code is 14.0101. The curriculum for the program is developed and provided in Appendix A.

§Section 5.2.c: Standards and Assessment

West Virginia State University, as shown by its record of accreditation, has long had high quality standards for its programs. Engineering program will be no different. The student learning outcomes and program objectives will be evaluated and assessed periodically. The program will also align with the Higher Learning Commission (HLC) of the North Central Association of Colleges and Schools (NCA). As the program develops we would seek ABET (Accreditation

Board for Engineering and Technology) accreditation, which is the principally recognized accrediting body for undergraduate engineering degrees in the United States.

§Section 5.2.d: Other Institutions in West Virginia offering Similar Program

Table 1 summarizes the baccalaureate program available in the state of West Virginia. Marshall University offers a BS in Engineering degree (CIP code 14.0101) with Civil Concentration. West Virginia University (and its branch campus WVU Institute of Technology[1]) offers a BS in Chemical Engineering program with the CIP code 14.0701. As a research university, WVU is able to be extremely selective in its enrollment, drawing not only from the best and brightest of the state's applicants but also from national and international applicants. According to HEPC, only 49% of the students of WVU are in-state. As Table 2 and 3 indicates, Kanawha Valley's students' eagerness to stay close to the Charleston area, a BS in Engineering program (CIP code 14.0101) with a major in Chemical Engineering at West Virginia State University will serve the needs of not only the students but also the state as the curriculum will be designed with an emphasis on practical/experimental/hands-on learning.

Table 1: Baccalaureate Programs in West Virginia

Institution	Institution Type	CIP Code(s)	Program Type
Marshall University	Public	14.0101	BS in Engineering (Civil Concentration)
WVU Institute of Technology	Public	14.0701	BS in Chemical Engineering
West Virginia University	Public	14.0701	BS in Chemical Engineering

§Section 5.2.e: Needs Met by and Demand for the Program

§§Subsection A: Needs Met by the Program

The needs that will be met by this program may be broken down into *societal*, *occupational*, *educational* and *public service* needs.

The societal needs met would include:

- providing an educated citizenry;
- preparing students to enter the workforce;
- providing continuing education or retraining to current workers;
- increase economic development in the service area of WVSU by attracting companies looking for a well-educated, technologically-skilled workforce.

[1] On September 1, 2015, the WVU BOG has voted to move WVU IT from Montgomery, WV to Beckley, WV. This move further emphasizes the importance of establishing engineering program(s) in Kanawha Valley and neighboring counties.

Occupational Needs:

The Kanawha Valley is the economic hub of the state of West Virginia. Economic development and sustainability of any state directly connected to Engineering. Chemical engineers apply the principles of chemistry, biology, physics, and math to solve problems that involve the production or use of chemicals, fuel, drugs, food, and many other products. They design processes and equipment for large-scale manufacturing, plan and test production methods and byproducts treatment, and direct facility operations. An adequate supply of engineers is critical to the goal of fostering a statewide environment that nurtures high-tech industries. A review of US Census records will reveal that the more engineers working in a state, the wealthier the state. Additionally, there is a strong and positive correlation between the number of engineers working in a state and the number of engineering schools located in the state. According to Bureau of Labor Statistics, US Department of Labor[1], employment of engineers is projected to grow 4% from 2014 to 2024 (Figure 1). The addition of BS in Engineering with a major in Chemical Engineering program at WVSU will attract students of the state to serve the needs of its own.

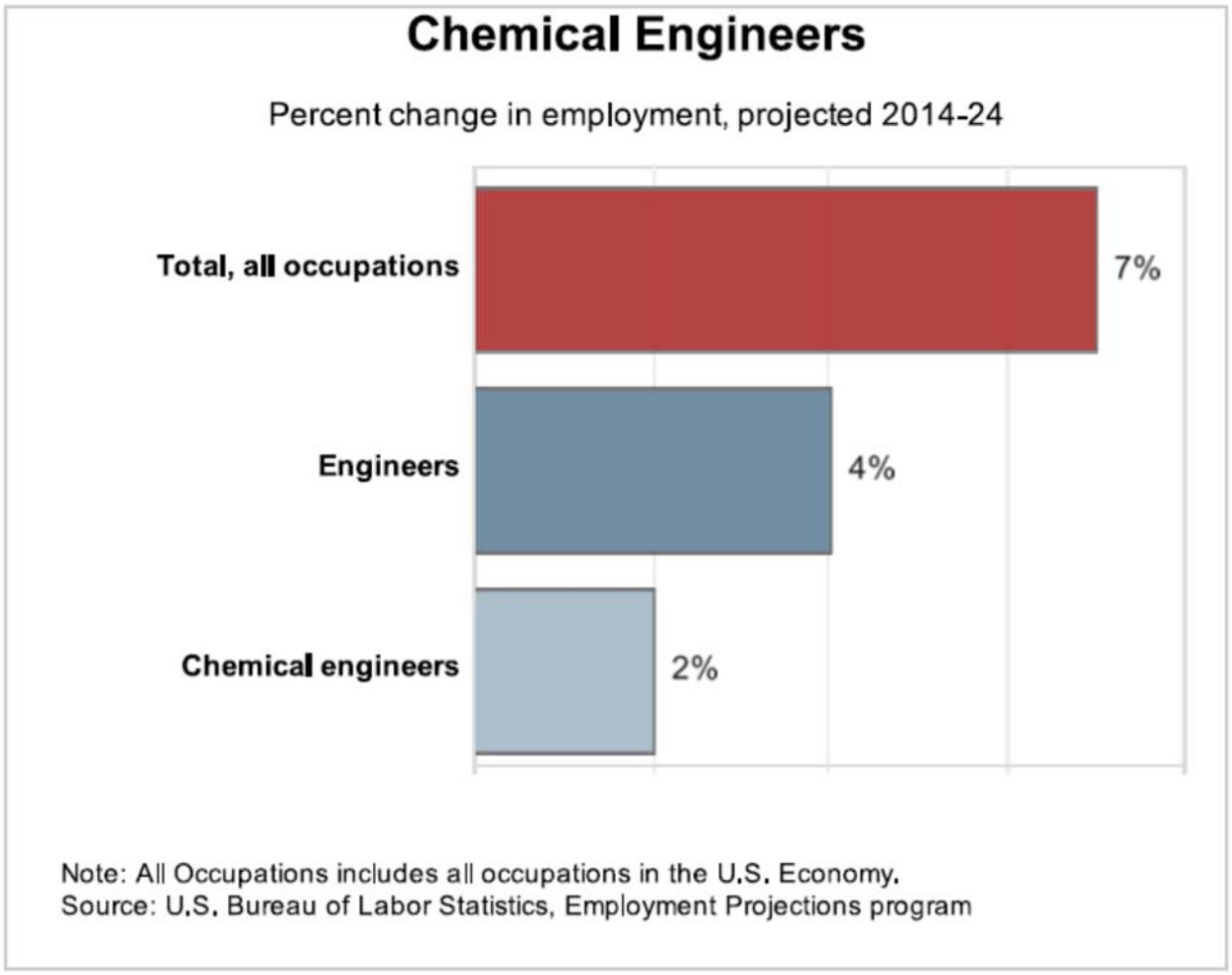

Figure 1: Projected growth of job according to US Department of Labor (2017)

[1]Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2016-17 Edition*, Chemical Engineers,
on the Internet at http://www.bls.gov/ooh/architecture-and-engineering/chemical-engineers.htm (visited *Feb 12, 2017*)

Finally, the two main public service needs met by this program would be

- Educating the citizens of West Virginia
- Serving as a source of technical expertise

§§Subsection B: Student Demand for the Program

We have good evidence of student demand for the proposed engineering (Chemical concentration) program. The student enrollment of the current Engineering 2+2 (Civil, Mechanical, Industrial) increased from just a few students to 22 students within just one year. A brief survey of these engineering students was conducted. Table 2 summarized the survey, but the significant result is that 79% of the engineering students want to complete their B.S in Engineering at WVSU. We also conducted a survey of freshmen in other disciplines (e.g. Biology/Pre-Medical, Computer Science, Chemistry, undecided, etc.) as shown in Table 3. Table 3 indicates that out of 67 non-engineering students, 15 students want to complete a B.S. in Engineering. Another encouraging finding from Table 3: another 15 students indicated that they would have enrolled in Engineering if a 4-year B.S. in Engineering program existed at WVSU one year ago.

Table 2: Survey of Students currently in the 2+2 engineering program at WVSU

Number Surveyed	**Willing to Complete 4-year BSE at WVSU**	
	Yes	No
14	**11**	3

Table 3: Survey of students currently NOT in engineering program at WVSU

Major	**Number Surveyed**	**Willing to Complete 4-year BSE at WVSU**		**If 4-year Engineering existed one year ago, would you have enrolled in the Engineering Program?**	
		Yes	**No**	**Yes**	**No**
Biology	34	6	28	6	28
Undecided	3	1	2	1	2
Psychology/Clinical Psychology	2	1	1	1	1
Computer Science	12	2	10	2	10
Chemistry/Applied Chemistry	8	2	6	2	6
Pre-Dental	2	0	2	1	1
Pre-Pharm	1	0	1	0	1

Political Science/Pre-Law	1	1	0	1	0
Elementary Education	1	0	1	0	0
Biotechnology	1	0	1	0	1
Math/Computer Science	1	1	0	0	1
Business	1	1	0	1	0
Total:	**67**	**15**		**15**	

§Section 5.2.f: Resources Needed

The proposed Bachelor of Science in Engineering will initially require minimal additional resources.

At the present time, the WVSU 2+2 Engineering program maintains a faculty of higly-qualified teacher whose credentials are without question. Two-full-time faculty members are currently empoyed in the program. Most of the classes in the first two years of Bachelar of Science in Engineering with a major in Chemical Engineering program will be taught by the current faculty members. Faculty resources to teach Mathmetics, Science, and General education classes are already available at WVSU. It is estimated that two new faculty member will need to be hired; however, he/she need not be hired until after the Bachelar of Science in Engineering with a major in Chemical Engineering program is well-established.

WVSU has the existing library resources to deliver the program. WVSU's library currently hold twenty two (22) journal subscription in the field of Mathematics, Science and Computer Science area. The current allotment of funds for the purchase of educational materials extended to the Department by the WVSU Library is adequate to meet the needs of the Bachelor of Science in Engineering with a major in Chemical Engineering during its development. As the program develops, it is likely that increased funding in this area will be necessary.

The existing classrooms, three computer labs dedicated to the engineering program are sufficient to deliver the program. Additionally, we will explore the possibility of utilizing the chemical lab at Bridge Valley Community and Technical Center. Furthermore, WVSU has included engineering as a part of it current Title III comprehensive development plan (2012-2017) and is proposing that engineering be included in the plan for the next five-year cycle (2018-2022). Funds are and will be available for faculty salaries and fringe, equipment and supplies, renovations, and other necessary items for the implementation of academic program in engineering.

§Section 5.2.g: Instructional Delivery Method

The various course components will be delivered by current methods being used to support student retention and progression, through traditional (face-to-face) classroom, online and laboratory instruction by faculty on West Virginia State University's main campus.

APPENDIX A

BS in Engineering (Chemical concentration) Curriculum

The following list contain the Math and Science courses that are required as well as the Engineering course requirements. Transfer students may import credits to WVSU based upon the WV Higher Education Policy Commission's Transfer Agreement, as well as the discretion of the engineering faculty.

Course requirements for each categories are shown below (new courses are identified with asterisks):

MATHEMATICS AND BASIC SCIENCES		
MATH 206	Calculus I	4
CHEM 105/107	General Chemistry I	5
MATH 207	Calculus II	4
PHYS 231/203	Physics for Science & Engineers I	5
MATH 208	Calculus III	4
MATH 402	Differential Equations for Scientists & Engineers	4
PHYS 232/204	Physics for Science & Engineers II	5
STAT 215	Probability and Statistics (for Engineers)	3
CHEM 106/108	General Chemistry II	5
CHEM 205/207	Organic Chemistry I / Lab	5
CHEM 206/208	Organic Chemistry I I/ Lab	5
TOTAL MATHEMATICS AND BASIC SCIENCES		49

ENGINEERING SCIENCES & ENGINEERING DESIGN		
ENGR 101	Intro to Problem Solving I	2
ENGR 102	Intro to Problem Solving II	3
*ENGR 245	Principles of Chemical Engineering	3
*ENGR 246	Chemical Engineering Progress Assessment I	3
*ENGR 247	Chemical Engineering Progress Assessment II	3
*ENGR 310	Computer Aided Chemical Engineering	3
*ENGR 321	Phase and Reaction Equilibrium	3
*ENGR xxx	Transport I	3
*ENGR xxx	Transport II	3
*ENGR xxx	Chemical Engineering Analysis	3
*ENGR xxx	Chemical Engineering Lab I	2
*ENGR xxx	Chemical Engineering Lab II	2
*ENGR xxx	Chemical reaction Engineering	3
*ENGR xxx	Digital Process Control	3
TOTAL ENGINEERING SCIENCES & ENGINEERING DESIGN		39

Intent to Plan

Program: Master of Science in Computer Science

Institution: West Virginia State University

Projected Date for Full Proposal: June 30, 2017

Projected Program Implementation Date: August 2018 (academic year 2018-2019)

§Section 1: Program Objectives and Institutional Mission

The main objective is to provide students with a graduate-level education in computer science, which, as for any graduate program, will provide students with advanced skills to be more successful in today's world and the skills needed for lifelong learning so as to continue succeeding in tomorrow's world.

At West Virginia State University, "Our mission is to meet higher education and economic development needs of the state and region through innovative teaching and applied research." (*WVSU Mission Statement*). As computer science is one of the engines of the new economy, an M.S. program in computer science at WVSU will produce graduates well prepared to find employment and will attract companies looking for workers with advanced technological skills to the state.

Special features of West Virginia State University that make it desirable for such a program are: First, WVSU is a historically black college, and, hence, has always had a mission to educate minorities and other underrepresented populations. Second, WVSU is racially diverse; as Dr. Hazo W. Carter, Jr., one of the previous Presidents of WVSU, said, "Students studying at WVSU do so at an institution that more closely reflects the diversity of American than any other institution of higher education, public or private, in the state of West Virginia". Third, WVSU is the largest undergraduate college or university in the Charleston metropolitan area and will be the first one to offer a M.S. degree program in computer science in this area. Thus it is conveniently located for computer professionals in the area who wish to continue their education at the post-graduate level.

§Section 2: Program Description

This M.S. program will teach students about advanced object-oriented programming techniques, algorithms, computer architecture, database management systems, operating systems, and distributed computing, etc, in order to provide them with advanced skills in computer science which will enable them to adapt to and function in any current computing environment. The program will be designed so that well-prepared students with an undergraduate degree and/or background in computer science can continue their studies to obtain a master's degree from this program.

§Section 3: Standards and Assessment

West Virginia State University, as shown by its record of accreditation, has long had high quality standards for its programs. Computer Science will be no different. The program will actually be offered through the Department of Mathematics and Computer Science, which is known for its rigorous program of instruction. Assessment of the quality of the program will be done by examining student skills in a degree thesis or project and by using post-graduation surveys to learn about the experience of graduates after finishing the program.

§Section 4: Other Computer Science Master Programs in West Virginia

Most other colleges and universities in West Virginia have a Bachelor of Science in Computer Science degree program. However, only two universities currently offer Master of Science degree in Computer Science, as shown in Table 1.

It should be pointed out that, as the table below shows, the specific kind of Master of Science in Computer Science degree program WVSU plans to offer (as categorized by the CIP code), will be no different from that offered at West Virginia University.

Table 1: Master Computer Science Programs in West Virginia

Institution	Institution Type	CIP Code(s)	Description
Marshall University	Public	11.0401	Information Systems
		11.1099	Technology Management
		11.0701	Computer Science
West Virginia University	Public	11.0903	Software Engineering
		11.0701	Computer Science

§Section 5: Needs Met by and Demand for the Program

§§Subsection A: Needs Met by the Program

The needs that will be met by this program may be broken down into *societal*, *occupational*, *educational* and *public service* needs. The societal needs met would include:

- providing well-educated citizenry;
- preparing students with advanced techniques to enter the workforce;
- providing graduate education or retraining to current workers;
- preparing people to deal with technological change caused by the continuing massive infusion of computing into society;
- increase economic development in the service area of WVSU by attracting companies looking for a well-educated, technologically-skilled workforce.

In regards to occupational needs, the *2016-2017 Occupational Outlook Handbook* from the U.S. Bureau of Labor Statistics states (Computer and Information Technology category):

> *Employment of computer and information technology occupations is projected to grow 12 percent from 2014 to 2024, faster than the average for all occupations.*

and (Computer and Information Technology category):

> *These occupations are expected to add about 488,500 new jobs, from about 3.9 million jobs to about 4.4 million jobs from 2014 to 2024, in part due to a greater emphasis on cloud computing, the collection and storage of big data, more everyday items becoming connected to the Internet in what is commonly referred to as the "Internet of things," and the continued demand for mobile computing.*

This suggests the need for qualified computer professionals, which this program would produce.

The main research need expected to be met by this program would be to provide technical infrastructure support to the institutional land grant activities.

Finally, the two main public service needs met by this program would be

- Educating the citizens of West Virginia
- Serving as a source of technical expertise

§§Subsection B: Student Demand for the Program

Computer Science (B.S.) program is the fastest growing program in the College of Natural Sciences and Mathematics. Currently, it is the second largest program in the College (Biology being the first). Recently, many international students has enrolled in the Computer Science program as well (for example, in spring 2017, approximately 15 international students joined the B.S. in CS program).

Anecdotal evidence from students currently working towards an undergraduate degree at WVSU suggests that many would be interested in continuing their studies at the graduate level to obtain a M.S. in Computer Science. A brief, informal survey of students and faculty/staffs of WVSU was conducted. The actual data can be found in Table 2 below, but the significant results are that 100% of the computer science majors (B.S.) surveyed said they wished to continue on and earn a M.S. degree in Computer Science while 71% of the Applied Math Majors (B.S.) surveyed indicated they would like to pursue a M.S. degree in computer science. In addition, there is also demand for a M.S. degree in Computer Science from students in other majors and from faculty/staffs as well. As seen in in Table 2, 13 students from other majors and 5 faculty/staff members indicated that they wanted a M.S. degree in Computer Science. It is also noticed in Table 2 that among all people surveyed who want a M.S. degree in Computer Science, 69% prefer a traditional degree program while 31% prefer an online degree program.

Table 2: Survey of Students and Faculty/Staffs of WVSU

Major	Number Surveyed	Number Who Want a M.S. in Computer Science	Number Who Don't Want a M.S. in Computer Science	Number Who Prefer a Traditional Program	Number Who Prefer an online Program
Business – Management Information Systems (B.S.)	5	4	0	1	3
Computer Science (B.S.)	31	31	0	26	5
Mathematics – (B.S.)	7	5	1	5	0
Other major (B.S. or M.S.)	56	13	5	6	7
None of the above (Faculty/Staff included)	13	5	8	2	3
Total:	**112**	**58**	**14**	**40**	**18**

§Section 6: Resources Needed

Since there is a dedicated computer lab assigned for Computer Science students, the primary additional resource needed would be a faculty member with a Ph.D. in Computer Science. However, this goal need not be achieved until after the program is well-established. We will allocate approximately $10,000 from the literacy fees to acquire library resources for the program.

Intent to Plan
March 2017

Program: Master of Science in Sports Studies

Institution: West Virginia State University

Projected Date for Full Proposal: September 2017

Projected Program Implementation Date: **August 2018**

Section I: Program Objectives and Institutional Mission

The main objective is to provide students with a Masters-level education in Sports Studies with an emphasis in one or a combination of tracks (Sports Science/Wellness or Sport Science/Athletic Coaching). West Virginia State University will provide students with the cognitive and psychomotor skills necessary to achieve self-actualization while extending their living laboratory of human relations well beyond the lawns of the university campus.

Additionally, the Master of Science in Sports Studies Program and its various track options will afford students opportunity to actively engage in applied research and to study innovative coaching, training, managing, teaching and safety education. This will lead the students towards a life of productive and meaningful work, lifelong learning, and economical contribution to their surrounding communities and state. Under the two-track program, West Virginia State University will produce graduates well prepared to continue or gain state and national certification through athletic coaching credentialing agencies, sports science credentialing agencies and sport safety credentialing agencies. Graduates will have the knowledge and skills to be poised and ready for advancement into management and leadership roles in their current respective fields. In addition to moving forward in their current career, the graduates from a Master of Science in Sport Studies will be attractive to public and private school systems, university systems, wellness facilities, and general fitness companies as employees. These highly educated and knowledgeable graduates will continue to serve our surrounding communities.

Lastly, yet perhaps most importantly, West Virginia State University is a historically black university, and, hence, has always had a mission to educate minorities and other underrepresented population. Learning opportunities are embedded in environments that expose students to diversity and cultural differences. The diverse environment is beneficial to students seeking a graduate degree in sport studies as they strive for employment in the diverse and expanding sport industries.

Section II: Program Description

The Master of Science (M.S.) in Sports Studies Program will provide students with in-depth cognitive and affective knowledge as well as psychomotor skill associated with a career and graduate study in any of the offered sport study tracks. The program will stress didactic, psychomotor and field study opportunities blended in a combination of online and in-seat delivery to afford the students learning activities integrating lecture, discussion, case study, research, ethical practice and decision making, problem solving, critical thinking, analysis and psychomotor performance.

The program will be guided by national standards from NASPE (National Association for Sport and Physical Education), NSCA (National Strength and Conditioning Association), ACSM (American College of Sports Medicine) and the ARC (American Red Cross). This program's matriculation, for either track, will be developed so that interested and qualified students could apply and begin their program of study in the Fall, Spring or Summer academic sessions. Furthermore, the program will be designed so that students will be prepared to take and pass the National Strength and Conditioning Association Certified Strength and Conditioning Specialist Certification (CSCS), the NSCA-CPT (Certified Personal Trainer) Certification, or the NSCA-TSAC (Tactical Strength and Conditioning Specialist) Certification Exams.

Section III: Standards and Assessment

West Virginia State University has a long history of achieving accreditation from regional and national associations for its current programs. By creating the M.S. in Sports Studies using standards from the North Central Association, NASPE, NSCA, ACSM and the American Red Cross the M.S. in Sports Studies and creating assessment and evaluation procedures that are designed to show that the program meets those standards, the program expects to continue that tradition.

The program will be offered through the Department of Health and Human Performance which is known for its continual development of assessment methods, variety of teaching strategies and overwhelming success with student pass rates on various certification exams. Assessment of the program will be conducted through examination of student knowledge and skill progression in courses and the internship/portfolio experience. In addition, the M.S. in Sport Studies would undergo a rigorous Institutional Program Review every five years of its existence. Furthermore, performance on national exams such as the NFHS (National Federation of High Schools) coaching examination, NCAA coaching certification, NSCA-CSCS examination, and/or the NSCA-CPT examination, ACSM instructor examination, and various ARC certification examination will reveal areas of strength and areas of concern with the Sport Studies Program and its various track options. Lastly, post graduate surveys will be used to assess both the student and their job placement as well as employer questionnaires.

Section IV: Other M.S. in Sport Studies Programs in West Virginia

Other higher education institutions in West Virginia provide Master of Science degrees for those individuals interested in sport study areas; however their programmatic focus tends to be narrow. You can find both an M.S. Degree in Athletic Coaching and a M.S. in Physical Education at WVU, but the programs do not allow a broad study of content that satisfies the learner interested in both general wellness education and coaching aspects of strength and conditioning. As the fields of Exercise Science, Athletic Coaching, Wellness Education, and Sports Leadership continue to expand, students in these fields and employers of such educated individuals are seeking broad spectrum of study resulting in students and employees capable of understanding and completing multiple tasks in different areas of sport and wellness.

As mentioned earlier, the nation is at war with obesity. The wellness industry is a billion dollar business with NSCA-CPT credentialed individuals making over $100,000.00 per year personal training clients in fitness and wellness centers in areas as close as Charlotte and Statesville North Carolina. NSCA credentialed individuals in Charleston report income over $60,000.00 per year. All Division I athletic programs employee strength and conditioning specialist and most top tier Division II and III schools employee them also. Their salary range is from $40,000.00 (Division II full-time) to $250,000.00 (Head CSCS at top Division I football schools). In addition, at West Virginia State University we annually direct B.S. in Sport Studies Graduates, Wellness Education Graduates and other interested alumni and community members to programs that do not satisfy their broad scope educational desires and that require them to relocate away from home or out of state.

Though similar to the Sport Education Graduate Program at WVU, the proposed program will offer more options of study. Students can study athletic coaching, corporate wellness, youth sport, general fitness and wellness education all combined into two specific degree tracks. Presently there are no graduate program in West Virginia with curriculum relating to Sport Studies that are Nationally Recognized by the NSCA's ERP (Education Recognition Program). WVSU takes great pride in having the only Bachelor Degree Program associated with the study of sports in WV to have obtained NSCA National Recognition. WVSU plans to ask the NSCA to review the M.S. in Sports Studies program at the earliest opportunity with the goal of obtaining National Recognition.

Section V: Needs Met by and Demands for the Program

Several needs can be successfully met with a Master Program of Sport Studies and its various track options. The first is to reduce the obesity rate in the state and the country. West Virginia has an adult obesity rate of over 35%, and has been in the top three most obese states for several years. (http://stateofobesity.org/adult-obesity/). With the epidemic of obesity spanning the whole United States, more and more Americans are recognizing the need for quality fitness, wellness, and competition in their lives. The M.S. in Sport

Studies Program at WVSU, depending on the track taken, would produce competent individuals educated with the skills and knowledge to coach, train, motivate, manage, prevent and treat injury, assess fitness, assess chronic and acute illness and promote ethically correct fitness and sport competition to individuals of all ages and of all cultures.

In addition to the need for knowledgeable coaches, educators, wellness trainers and motivators to help the country in its fight against obesity, the sporting industry is a growing part of the cultural landscape in the United States today that is demanding well educated coaches and sport professionals. The advancements in Exercise Science and Sports Medicine concepts, Coaching Strategy, Conditioning and Training Principles, and the high increase in athletic coaching salaries from the high school level to the professional ranks has placed a high demand on sport and fitness professionals who are well-prepared with knowledge and proficient skills of their craft. The graduate sport studies program and its various tracks, focusing on educating the student in these sport world advancements, can educate and prepare students for a life of productive and satisfying work at the middle school, high school, community, workplace, college and/or the professional ranks of education, sport and fitness – at the state, national and international levels.

All programs at WVSU produce graduates who are well-rounded educated citizens. WVSU's graduate sport studies program at WVSU would be no different in that it meets the state, regional, and national need for competent, educated and ethical citizens for community collaboration. The diverse learning atmosphere at WVSU provides an environment to satisfy such an important need.

WVSU B.S. in Sport Studies Degree Alumni along with Wellness Educators, local and regional coaches, personal training career individuals and business leaders in the wellness industry were surveyed regarding the needs for this type of program locally. The survey also asked about interest in pursuing this program should it be developed and offered. The survey results (see attached) were overwhelmingly positive (93.24% would attend this program). The Health and Human Performance Department Chair received several phone calls and emails expressing excitement about the proposed program. Community support and need is evident and community members and alumni are enthusiastic about joining such a program of study.

The wellness industry is a billion dollar business with NSCA-CPT credentialed individuals making over $100,000.00 per year personal training clients in fitness and wellness centers in areas as close as Charlotte and Statesville North Carolina. NSCA credentialed individuals in Charleston report income over $60,000.00 per year. All Division I athletic programs employee strength and conditioning specialist and most top tier Division II and III schools employee them also. Their salary range is from $40,000.00 (Division II full-time) to $250,000.00 (Head CSCS at top Division I football schools). In the past districts have adhered to a policy of only hiring certified teachers to the coaching positions; however, this hiring process is changing. With the completion of the NFHS coaching certification, non-teaching individuals are being hired. Furthermore,

there is no need to teach in most college or professional coaching scenarios. In fact in top tier athletic programs, they forbid it.

With respect to the need for the wellness track option, wellness educators in local school districts are required to attend exercise related continual education courses due to the need to fight obesity and the need to learn strategies to help students meet the performance standards on the *Physical Best* test. Wellness Educators choosing this graduate program pathway will be educated in the latest knowledge and psychomotor skills so that they can help their students to achieve their mandated Physical Best through public school wellness education. Furthermore, licensed Health Educators will achieve permanent certification and a pay scale increase with the completion of a Master Degree.

Regarding the Sport Science/Athletic Coaching Track, as mentioned earlier, the nation is at war with obesity. The wellness industry is a billion dollar business with NSCA-CPT credentialed individuals making over $100,000.00 per year personal training clients in fitness and wellness centers in areas as close as Charlotte and Statesville North Carolina. NSCA credentialed individuals in Charleston report income over $60,000.00 per year. The need for sport specific strength and conditioning specialist is at high demand at this point in time. All Division I athletic programs employee strength and conditioning specialist and most top tier Division II and III schools employee them also. Their salary range is from $40,000.00 (Division II full-time) to $550,000.00 (Head CSCS at top Division I football schools.

Lastly, the Master in Science Sport Studies Program provides the student with the necessary skills and knowledge to further their education at the graduate school level. The sport studies graduate program and its various tracks would provide opportunity to individuals of diverse demographics the opportunity to as mentioned earlier, the nation is at war with obesity. The wellness industry is a billion dollar business with NSCA-CPT credentialed individuals making over $100,000.00 per year personal training clients in fitness and wellness centers in areas as close as Charlotte and Statesville North Carolina. NSCA credentialed individuals in Charleston report income over $60,000.00 per year. All Division I athletic programs employee strength and conditioning specialist and most top tier Division II and III schools employee them also. Their salary range is from $40,000.00 (Division II full-time) to $250,000.00 (Head CSCS at top Division I football schools). In addition, continue their education in a broad yet focused curriculum designed to create leaders and lifelong learners that contribute to their workplace and their community.

Section VI: Resources Needed

The primary additional resource needed would be a faculty member with a minimum of a Ph.D. or Ed.D degree in one of the following areas (Athletic Coaching, Physical Education, Health Education, Athletic Training/Sports Medicine, Exercise Physiology, or Sports Management/Sports Administration. The faculty member must be CPR/AED/and First-Aid Certified and preference should be given to a faculty member that is either

NSCA-CSCS certified, NSCA-CPT certified or both. Having a faculty member of such quality and certification will ensure the quality of the program and would strengthen the pursuit of national recognition.

Due to the design of the curriculum matriculation schedule, the program could begin without the immediate hiring of an additional faculty member. Though new courses will need designed and approved by the university and the Higher Education Policy Commission, the current faculty could manage the load as the first and second semesters of the program would start and matriculate.

A state of the art Exercise Physiology Lab is optimal to provide all of the laboratory educational needs for such a graduate program in sport studies. The new sports training/weight room built and dedicated in 2015 provides all of the latest fitness and weightlifting equipment to educate students regarding updated technique, safety and program procedure. Therefore, there as mentioned earlier, the nation is at war with obesity. The wellness industry is a billion dollar business with NSCA-CPT credentialed individuals making over $100,000.00 per year personal training clients in fitness and wellness centers in areas as close as Charlotte and Statesville North Carolina. NSCA credentialed individuals in Charleston report income over $60,000.00 per year. All Division I athletic programs employee strength and conditioning specialist and most top tier Division II and III schools employee them also. Their salary range is from $40,000.00 (Division II full-time) to $250,000.00 (Head CSCS at top Division I football schools). In addition, s no need for resources for a lab and lab equipment.

Section VII: Instructional Delivery Methodology

As indicated by the attached survey data, most potential students showing interest in such a graduate program prefer a combination of online and in-class learning sessions. This is because those employed in the industry and alumni of the Bachelor of Science in Sport Studies Program understand the critical need to learn the necessary psychomotor skills associated with such a graduate curriculum. It is recommended by leaders in the industry through literature that a combination of learning methods be implemented. Therefore, the M.S. in Sport Studies at WVSU would combine both online learning and in-class learning sessions.

PROGRAM REVIEW Committee
Committee Recommendation Form

2016/2017

Program: Bachelor of Science in Mathematics **Date:** September 23, 2016

Type of Review: X Comprehensive Self-Study
Follow-Up / Progress Report

Recommendation to the Board of Governors:

x **1.** Continuation of the program at the current level of activity without specific action as described in the Rationale section of this Form;

2. Continuation of the program at a reduced level of activity (e.g., reducing the range of optional tracks, merging programs, etc.) or other corrective action as described in the Rationale section;

3. Identification of the program for further development (e.g., providing additional institutional commitment);

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

5. Discontinuance of the Program according the provisions of Higher Education Policy Commission (Section 8.1, Series 11, Title 133)

6. Other. Specify.

Rationale for Recommendation:

The Program Review Committee recommends the Bachelor of Science in Mathematics be continued at the current level of activity.

The program has a number of strengths. The annual average number of majors and graduates is 18 and 4 respectively over the review period. The program provides content area coursework for an average of 19 math education pre-service teachers each year of the review period. Other strengths are its strong service role to the university's general education program and other degree programs and its providing of many early enrollment courses to area high schools.

The program has a comprehensive assessment program with data that will provide information to improve the program.

Place a check if additional sheet(s) attached ☐

Signature of Committee Chairperson

_____

West Virginia State University

Comprehensive Program Review

for

Bachelor of Science in Mathematics

Submitted to

The Program Review Committee

Fall 2011-Spring 2016

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SECTION I: PROGRAM DESCRIPTION

A. Program Purpose Statement

The Department endeavors to give students a sound background for a basic understanding of science; to give prospective teachers a professional attitude, a strong subject matter foundation and adequate skills and techniques in the application and the teaching of the material; and, to show students that mathematics is a living and vital discipline by seeing it applied in the classroom and in the various fields of industry.

B. Program Outcomes

The program-level outcomes (PLOs) for mathematics are:

1. Demonstrate conceptual understanding and integration of the fundamentals in mathematics.
2. Formulate mathematical models to represent physical situations and evaluate their efficacy.
3. Effectively use the terminology and symbols of mathematics in communication.
4. Think critically and analytically using precise definitions as well as mathematical reasoning and arguments.
5. Evaluate the validity of inferences arising from quantitative and visual data.
6. Utilize technological tools in solving mathematical problems.
7. Demonstrate an understanding of the major branches of mathematics and the underlying connections between them.
8. Organize, describe, analyze and draw inferences from data.

C. Consistency with University Mission

The values of WVSU as outlined in its Mission Statement are reflected in this program in a number of ways:

- "academic excellence" – mathematics students follow a rigorous program of study and are held to high standards;
- "a core of student learning that includes effective communication, understanding and analysis of the interconnections of knowledge and responsibility for one's own learning" – many courses in the curriculum emphasize proper documentation. In particular, the Senior Seminar course (MATH 408) focuses on various ways to communicate important material in mathematics. Furthermore, this course helps the students see the connections between the various areas of the discipline.
- "lifelong growth, development, and achievement of our students" – Students learn the foundational skills in mathematics which will enable them to continue on to more advanced levels in the field. Upper-level courses often require students to complete projects, which may entail individual study or research, thus preparing them for lifelong learning on their own.

D. Previous Reviews and Corrective Actions

In the last program review cycle, it was recommended that the B.S. in Mathematics program expand its advisory committee "to include area employers not only to gain their perspective for preparation of our graduates but also to publicize the major." In regards to this recommendation, it must be reported that the advisory committee is currently inactive.

The committee also recommended follow-up reports that involved the submission of a detailed comprehensive assessment plan and evidence of data collection and analysis. As Appendix II-E shows, the program has a comprehensive assessment plan with ongoing data collection and analysis.

SECTION II: ADEQUACY

A. Curriculum

The Department offers the Bachelor of Science in Mathematics with either the Classical option or the Applied option. The department also provides the Teaching Field of Secondary Mathematics for the Bachelor of Science in Education degree offered by the Department of Education. Historically, the Applied option provided a way for students interested in computer science to earn a related degree, but currently, there is minimal difference between the two options, though there are ongoing discussions on ways to increase the differentiation between the two options. In addition to the General Education curriculum common to all majors at WVSU, the Mathematics program consist of a core of lower division mathematics courses and several required upper-division mathematics courses along with upper-division electives. The major courses in the curriculum begin with MATH 206 – Calculus and Analytic Geometry (a large percentage of the students enter the program below the calculus level and must take foundation courses to meet eligibility). Two additional calculus courses, a course in Discrete Mathematics (MATH 205) and a course in Elementary Statistics (MATH 222) make up the lower-division core of the curriculum. The required upper-level courses are Linear Algebra (MATH 307), Differential Equations (MATH 402), and either Abstract Algebra (MATH 308) in the Classical option or Numerical Analysis (MATH 404) in the Applied option. The final required course is the capstone course MATH 408 (Senior Seminar). In addition to these, students must take an additional 12 credits of 300-400-level mathematics courses. The cognates consist of two laboratory science course (BIOL 120 & 121 or CHEM 105, 106, 107 and 108 or PHY 231 & 232), plus one computer science course (CS 101). The usual general education courses and personal electives complete the curriculum.

In the last year of the review period, WVSU approved major changes to the general education program. Curriculum sheets for the B.S. in Mathematics with the new general education curriculum may be seen in Exhibit 2.

B. Faculty

At the end of the review period, the Department of Mathematics and Computer Science consisted of 10 full-time faculty, supplemented each semester by 2-3 part-time faculty. Of the full-time faculty, six were present during the entire period and taught the major courses for the Bachelor of Science in Mathematics (Classical and Applied options), and the Mathematics Teaching Field of the B. S. in Education (grades 5-8 and 5-12 options), along with service courses for the general education program and for the elementary education major. All of these faculty hold an earned doctorate in Mathematics from nationally accredited universities and are tenured. The department also has one full-time faculty member who only teaches major courses for the B.S. in Computer Science. He holds an earned doctorate in Computer Science. There is also one faculty member with a doctorate in engineering who teaches full-time for the Engineering 2+2 program. Finally, the department has two full-time Instructors (non tenure-track) who do not teach major courses in the Mathematics program, though they do teach prerequisite courses.

C. Students

1. Entrance Standards:

The B.S. in Mathematics program has no formal standards for admittance. In general, WVSU students may self-declare as Mathematics Majors. However, in practice, students will need to have successfully completed Math 120 (College Algebra) or its equivalent before taking any major courses.

2. Entrance Abilities:

The following tables compare mean ACT Mathematics scores and mean High School GPAs for first-time freshman at WVSU during the review period.

WVSU

	2011	2012	2013	2014	2015
ACT Math	18.6	18.1	18.5	18.5	18.8
GPA	3.05	3.03	3.03	3.05	3.08

Mathematics Program

	2011	2012	2013	2014	2015
ACT Math	22.5	26	21	21.6	21.8
GPA	3.3	3.47	3.43	3.14	3.3

As the data show, the average freshman mathematics major at WVSU is not quite ready to start the major courses, since an ACT Math score of 21 would make them only eligible for College Algebra (MATH 120), but major courses have a prerequisite of at least MATH 120 or an ACT Math score of 26. Overall, the average mathematics major is better prepared for college and hence more likely to graduate on time.

3. Exit Abilities:

The B.S. in Mathematics programs has no requirement for students to take national proficiency exams or include a field placement in their program, so the only measure of exit abilities available is final GPA for graduates:

	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
WVSU	3.0	3.0	3.1	3.1	3.1
Math	3.1	2.5	2.8	3.2	3.3

As the data show, graduates in Mathematics tend to have similar or slightly better GPAs than the average WVSU graduate.

4. Graduates:

Information about job or graduate school placement is purely anecdotal, since no formal departmental survey is administered. However, many of the graduates end up as public school teachers under programs that put them in the classroom immediately while doing graduate work to receive certification. Of the 2015-2016 graduates, it is known that one gained employment with BrickStreet Insurance and one is preparing for graduate school. Of 2014 graduates, the university's graduate survey indicates one is now attending Marshall University, one is employed by Kanawha County Schools and one is employed by ResCare.

D. Resources

1. Financial

For the most part, the department has the usual funding for personnel and supplies. The Mathematics program is also indirectly funded by the developmental mathematics course fee and the computer science course fee, both of which support computer classrooms which are also used by the Mathematics program. The developmental mathematics course fee brings in about $10,000 per year and the computer science course fee brings in about $5,000 per year. Both fees were first implement during AY 2014-2015.

2. Facilities

The program oversees several computer classrooms and labs. 431 Wallace contains 28 PCs running Linux and is primarily used by the Computer Science program, but Math 206 is often scheduled in there. 733 Wallace contains 30 PCs running Windows 7 and is primarily used for developmental mathematics courses, but Math 222 is usually scheduled in there. 723 Wallace has 30 PCs, some running Windows 7 or Windows XP, others running Linux. It's an open computer lab, the computers have software installed to support both the Mathematics program and the Computer Science program. 830 Wallace has 21 PCs running Windows XP. Most mathematics courses in the program that use computers are scheduled in this room. The program also frequently uses the non-computer classrooms 831 Wallace, 820 Wallace and 731 Wallace for classes.

E. Program-Level Assessment

1. Assessment Procedures

The B.S. in Mathematics does program-level assessment at three points: at the end of Math 206, at the end of Math 208 and at the end of Math 408. At all three points, multiple-choice exams developed by the department is used as the main assessment instrument (a different exam at each level, though with some carryover of individual questions). In Math 408, students also write a major paper and give a presentation, and these are used as part of the program assessment. See Appendix II-E for details.

Data from these instruments is initially analyzed using computer programs created by a faculty member of the department (see Appendix II-E for copies of the output). The results are then analyzed and discussed by the department's Assessment Committee, then further discussed by the entire department.

2. Use of Assessment Data: Learning-Teaching-Curriculum

During the review period, the major use of the assessment data has been to improve and refine the assessment instruments and process. However, the data collected does show that students abilities with respect to the Program Learning Objectives are developing in the manner we expected as they progress through the program. No major changes to the curriculum are expected, though we expect some changes in emphasis in course-level instruction, particularly in regards to PLO 7 and content retention, which the data from the third instrument seems to indicate is in need of improvement. To be more precise, on the third test, the mastery level of the students in regards to PLOs 1-4 (which relate to knowledge and use of mathematical content) was not as high as we anticipated it would be. The most probable reason for this is that the third tests assesses these PLOs using more sophisticated material, but we also feel that the data from individual questions that do make use of material from courses belonging to earlier phases of the program indicate a decrease in retention of that material by the students. PLO 7, on the other hand, deals with students gaining an understanding of the connection between the major branches of mathematics and is assessed using a paper and presentation in the Senior Seminar course. Results from this assessment (see Appendix II-E) do not show a clear development of this understanding, hence the need for greater emphasis of this in content courses.

3. Graduate Satisfaction

A small amount of data is available from the university's graduate survey. One student directly addressed the question of satisfaction and indicated that the degree was directly related to his employment and that he was "somewhat satisfied".

F. Advisory Committee(s)

The advisory committee was inactive during the review period

G. Program Strengths and Weaknesses

The greatest strength of the program is clearly its highly qualified and diverse faculty. All members of the faculty in the program hold doctoral degrees from nationally-ranked accredited institutions. The diversity is reflected culturally, in mathematics specialization, in gender, and in ethnicity. This diversity lends itself to a wide range of pedagogy and a rich learning environment to offer to the students. Additional strengths include: the course offerings; students have a variety of courses from which to select the 12 credit of 300-400 level courses; students have

opportunity to work with faculty to conduct undergraduate research, and to participate in regional Mathematical competition like the Virginia Tech Regional Mathematics Competition.

The major weakness of the program is the ability-level of the students entering the program. As was discussed above, an average student entering the program is unable to take the first program-level course in their first year and some not even able to take it until after several semesters of 100-level courses. This becomes problematic in increasing the graduation rate and in having enough students to be able to offer upper-level math courses.

SECTION III: VIABILITY

A. Program Enrollment

As Appendix III-A shows, the number of majors has tended to decrease during the review period, though recent data show the number of majors has increased for AY 2016-2017 over the previous year. Reasons for the decline in majors can probably be assigned to demographic trends in West Virginia, i.e., the decline in the number of high school graduates. In addition, the various changes at WVSU have affected the number and composition of the student body. As the program also provides the content specialization in mathematics for the B.S. in (Secondary) Education, it should be noted that the number majors in that specialization has also decreased over the review period, suggesting that the fluctuations in majors is not due to the program itself, but rather to the external factors mentioned above.

B. Course Enrollment

Course enrollment in upper-level program courses has been stable over the review period, though they do show a jump in enrollment in AY 2013-2014, which reflects the size of the mathematics/math education cohort which graduated in AY 2014-2015.

Enrollment in a number of lower-level program courses (such as Math 205 and Math 206) has trended upwards over the review period. This reflects their status as cognate courses for the Computer Science, Chemistry and Biology programs, which has gained in popularity during this time period.

C. Enrollment Projections

We expect the number of majors to stabilize at approximately 20 per year. This is based on the relative popularity of mathematics as a major and the average mathematical abilities of new students at WVSU. However, the discussions that WVSU is conducting with universities in China may have positive effects on the program enrollment.

D. Cost Analysis

The Departmental Cost of Instruction (DCI) encompasses two components: (1) departmental cost to offer the major and (2) departmental cost to offer courses in the department. To determine the departmental cost to offer the major, calculations were conducted to generate the program cost per graduate and the cost per student in the major. In this cost analysis we only considered salaries, including fringe benefits.

$$\text{cost per student in major} = \frac{\text{2015 - 2016 program faculty salary}}{\text{Average number of majors 2011 - 2016}}$$

$$\text{cost per graduate} = \frac{\text{2015 - 2016 program faculty salary}}{\text{Average number of graduates 2011 - 2016}}$$

The total salary including fringe benefits for Mathematics faculty during the 2015–2016 year of the review period was $455,380. Dividing by the average number of (unduplicated) majors in the degree program annually, which is 18, the *cost per major* is calculated to be $25,299. To calculate the program *cost per graduate*, the numerator remains the same but the denominator used is the average number of annual program graduates for the 2011–2016 period, which was found to be 3.6; thus the Mathematics cost per graduate was determined to be $126,494.

$$\text{Cost of courses offered in the program} = \frac{\text{2015 - 2016 program faculty salary}}{\text{Average SCH produced by program 2011 - 2016}}$$

The cost of offering courses in the program for all students is calculated using the same numerator; the denominator is the average number of student credit hours produced for the academic years 2011–2016. Aggregating fall and spring terms, there was an average of 3473.6 credit hours associated with courses taken by both majors and non-majors during this period. Based on these numbers, the *cost per credit hour* (CPCH) in the program is $131.10.

The Facilities and Administrative cost (non-instructional operational cost) is also computed the using total faculty compensation for 2015–2016; in calculating this value, it is multiplied by the federal indirect rate of 56.9% or .569, which is a measure that is used to determine the cost of operation for grant administration. The *Mathematics Facilities and Administrative cost* (non–instructional cost) is therefore $455,380 * 0.569 = $259,111.

It should be noted that the above are actually *departmental* costs, rather than *program* costs. A comparison of Appendix II-A with Appendix III-B shows that on the average, the department offers 16 courses in the major each academic year. At the standard faculty load of four courses per semester, this is equivalent to the program only using two faculty members (the remainder teach non-program service courses, including developmental and general education mathematics courses). As Section II-B (above) shows, there are eight mathematical faculty, so a reasonable approximation of actual program costs would be one-fourth of those given above, i.e., cost per major is $6,325, cost per graduate is $31,624, and Facilities & Administrative cost is $64,778. On the other hand, average student credit hours for major courses was only 425.4, so the cost per credit hour is $267.62.

Another approach would take into account the fact that students in secondary Mathematics Education are required to take the same curriculum as Mathematics majors, and so should be added to the numbers of majors and graduates used above. Following this method, the denominator of the first formula would become 37, and the denominator of the second formula would become 5.6, leading to a cost per major of $12,308 (using total departmental salary) or $3,077 (using program salary) and a cost per graduate of $81,318 (departmental) or $20,329 (program).

E. Service Courses

The department has a large service role for the university, providing the courses to prepare students with deficiencies for college-level mathematics courses; providing the courses (Math 103, 111, 119, 120) designated by programs for the Mathematics component of the General Education program; offering the courses needed for the

Content Specialization in Mathematics for the B.S. in Education; and satisfying cognate requirements in Computer Science, Biology and Chemistry. See Appendix III-E for details.

F. Off-Campus Courses

No program course was offered off-campus during the review period, but the department is a major participant in the Early Enrollment program. Math 120 has been offered at many high schools in the area. Math 102 and Math 121 have also been offered a few times. See Appendix III-F for details.

G. Articulation Agreements

None.

SECTION IV: NECESSITY

A. Similar Programs

Currently, West Virginia State University is the only institution in the Charleston metropolitan area offering a B.S. in Mathematics or the Mathematics Content Specialization for the B.S. in Education. The University of Charleston (UC) at one time had a Mathematics Education program, but withdrew it due a decline in enrolment. Indeed, the UC Mathematics Department no longer offers any courses beyond Calculus, so there is no program duplication with UC in Mathematics. West Virginia University Institute of Technology (WVU-IT) does offer the B. S. in Mathematics degree. The WVU-IT Mathematics Department is housed in the College of Engineering Sciences at WVU-IT. The subfields of Mathematics represented at WVU-IT are all from the general areas of Analysis (Functional Analysis, Univalent Function Theory, Approximation Theory, Topology) and classical Applied Mathematics (Control Theory, ODE, PDE), possibly due to the influence of their engineering program. The B.S. in Mathematics program at WVSU has more of a classical/liberal arts focus, hence there is no program duplication with WVU-IT.

Outside of the Kanawha Valley, the nearest program in mathematics is at Marshall University. Requirements for that program follow the usual pattern of a degree that is preparatory for graduate education in mathematics. At WVSU, the majority of graduates with a B.S. in Mathematics seem to view it as a terminal degree or a gateway into public school teaching, so again, there is little program duplication.

B. Post-Program Placement

As mentioned above (Section II.C.4), many of the program graduates have ended up as teachers of mathematics in public school systems in the area. This is possible due to a program in the public school systems wherein graduates with a B.S. in Mathematics can enter the classroom as full-time teachers while they take classes to earn their teacher certification. One recent graduate has found related employment at BrickStreet Insurance while another recent graduate is preparing for graduate school. A third recent graduate has returned to WVSU to earn a B.S. in Chemistry.

Appendices

APPENDIX II-A: Curriculum

Degree Program: B.S. in Mathematics – Applied Option	Total number of credit hours required for graduation: 120
Professional society that may have influenced the program offering and requirements:	

Courses Required in Major (by course number and title)	Hours	Additional Credit Required in Major	Hours	Courses Required in Related Fields	Hours	Courses Required in General Education and Elective Hours	Hours
MATH 205 – Discrete Mathematics	3	Any four of the following course:		CS 101 – Fund. Of Program.	3	NSM 101	1
MATH 206 – Calculus I	4	MATH 300 – Geometry	3			GE 100	3
MATH 207 – Calculus II	4	MATH 308 – Abstract Algebra	3	BIOL 120 – Fund. Of Biology	4	GE 200	3
MATH 208 – Calculus III	4	MATH 309 – History of Math	3	BIOL 121 – Biol. Diversity	4	HIST 201 or 201	3
MATH 222 – Stats for Nat. Sci/Math	3	MATH 310 – Number Theory	3			International Perspectives	6
MATH 307 – Linear Algebra	3	MATH 315 – Complex Variables	3	Or			
MATH 402 – Diff. Eq. I	3	MATH 401 – Vector Analysis	3			COMM 100	3
MATH 404 – Numerical Analysis	3	MATH 403 – Intro to Probability	3	CHEM 105 – Chemistry I	3	ENGL 101 & 102	6
MATH 408 – Senior Seminar	2	MATH 405 – Diff. Eq II	3	CHEM 106 – Chemistry II	3	MATH 111 or 120	3
		MATH 406 – Math. Statistics	3	CHEM 107 – Chem. Lab I	2	HHP 122 or 157	2
		MATH 407 – Topology	3	CHEM 108 – Chem. Lab ii	2		
		MATH 409 – Advanced Calculus I	3			ENGL 150	3
		MATH 410 – Advanced Calculus II	3	Or		Fine Arts	6
						Natural Sciences	6-8
						American Traditions	3
				PHY 231 – Physics I	4	Social Structures	3
				PHY 232 – Physics II	4		
						Free Elective	13- 17
Total Required Major Hours:	**29**	Total Additional Major Hours:	**12**	Total Cognate Hours:	**11-13**	Total Gen. Ed. / Elective Hours:	**64-70**

Note:

APPENDIX II-A: Curriculum

Degree Program: B.S. in Mathematics – Classical Option	Total number of credit hours required for graduation: 120
Professional society that may have influenced the program offering and requirements:	

Courses Required in Major (by course number and title)	Hours	Additional Credit Required in Major	Hours	Courses Required in Related Fields	Hours	Courses Required in General Education and Elective Hours	Hours
MATH 205 – Discrete Mathematics	3	Any four of the following course:		CS 101 – Fund. Of Program.	3	NSM 101	1
MATH 206 – Calculus I	4	MATH 300 – Geometry	3			GE 100	3
MATH 207 – Calculus II	4	MATH 309 – History of Math	3	BIOL 120 – Fund. Of Biology	4	GE 200	3
MATH 208 – Calculus III	4	MATH 310 – Number Theory	3	BIOL 121 – Biol. Diversity	4	HIST 201 or 201	3
MATH 222 – Stats for Nat. Sci/Math	3	MATH 315 – Complex Variables	3			International Perspectives	6
MATH 307 – Linear Algebra	3	MATH 401 – Vector Analysis	3	Or			
MATH 308 – Abstract Algebra	3	MATH 403 – Intro to Probability	3			COMM 100	3
MATH 402 – Diff. Eq. I	3	MATH 404 – Numerical Analysis	3	CHEM 105 – Chemistry I	3	ENGL 101 & 102	6
MATH 408 – Senior Seminar	2	MATH 405 – Diff. Eq II	3	CHEM 106 – Chemistry II	3	MATH 111 or 120	3
		MATH 406 – Math. Statistics	3	CHEM 107 – Chem. Lab I	2	HHP 122 or 157	2
		MATH 407 – Topology	3	CHEM 108 – Chem. Lab ii	2		
		MATH 409 – Advanced Calculus I	3			ENGL 150	3
		MATH 410 – Advanced Calculus II	3	Or		Fine Arts	6
						Natural Sciences	6-8
						American Traditions	3
				PHY 231 – Physics I	4	Social Structures	3
				PHY 232 – Physics II	4		
						Free Elective	13- 17
Total Required Major Hours:	**29**	Total Additional Major Hours:	**12**	Total Cognate Hours:	**11-13**	Total Gen. Ed. / Elective Hours:	**64-70**

Note:

APPENDIX II-B: Faculty Data

(No more than TWO pages per faculty member)

Name: Michael R. Anderson	Rank: Professor
Status: ☒ Full-time ☐ Part-time ☐ Adjunct ☐ Graduate Asst.	Highest Degree Earned: Ph.D.
Degree Conferred by: Ohio State University	Date Degree Received: 1993
Area of Specialization: Mathematics	

Professional registration/licensure:	
Years of employment at present institution:	21
Years of employment in higher education:	23
Years of related experience outside higher education:	

To determine compatibility of credentials with assignment:

(A). List courses you taught in the last two years (fall and spring semesters) of the review period. If you participated in team-taught courses, indicate each of them and what percent of these courses you taught. For each course include year and semester taught, course number, course title, and enrollment.

YEAR / SEMESTER	COURSE NUMBER AND TITLE	ENROLLMENT
2014/Fall	Math 020 Fundamentals of Algebra	26
2014/Fall	Math 206 Analytic Geometry & Calculus I	15
2014/Fall	Math 307 Linear Algebra	10
2014/Fall	CS 408 Senior Seminar	2
2014/Fall	CS 410 Systems Administration	2
2015/Spring	Math 121 Precalculus	13
2015/Spring	Math 207 Analytic Geometry & Calculus II	7
2015/Spring	Math 408 Senior Mathematics Seminar	5
2015/Spring	CS 210 Fundamentals of Operating Systems	7
2015/Fall	CS 408 Senior Seminar	5
2015/Fall	Math 205 Discrete Mathematics	20
2015/Fall	Math 307 Linear Algebra	8
2016/Spring	CS 210 Fundamentals of Operating Systems	11
2016/Spring	CS 410 Systems Administration	9
2016/Spring	Math 308 Introduction to Modern Abstract Algebra	5

(B). If degree is not in area of current assignment, explain:

In regards to the computer courses, I am mostly self-taught in regards to working with computers, but I have had three programming courses and one "theory of computing" course, along with programming experience dating back to the mid 1970s.

(C). Identify your professional development activities during the past five years.

1. Technical consultant for the West Virginia Clearinghouse for Workforce Education. The work involves database, website and systems administration.
2. Attendance at annual West Virginia Mathematical Association of Two-Year Colleges 2012-2016.

(D). List awards/honors (including invitations to speak in your area of expertise) or special recognitions in last five years.

(E). Indicate any other activities that have contributed to effective teaching.

(F). List professional books/papers published during the last five years.

(G). List externally funded research (grants and contracts) during the last five years.

APPENDIX II-B: Faculty Data

(No more than TWO pages per faculty member)

Name: Sonya M. Armstrong	Rank: Professor
Status: ☒ Full-time ☐ Part-time ☐ Adjunct ☐ Graduate Asst.	Highest Degree Earned: PhD
Degree Conferred by: University of Rochester	Date Degree Received: May 1997
Area of Specialization: Mathematics Education	

Professional registration/licensure:	
Years of employment at present institution:	19
Years of employment in higher education:	25
Years of related experience outside higher education:	4

To determine compatibility of credentials with assignment:

(A). List courses you taught in the last two years (fall and spring semesters) of the review period. If you participated in team-taught courses, indicate each of them and what percent of these courses you taught. For each course include year and semester taught, course number, course title, and enrollment.

YEAR / SEMESTER	COURSE NUMBER AND TITLE	ENROLLMENT
2014/Fall	Math 111/01 Mathematics for Liberal Arts	25
2014/Fall	Math 111/04 Mathematics for Liberal Arts	16
2014/Fall	Math 309 Introduction to the History of Mathematics	3
2014/Fall	Math 411 Teaching Mathematics in Secondary/Middle Schools	4
2015/Spring	Math 111 Mathematics for Liberal Arts	25
2015/Spring	Math 222 Statistics for the Natural Sciences & Mathematics	22
2015/Spring	Math 403 Introduction to Probability	1
2015/Spring	Math 406 Mathematical Statistics	4
2015/Spring	CS 309 Software Engineering	5
2015/Fall	Math 104 Math Ed Algebra & Statistics	10
2015/Fall	Math 111/02 Mathematics for Liberal Arts	31
2015/Fall	Math 111/03 Mathematics for Liberal Arts	25
2015/Fall	Math 111/04 Mathematics for Liberal Arts	22
2015/Fall	Math 309/Introduction to the History of Mathematics	1

(B). If degree is not in area of current assignment, explain:

(C). Identify your professional development activities during the past five years.

Fulbright Scholar 2015-2016 (1/6-6/16) , Slovak Republic
Introduction to Computational Thinking Workshop, National Computational Institute, Orem, Utah
The Joy of Mathematics, West Virginia Teacher of Mathematics (WVCTM) Annual Conference, Flatwoods WV, March, 2014
Using the High Performance Super Computer to improve instruction – WVSU CI-Train Day, August 2012

Academic Freedom Vs. Academic responsibility – Keynote Address: *WVMATYC Annual Conference, West Virginia State University, April, 2011.*

(D). List awards/honors (including invitations to speak in your area of expertise) or special recognitions in last five years.

Fulbright Core Award - **Slovak Republic** January 2015 – for Academic Year 2016
Conducted 1-week *Research Methodology* ***Workshop*** **University of Guadalajara** , Guadalajara, Mexico , July 2015
Invited Speaker – *"What the Data Show about ASD Comorbidity in Nigeria,* **GT_Bank 5th Annual ASD Symposium**, Lagos Nigeria
Invited Speaker – *Statistical Analysis of Prevalence of ASD in Nigeria*, **World Congress of psychology**, Madrid Spain Sept 2014

(E). Indicate any other activities that have contributed to effective teaching.

Attendance at Local, National and International Conferences and Workshop on Pedagogy
Reading of Journal Articles on latest improvements in Teaching
Webinars on Student engagement activities

(F). List professional books/papers published during the last five years.

Lamikanra Anna, Armstrong Sonya, Yazhong Fang, Esmail Ashraf and Eargle Lisa, (2014):
Empowering International Students and Clients to Succeed In a Global Classroom and Society:
In An International – Social Action Approach for Best Practices for Teaching Global Citizenship*;* 2015
Esmail, Ashraf, Lisa Eargle, Anna Lamikanra, and Sonya Armstrong (2013) *The Art of Killing a Dream; Race Class and Gender*, (2014)

(G). List externally funded research (grants and contracts) during the last five years.

1. Unlocking the Common Core Making the Next Generation Content Standards in the Elementary Mathematics classroom, West Virginia Higher Education (NCLB) , 2012 $89,737
2. Illuminating Math and Science West Virginia Higher Education (NCLB) 2011, $89,388
3. HBCUP-Planning Grant (CPI/CPD) – NSF , 2011, $75,000

APPENDIX II-B: Faculty Data

(No more than TWO pages per faculty member)

Name:	Ronald Baker	**Rank**	Professor
Status:	☒ Full-time ☐ Part-time ☐ Adjunct ☐ Graduate Asst.	**Highest Degree Earned:**	Ph.D.
Degree Conferred by:	The Ohio State University	**Date Degree Received:**	1975
Area of Specialization:	Mathematics		

Professional registration/licensure:	
Years of employment at present institution:	22
Years of employment in higher education:	33
Years of related experience outside higher education:	8

To determine compatibility of credentials with assignment:

(A). List courses you taught in the last two years (fall and spring semesters) of the review period. If you participated in team-taught courses, indicate each of them and what percent of these courses you taught. For each course include year and semester taught, course number, course title, and enrollment.

YEAR / SEMESTER	COURSE NUMBER AND TITLE	ENROLLMENT
2014/Fall	Math 121 Precalculus	24
2014/Fall	Math 205 Discrete Mathematics	17
2014/Fall	Math 300 Introduction to College Geometry	3
2014/Fall	CS 240 Data Communications & Networking	7
2015/Spring	Math 102 Plane Trigonometry	13
2015/Spring	Math 111 Mathematics for Liberal Arts	8
2015/Spring	Math 206 Analytic Geometry & Calculus I	17
2015/Spring	Math 402 Differential Equations I	3
2015/Fall	CS 240 Data Communications & Networking	14
2015/Fall	CS 405 Algorithms	9
2015/Fall	Math 207 Analytic Geometry & Calculus II	10
2015/Fall	Math 300 Introduction to College Geometry	6
2015/Fall	Math 315 Introduction to Complex Variables	1
2016/Spring	CS 250 Data Structures & Algorithms	11
2016/Spring	Math 111 Mathematics for Liberal Arts	26
2016/Spring	Math 121 Pre-Calculus	17
2016/Spring	Math 208 Analytic Geometry & Calculus III	6

(B). If degree is not in area of current assignment, explain:

(C). Identify your professional development activities during the past five years.

Founding Fellow of the Institute of Combinatory and Its Applications
Member of Mathematical Association of America and American Mathematical Society

(D). List awards/honors (including invitations to speak in your area of expertise) or special recognitions in last five years.

March 2012 – invited address "The search for Sporadic Elliptic Semiplanes" at WilsonFest,

(E). Indicate any other activities that have contributed to effective teaching.

Installed software to support various classes.

(F). List professional books/papers published during the last five years.

(G). List externally funded research (grants and contracts) during the last five years.

APPENDIX II-B: Faculty Data

(No more than TWO pages per faculty member)

Name: Upali Karunathilake	Rank: Associate Professor
Status: ☒ Full-time ☐ Part-time ☐ Adjunct ☐ Graduate Asst.	Highest Degree Earned: PhD
Degree Conferred by: University of Minnesota	Date Degree Received: 2007
Area of Specialization: Partial Differential Equations	

Professional registration/licensure: None	
Years of employment at present institution:	8
Years of employment in higher education:	12
Years of related experience outside higher education:	

To determine compatibility of credentials with assignment:

(A). List courses you taught in the last two years (fall and spring semesters) of the review period. If you participated in team-taught courses, indicate each of them and what percent of these courses you taught. For each course include year and semester taught, course number, course title, and enrollment.

YEAR / SEMESTER	COURSE NUMBER AND TITLE	ENROLLMENT
2014/Fall	MATH111/02 – Mathematics for Liberal Arts	31
2014/Fall	MATH111/03 – Mathematics for Liberal Arts	32
2014/Fall	MATH 207/01 – Analytic Geometry and Calculus II	12
2014/Fall	MATH 403/01 – Introduction to Probability	05
2015/Spring	MATH 020/06 – Fundamentals of Algebra	26
2015/Spring	MATH111/01 – Mathematics for Liberal Arts	27
2015/Spring	MATH111/04 – Mathematics for Liberal Arts	22
2015/Spring	MATH 208/01- Analytic Geometry and Calculus III	08
2015/Spring	MATH 399/01 – Special Topics – Differential Equations	01
2015/Fall	MATH111/01 – Mathematics for Liberal Arts	30
2015/Fall	MATH 119/01 – Algebraic Methods	31
2015/Fall	MATH 120/02 – College Algebra	37
2015/Fall	MATH 404/01 – Numerical Analysis	04
2016/Spring	MATH111/01 – Mathematics for Liberal Arts	26
2016/Spring	MATH111/02 – Mathematics for Liberal Arts	28
2016/Spring	MATH111/04 – Mathematics for Liberal Arts	16
2016/Spring	MATH206/01 – Analytic Geometry and Calculus I	11

(B). If degree is not in area of current assignment, explain: Not Applicable

(C). Identify your professional development activities during the past five years.

- Supervised an undergraduate research project "Numerical Method approach to solving incompressible Navier Stokes Equation in 2 dimension" under a NASA scholarship grant (2013/2014).
- Supervised undergraduate research project "relativity using basic algebra" under Research Rookies program (Spring 2015).
- Attended following conferences
    - West Virginia Mathematical Association of Two Year Colleges (WVMATYC) annual meeting 2015
    - West Virginia Mathematical Association of Two Year Colleges (WVMATYC) annual meeting 2016

(D). List awards/honors (including invitations to speak in your area of expertise) or special recognitions in last five years. None

(E). Indicate any other activities that have contributed to effective teaching.

(F). List professional books/papers published during the last five years.

None

(G). List externally funded research (grants and contracts) during the last five years.

- Co-Principal Investigator and Summer Bridge Program Supervisor of the NSF grant Stem Talent Expansion program (STEP to success).
  This is grant of approximately $500,000 starting from January 2013 till December 2017 with the primary objective of improving recruitment, retention and graduation of students in STEM field.

APPENDIX II-B: Faculty Data

(No more than TWO pages per faculty member)

Name: Sridhar A Malkaram	Rank: Assistant Research Professor
Status: ☒ Full-time ☐ Part-time ☐ Adjunct ☐ Graduate Asst.	Highest Degree Earned: Ph.D.
Degree Conferred by: Manipal University, Karnataka, India	Date Degree Received: 2008
Area of Specialization: Computational Biology	

Professional registration/licensure:	-
Years of employment at present institution:	4
Years of employment in higher education:	14
Years of related experience outside higher education:	-

To determine compatibility of credentials with assignment:

(A). List courses you taught in the last two years (fall and spring semesters) of the review period. If you participated in team-taught courses, indicate each of them and what percent of these courses you taught. For each course include year and semester taught, course number, course title, and enrollment.

YEAR / SEMESTER	COURSE NUMBER AND TITLE	ENROLLMENT
2014/Fall	BT-571 Techniques in Biotechnology I **(Team Taught, 15%)**	5
2014/Fall	BT-567 Current Concepts in Biotechnology **(Team Taught, 12%)**	4
2015/Spring	ENGR-102 Engineering Problem Solving-II	4
2015/Fall	BT-571 Techniques in Biotechnology I **(Team Taught, 15%)**	9
2015/Fall	BT-567 Current Concepts in Biotechnology **(Team Taught 12%)**	9
2016/Spring	BT-572 Techniques in Biotechnology II **(Team Taught, 12%)**	6
2016/Spring	MATH-222 Statistics for Natural Sciences and Mathematics	18

(B). If degree is not in area of current assignment, explain:
ENGR-102, MATH-222: Had equivalent background and experience to teach the courses.

(C). Identify your professional development activities during the past five years.

- Have been XSEDE campus coordinator since 2012, with a role to assist campus faculty/students in accessing XSEDE computing resources.
- Attended XSEDE conferences during last 4 years to keep updated with the latest developments in High performance computing area.
- Hosted workshops related to computational science and HPC.
- Serving as systems administrator for local HPC since 2 years.
- Peer reviewed 6 journal articles.
- Served as panel member for two terms (2013, 2014) the NSF-GRFP fellowship applications.

(D). List awards/honors (including invitations to speak in your area of expertise) or special recognitions in last five years.

- lnvited lecture at University of Charleston, dated 04/05/2016, on Introduction to Bioinformatics and its role in Pharmacogenomics.

(E). Indicate any other activities that have contributed to effective teaching.

- Mentored 6 graduate students as part their thesis committee member, and 3 undergraduate students.
- Mentored 2 TREK students (a high school teacher and student)
- Attended workshops related to High performance computing and computational science

(F). List professional books/papers published during the last five years.

Saminathan T, Malkaram SA, Patel D, Taylor K, Hass A, Nimmakayala P, Huber DH, Reddy UK. Transcriptome Analysis of Invasive Plants in Response to Mineral Toxicity of Reclaimed Coal-Mine Soil in the Appalachian Region. Environ Sci Technol. 2015 Sep 1;49(17):10320-9.

Saminathan T, Nimmakayala P, Manohar S, Malkaram S, Almeida A, Cantrell R, Tomason Y, Abburi L, Rahman MA, Vajja VG, Khachane A, Kumar B, Rajasimha HK, Levi A, Wehner T, Reddy UK. Differential gene expression and alternative splicing between diploid and tetraploid watermelon. J Exp Bot. 2015 Mar;66(5):1369-85.

Nimmakayala P, Levi A, Abburi L, Abburi VL, Tomason YR, Saminathan T, Vajja VG, Malkaram S, Reddy R, Wehner TC, Mitchell SE, Reddy UK. Single nucleotide polymorphisms generated by genotyping by sequencing to characterize genome-wide diversity, linkage disequilibrium, and selective sweeps in cultivated

Nimmakayala P, Abburi VL, Abburi L, Alaparthi SB, Cantrell R, Park M, Choi D, Hankins G, Malkaram S, Reddy UK. Linkage disequilibrium and population-structure analysis among Capsicum annuum L. cultivars for use in association mapping. Mol Genet Genomics. 2014 Aug;289(4):513-21.

Li Y, Malkaram SA, Zhou J, Zempleni J. Lysine biotinylation and methionine oxidation in the heat shock protein HSP60 synergize in the elimination of reactive oxygen species in human cell cultures. J Nutr

Xia M, Malkaram SA, Zempleni J. Three promoters regulate the transcriptional activity of the human holocarboxylase synthetase gene. J Nutr Biochem. 2013 Nov;24(11):1963-9.

Camara Teixeira D, Malkaram SA, Zempleni J. Enrichment of meiotic recombination hotspot sequences by avidin capture technology. Gene. 2013 Mar 1;516(1):101-6.

Malkaram SA, Hassan YI, Zempleni J. Online tools for bioinformatics analyses in nutrition sciences. Adv Nutr. 2012 Sep 1;3(5):654-65.

Esaki S, Malkaram SA, Zempleni J. Effects of single-nucleotide polymorphisms in the human holocarboxylase synthetase gene on enzyme catalysis. Eur J Hum Genet. 2012 Apr;20(4):428-33.

(G). List externally funded research (grants and contracts) during the last five years.

(Co-Investigator)1458952, NSF, Jan Taylor (PI), 07/31/2015-07/31/2020, Gravitationa Wave Astronomy and the Appalachian Freshwater Initiative.

(Co-PI) 2014-38821-22455, USDA-NIFA, David Huber (PI), 09/01/14-08/01/17, Bioengineering the carboxylate platform in thermophilic anaerobic microbiomes.

(Co-PI) 2013-38821-21453, USDA-NIFA, Umesh Reddy (PI), 09/01/13-08/01/16, Diversifying the watermelon cultivar genetic base using genomic selection to improve nutraceutical traits and use them as parental lines in seedless breeding pipeline.

(Co-Investigator) 2015-38821-24373, USDA-NIFA, Umesh Reddy (PI), 09/01/15-08/01/18, Phenomics for crop improvement: Tools to create next generation plant breeders

(Co-Investigator) 2012-38821-20044, USDA-NIFA, Umesh Reddy (PI), 09/01/12-08/01/15, Engaging students in global genomic research through CGIAR visits and independent next-generation sequencing projects.

(Co-Investigator) 2013-38821-21454, USDA, Padma Nimmakayala (PI), 09/01/13-08/01/16, Summer academy of plant breeding: A platform to develop minority workforce in molecular plant breeding.

APPENDIX II-B: Faculty Data

(No more than TWO pages per faculty member)

Name: Naveed Zaman	Rank: Professor
Status: ☒Full-time ☐ Part-time ☐ Adjunct ☐ Graduate Asst.	Highest Degree Earned: Ph.D.
Degree Conferred by: University of Kentucky	Date Degree Received: May 2000
Area of Specialization: Homological Algebra, Module Theory, Ring Theory	

Professional registration/licensure:	
Years of employment at present institution:	16
Years of employment in higher education:	16
Years of related experience outside higher education:	

To determine compatibility of credentials with assignment:

(A). List courses you taught in the last two years (fall and spring semesters) of the review period. If you participated in team-taught courses, indicate each of them and what percent of these courses you taught. For each course include year and semester taught, course number, course title, and enrollment.

YEAR / SEMESTER	COURSE NUMBER AND TITLE	ENROLLMENT
2014/Fall	Math 120-03 College Algebra	19
2014/Fall	Math 120-04 College Algebra	19
2014/Fall	Math 208 Analytic Geometry & Calculus 3	5
2015/Spring	Math 120-03 College Algebra	18
2015/Spring	Math 120-04 College Algebra	17
2015/Fall	Math 120 College Algebra	31
2015/Fall	Math 310 Number Theory	4
2016/Spring	Math 120 College Algebra	27
2016/Spring	Math 408 Senior Mathematics Seminar	4

(B). If degree is not in area of current assignment, explain:

(C). Identify your professional development activities during the past five years.

- "WV Summit on Remedial Education'", Marriott Town Center, Charleston, WV, April 7, 2016
- "WVHEPC CompactCon Summit'", Embassy Suites, Charleston, WV, October 20-21, 2015
- "International Conference in Homological Algebra"', University of Kentucky, July 22-

24, 2015
- "College Completion Academy'", Morgantown, WV, January 9-10, 2014
- "West Virginia Developmental Education Summit'", Stonewall Jackson resort, WV, June 5-6, 2013
- "WVHEPC Developmental Education Meeting", Charleston, WV, October 25, 2012
- "Developmental Education Faculty Workshop", Stonewall Jackson resort, WV, June 5-7, 2012

(D). List awards/honors (including invitations to speak in your area of expertise) or special recognitions in last five years.

(E). Indicate any other activities that have contributed to effective teaching.

Developed hybrid College Algebra Class.

(F). List professional books/papers published during the last five years.

(G). List externally funded research (grants and contracts) during the last five years.

APPENDIX II-B: Faculty Data

(No more than TWO pages per faculty member)

Name: Xiaohong Zhang	Rank: Associate Professor
Status: ☒ Full-time ☐ Part-time ☐ Adjunct ☐ Graduate Asst.	Highest Degree Earned: Ph. D
Degree Conferred by: Virginia Tech	Date Degree Received: May, 1993
Area of Specialization: Optimal Feedback Control for Nonlinear Discrete System and Applications to Optimal Control of Nonlinear Periodic Ordinary Differential System	

Professional registration/licensure:	
Years of employment at present institution:	20
Years of employment in higher education:	23
Years of related experience outside higher education:	3

To determine compatibility of credentials with assignment:

(A). List courses you taught in the last two years (fall and spring semesters) of the review period. If you participated in team-taught courses, indicate each of them and what percent of these courses you taught. For each course include year and semester taught, course number, course title, and enrollment.

YEAR / SEMESTER	COURSE NUMBER AND TITLE	ENROLLMENT
2014/Fall	Math 120-01 College Algebra	27
2014/Fall	Math 120-02 College Algebra	18
2014/Fall	Math 102-01 Plane Trigonometry	26
2014/Fall	Math 105-01 Geometry	26
2015/Spring	Math 120-01 College Algebra	25
2015/Spring	Math 120-02 College Algebra	14
2015/Spring	Math 105-01 Geometry	26
2015/Spring	Math 111-03 Mathematics for Liberal Arts	27
2015/Fall	Math 120-01 College Algebra	22
2015/Fall	Math 121-01 Pre-Calculus	17
2015/Fall	Math 206-01 Calculus I	21
2016/Spring	Math 120-01 College Algebra	20
2016/Spring	Math 102-01 Trigonometry	15
2016/Spring	Math 105-01 Math ED-Geometry	19
2016/Spring	Math 207-01 Calculus II	11

(B). If degree is not in area of current assignment, explain:

(C). Identify your professional development activities during the past five years.

Grant Activities:

- **NSF STEP Grant WVSU Co-Pi,** 2012-present
  - ✓ Grant Committee
  - ✓ Grantee Annul Meeting, Participation, Washington, DC, March14-15, 2013
  - ✓ Grantee Annul Meeting, Participation, Panelist, Presenting, Poster Presenting, Washington, DC, March 6-7, 2014
    Panel served on *Learning Communities & Cohort Building*
    Presenting on *Learning Community-SI Program at WVSU*
  - ✓ **SI Program Director & Supervisor**
  - ✓ SI Program Committee, Chair, 2012-2013
  - ✓ Supplemental Instruction Supervisor Workshop, Participation, University of Missouri-Kansas City, Kansas City, MI, March 25-27, 2013
  - ✓ Supplemental Instruction International Conference**,** Chicago, IL, May 22-26, 2014
  - ✓ SI leaders' Training each semester Fall 2013 – Fall 2015
- **MSEIP Grant** Funded by the US Department of Education, with ECSU 2012-2015
  Special Cooperative Project: *Critical Thinking through Technology*, Research/Co-work, Participant and Mentor.
  - ✓ Workshop Participation at Elizabeth City State University, SC, 2012
  - ✓ Workshop Participation and Presenting at Dillard University, LA, 2013
  - ✓ Workshop Participation and Mentor of faculty at Bennett College for Women, NC, 2014
  - ✓ Workshop Participation and joint work at Virginia Union University, VA, 2015
  - ✓ Publication: *Critical Thinking through Technology Applied in Collegiate Pedagogy*, Resource Manual and Analysis, 2015
  - ✓ *The Nuts and Bolts of Building An APP* Webinar, Sept. 8, 2015
  - ✓ "*The Nuts and Bolts of Building an APP*" Proposal to ECSU, Sept. 2015
- **Teaching and Learning Math by Standards Grant,** Funded by US Department of Education, WVSU, 2009-2013
  - ✓ Service follow ups, School visiting and participation teachers' evaluations in Clay County, taught workshops

Presentations:

- **"The Beauty of Mathematics",** West Virginia Council of Teachers of Mathematics, Flatwoods, WV, March 17th, 2012
- "**Mathematical Origami**", West Virginia Council of Teachers of Mathematics, Stone Wall, WV, March 15-16, 2013
- **"Encountering the Chinese: A Modern Country, An Ancient Culture",** Organized and presented online Webinar, WVSU, May 22nd, 2013
- **"American Education System"**, in Chinese, Henan Provence, China, July 2013
- **"A Modern Country whit an Ancient Culture: Summer Learning and Service Program in China",** Faculty Lecture Series, West Virginia State University, October 14th, 2013
- **NSF STEP Grant at WVSU**, Poster showcase, Grantee Annul Meeting, Washington, DC, March 5th, 2014
- "**Learning Community-SI Program at WVSU**", Grantee Annul Meeting, Washington, DC, March 6th, 2014
- **"Mathematics Magic And Mystery",** West Virginia Council of Teachers of Mathematics, Stone Wall, WV, March 14, 2014

(D). List awards/honors (including invitations to speak in your area of expertise) or special recognitions in last five years.

(E). Indicate any other activities that have contributed to effective teaching.

(F). List professional books/papers published during the last five years.

"***Critical Thinking through Technology Applied in Collegiate Pedagogy***", Resource Manual and analysis of a special cooperative project in the minority science and engineering improvement program, Co-author with Dr. Upali Karunathilake, pp.38-40, Elizabeth City State University, 2015

(G). List externally funded research (grants and contracts) during the last five years.

Assessment Plan for Mathematics

1. Program-Level Outcomes

The program-level outcomes (PLOs) for mathematics are:

1. Demonstrate conceptual understanding and integration of the fundamentals in mathematics.
2. Formulate mathematical models to represent physical situations and evaluate their efficacy.
3. Effectively use the terminology and symbols of mathematics in communication.
4. Think critically and analytically using precise definitions as well as mathematical reasoning and arguments.
5. Evaluate the validity of inferences arising from quantitative and visual data.
6. Utilize technological tools in solving mathematical problems.
7. Demonstrate an understanding of the major branches of mathematics and the underlying connections between them.
8. Organize, describe, analyze and draw inferences from data.

2. PLO Taxonomy

A classification of the PLOs according to Anderson's and Krauthwohl's revision of Bloom's taxonomy:

	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual	3	3				
Conceptual	1	1,7	2	2,4	2,4	
Procedural			6,8	6,8	5,8	
Metacognitive						

3. Curriculum Map

I = Introducing, D = Developing, M = Mastering

PLO	Required Courses								
	205	206	207	208	222	307	308 or 404	402	408
1	D	D	D	D	D	D	D	D	M
2		D	D	D	D			D	M
3	D	D	D	D	D	D	D	D	M
4	I	I				D	M		M
5					I				M
6		I	D	D	D	D		D	M
7	I	I	D	D	I	I	I	D	M
8					I				M

4. Timeline

Course	Tools	PLOs	Semester	Years
Math 206	Test 1	1-4, 6	Fall, Spring	Fall 2012-Spring 2016
Math 208	Test 2	1-4	Fall, Spring	Fall 2012-Spring 2016
Math 408	Test 3	1-4, 8	Spring	Fall 2012-Spring 2016
	Paper, presentation	5, 7		

5. Assessment Instruments

The mathematics program will be assessed by three multiple choice exams, the first to be administered at the end of Math 206, the second at the end of Math 208 and the third at the end of Math 408, plus a research paper and oral presentation during Math 408.

The first test will assess PLOs in the following manner:

PLO	Questions
1	1-20
2	3, 7, 12, 16, 20
3	1, 4, 8, 9, 11, 13, 14, 15, 18, 19
4	2, 5, 10, 17
6	3, 7, 10, 12

For a basic analysis of performance on the PLOs, the scores on the question blocks will be converted into ratings (Mastered = 4, Developed = 3, Emerging = 2, Inchoate = 1) like this:

PLO	Mastered	Developed	Emerging	Inchoate
1	16-20	12-15	8-11	0-7
2	4-5	3	2	0-1
3	8-10	6-7	4-5	0-3
4	4	3	2	0-1
6	3-4	2	1	0

The second test will assess PLOs in the following manner:

PLO	Questions
1	1-20
2	3,10,13,16, 18
3	1, 2, 5, 6, 7, 12, 15, 17, 19, 20
4	4, 8, 9, 11, 14

For a basic analysis of performance on the PLOs, the scores on the question blocks will be converted into ratings (Mastered = 4, Developed = 3, Emerging = 2, Inchoate = 1) like this:

PLO	Mastered	Developed	Emerging	Inchoate
1	16-20	12-15	8-11	0-7
2	4-5	3	2	0-1
3	8-10	6-7	4-5	0-3
4	4	3	2	0-1

The third test will assess PLOs in the following manner:

PLO	Questions
1	1-20
2	3, 12, 13, 16, 19
3	1, 2, 5, 7, 9, 10
4	4, 6, 8, 11, 14, 15, 17, 18, 20
8	12, 16

For a basic analysis of performance on the PLOs, the scores on the question blocks will be converted into ratings (Mastered = 4, Developed = 3, Emerging = 2, Inchoate = 1) like this:

PLO	Mastered	Developed	Emerging	Inchoate
1	16-20	12-15	8-11	0-7
2	4-5	3	2	0-1
3	5-6	3-4	2	0-1
4	7-9	5-6	3-4	0-2
8	2		1	0

Finally, the paper and presentation will assess PLOs 5 and 7. A committee will determine the appropriate PLO ratings.

The tests will be reviewed at the end of each program review cycle, but may be reviewed more frequently.

6. Data Collection

After the tests are administered, the answer sheets will be given to the department's assessment coordinator for entry into the database. For the paper and presentation, the ratings determined by the committee will be given to the assessment coordinator for entry into the database.

7. Data Analysis

Data analysis will be done by the entire department and will partly consist of considering students' performance on the PLOs both at the individual assessment points and throughout the program. More in-depth analysis of the data for each PLO will be done according to this five-year schedule (beginning spring 2015):

Year	PLOs
1	2, 6
2	3, 4
3	5, 8
4	1, 7
5	Meta-analysis and resolution of problems

The data distributions that will be used for analysis are:
1. Number of students choosing each item on each question
2. Average overall rating for each PLO
3. Number of students in each category for each PLO

The standard analysis questions are:
1. Has the distribution of students shifted from the lower categories to the higher categories as students progress through the programs?
2. At a particular level, does the distribution match expectations?
   The basic expectations are:
   - Initial Assessment -- Majority of students are ``inchoate" or ``emerging".
   - Second Assessment -- Majority of students are ``emerging" with some ``developed".
   - Final Assessment -- Majority of students are ``developed" or ``mastered".
3. Instrument Analysis

Curriculum changes will be made if the analyses indicate they are needed.

Data-Test 1 Results

Mathematics Assessment Test 1 results (given in Math 206)

PLO results by student

Term	PLO 1	PLO 2	PLO 3	PLO 4	PLO 7
Spring 2014	1	1	1	1	3
Spring 2014	1	1	1	2	2
Spring 2014	1	1	2	1	2
Spring 2014	1	3	1	1	3
Spring 2014	2	1	1	1	2
Spring 2014	2	1	2	1	2
Spring 2014	1	1	1	2	2
Spring 2014	2	2	2	3	3
Average:	1.38	1.38	1.38	1.5	2.38

Distribution by student of PLO results

	Not Acceptable	Acceptable	Accomplished	Superior
PLO 1	5	3	0	0
PLO 2	6	1	1	0
PLO 3	5	3	0	0
PLO 4	5	2	1	0
PLO 7	0	5	3	0

Mathematics Assessment Test 1 results (given in Math 206)

PLO results by student

Term	PLO 1	PLO 2	PLO 3	PLO 4	PLO 7
Fall 2014	2	1	2	2	2
Fall 2014	2	4	2	1	3
Fall 2014	3	1	2	3	1
Fall 2014	3	3	1	3	4
Fall 2014	2	3	1	1	4
Fall 2014	2	1	2	1	2
Fall 2014	3	4	2	1	3
Fall 2014	1	1	1	1	2
Fall 2014	2	2	1	1	3
Average:	2.22	2.22	1.56	1.56	2.67

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	1	5	3	0
PLO 2	4	1	2	2
PLO 3	4	5	0	0
PLO 4	6	1	2	0
PLO 7	1	3	3	2

Mathematics Assessment Test 1 results (given in Math 206)

PLO results by student

Term	PLO 1	PLO 2	PLO 3	PLO 4	PLO 7
Spring 2015	1	1	3	1	3
Spring 2015	1	2	1	1	3
Spring 2015	2	2	1	1	2
Spring 2015	2	1	1	2	2
Spring 2015	1	1	1	1	2
Spring 2015	1	2	1	1	2
Spring 2015	2	1	2	1	2
Spring 2015	2	2	1	2	3
Spring 2015	2	1	2	1	3
Spring 2015	3	1	2	3	2
Spring 2015	1	1	1	1	1
Average:	1.64	1.36	1.45	1.36	2.27

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	5	5	1	0
PLO 2	7	4	0	0
PLO 3	7	3	1	0
PLO 4	8	2	1	0
PLO 7	1	6	4	0

Mathematics Assessment Test 1 results (given in Math 206)

PLO results by student

Term	PLO 1	PLO 2	PLO 3	PLO 4	PLO 7
Summer 2015	2	2	1	2	2
Summer 2015	2	2	1	3	4
Summer 2015	2	1	3	2	3
Summer 2015	2	2	1	1	2
Summer 2015	2	2	1	1	2
Summer 2015	2	2	1	1	3
Summer 2015	2	1	1	3	2
Summer 2015	3	3	2	3	3
Average:	2.13	1.88	1.38	2	2.63

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	0	7	1	0
PLO 2	2	5	1	0
PLO 3	6	1	1	0
PLO 4	3	2	3	0
PLO 7	0	4	3	1

Mathematics Assessment Test 1 results (given in Math 206)

PLO results by student

Term	PLO 1	PLO 2	PLO 3	PLO 4	PLO 7
Fall 2015	2	1	1	3	3
Fall 2015	3	2	1	3	3
Fall 2015	2	2	1	2	3
Fall 2015	2	1	1	1	2
Fall 2015	3	2	2	2	4
Fall 2015	3	1	2	4	2
Fall 2015	2	3	1	1	3
Fall 2015	1	1	2	1	1
Fall 2015	2	3	1	1	3
Fall 2015	2	2	1	2	4
Fall 2015	2	2	1	3	3
Fall 2015	2	4	1	2	4
Fall 2015	1	1	1	1	2
Fall 2015	3	4	2	1	4
Fall 2015	1	1	1	1	2
Fall 2015	1	2	1	1	4
Fall 2015	2	1	1	2	3
Average:	2	1.94	1.24	1.82	2.94

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	4	9	4	0
PLO 2	7	6	2	2
PLO 3	13	4	0	0
PLO 4	8	5	3	1
PLO 7	1	4	7	5

Mathematics Assessment Test 1 results (given in Math 206)

PLO results by student

Term	PLO 1	PLO 2	PLO 3	PLO 4	PLO 7
Spring 2016	2	1	2	1	1
Spring 2016	4	3	3	3	3
Spring 2016	2	2	2	1	2
Spring 2016	2	2	1	3	3
Spring 2016	4	3	2	3	3
Spring 2016	2	1	1	1	1
Spring 2016	2	2	1	1	2
Spring 2016	2	2	1	1	3
Spring 2016	3	1	2	2	3
Average:	2.56	1.89	1.67	1.78	2.33

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	0	6	1	2
PLO 2	3	4	2	0
PLO 3	4	4	1	0
PLO 4	5	1	3	0
PLO 7	2	2	5	0

Data-Test 2 Results

Math Assessment Test 2 (given in Math 208)
PLO results by student

Term	PLO 1	PLO 2	PLO 3	PLO 4
Fall 2014	2	2	2	3
Fall 2014	1	2	1	2
Average:	1.5	2	1.5	2.5

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	1	1	0	0
PLO 2	0	2	0	0
PLO 3	1	1	0	0
PLO 4	0	1	1	0

Math Assessment Test 2 (given in Math 208)
PLO results by student

Term	PLO 1	PLO 2	PLO 3	PLO 4
Spring 2015	1	1	1	1
Spring 2015	2	2	3	3
Spring 2015	1	3	1	1
Spring 2015	1	1	1	3
Spring 2015	2	3	1	2
Spring 2015	2	2	2	2
Average:	1.5	2	1.5	2

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	3	3	0	0
PLO 2	2	2	2	0
PLO 3	4	1	1	0
PLO 4	2	2	2	0

Math Assessment Test 2 (given in Math 208)
PLO results by student

Term	PLO 1	PLO 2	PLO 3	PLO 4
Fall 2015	1	1	3	1
Fall 2015	2	2	2	3
Average:	1.5	1.5	2.5	2

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	1	1	0	0
PLO 2	1	1	0	0
PLO 3	0	1	1	0
PLO 4	1	0	1	0

Math Assessment Test 2 (given in Math 208)
PLO results by student

Term	PLO 1	PLO 2	PLO 3	PLO 4
Spring 2016	2	1	3	2
Spring 2016	1	1	1	1
Spring 2016	2	4	3	1
Spring 2016	1	1	2	1
Spring 2016	1	1	2	1
Average:	1.4	1.6	2.2	1.2

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	3	2	0	0
PLO 2	4	1	0	1
PLO 3	1	2	2	0
PLO 4	4	1	0	0

Data-Test 3 & Presentation Results

Math Assessment Test 3 results (given in Math 408)

PLO results by student

Term	PLO 1	PLO 2	PLO 3	PLO 4	PLO 8
Spring 2014	3	3	4	4	2
Spring 2014	3	4	3	4	4
Spring 2014	2	3	3	3	2
Spring 2014	1	3	1	2	2
Spring 2014	1	2	1	2	2
Spring 2014	1	2	1	2	2
Spring 2014	1	1	2	2	2
Spring 2014	3	3	2	4	2
Average:	1.88	2.63	2.13	2.88	2.25

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	8	0	0	0
PLO 2	1	2	4	1
PLO 3	3	2	3	0
PLO 4	4	4	0	0
PLO 8	0	0	0	8

Math Assessment Test 3 results (given in Math 408)

PLO results by student

Term	PLO 1	PLO 2	PLO 3	PLO 4	PLO 8
Spring 2015	2	2	4	1	4
Spring 2015	1	2	1	2	2
Spring 2015	2	2	3	2	2
Spring 2015	2	2	3	2	4
Spring 2015	2	3	3	2	2
Average:	1.8	2.2	2.8	1.8	2.8

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	1	4	0	0
PLO 2	0	4	1	0
PLO 3	1	0	3	1
PLO 4	1	4	0	0
PLO 8	0	3	0	2

Presentation Results (given in Math 408)

PLO results by student

Term	PLO 5	PLO 7
Spring 2015	n/a	3
Spring 2015	n/a	3
Spring 2015	n/a	2
Spring 2015	n/a	2
Spring 2015	n/a	3
Average:	n/a	2.6

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 5	0	0	0	0
PLO 7	0	2	3	0

Math Assessment Test 3 results (given in Math 408)

PLO results by student

Term	PLO 1	PLO 2	PLO 3	PLO 4	PLO 8
Spring 2016	2	2	3	2	2
Spring 2016	2	2	3	3	2
Spring 2016	2	2	2	3	2
Spring 2016	1	2	1	2	4
Average:	1.75	2	2.25	2.5	2.5

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	1	3	0	0
PLO 2	0	4	0	0
PLO 3	1	1	2	0
PLO 4	0	2	2	0
PLO 8	0	3	0	1

Presentation Results (given in Math 408)

PLO results by student

Term	PLO 5	PLO 7
Spring 2016	2	2
Spring 2016	3	3
Spring 2016	2	2
Spring 2016	4	3
Average:	2.75	2.5

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 5	0	2	1	1
PLO 7	0	2	2	0

APPENDIX III-A: Program Enrollment Data

B.S. in Mathematics (both options)

Academic Year	Number of Majors	Number of Graduates
2011-2012	22	4
2012-2013	18	1
2013-2014	19	3
2014-2015	17	6
2015-2016	14	4

Math Education

Academic Year	Number of Majors	Number of Graduates
2011-2012	39	2
2012-2013	20	3
2013-2014	12	2
2014-2015	15	2
2015-2016	9	1

APPENDIX III-B: Course Enrollment Data

Course	Academic Year	No. of Sections	Credit Hours	Enrollment	C.H.P.
205	2011-2012	1	3	6	18
	2012-2013	1	3	7	21
	2013-2014	1	3	18	54
	2014-2015	1	3	17	51
	2015-2016	1	3	20	60
206	2011-2012	3	4	24	96
	2012-2013	3	4	30	120
	2013-2014	3	4	26	104
	2014-2015	3	4	40	160
	2015-2016	2	4	35	140
207	2011-2012	2	4	7	28
	2012-2013	2	4	13	52
	2013-2014	2	4	21	84
	2014-2015	2	4	24	96
	2015-2016	2	4	16	64
208	2011-2012	2	4	7	28
	2012-2013	1	4	11	44
	2013-2014	2	4	6	24
	2014-2015	2	4	12	48
	2015-2016	2	4	8	32
222	2011-2012	1	3	12	36
	2012-2013	1	3	19	57
	2013-2014	1	3	19	57
	2014-2015	1	3	22	66
	2015-2016	1	3	18	54
307	2011-2012	1	3	7	21
	2012-2013	1	3	12	36
	2013-2014	1	3	8	24
	2014-2015	1	3	10	30
	2015-2016	1	3	8	24
308	2011-2012	1	3	6	18
	2012-2013	1	3	11	33
	2013-2014	1	3	5	15
	2014-2015	1	3	1	3
	2015-2016	1	3	5	15
309	2011-2012	1	3	3	9
	2012-2013	1	3	8	24
	2014-2015	1	3	3	9
	2015-2016	1	3	1	3
310	2013-2014	1	3	9	27
	2015-2016	1	3	2	6
315	2012-2013	1	3	6	18
	2015-2016	1	3	1	3
401	2013-2014	1	3	8	24
402	2011-2012	1	3	2	6

Course	Academic Year	No. of Sections	Credit Hours	Enrollment	C.H.P.
	2012-2013	1	3	6	18
	2013-2014	1	3	8	24
	2014-2015	1	3	3	9
403	2014-2015	2	3	6	18
404	2011-2012	1	3	1	3
	2012-2013	1	3	1	3
	2013-2014	1	3	11	33
	2015-2016	1	3	3	9
406	2014-2015	1	3	4	12
408	2011-2012	1	2	5	10
	2012-2013	1	2	4	8
	2013-2014	1	2	10	20
	2014-2015	1	2	5	10
	2015-2016	1	2	4	8

APPENDIX III-E: Service Courses

Course	**Other Program**
020	Developmental – all majors
021	Developmental – all majors
102	Some secondary education certifications, Sports Studies
103	General Education, Elementary Education, some secondary education certifications
111	General Education, History, Sociology, Communication
119	General Education
120	Business Administration, some secondary education certifications, Economics, History, Sociology
205	Computer Science, Secondary Math Education
206	Biology, Computer Science, Chemistry, Secondary Math Education
207	Computer Science, Chemistry, Secondary Math Education
208	Chemistry, Secondary Math Education
222	Biology, Computer Science, Secondary Math Education
300	Secondary Math Education
307	Computer Science, Secondary Math Education
308	Secondary Math Education
309	Secondary Math Education
315	Secondary Math Education
317	Elementary Education
401	Secondary Math Education
402	Secondary Math Education
403	Secondary Math Education
404	Computer Science, Secondary Math Education
405	Secondary Math Education
406	Secondary Math Education
407	Secondary Math Education
408	Secondary Math Education
409	Secondary Math Education
410	Secondary Math Education
411	Secondary Math Education

APPENDIX III-F: Off-Campus Courses

Course	Enrollment	Location	Semester
102	9	BNCTC	Fall 2015
	14	TYSVCS	Fall 2015
120	23	GWHS	Fall 2011
	14	SCHS	Fall 2012
	28	SAHS	Fall 2012
	22	GWHS	Fall 2012
	13	SHS	Fall 2013
	16	SCHS	Fall 2013
	16	SAHS	Fall 2013
	18	GWHS	Fall 2014
	17	SCHS	Fall 2014
	12	SHS	Fall 2014
	23	SAHS	Fall 2014
	20	SCOTHS	Fall 2014
	24	SHERHS	Spring 2015
	33	SCOTHS	Spring 2015
	22	S	Spring 2015
	20	RHS	Fall 2015
	16	SHS	Fall 2015
	15	RHS	Fall 2015
	28	SCOTHS	Fall 2015
	21	GWHS	Fall 2015
	13	SCHS	Fall 2015
	24	NHS	Fall 2015
	5	TYSVCS	Fall 2015
	8	CHS	Spring 2016
	22	SHERHS	Spring 2016
	13	SCOTHS	Spring 2016
121	9	BNCTC	Spring 2016
	15	TYSVCS	Spring 2016
	20	SHERHS	Spring 2016

Exhibits

Assessment Exam - Math 206

1. If $f(x) = 9x^2 - 5$, evaluate $\dfrac{f(x+h) - f(x)}{h}$

   (a) $9h^2 - 5$

   (b) $18x + 9h$

   (c) $9h - \dfrac{5}{h}$

   (d) $18xh + 9h^2$

2. Which of the following points is not in the interior of the circle $x^2 + y^2 - 4x + 6y = 0$?

   (a) $(5, -2)$

   (b) $(0, -3)$

   (c) $(-1, 0)$

   (d) $(3, -5)$

3. A chemical element has a half-life of 21 days. If you have 12 grams left after 10 days, how much did you start with?

   (a) 8.6 grams

   (b) 12 grams

   (c) 16.7 grams

   (d) 21 grams

4. If $\sin\alpha = \dfrac{2}{5}$ and $\cos\alpha < 0$ find the value of $\cot\alpha$

   (a) $3/5$

   (b) $-3/2$

   (c) $-2\sqrt{21}/21$

   (d) $-\sqrt{21}/2$

5. In the interval $[-\pi/4, 11\pi/4]$, how many times does the graph of $y = 4\sin 3x$ crosses the x-axis?

   (a) 0

   (b) 5

   (c) 9

   (d) 11

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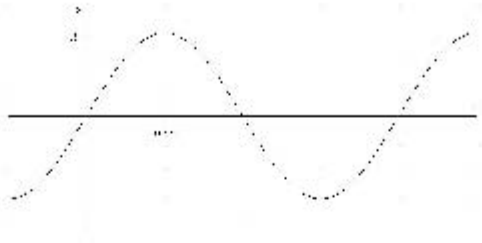
6. Which of the following functions is best represented by the given graph?



(a) $y = 3\sin(2x - \frac{\pi}{4})$

(b) $y = 2\sin(3x)$

(c) $y = 3\sin(2x)$

(d) $y = 3\sin(2\pi x)$

7. A new water pipeline was to replace one that had been installed years earlier. Since the terrain was rocky, the old line ran due west for 650 feet then turned 60° to the north for another 750 feet. It was decided to cut through the rocks with modern equipment and replace the old line with a straight one. How much pipe (to the nearest foot) is needed to lay a straight pipeline?

(a) 4975 feet

(b) 1213 feet

(c) 1352 feet

(d) 375 feet

8. Evaluate $\lim_{x \to 7} \frac{\sqrt{x+9} - 4}{x - 7}$

(a) 0

(b) 1/8

(c) 1

(d) ∞

9. For which value of k will $f(x) = \begin{cases} kx + 3 & \text{if } x < 1 \\ k^2x^2 + 1 & \text{if } x \geq 1 \end{cases}$ be continuous at $x = 1$?

(a) 2

(b) -2

(c) 1

(d) 3

10. Consider the implicitly-defined curve $x^2 + 3y^3 = x - 1$. What is the y-intercept of the tangent line to this curve at the point $(2, -1)$?

    (a) $(0, -1)$
    (b) $(0, 2)$
    (c) $(0, -\frac{1}{3})$
    (d) $(0, \frac{2}{3})$

11. Find the slope-intercept form of the equation of the tangent line to the graph of $x^2y^2 + 6x - 3 = 0$ at $(-1, 3)$

    (a) $y = 2x + 5$
    (b) $y = \frac{1}{2}x + \frac{7}{2}$
    (c) $y = 4x + 7$
    (d) $y = 2x - 5$

12. An open box is to be made from a 3-foot by 5-foot rectangular piece of material by cutting equal squares from each corner and turning up the sides. Find the volume of the largest box that can be made in this manner.

    (a) 5.2 cubic feet
    (b) 4.1 cubic feet
    (c) 7.5 cubic feet
    (d) 3.3 cubic feet

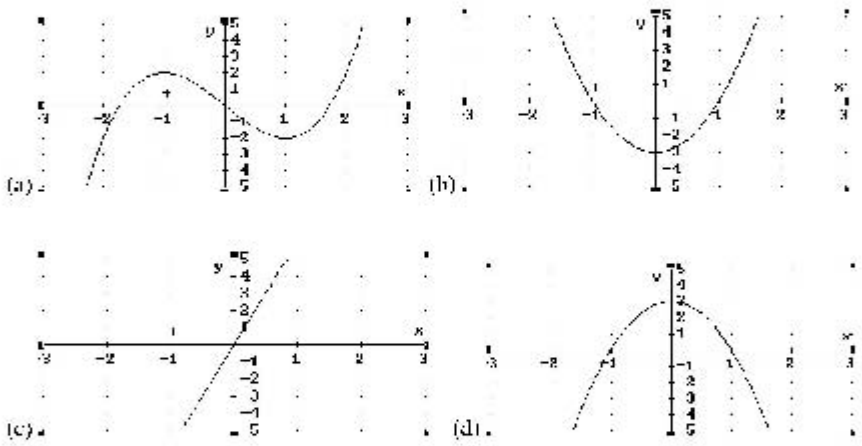
13. Let $f(3) = 0$, $f'(3) = 6$, $g(3) = 1$, and $g'(3) = \frac{1}{3}$. Find $h'(3)$ if $h(x) = \frac{f(x)}{g(x)}$

    (a) 18
    (b) 6
    (c) -6
    (d) -2

14. Let $f(x)$ be a polynomial function such that $f(4) = -1$, $f'(4) = 2$, $f''(4) = 0$. If $x < 4$, then $f''(x) < 0$ and if $x > 4$, then $f''(x) > 0$. The point $(4, -1)$ is a(n) ———- of the graph.

    (a) intercept
    (b) relative maximum
    (c) relative minimum
    (d) point of inflection

15. The graph of $f'(x)$ is given. Which of the following graphs represents the graph of $f(x)$?



16. A ladder 25 feet long is leaning against the wall of a house. The base of the ladder is pulled away from the wall at a rate of 2 feet per second. How fast is the top of the ladder moving down the wall when the base is 7 feet from the wall?

(a) 24 feet per second

(b) 14 feet per second

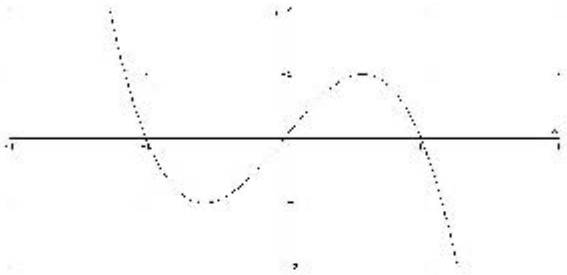
(c) $\frac{7}{24}$ feet per second

(d) $\frac{7}{12}$ feet per second

17. Find the area of the region bounded by $y = (x-1)^2 + 1$, the x–axis, $x = 2$, and $x = -1$.

(a) 6
(b) 7
(c) -6
(d) $\frac{9}{2}$

18. The graph of $f(x)$ is given. Evaluate $\int_{-1}^{1} f(x)\,dx$



(a) 2
(b) 0
(c) 1
(d) π

19. To integrate $\int x^2\sqrt[3]{x^3-4}\,dx$ using substitution, which of the following substitutions should be used?

(a) $u = \sqrt[3]{x^3-4}$
(b) $u = x^2$
(c) $u = x^3 - 4$
(d) $x = \sqrt[3]{x}$

20. A 24 cm long wire is cut into two pieces, each of which is bent into a circular shape. If the ratio of the area of the circular regions is 4 to 1, what was the length of the shorter piece of wire?

(a) 4 cm
(b) 6 cm
(c) 8 cm
(d) 10 cm

Assessment Exam - Math 208

1. Evaluate $\lim_{x \to 7} \frac{\sqrt{x+9}-4}{x-7}$

   (a) 0

   (b) 1/8

   (c) 1

   (d) ∞

2. Find the equation of the tangent line to the graph of $x^2y^2 + 6x - 3 = 0$ at $(-1, 3)$

   (a) $y = 2x + 5$

   (b) $y = \frac{1}{2}x + \frac{7}{2}$

   (c) $y = 4x + 7$

   (d) $y = 2x - 5$

3. An open box is to be made from a 3-foot by 5-foot rectangular piece of material by cutting equal squares from each corner and turning up the sides. Find the volume of the largest box that can be made in this manner.

   (a) 5.2 cubic feet

   (b) 4.1 cubic feet

   (c) 7.5 cubic feet

   (d) 3.3 cubic feet

4. Find the area of the region bounded by $y = (x-1)^2 + 1$, the x–axis, $x = 2$, and $x = -1$.

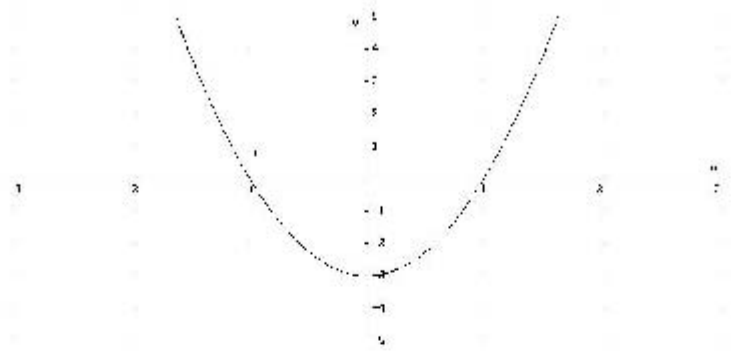
   (a) 6

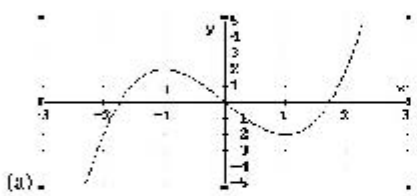
   (b) 7

   (c) -6

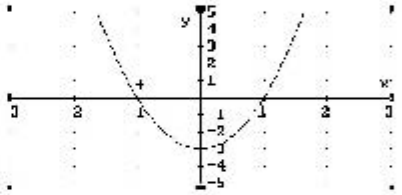
   (d) $\frac{9}{2}$

5. The graph of $f'(x)$ is given. Which of the following graphs represents the graph of $f(x)$?



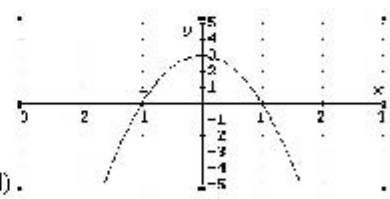


(a)



(b)

(c)



(d)

6. Using integration by parts, $\int (\ln x)^3 \, dx$ evaluates to:

(a) $\frac{1}{4}(\ln x)^4 + C$

(b) $x(\ln x)^3 - \int (\ln x)^2 \, dx$

(c) $x(\ln x)^3 - 3\int (\ln x)^2 \, dx$

(d) $3(\ln x)^2 + C$

7. If you were to use trigonometric substitution to integrate $\int \frac{\sqrt{x^2-4}}{x} dx$, what substitution would you use?

   (a) $x = 2\sec\theta,\ dx = 2\sec\theta\ d\theta$

   (b) $x = 2\sec\theta,\ dx = 2\sec\theta\tan\theta\ d\theta$

   (c) $x = 2\sin\theta,\ dx = 2\cos\theta\ d\theta$

   (d) $x = 2\tan\theta,\ dx = 2\sec^2\theta\ d\theta$

8. Find the volume of the solid generated by revolving the curve $y = \frac{1}{x}$, $1 \leq x < \infty$ around the x-axis.

   (a) 0

   (b) ∞

   (c) π

   (d) 2π

9. Which of the following integrals represents the volume of the solid formed by revolving the region bounded by the graphs of $y = x^3$, $y = 1$ and $x = 2$ about the line $x = 2$

   (a) $2\pi \int_1^8 (2-y)(\sqrt[3]{y} - 1)\ dy$

   (b) $\pi \int_1^2 [(x^3-1)^2 - 1^2]\ dx$

   (c) $\pi \int_1^8 [(\sqrt[3]{y})^2 - 1^2]\ dy$

   (d) $2\pi \int_1^2 (2-x)(x^3-1)\ dx$

10. A ball is dropped from a height of 24 feet. Each time, it drops h feet, it rebounds $\frac{2}{3}h$ feet. Find the total distance travelled by the ball before coming to rest.

    (a) 72 feet

    (b) 144 feet

    (c) 120 feet

    (d) 84 feet

11. Which of the following integrals represents the area of one leaf of $r = 4\sin(5\theta)$?

(a) $4\int_0^{\pi} \sin(5\theta)\, d\theta$

(b) $8\int_0^{\pi} \sin^2(5\theta)\, d\theta$

(c) $4\int_0^{\pi/5} \sin(5\theta)\, d\theta$

(d) $8\int_0^{\pi/5} \sin^2(5\theta)\, d\theta$

12. Find the interval of convergence of the series $\sum_{n=1}^{\infty} \frac{(-1)^n(x-2)^n}{n}$.

(a) (1, 3)

(b) (1, 3]

(c) [1, 3)

(d) [1, 3]

13. A baseball is hit 4 feet above ground at 80 feet per second at an angle of $\pi/3$ with respect to the horizontal. How high did it go?

(a) 75 feet

(b) 154 feet

(c) 79 feet

(d) $75\sqrt{3}$ feet

14. Find the absolute minimum of the function $f(x, y) = x^2 - xy + 3y^2 + 11x - 6$.

(a) -6

(b) 8

(c) -86

(d) -39

15. 1. Set $x = 3$
    2. Loop on k from 1 to 4, increasing by 1 each time.
       (i). If $k = 1$ or $k = 3$, then $x = x + k$
       (ii). If $k = 2$, then $x = x + 2k$
       (iii). If $k = 4$, then $x = x + 4k$
    3. Output x

    (a) 3

    (b) 13

    (c) 19

    (d) 27

16. In a survey of 370 college students, it is found that 64 like brussel sprouts, 94 like broccoli, 58 like cauliflower, 26 like both brussel sprouts and broccoli, 28 like both brussel sprouts and cauliflower, 22 like both broccoli and cauliflower, and 14 like all three vegetables. How many of the 370 students do not like any of these vegetables?

    (a) 216

    (b) 64

    (c) 154

    (d) 92

17. Matrix A is given. Which of the following vectors are eigenvectors of A?

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 2 & -5 & 4 \end{bmatrix}$$

$$u = \begin{bmatrix} 2 \\ 2 \\ 2 \end{bmatrix} \quad v = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \quad w = \begin{bmatrix} 1 \\ 2 \\ 4 \end{bmatrix}$$

    (a) u only.

    (b) v only.

    (c) u and w only.

    (d) v and w only.

19. Find the fourth degree Taylor polynomial centered at $c = 3$ for the function $f(x) = \ln(x-2)$

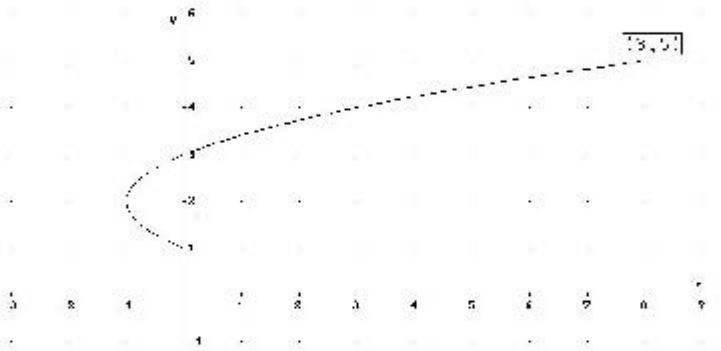
(a) $1 + x - \dfrac{x^2}{2} + \dfrac{x^3}{3} + \dfrac{x^4}{4}$

(b) $(x+3) - \dfrac{(x+3)^2}{2!} + \dfrac{(x+3)^3}{3!} - \dfrac{(x+3)^4}{4!}$

(c) $(x-3) - \dfrac{(x-3)^2}{2!} + \dfrac{(x-3)^3}{3!} - \dfrac{(x-3)^4}{4!}$

(d) $(x-3) - \dfrac{(x-3)^2}{2} + \dfrac{(x-3)^3}{3} - \dfrac{(x-3)^4}{4}$

20. Find the parametric equations whose graph is shown.



(a) $x = \dfrac{t^2}{2}, \quad y = t+1, \quad 0 \le t \le 4$

(b) $x = t^2 - 2t, \quad y = t+1, \quad 0 \le t \le 4$

(c) $x = 2t, \quad y = t^2 - 3t + 1, \quad 0 \le t \le 4$

(d) $x = t+1, \quad y = \dfrac{t^2}{2}, \quad 0 \le t \le 4$

Assessment Exam - Math 408

1. Evaluate $\lim_{x \to 7} \dfrac{\sqrt{x+9}-4}{x-7}$

   (a) 0

   (b) 1/8

   (c) 1

   (d) ∞

2. Find the equation of the tangent line to the graph of $x^2y^2 + 6x - 3 = 0$ at $(-1, 3)$

   (a) $y = 2x + 5$

   (b) $y = \dfrac{1}{2}x + \dfrac{7}{2}$

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3. An open box is to be made from a 3-foot by 5-foot rectangular piece of material by cutting equal squares from each corner and turning up the sides. Find the volume of the largest box that can be made in this manner.

   (a) 5.2 cubic feet

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4. Find the area of the region bounded by $y = (x-1)^2 + 1$, the x–axis, $x = 2$, and $x = -1$.

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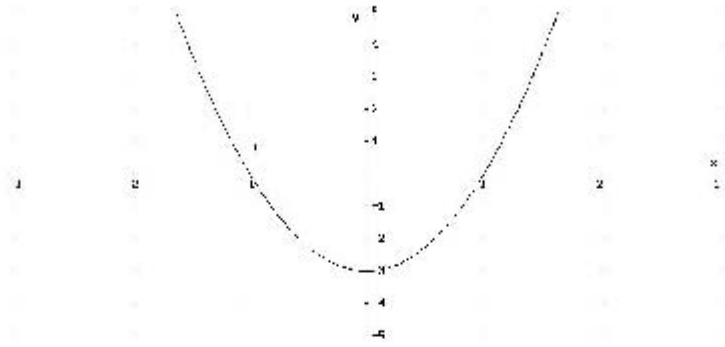

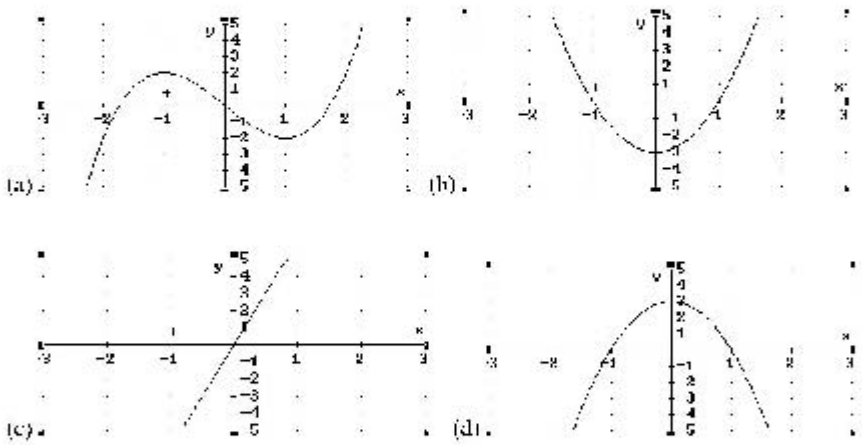

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(a) (1, 3)
(b) (1, 3]
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(d) [1, 3]

8. Find the absolute minimum of the function $f(x, y) = x^2 - xy + 3y^2 + 11x - 6$.

(a) -6
(b) 8
(c) -86
(d) -39

9. Reverse the order of integration of $\int_0^9 \int_0^{\sqrt{x}} f(x, y)\, dy\, dx$

(a) $\int_0^3 \int_0^{y^2} f(x, y)\, dx\, dy$
(b) $\int_0^9 \int_0^{y} f(x, y)\, dx\, dy$
(c) $\int_0^3 \int_{y^2}^{9} f(x, y)\, dx\, dy$
(d) $\int_0^3 \int_{y^2}^{3} f(x, y)\, dx\, dy$

10. Find the fourth degree Taylor polynomial centered at $c = 3$ for the function $f(x) = \ln(x - 2)$

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(d) $(x-3) - \frac{(x-3)^2}{2} + \frac{(x-3)^3}{3} - \frac{(x-3)^4}{4}$

11. A pyramid has a square base with sides of length a and lateral edges of length s. If the altitude of the pyramid is h, what is the value of h in terms of a and s?

(a) $\sqrt{\frac{s^2}{2}+\frac{a^2}{2}}$

(b) $\sqrt{s^2-\frac{a^2}{2}}$

(c) $\sqrt{s^2+\frac{a^2}{2}}$

(d) $\sqrt{s^2-a^2}$

12. In a Math class the following grading scheme is used to determine the course grade: Three tests count 60%, quizzes count 10%, and the final exam counts 30%. Thomas has test scores of 93,82, and 89, and a quiz average of 88. What does Thomas need on the final exam to have a 90% course grade?

(a) 92

(b) 90

(c) 95

(d) 88

13. A rabbit is hopping around in a fenced-off circular pen of radius 25 feet. If the position of the rabbit is uniformly random throughout the pen, what is the probability that the rabbit is 5 feet or more away from the fence at any given time?

(a) 0.64

(b) 0.75

(c) 0.80

(d) 0.90

14. Consider the set S of 2×2 matrices, all of whose entries are nonzero real numbers. Which of the following properties is satisfied by S under matrix multiplication?
I. S is closed.
II. S is commutative.
III. S contains an identity.

(a) None

(b) I only

(c) I and II only

(d) II and III only.

15. 1. Set $x = 3$
    2. Loop on k from 1 to 4, increasing by 1 each time.
       (i). If $k = 1$ or $k = 3$, then $x = x + k$
       (ii). If $k = 2$, then $x = x + 2k$
       (iii). If $k = 4$, then $x = x + 4k$
    3. Output x

    (a) 3

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$$u = \begin{bmatrix} 2 \\ 2 \\ 2 \end{bmatrix} \quad v = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \quad w = \begin{bmatrix} 1 \\ 2 \\ 4 \end{bmatrix}$$

    (a) u only.

    (b) v only.

    (c) u and w only.

    (d) v and w only.

18. Which of the following sets of vectors are linearly independent?
I. $\{(1,-2,1),\ (0,1,1),\ (0,0,0)\}$
II. $\{(1,-2,1),\ (0,1,1),\ (-2,4,-2)\}$
III. $\{(1,0,0),\ (1,1,1),\ (0,0,3),(3,-15,5)\}$

(a) None.

(b) I only.

(c) II and III only.

(d) II only.

19. A tank originally contains 600 gal of fresh water. Then water containing 2 lb of salt per gallon is poured into the tank at a rate of 3 gal/min, and the mixture is allowed to leave at the same rate. Which of the following initial value problems models the amount of salt in the tank $Q(t)$ at any time t?

(a) $\dfrac{dQ}{dt} + \dfrac{Q}{200} = 6,\ Q(0) = 0$

(b) $\dfrac{dQ}{dt} + \dfrac{Q}{200} = 3,\ Q(0) = 0$

(c) $\dfrac{dQ}{dt} + \dfrac{Q}{600} = 6,\ Q(0) = 0$

(d) $\dfrac{dQ}{dt} + \dfrac{Q}{600} = 3,\ Q(0) = 0$

20. Let G be a group with elements a, b, c, and d. A partial multiplication table for G is given. Complete the last row of the table.

$\cdot$	a	b	c	d
a	a	b	c	d
b	b	a		
c	c		a	
d	d			

(a) $d\ a\ b\ c$

(b) $d\ d\ d\ d$

(c) $d\ b\ c\ a$

(d) $d\ c\ b\ a$

Exhibit 2 – Mathematics Curriculum Sheets with new General Education Curriculum

Degree Program: B.S. in Mathematics – Applied Option	Total number of credit hours required for graduation: 120
Professional society that may have influenced the program offering and requirements:	

Courses Required in Major (by course number and title)	Hours	Additional Credit Required in Major	Hours	Courses Required in Related Fields	Hours	Courses Required in General Education and Elective Hours	Hours
MATH 205 – Discrete Mathematics	3	Any four of the following course:		CS 101 – Fund. Of Program.	3	First Year Experience	3
MATH 206 – Calculus I	4	MATH 300 – Geometry	3			Written Communication	6
MATH 207 – Calculus II	4	MATH 308 – Abstract Algebra	3	BIOL 120 – Fund. Of Biology	4	Oral Communication	3
MATH 208 – Calculus III	4	MATH 309 – History of Math	3	BIOL 121 – Biol. Diversity	4	Math	3
MATH 222 – Stats for Nat. Sci/Math	3	MATH 310 – Number Theory	3			Scientific Reasoning	3-4
MATH 307 – Linear Algebra	3	MATH 315 – Complex Variables	3	Or			
MATH 402 – Diff. Eq. I	3	MATH 401 – Vector Analysis	3			Arts	3
MATH 404 – Numerical Analysis	3	MATH 403 – Intro to Probability	3	CHEM 105 – Chemistry I	3	Humanities	3
MATH 408 – Senior Seminar	2	MATH 405 – Diff. Eq II	3	CHEM 106 – Chemistry II	3	Natural Sciences	3-4
		MATH 406 – Math. Statistics	3	CHEM 107 – Chem. Lab I	2	Social Science	3
		MATH 407 – Topology	3	CHEM 108 – Chem. Lab ii	2	International Perspectives	3
		MATH 409 – Advanced Calculus I	3			Histories	3
		MATH 410 – Advanced Calculus II	3	Or		Wellness	2
						Free Elective	24- 32
				PHY 231 – Physics I	4		
				PHY 232 – Physics II	4		
Total Required Major Hours:	**29**	Total Additional Major Hours:	**12**	Total Cognate Hours:	**11-13**	Total Gen. Ed. / Elective Hours:	**64-70**

Note:

Degree Program: B.S. in Mathematics – Classical Option	Total number of credit hours required for graduation: 120
Professional society that may have influenced the program offering and requirements:	

Courses Required in Major (by course number and title)	Hours	Additional Credit Required in Major	Hours	Courses Required in Related Fields	Hours	Courses Required in General Education and Elective Hours	Hours
MATH 205 – Discrete Mathematics	3	Any four of the following course:		CS 101 – Fund. Of Program.	3	First Year Experience	3
MATH 206 – Calculus I	4	MATH 300 – Geometry	3			Written Communication	6
MATH 207 – Calculus II	4	MATH 309 – History of Math	3	BIOL 120 – Fund. Of Biology	4	Oral Communication	3
MATH 208 – Calculus III	4	MATH 310 – Number Theory	3	BIOL 121 – Biol. Diversity	4	Math	3
MATH 222 – Stats for Nat. Sci/Math	3	MATH 315 – Complex Variables	3			Scientific Reasoning	3-4
MATH 307 – Linear Algebra	3	MATH 401 – Vector Analysis	3	Or			
MATH 308 – Abstract Algebra	3	MATH 403 – Intro to Probability	3			Arts	3
MATH 402 – Diff. Eq. I	3	MATH 404 – Numerical Analysis	3	CHEM 105 – Chemistry I	3	Humanities	3
MATH 408 – Senior Seminar	2	MATH 405 – Diff. Eq II	3	CHEM 106 – Chemistry II	3	Natural Sciences	3-4
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		MATH 407 – Topology	3	CHEM 108 – Chem. Lab ii	2	International Perspectives	3
		MATH 409 – Advanced Calculus I	3			Histories	3
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Total Required Major Hours:	**29**	Total Additional Major Hours:	**12**	Total Cognate Hours:	**11-13**	Total Gen. Ed. / Elective Hours:	**64-70**

Note:

PROGRAM REVIEW Committee
Committee Recommendation Form

2016/2017

Program: Bachelor of Science in Computer Science **Date:** November 11, 2016

Type of Review: X Comprehensive Self-Study
Follow-Up / Progress Report

Recommendation to the Board of Governors:

1. Continuation of the program at the current level of activity without specific action as described in the Rationale section of this Form;

2. Continuation of the program at a reduced level of activity (e.g., reducing the range of optional tracks, merging programs, etc.) or other corrective action as described in the Rationale section;

x 3. Identification of the program for further development (e.g., providing additional institutional commitment);

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

5. Discontinuance of the Program according the provisions of Higher Education Policy Commission (Section 8.1, Series 11, Title 133)

6. Other. Specify.

Rationale for Recommendation:

The Program Review Committee recommends the Bachelor of Science in Computer Science be continued at the current level of activity.

The program has a number of strengths. The annual average number of majors has been increasing over the review period. The program's curriculum gives students a strong foundation in computer science from which to launch their careers or to leverage toward additional academic ambitions including graduate school.

A weakness of the program is that there is only one faculty member devoted to the program. This is holding back growth because it means the program cannot meet student demand for major courses.

The program has a comprehensive assessment program with data that will provide information to improve the program. Therefore, at this time, no follow-up is recommended.

Place a check if additional sheet(s) attached ☐

Signature of Committee Chairperson

_____

West Virginia State University

Comprehensive Program Review

for

Bachelor of Science
In Computer Science

Submitted to

The Program Review Committee

Fall 2011-Spring 2016

TABLE OF CONTENTS

TABLE OF CONTENTS

SECTION I: PROGRAM DESCRIPTION

A. Program Purpose Statement

This program will teach students about object-oriented and procedural programming techniques, data structures and database management, operating systems and distributed computing in order to provide them with a fundamental understanding of those concepts of computer science which will enable them to adapt to a function in any current computing environment.

This degree is designed as a liberal arts computer science program rather than a job training program. Hence, principles of computer science are emphasized over learning skills with a goal of certification.

B. Program Outcomes

1. Demonstrate conceptual understanding of the fundamentals of computer science.
2. Develop software to solve real-world problems and evaluate its efficacy.
3. Document software using appropriate symbols and terminology.
4. Use standard software design techniques to create efficient programs with easy-to-understand source code.
5. Evaluate software for its suitability and validity.
6. Demonstrate an understanding of the major branches of computing and the underlying connections between them.

C. Consistency with University Mission

The values of WVSU as outlined in its Mission Statement are reflected in this program in a number of ways:

- "academic excellence" – computer science students follow a rigorous program of study and are held to high standards. The curriculum is designed to give students a solid foundation in computer science. Many classes include hands-on projects. The assessment plan (see Appendix II-E) shows the department expects students to have reached the "Mastered" level in regards to the Program Learning Outcomes by the time they graduate.;
- "a core of student learning that includes effective communication, understanding and analysis of the interconnections of knowledge and responsibility for one's own learning" – many courses in the curriculum emphasize proper documentation. In particular, the Senior Seminar course (CS 408) focuses on various ways to communicate important material in computer science. Furthermore, that course helps the students see the connections between the various areas of the discipline.
- "lifelong growth, development, and achievement of our students" – Students learn the foundational skills in computer science which will enable them to continue on to more advanced levels in the field. Upper-level courses often require students to complete projects, which may entail individual study or research, thus preparing them for lifelong learning.

D. Previous Reviews and Corrective Actions

The previous review recommended continuing the program at the current level of support and required further development of the assessment plan for the program. This has been done (see Appendix II-E).

SECTION II: ADEQUACY

A. Curriculum

The major courses begin with CS 101, an introduction to programming using a procedural language. This is followed by CS 102, an introduction to object-oriented programming. In the sophomore year, students take courses in databases (CS 230), data communications and networking (CS 240), data structures (CS 250), and operating systems (CS 210). For junior and senior level courses, the student must take a course in the theory of object-oriented programming (CS 311), a course in scripting languages (CS 336), a course in algorithms (CS 405) and Senior Seminar (CS 408), plus select four other upper division CS courses, which may include software engineering (CS 309), GUI programming (CS 365), systems administration (CS 410), numerical analysis (MATH 404), theory of computing (CS 415), computer architecture and assembly language programming (CS 310), compiler design (CS 425), embedded systems (CS 445), or an upper-level special topics course. For cognates, students take one laboratory science course and several mathematics courses: Calculus I (MATH 206), Calculus II (MATH 207), Discrete Mathematics (MATH 205), Statistics (MATH 222) and Linear Algebra (MATH 307). Free electives and the usual general education courses complete the program.

B. Faculty

The Department of Mathematics and Computer Science currently has just one faculty member who has a terminal degree in computer science. This faculty member teaches only computer science courses. He is up for tenure in AY 2016-2017. Three other members of the department, all with terminal degrees in mathematics but with extensive experience working with computers, also teach computer science courses, possible up to 50% of his or her teaching load. All three of these faculty are tenured. Finally, one term instructor, who has a B.S. in Computer Science and a Master's in Mathematics Education and who worked a number of years as a programmer, teaches the introductory computer science courses. No adjunct instructors were employed by the program during the review period.

C. Students

1. Entrance Standards:

The B.S. in Computer Science program has no formal standards for admittance. In general, WVSU students may self-declare as Computer Science Majors. However, in practice, students will need to be eligible for Math 120 (College Algebra) or its equivalent before taking any major courses.

2. Entrance Abilities:

The following tables compare mean ACT Mathematics scores and mean High School GPAs for first-time freshman at WVSU during the review period.

Table 1: Average ACT Math Scores at WVSU, 2011-2015

	WVSU				
	2011	2012	2013	2014	2015
ACT Math	18.6	18.1	18.5	18.5	18.8
GPA	3.05	3.03	3.03	3.05	3.08

Table 2: Average ACT Math Scores for CS Majors, 2011-2015

	CS Program				
	2011	2012	2013	2014	2015
ACT Math	18.4	21.6	19.9	21.5	21.6
GPA	2.9	3.1	2.8	3.3	2.8

As the data show, the average freshman computer science major at WVSU is ready to start the major courses, since an ACT Math score of 21 would make them eligible for College Algebra (MATH 120). Overall, the average computer science major is better prepared for college and hence more likely to graduate on time than the average WVSU student.

3. Exit Abilities:

Computer Science majors neither take national proficiency exams nor include a field placement in their program. Hence, no external measure of their abilities is available. The assessment program (see Appendix II-E) provides an internal measure of graduates' abilities, but for comparison across the university, the only measure of exit abilities available is final GPA for graduates:

Table 3: Average Graduate GPA, 2011-2016

	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
WVSU	3.0	3.0	3.1	3.1	3.1
Math	n/a	n/a	n/a	3.1	3.4

As the data show, graduates in Computer Science tend to have similar or slightly better GPAs than the average WVSU graduate.

4. Graduates:

Information about job or graduate school placement is purely anecdotal, since no formal departmental survey is administered. However, it is known that the two 2014 graduates are employed by the WV Department of Environmental Protection as programmers.

D. Resources

1. Financial

For the most part, the department has the usual funding for personnel and supplies. The Computer Science program is also funded directly by the computer science course fee, which supports computer classrooms used by the Computer Science program and is also used to purchase equipment needed for hands-on instruction in some courses. The computer science course fee brings in about $5,000 per year. The fee was first implement during AY 2014-2015. Finally, in 2015-2016, the Computer Science program received a $50,000 grant from the Apple/Thurgood Marshall College Fund which has been used for equipment purchases, student scholarships and student research support.

2. Facilities

The program oversees several computer classrooms and labs. 431 Wallace contains 28 PCs running Linux and is the primary classroom for the Computer Science program. 733 Wallace contains 30 PCs running Windows 7 and is primarily used for developmental mathematics courses, but Math 222 (a cognate course for computer science) is usually scheduled in there. 723 Wallace has 30 PCs, some running Windows 7 or Windows XP, others running Linux. It's an open computer lab, the computers have software installed to support both the Mathematics program and the Computer Science program. 830 Wallace has 21 PCs running Windows XP. A few computer science courses in the program are scheduled in this room. The program also occasionally uses the non-computer classroom 831 Wallace for classes.

E. Program-Level Assessment

1. Assessment Procedures

The B.S. in Computer Science does program-level assessment at three points: at the end of CS 102, at the end of CS 250 and at the end of CS 408. At all three points, multiple-choice exams developed by the department are used as the main assessment instrument (a different exam at each level, though with some carryover of individual questions). In CS 408, students also write a major paper, give a presentation, and submit a portfolio of work from their major courses, and these are used as part of the program assessment. See Appendix II-E for details.

Data from these instruments is initially analyzed using computer programs created by a faculty member of the department (see Appendix II-E for copies of the output). The results are then analyzed and discussed by the department's Assessment Committee, then further discussed by the entire department.

2. Use of Assessment Data: Learning-Teaching-Curriculum

During the review period, the major use of the assessment data has been to improve and refine the assessment instruments and process. However, the data collected does show that students abilities with respect to the Program

Learning Objectives are developing in the manner we expected as they progress through the program. No major changes to the curriculum are expected, though we expect some changes in emphasis in course-level instruction, particularly in regards to PLO 5, which the data from the third instrument seems to indicate is in need of improvement. To be more precise, the mastery level of the students in regards to PLO 3 (which relates to documenting software) was progressing appropriately. On the other hand, the results for PLO 5 (evaluating software for its suitability and validity) are more mixed. Students seem to have some understanding of how to appropriately test software, but are struggling with the idea of program validity. Furthermore, program suitability is currently lacking a home in the curriculum. Greater emphasis of program suitability will be added to a number of courses, particularly. CS 250 in regards to suitability of data structures and some of the programming courses in regards to empirical computational efficiency.

3. Graduate Satisfaction

No data available.

F. Advisory Committee(s)

The advisory committee was inactive during the review period

G. Program Strengths and Weaknesses

The major strength of the program is the diverse set of course offerings in the program, which expose the student to most important areas of computer science. This, in fact, is what distinguishes this program from an associate degree program or technical training program. In those programs, students learn specific technical skills and, perhaps, gain official certification in those skills. Our students do learn those skills, but more importantly, they learn the concepts behind those skills, and thus are able to generalize them to new situations. Hence, rather than being limited to just one particular job in computer science, they will have the knowledge and abilities to enter into work in many different areas of computer science or to progress onto graduate school to deepen their understanding of the field.

A second strength is the growing number of majors in the program, which allows the program to regularly offer the upper-division courses, thus enabling students to graduate from the program in a timely manner. (See Appendix III-A for more details.)

SECTION III: VIABILITY

A. Program Enrollment

On the whole, as Appendix III-A shows, the number of computer science majors has been increasing through most of the review period, from a low of 32 in 2012-2013 to 55 in 2015-2016. This increase probably reflects the strong career prospects for graduates in computer science as well as interest by students in the field due to the large role computers now play in modern society.

B. Course Enrollment

Appendix III-B shows an increase in enrollment over the review period for most courses in the program. Particularly significant is the increase in enrollment in sophomore-level courses, as this indicates students are having more success in the introductory courses in the major. The increase in enrollment in upper-level courses is also noteworthy, as this will lead to an increasing number of graduates in the near future. One final result from the data is the increasing number of upper-level courses which have a high enough enrollment to be offered.

C. Enrollment Projections

Based on the numbers in Appendix III-A, one might expect the number of majors to continue to grow over the next five years to a level of about 90-100 students. A more conservative estimate would be that the number of majors would continue to increase and then stabilize at about 75 students. This last estimate is based on the low-level of resources devoted to the program, particularly the one faculty member in the program, which impedes recruiting and other activities which would grow the program.

D. Cost Analysis

The Departmental Cost of Instruction (DCI) encompasses two components: (1) departmental cost to offer the major and (2) departmental cost to offer courses in the department. To determine the departmental cost to offer the major, calculations were conducted to generate the program cost per graduate and the cost per student in the major. In this cost analysis we only considered salaries, including fringe benefits.

$$\text{cost per student in major} = \frac{\text{2015 - 2016 program faculty salary}}{\text{Average number of majors 2011 - 2016}}$$

$$\text{cost per graduate} = \frac{\text{2015 - 2016 program faculty salary}}{\text{Average number of graduates 2011 - 2016}}$$

The total salary including fringe benefits for Computer Science faculty during the 2015–2016 year of the review period was $33,176. Dividing by the average number of (unduplicated) majors in the degree program annually, which is 44.8, the *cost per major* is calculated to be $740.53. To calculate the program *cost per graduate*, the numerator remains the same but the denominator used is the average number of

annual program graduates for the 2011–2016 period, which was found to be 1; thus the Computer Science cost per graduate was determined to be $33,176.

$$\text{Cost of courses offered in the program} = \frac{\text{2015 - 2016 program faculty salary}}{\text{Average SCH produced by program 2011 - 2016}}$$

The cost of offering courses in the program for all students is calculated using the same numerator; the denominator is the average number of student credit hours produced for the academic years 2011–2016. Aggregating fall and spring terms, there was an average of 284.2 credit hours associated with courses taken by both majors and non-majors during this period. Based on these numbers, the *cost per credit hour* (CPCH) in the program is $116.73.

The Facilities and Administrative cost (non-instructional operational cost) is also computed the using total faculty compensation for 2015–2016; in calculating this value, it is multiplied by the federal indirect rate of 56.9% or .569, which is a measure that is used to determine the cost of operation for grant administration. The *Mathematics Facilities and Administrative cost* (non–instructional cost) is therefore $33,176 * 0.569 = $18,877.14.

It should be noted that the above are actually *departmental* costs, rather than *program* costs. A comparison of Appendix II-A with Appendix III-B shows that on the average, the department offers 16 courses in the major each academic year. At the standard faculty load of four courses per semester, this is equivalent to the program using two faculty members. As there is only one faculty member teaching full-time (8 courses per year) in the B.S. in Computer Science program, the remaining courses are taught by Mathematics faculty in the department, of which there are eight. The total salary for the mathematics faculty is $455,379.90, so a reasonable approximation of mathematics faculty contribution to computer science salary costs would be $56,922.48 (one-eighth of the mathematics faculty total salary), leading to an overall computer science program faculty salary of $90,098.48, and so cost per major is $2,011.13, cost per graduate is $90,098.48, cost per credit hour is $317.02 and Facilities & Administrative cost is $51,266.04.

E. Service Courses

The Department of Mathematics & Computer Science has a large service role for the university, but that is mostly with respect to mathematics courses. The B.S. in Computer Science program has much more restricted service role. The program making most use of computer science courses is the Management Information Systems option of the B.S. in Business Administration, which requires its students to take CS 101, CS 102, CS 230, CS 240 and CS 410. The B.S. in Mathematics program (both options) requires CS 101 as a cognate. See Appendix III-E for details.

F. Off-Campus Courses

No program course was offered off-campus during the review period, but the department is a major participant in the Early Enrollment program. CS 100, a computer literacy course has been offered several times in area high schools. See Appendix III-F for details.

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G. Articulation Agreements

During the review period, articulation with BridgeValley CTC (at the time, Kanawha Valley CTC) was discussed, but no agreement was reached. Hence, the program currently has no articulation agreements.

SECTION IV: NECESSITY

A. Similar Programs

WVU Institute of Technology offers a B.S. in Computer Science and a B.S. in Computer Engineering. The Computer Engineering program at WVU-IT focuses mostly on computer hardware, particularly digital design. The Computer Science program at WVU-IT more closely resembles WVSU's Computer Science program, but puts a greater emphasis on teaching programming and software engineering. Hence, it could be considered a more specialized degree that WVSU's. It should also be noted that with WVU-IT's move to Beckley, they will no longer be in the immediate service area of WVSU.

Marshall University also offers a B.S. in Computer Science. They approach the subject mainly from an engineering perspective. Software Engineering and related topics form a major thread in their curriculum, and so this degree more resembles the B.S. in Computer Science at WVU-IT than the B.S. in Computer Science at WVSU.

No other accredited institutions in the immediate service area of WVSU offer a B.S. in Computer Science.

B. Post-Program Placement

As mentioned above (Section II.C.4), the graduates from 2014 have found employment as computer programmers with the State of West Virginia.

Appendices

APPENDIX II-A: Curriculum

Degree Program: B.S. in Computer Science	Total number of credit hours required for graduation: 120
Professional society that may have influenced the program offering and requirements:	

Courses Required in Major (by course number and title)	Hours	Additional Credit Required in Major	Hours	Courses Required in Related Fields	Hours	Courses Required in General Education and Elective Hours	Hours
						NSM 101	1
CS 101 – Fund. Of Programming	3	Any four of the following course:		MATH 205 – Discrete Math.	3	GE 100	3
CS 102 – Object-Oriented Paradigm	3	CS 309 – Software Engineering	3	MATH 206 – Calculus I	4	GE 200	3
CS 210 – Operating Systems	3	CS 310 – Comp. Architecture	3	MATH 207 – Calculus II	4	HIST 201 or 201	3
CS 230 – Database Man. Systems	3	CS 335 – Systems Analysis	3	MATH 222 – Stats for Nat	3	International Perspectives	6
CS 240 – Data Comm. & Networking	3	CS 365 – GUI Programming	3	Sci.			
CS 250 – Data Struct. & Algorithms	3	CS 410 – Systems Administration	3	MATH 307 – Linear Algebra.	3	COMM 100	3
CS 311 – Object-Oriented Program.	3	CS 415 – Theory of Computing	3			ENGL 101 & 102	6
CS 336 – Scripting Languages	3	CS 425 – Compiler Design	3	BIOL 120 – Fund. Of Biology	4	Mathematics	3
CS 405 – Algorithms	3	CS 445 – Embedded Systems	3			HHP 122 or 157	2
CS 408 – Senior Seminar	2	MATH 404 – Numerical Analysis	3	Or			
						ENGL 150	3
				CHEM 105 – Chemistry I	3	Fine Arts	6
				CHEM 107 – Chem. Lab I	2	Natural Sciences	6-8
						American Traditions	3
				Or		Social Structures	3
				PHY 231 – Physics I	4	Free Elective	13- 17
Total Required Major Hours:	**29**	Total Additional Major Hours:	**12**	Total Cognate Hours:	**21-22**	Total Gen. Ed. / Elective Hours:	**64-70**

Note:

APPENDIX II-B: Faculty Data

(No more than TWO pages per faculty member)

Name: Michael R. Anderson	Rank: Professor
Status: ☒ Full-time ☐ Part-time ☐ Adjunct ☐ Graduate Asst.	Highest Degree Earned: Ph.D.
Degree Conferred by: Ohio State University	Date Degree Received: 1993
Area of Specialization: Mathematics	

Professional registration/licensure:	
Years of employment at present institution:	21
Years of employment in higher education:	23
Years of related experience outside higher education:	

To determine compatibility of credentials with assignment:

(A). List courses you taught in the last two years (fall and spring semesters) of the review period. If you participated in team-taught courses, indicate each of them and what percent of these courses you taught. For each course include year and semester taught, course number, course title, and enrollment.

YEAR / SEMESTER	COURSE NUMBER AND TITLE	ENROLLMENT
2014/Fall	Math 020 Fundamentals of Algebra	26
2014/Fall	Math 206 Analytic Geometry & Calculus I	15
2014/Fall	Math 307 Linear Algebra	10
2014/Fall	CS 408 Senior Seminar	2
2014/Fall	CS 410 Systems Adminsitration	2
2015/Spring	Math 121 Precalculus	13
2015/Spring	Math 207 Analytic Geometry & Calculus II	7
2015/Spring	Math 408 Senior Mathematics Seminar	5
2015/Spring	CS 210 Fundamentals of Operating Systems	7
2015/Fall	CS 408 Senior Seminar	5
2015/Fall	Math 205 Discrete Mathematics	20
2015/Fall	Math 307 Linear Algebra	8
2016/Spring	CS 210 Fundamentals of Operating Systems	11
2016/Spring	CS 410 Systems Adminstration	9
2016/Spring	Math 308 Introduction to Modern Abstract Algebra	5

(B). If degree is not in area of current assignment, explain:

In regards to the computer courses, I am mostly self-taught in regards to working with computers, but I have had three programming courses and one "theory of computing" course, along with programming experience dating back to the mid 1970s.

(C). Identify your professional development activities during the past five years.

1. Technical consultant for the West Virginia Clearinghouse for Workforce Education. The work involves database, website and systems administration.
2. Attendance at annual West Virginia Mathematical Association of Two-Year Colleges 2012-2016.

(D). List awards/honors (including invitations to speak in your area of expertise) or special recognitions in last five years.

(E). Indicate any other activities that have contributed to effective teaching.

(F). List professional books/papers published during the last five years.

(G). List externally funded research (grants and contracts) during the last five years.

APPENDIX II-B: Faculty Data

(No more than TWO pages per faculty member)

Name:	Ronald Baker	**Rank**	Professor
Status:	☒ Full-time ☐ Part-time ☐ Adjunct ☐ Graduate Asst.	**Highest Degree Earned:**	Ph.D.
Degree Conferred by:	The Ohio State University	**Date Degree Received:**	1975
Area of Specialization:	Mathematics		

Professional registration/licensure:	
Years of employment at present institution:	22
Years of employment in higher education:	33
Years of related experience outside higher education:	8

To determine compatibility of credentials with assignment:

(A). List courses you taught in the last two years (fall and spring semesters) of the review period. If you participated in team-taught courses, indicate each of them and what percent of these courses you taught. For each course include year and semester taught, course number, course title, and enrollment.

YEAR / SEMESTER	COURSE NUMBER AND TITLE	ENROLLMENT
2014/Fall	Math 121 Precalculus	24
2014/Fall	Math 205 Discrete Mathematics	17
2014/Fall	Math 300 Introduction to College Geometry	3
2014/Fall	CS 240 Data Communications & Networking	7
2015/Spring	Math 102 Plane Trigonometry	13
2015/Spring	Math 111 Mathematics for Liberal Arts	8
2015/Spring	Math 206 Analytic Geometry & Calculus I	17
2015/Spring	Math 402 Differential Equations I	3
2015/Fall	CS 240 Data Communications & Networking	14
2015/Fall	CS 405 Algorithms	9
2015/Fall	Math 207 Analytic Geometry & Calculus II	10
2015/Fall	Math 300 Introduction to College Geometry	6
2015/Fall	Math 315 Introduction to Complex Variables	1
2016/Spring	CS 250 Data Structures & Algorithms	11
2016/Spring	Math 111 Mathematics for Liberal Arts	26
2016/Spring	Math 121 Pre-Calculus	17
2016/Spring	Math 208 Analytic Geometry & Calculus III	6

(B). If degree is not in area of current assignment, explain:

(C). Identify your professional development activities during the past five years.

Founding Fellow of the Institute of Combinatory and Its Applications
Member of Mathematical Association of America and American Mathematical Society

(D). List awards/honors (including invitations to speak in your area of expertise) or special recognitions in last five years.

March 2012 – invited address "The search for Sporadic Elliptic Semiplanes" at WilsonFest,

(E). Indicate any other activities that have contributed to effective teaching.

Installed software to support various classes.

(F). List professional books/papers published during the last five years.

(G). List externally funded research (grants and contracts) during the last five years.

APPENDIX II-B: Faculty Data

(No more than TWO pages per faculty member)

Name: Karen A. Kail	Rank: Instructor
Status: ☒Full-time ☐ Part-time ☐ Adjunct ☐ Graduate Asst.	Highest Degree Earned: Masters
Degree Conferred by: Marshall University Graduate College	Date Degree Received: May 2004
Area of Specialization: Math Education	

Professional registration/licensure:	
Years of employment at present institution:	1
Years of employment in higher education:	1
Years of related experience outside higher education:	11

To determine compatibility of credentials with assignment:

(A). List courses you taught in the last two years (fall and spring semesters) of the review period. If you participated in team-taught courses, indicate each of them and what percent of these courses you taught. For each course include year and semester taught, course number, course title, and enrollment.

YEAR / SEMESTER	COURSE NUMBER AND TITLE		ENROLLMENT
2014 / Fall	Math 020-06	Fundamentals of Algebra	22
2014 / Fall	Math 120-05	College Algebra	28
2015 / Spring	Math 020-05	Fundamentals of Algebra	24
2015 / Spring	Math 120-05	College Algebra	21
2015 / Fall	Math 020-08	Fundamentals of Algebra	25
2015 / Fall	Math 021-01, 02, and 03	Essentials of Algebra	64
2015 / Fall	Math 102-01	Plane Trigonometry	12
2015 / Fall	Math 103-01 and 02	Math Ed Problem Solving	42
2016 / Spring	CS 101-01	Programming Fundamentals	16
2016 / Spring	Math 020-06	Fundamentals of Algebra	23
2016 / Spring	Math 021-01, 02, and 03	Essentials of Algebra	27
2016 / Spring	Math 103-01	Math Ed Problem Solving	29
2016 / Spring	Math 104-01	Math Ed Algebra & Statistics	26
2016 / Spring	Math 120-02	College Algebra	22

(B). If degree is not in area of current assignment, explain: N/A

Has B.S. in Computer Science and worked several years as programmer

(C). Identify your professional development activities during the past five years.

Attended Math I Common Core Training
Attended Math II Common Core Training
Attended WVCTM Conference
Attended HEPC conference on Developmental Education

(D). List awards/honors (including invitations to speak in your area of expertise) or special recognitions in last five years.

(E). Indicate any other activities that have contributed to effective teaching.

(F). List professional books/papers published during the last five years.

(G). List externally funded research (grants and contracts) during the last five years.

APPENDIX II-B: Faculty Data

(No more than TWO pages per faculty member)

Name:	Carl Lebsack	**Rank**	Assistant Professor
Status:	X Full-time ☐ Part-time ☐ Adjunct ☐ Graduate Asst.	**Highest Degree Earned:**	Ph.D.
Degree Conferred by:	Iowa State University	**Date Degree Received:**	2008
Area of Specialization:	Computer Engineering		

Professional registration/licensure:	
Years of employment at present institution:	1
Years of employment in higher education:	5
Years of related experience outside higher education:	3

To determine compatibility of credentials with assignment:

(A). List courses you taught in the last two years (fall and spring semesters) of the review period. If you participated in team-taught courses, indicate each of them and what percent of these courses you taught. For each course include year and semester taught, course number, course title, and enrollment.

YEAR / SEMESTER	COURSE NUMBER AND TITLE	ENROLLMENT

(B). If degree is not in area of current assignment, explain:

(C). Identify your professional development activities during the past five years.

(D). List awards/honors (including invitations to speak in your area of expertise) or special recognitions in last five years.

US Patent 7,991,956 – Providing Application-Level Information for Use in Cache Management (granted August 2, 2011)

(E). Indicate any other activities that have contributed to effective teaching.

(F). List professional books/papers published during the last five years.

(G). List externally funded research (grants and contracts) during the last five years.

APPENDIX II-B: Faculty Data

(No more than TWO pages per faculty member)

Name: Linwei Niu	Rank: Associate Professor
Status: ☒ Full-time ☐ Part-time ☐ Adjunct ☐ Graduate Asst.	Highest Degree Earned: Ph.D.
Degree Conferred by: University of South Carolina	Date Degree Received: Dec 18, 2006
Area of Specialization: Computer Science and engineering	

Professional registration/licensure:	
Years of employment at present institution:	4
Years of employment in higher education:	10
Years of related experience outside higher education:	2

To determine compatibility of credentials with assignment:

(A). List courses you taught in the last two years (fall and spring semesters) of the review period. If you participated in team-taught courses, indicate each of them and what percent of these courses you taught. For each course include year and semester taught, course number, course title, and enrollment.

YEAR / SEMESTER	COURSE NUMBER AND TITLE	ENROLLMENT
2014/Fall	CS101 Programming Fundamentals	19
2014/Fall	CS102 The Object-Oriented Paradigm	5
2014/Fall	CS230 Data Base Management Systems	9
2014/Fall	CS310 Computer Arch & Assembly Lang	6
2015/Spring	CS101 Programming Fundamentals	17
2015/Spring	CS102 The Object-Oriented Paradigm	11
2015/Spring	CS250 Data Structures & Algorithms	4
2015/Spring	CS336 Scripting Languages	9
2015/Fall	CS101 Programming Fundamentals	19
2015/Fall	CS102 The Object-Oriented Paradigm	8
2015/Fall	CS230 Data Base Management Systems	12
2015/Fall	CS311 Object-Oriented Programming	6
2016/Spring	CS102 The Object-Oriented Paradigm	10
2016/Spring	CS311 Object-Oriented Programming	1
2016/Spring	CS365 Gui Programming	9
2016/Spring	CS336 Scripting Languages	10
2016/Spring	CS445 Embedded Systems	5

(B). If degree is not in area of current assignment, explain:

(C). Identify your professional development activities during the past five years.

- Attended the NSF/HBCU-UP Research Initiation Awards (RIA) Proposal Development Workshop held by QUALITY EDUCATION FOR MINORITIES (QEM) NETWORK at Baltimore, Maryland between August 14-15, 2015

(D). List awards/honors (including invitations to speak in your area of expertise) or special recognitions in last five years.

- WVSU PEER Award ($5000), from June 1, 2015 to April 31, 2016

(E). Indicate any other activities that have contributed to effective teaching.

(F). List professional books/papers published during the last five years.

Refereed Journal Papers
[1] Linwei Niu, Gang Quan, "Peripheral-Conscious Scheduling for Weakly Hard Real-Time Systems", International Journal of Embedded Systems, Volume 7, No. 1, page 11-25, 2015.

[2] Qiushi Han, Linwei Niu, Gang Quan, Shaolei Ren, Shangping Ren, "Energy efficient fault-tolerant earliest deadline first scheduling for hard real-time systems", Journal of Real-Time Systems: the International Journal of Time-Critical Computing Systems, Volume 50 Issue 5-6, pages 592-619, November, 2014

[3] Linwei Niu, "Power-Low Scheduling for Real-Time Embedded Systems with QoS Constraints", WIT Transactions on Engineering Sciences, Volume 87, page 389-395, 2014.

[4] Linwei Niu, "Energy-Efficient Scheduling for (m,k)-firm Real-Time Control Systems", International Journal of Automation and Power Engineering, Volume 3 Issue 1, page 28-31, January 2014

Refereed Conference Papers
[1] Tianyi Wang, Linwei Niu, Shaolei Ren and Gang Quan, "Multi-Core Fixed-Priority Scheduling of Real-Time Tasks with Statistical Deadline Guarantee", IEEE/ACM Design, Automation & Test in Europe Conference (DATE'15), Grenoble, France, March 9-13, 2015.

[2] Qiushi Han, Ming Fan, Linwei Niu and Gang Quan, "Energy Minimization for Fault Tolerant Scheduling of Periodic Fixed-Priority Applications on Multiprocessor Platforms", IEEE/ACM Design, Automation & Test in Europe Conference (DATE'15), Grenoble, France, March 9-13, 2015.

[3] Oswald, D., Wei Li, Linwei Niu, Jin Zhang, Yan Li, Jiangchen Yu and Fuchun Sun, "Implementation of fuzzy color extractor on NI myRIO embedded device", 2014 IEEE International Conference on Multisensor Fusion and Information Integration for Intelligent Systems (MFI'14), Beijing, China, Sep 28-30, 2014.

[4] Alemayehu Mengste, Linwei Niu, "Reducing (m, k)-missing rate for overloaded real-time systems", 33rd IEEE International Performance Computing and Communications Conference (IPCCC'14 Poster Session), Austin, Texas, U.S.A., Dec 5-7, 2014.

[5] Linwei Niu, "Low Power Scheduling for Embedded Real-Time Systems with Quality of Service Constraints", 3rd International Conference on Advanced Materials and Information Technology Processing (AMITP'13), Los Angeles, CA, U.S.A., Oct 1-2, 2013.

(G). List externally funded research (grants and contracts) during the last five years.

Assessment Plan for Computer Science

1. Program-Level Outcomes

The program-level outcomes (PLOs) for Computer Science are:

1. Demonstrate conceptual understanding of the fundamentals of computer science.
2. Develop software to solve real-world problems and evaluate its efficacy.
3. Document software using appropriate symbols and terminology.
4. Use standard software design techniques to create efficient programs with easy-to-understand source code.
5. Evaluate software for its suitability and validity.
6. Demonstrate an understanding of the major branches of computing and the underlying connections between them.

2. PLO Taxonomy

A classification of the PLOs according to Anderson's and Krauthwohl's revision of Bloom's taxonomy:

	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual	3	3	3			
Conceptual	1,6	1,6	2,6	2,4	2,4	2,4
Procedural			2,4	2,4	2,4,5	2,4
Metacognitive						

3. Curriculum Map

I = Introducing, D = Developing, M = Mastering

PLO	Required Courses									
	101	102	210	230	240	250	311	336	405	408
1	I	D	D	D	D	D	D	D	D	M
2	I	D					D	D	D	M
3	I	D					D	D		M
4	I	D				D	D			M
5	I	D				D	D	D	D	M
6	I	D	I	I	I	D	D	D	D	M

4. Timeline

Course	Tools	PLOs	Semester	Years
CS 102	Test 1	1, 3	Fall, Spring	Fall 2012-Spring 2016
CS 250	Test 2	1,3,5,6	Spring	Fall 2012-Spring 2016
CS 408	Test 3	1,3,5,6	Fall	Fall 2012-Spring 2016
	Paper, presentation	6		
	Portfolio	2,4,6		

5. Assessment Instruments

The computer science program will be assessed by three multiple choice/matching exams, the first to be administered at the end of CS 102, the second at the end of CS 250 and the third at the end of CS 408, plus a research paper and oral presentation during CS 408, plus a portfolio consisting of student projects from the major courses (submitted in CS 408).

The first test will assess PLOs in the following manner:

PLO	Questions
1	1-12
3	2, 5, 8, 10, 12

For a basic analysis of performance on the PLOs, the scores on the question blocks will be converted into ratings (Mastered = 4, Developed = 3, Emerging = 2, Inchoate = 1) like this:

PLO	Mastered	Developed	Emerging	Inchoate
1	10-12	7-9	4-6	0-3
3	4-5	3	2	0-1

The second test will assess PLOs in the following manner:

PLO	Questions
1	1-15
3	3, 4, 5, 6, 8, 9, 14, 15
5	7, 10, 11, 12, 13
6	7, 8, 12, 13

For a basic analysis of performance on the PLOs, the scores on the question blocks will be converted into ratings (Mastered = 4, Developed = 3, Emerging = 2, Inchoate = 1) like this:

PLO	Mastered	Developed	Emerging	Inchoate
1	12-15	8-11	4-7	0-3
3	6-8	4-5	2-3	0-1
5	4-5	3	2	0-1
6	4	3	2	0-1

The third test will assess PLOs in the following manner:

PLO	Questions
1	1-16
3	13
5	2, 10, 15, 16
6	7, 14

For a basic analysis of performance on the PLOs, the scores on the question blocks will be converted into ratings (Mastered = 4, Developed = 3, Emerging = 2, Inchoate = 1) like this:

PLO	Mastered	Developed	Emerging	Inchoate
1	13-16	9-12	5-8	0-4
3	1			0
5	4	3	2	0-1
6	2		1	0

The paper and presentation will assess PLO 6. A committee will determine the appropriate PLO ratings.

The portfolio will assess PLOs 2, 4 and 6. A committee will determine the appropriate PLO ratings.

The tests will be reviewed at the end of each program review cycle, but may be reviewed more frequently.

6. Data Collection

After the tests are administered, the answer sheets will be given to the department's assessment coordinator for entry into the database. For the paper and presentation and the portfolio, the ratings determined by the committee will be given to the assessment coordinator for entry into the database.

7. Data Analysis

Data analysis will be done by the entire department and will partly consist of considering students' performance on the PLOs both at the individual assessment points and throughout the program. More in-depth analysis of the data for each PLO will be done according to this four-year schedule (beginning spring 2015):

Year	PLOs
1	2, 4
2	3, 5
3	1, 6
4	Meta-analysis and resolution of problems

The data distributions that will be used for analysis are:
1. Number of students choosing each item on each question
2. Average overall rating for each PLO
3. Number of students in each category for each PLO

The standard analysis questions are:
1. Has the distribution of students shifted from the lower categories to the higher categories as students progress through the programs?
2. At a particular level, does the distribution match expectations?
   The basic expectations are:
   - Initial Assessment -- Majority of students are ``inchoate" or ``emerging".
   - Second Assessment -- Majority of students are ``emerging" with some ``developed".
   - Final Assessment -- Majority of students are ``developed" or ``mastered".
3. Instrument Analysis

Curriculum changes will be made if the analyses indicate they are needed.

Data-Test 1 Results

CS Assessment Test 1 (given in CS102)
PLO results by student

Term	PLO 1	PLO 3
Fall 2014	2	3
Fall 2014	1	2
Fall 2014	3	2
Fall 2014	3	4
Fall 2014	2	2
Average:	2.2	2.6

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	1	2	2	0
PLO 3	0	3	1	1

CS Assessment Test 1 (given in CS102)
PLO results by student

Term	PLO 1	PLO 3
Spring 2015	2	4
Spring 2015	2	4
Spring 2015	3	4
Spring 2015	2	1
Spring 2015	3	3
Spring 2015	3	4
Spring 2015	1	3
Average:	2.29	3.29

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	1	3	3	0
PLO 3	1	0	2	4

CS Assessment Test 1 (given in CS102)
PLO results by student

Term	PLO 1	PLO 3
Fall 2015	2	4
Fall 2015	2	2
Fall 2015	2	4
Fall 2015	3	3
Fall 2015	2	2
Fall 2015	3	4
Average:	2.33	3.17

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	0	4	2	0
PLO 3	0	2	1	3

CS Assessment Test 1 (given in CS102)
PLO results by student

Term	PLO 1	PLO 3
Spring 2016	2	3
Spring 2016	2	3
Spring 2016	2	3
Spring 2016	4	4
Spring 2016	4	4
Spring 2016	3	4
Spring 2016	1	2
Spring 2016	3	4
Spring 2016	3	4
Average:	2.67	3.44

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	1	3	3	2
PLO 3	0	1	3	5

CS Assessment Test 2 (given in CS250)
PLO results by student

Term	PLO 1	PLO 3	PLO 5	PLO 6
Spring 2014	4	4	4	4
Spring 2014	4	4	4	4
Spring 2014	3	4	3	1
Average:	3.67	4	3.67	3

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	1	2	0	0
PLO 3	0	0	3	0
PLO 5	0	0	1	2
PLO 7 (6)	1	0	0	2

CS Assessment Test 2 (given in CS250)
PLO results by student

Term	PLO 1	PLO 3	PLO 5	PLO 6
Spring 2015	3	4	4	2
Spring 2015	3	4	4	3
Spring 2015	3	3	3	2
Average:	3	3.67	3.67	2.33

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	0	0	3	0
PLO 3	0	0	1	2
PLO 5	0	0	1	2
PLO 6	0	2	1	0

CS Assessment Test 2 (given in CS250)
PLO results by student

Term	PLO 1	PLO 3	PLO 5	PLO 6
Spring 2016	3	3	4	3
Spring 2016	3	3	3	3
Spring 2016	3	3	4	3
Spring 2016	3	3	4	2
Spring 2016	2	2	3	2
Spring 2016	2	3	2	1
Spring 2016	2	3	2	2
Spring 2016	2	2	2	1
Spring 2016	3	4	1	1
Average:	2.56	2.89	2.78	2

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	0	4	5	0
PLO 3	0	2	6	1
PLO 5	1	3	2	3
PLO 6	3	3	3	0

Data-Test 3 & Presentation Results

CS Assessment Test 3 (given in CS408)
PLO results by student

Term	PLO 1	PLO 3	PLO 5	PLO 6
Fall 2014	2	4	3	3
Fall 2014	2	4	3	4
Average:	2	4	3	3.5

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	0	2	0	0
PLO 3	0	0	0	2
PLO 5	0	0	2	0
PLO 6	0	0	1	1

CS Assessment Test 3 (given in CS408)
PLO results by student

Term	PLO 1	PLO 3	PLO 5	PLO 6
Fall 2015	3	4	4	3
Fall 2015	2	4	1	3
Fall 2015	2	4	2	4
Fall 2015	3	4	4	3
Average:	2.5	4	2.75	3.25

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 1	0	2	2	0
PLO 3	0	0	0	4
PLO 5	1	1	0	2
PLO 6	0	0	3	1

Presentation Results (given in CS 408)

PLO results by student

Term	PLO 6
Fall 2015	3
Fall 2015	2
Fall 2015	n/a
Fall 2015	n/a
Average:	2.5

Distribution by student of PLO results

	Inchoate	Emerging	Developed	Mastered
PLO 6	0	1	1	0

APPENDIX III-A: Program Enrollment Data

Academic Year	Number of Majors	Number of Graduates
2011-2012	59	0
2012-2013	32	0
2013-2014	36	0
2014-2015	42	2
2015-2016	55	3

APPENDIX III-B: Course Enrollment Data

Course	Academic Year	No. of Sections	Credit Hours	Enrollment	C.H.P.
101	2011-2012	2	3	33	99
	2012-2013	4	3	42	126
	2013-2014	3	3	52	156
	2014-2015	2	3	36	108
	2015-2016	2	3	40	120
102	2011-2012	1	3	3	9
	2012-2013	1	3	9	27
	2013-2014	1	3	11	33
	2014-2015	2	3	16	48
	2015-2016	2	3	18	54
210	2011-2012				
	2012-2013	1	3	3	9
	2013-2014	1	3	4	12
	2014-2015	1	3	7	21
	2015-2016	1	3	11	33
230	2011-2012	1	3	4	12
	2012-2013	1	3	4	12
	2013-2014	1	3	6	18
	2014-2015	1	3	9	27
	2015-2016	1	3	12	36
240	2011-2012	1	3	5	15
	2012-2013	1	3	3	9
	2013-2014	1	3	6	18
	2014-2015	1	3	7	21
	2015-2016	1	3	14	42
250	2011-2012				
	2012-2013	1	3	4	12
	2013-2014	1	3	3	9
	2014-2015	1	3	4	12
	2015-2016	1	3	11	33
309	2011-2012				
	2012-2013				
	2013-2014				
	2014-2015	1	3	5	15
	2015-2016				
310	2011-2012				
	2012-2013				
	2013-2014				
	2014-2015	1	3	6	18
	2015-2016				
311	2011-2012				
	2012-2013				
	2013-2014	1	3	4	12
	2014-2015				
	2015-2016	2	3	7	21
336	2011-2012				
	2012-2013				

	2013-2014	1	3	5	15
	2014-2015	1	3	9	27
	2015-2016	1	3	9	27
365	2011-2012				
	2012-2013				
	2013-2014				
	2014-2015				
	2015-2016	1	3	10	30
405	2011-2012				
	2012-2013				
	2013-2014	1	3	4	12
	2014-2015				
	2015-2016	1	3	9	27
408	2011-2012				
	2012-2013				
	2013-2014				
	2014-2015	1	2	2	4
	2015-2016	1	2	5	10
410	2011-2012	1	3	3	9
	2012-2013				
	2013-2014	1	3	4	12
	2014-2015	1	3	2	6
	2015-2016	1	3	9	27
445	2011-2012				
	2012-2013				
	2013-2014	1	3	1	3
	2014-2015				
	2015-2016	1	3	5	15

APPENDIX III-E: Service Courses

Course	**Other Program**
101	Mathematics, Mathematics Education, Business (MIS option)
102	Mathematics, Business (MIS option)
230	Business (MIS option)
240	Business (MIS option)
410	Business (MIS option)

APPENDIX III-F: Off-Campus Courses

Course	**Enrollment**	**Location**	**Semester**
100	20	LAKNCC	Fall 2014
	14	SALMCC	Spring 2015
	4	SHERHS	Spring 2015
	2	SHERHS	Fall 2015
	30	SCOTHS	Fall 2015
	26	SCOTHS	Spring 2016
	10	SHERHS	Spring 2016

Exhibits

Assessment Test
(to be given in CS 102)

1. Find the value of x using the following algorithm:
   1. Set $x = 3$
   2. Loop on k from 1 to 4, increasing by 1 each time.
      (i). If $k = 1$ or $k = 3$, then $x = x + k$
      (ii). If $k = 2$, then $x = x + 2k$
      (iii). If $k = 4$, then $x = x + 4k$
   3. Output x

   (a) 3
   (b) 13
   (c) 19
   (d) 27

2. Consider the following program:

```
/* I  */
#include <iostream.h>

int main()
{
    /*  II  */
    float cel;
    float fahr;

    cout << "Please enter the fahrenheit temperature:  "; /* III  */
    cin >> fahr; /* IV  */
    cel = 5.0*(fahr-32)/9.0; /* V  */
    cout << "The celsius temperature is " << cel << endl; /* VI  */
    return 0;
}
```

Comments:

A. calculate the output value	D. declare the variables
B. a program to convert fahrenheit to celsius	E. prompt for user input
C. output the value	F. get the user input

The order in which comments A-F go in locations I-VI is

(a) B,D,F,E,A,C
(b) B,D,C,F,A,E
(c) B,D,E,F,A,C
(d) D,B,C,F,A,E

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3. Find the center of the circle whose equation is given by $x^2 + y^2 + 10x - 4y + 28 = 0$.

   (a) $(5, -2)$
   (b) $(5, 2)$
   (c) $(-5, 2)$
   (d) $(10, -4)$

4. Let $C = (5/9)(F - 32)$. Solve for F.

   (a) $(9/5)C - 32$
   (b) $(9/5)C + 32$
   (c) $(9/5)(C + 32)$
   (d) $(5/9)C + 32$

5. Consider the following code fragment.

```
int x, y;
cout << "Please enter an integer: ";
cin >> x;
if(x > 14)
{
    if(x < 57)
    {
        y = -1;
    }
    else
    {
        y=0;
    }
}
else
{
    y=1;
}
```

   Which set of integers used as possible inputs would cause all lines of code to be executed?

   (a) $\{1, 14, 15\}$
   (b) $\{14, 15, 57\}$
   (c) $\{14, 57, -2\}$
   (d) $\{14, 15, 16\}$

6. Solve $\log_2(x + 5) - \log_2(x - 5) = 2$

   (a) $x = 15$
   (b) $x = 25/3$
   (c) $x = -25/3$
   (d) $x = 2$

7. Classify the following system: $\begin{cases} 4x + 5y = 43 \\ 3x - 2y = 11 \end{cases}$

   (a) Consistent and independent

   (b) Inconsistent

   (c) Consistent and dependent

   (d) None of the above

8. Given the following code, how many member variables does class C have?

```
class A{
  int a;
  int go();
};

class B: public A{
  int b;
  int go();
}

class C: public A{
  int c;
  int d;
}
```

   (a) 2

   (b) 3

   (c) 4

   (d) 5

9. Consider the recursively-defined function $f(1) = 2$, $f(n) = n \cdot f(n-1) + 2$. Find $f(4)$.

   (a) 8

   (b) 82

   (c) 6

   (d) 26

10. Given the following overloaded function definitions, which pair are not allowed, if any?

```
I    void test();
II   void test(int a);
III  void test(double b);
IV   void test(int a, int b);
V    int test(int a, double b);
VI   double test(double a, int b);
VII  int test(int a, int b);
```

(a) Function overloading is never allowed

(b) All the above overloaded functions are allowed

(c) V and VII

(d) IV and VII

11. Let $f(x) = \dfrac{3}{4-5x}$. Find its inverse function $f^{-1}(x)$.

(a) $f^{-1}(x) = \dfrac{4-5x}{3}$

(b) $f^{-1}(x) = \dfrac{5x-4}{3}$

(c) $f^{-1}(x) = \dfrac{4x-3}{5x}$

(d) $f^{-1}(x) = \dfrac{3-4x}{5x}$

12. Which feature of Object-Oriented languages helps to provide protection of data from improper access operations?

(a) Inheritance

(b) Polymorphism

(c) Encapsulation

(d) Function overloading

Assessment Test
(to be given in CS 250)

1. Find the value of x using the following algorithm:

   1. Set $x = 3$
   2. Loop on k from 1 to 4, increasing by 1 each time.
      (i). If $k = 1$ or $k = 3$, then $x = x + k$
      (ii). If $k = 2$, then $x = x + 2k$
      (iii). If $k = 4$, then $x = x + 4k$
   3. Output x

   (a) 3
   (b) 13
   (c) 19
   (d) 27

2. In a survey of 370 college students, it is found that 64 like brussel sprouts, 94 like broccoli, 58 like cauliflower, 26 like both brussel sprouts and broccoli, 28 like both brussel sprouts and cauliflower, 22 like both broccoli and cauliflower, and 14 like all three vegetables. How many of the 370 students do not like any of these vegetables?

   (a) 216
   (b) 64
   (c) 154
   (d) 92

3. Evaluate the prefix expression: * / 6 + − 5 3 1 5

   (a) 0
   (b) 5
   (c) 10
   (d) 15

4. Which of the following would be the postfix representation of $(4 + 3) * 2$?

   (a) 4 3 2 + *
   (b) 4 3 + 2 *
   (c) 4 3 * 2 +
   (d) + 4 3 * 2

5. Consider the following program:

```
/* I  */
#include <iostream.h>

int main()
{
    /*  II  */
    float cel;
    float fahr;

    cout << "Please enter the fahrenheit temperature:  "; /* III  */
    cin >> fahr; /* IV  */
    cel = 5.0*(fahr-32)/9.0; /* V  */
    cout << "The celsius temperature is " << cel << endl; /* VI  */
    return 0;
}
```

Comments:

A. calculate the output value	D. declare the variables
B. a program to convert fahrenheit to celsius	E. prompt for user input
C. output the value	F. get the user input

The order in which comments A-F go in locations I-VI is

(a) B,D,F,E,A,C
(b) B,D,C,F,A,E
(c) B,D,E,F,A,C
(d) D,B,C,F,A,E

6. Which of the following data structures is tpically used to implement function calls?

(a) Array
(b) Linked list
(c) Binary tree
(d) Stack

7. Consider the following code fragment.

```
int x;
cout << "Please enter an integer: ";
cin >> x;
if(x > 14)
{
    if(x < 57)
    {
        y=-1;
    }
    else
    {
        y=0;
    }
}
else
{
    y=1;
}
```

Which set of integers used as possible inputs would cause all lines of code to be executed?

(a) $\{1, 14, 15\}$
(b) $\{14, 15, 57\}$
(c) $\{14, 57, -2\}$
(d) $\{14, 15, 16\}$

8. What is the first address in the subnet identified by 192.168.3.47/16?

(a) 192.168.3.0
(b) 192.168.3.47
(c) 192.168.0.0
(d) 192.168.0.1

9. What is the data structure used to support the relational database model?

(a) Binary tree
(b) Directed acyclic graph
(c) Hash Table
(d) Linked list

10. What is the time-complexity of the following code fragment to operate on a three-dimensional array?

```
for(int i = 0; i < n; i*=2)
    for(int j = 0; j < n; j*=3)
        for(int k = 0; k < n; k++)
            a[i][j][k] *= 2;
```

(a) $O(n^3)$
(b) $O(n^2)$
(c) $O(n)$
(d) $O(3n)$

11. What is the height of a balanced tree with n nodes?

(a) 5
(b) $\log_2(n)$
(c) $\frac{1}{2}\log_2(n)$
(d) $n/2$

12. According to entity-relation modeling, how is a many-to-many relationship represented in a relational database?

(a) As a row in a table
(b) As a "connecting" table containing two primary/foreign key relationships to two tables
(c) As a primary/foreign key relationship from one table to another
(d) As an index on a table

13. A given scheduling algorithm chosen by a particular operating system developer is not "fair". What problem can arise as a direct result of this deficiency?

(a) Starvation
(b) Deadlock
(c) Synchronization
(d) Hardware failure

14. Given the following code, how many member variables does class C have?

```
class A{
  public:
  int a;
  int go();
};

class B: public A{
  int b;
  int go();
}

class C: public A{
  int c;
  int d;
}
```

(a) 2

(b) 3

(c) 4

(d) 5

15. Which feature of Object-Oriented languages helps to provide protection of data from improper access operations?

(a) Inheritance

(b) Polymorphism

(c) Encapsulation

(d) Function overloading

Assessment Test
(to be given in CS 408)

1. Consider the expression $(p \wedge q) \rightarrow (\neg q \vee p)$. This expression is a

   (a) tautology

   (b) negation

   (c) contingency

   (d) contradiction

2. Find the value of x using this algorithm:

   1. Set $x = 3$
   2. Loop on k from 1 to 4, increasing by 1 each time.
      (i). If $k = 1$ or $k = 3$, then $x = x + k$
      (ii). If $k = 2$, then $x = x + 2k$
      (iii). If $k = 4$, then $x = x + 4k$
   3. Output x

   (a) 3

   (b) 13

   (c) 19

   (d) 27

3. In a survey of 370 college students, it is found that 64 like brussel sprouts, 94 like broccoli, 58 like cauliflower, 26 like both brussel sprouts and broccoli, 28 like both brussel sprouts and cauliflower, 22 like both broccoli and cauliflower, and 14 like all three vegetables. How many of the 370 students do not like any of these vegetables?

   (a) 216

   (b) 64

   (c) 154

   (d) 92

4. Evaluate the prefix expression: $* / 6 + - 5\ 3\ 1\ 5$

   (a) 0

   (b) 5

   (c) 10

   (d) 15

5. Matrix A is given. Which of the following vectors are eigenvectors of A?

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 2 & -5 & 4 \end{bmatrix}$$

$$u = \begin{bmatrix} 2 \\ 2 \\ 2 \end{bmatrix} \quad v = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \quad w = \begin{bmatrix} 1 \\ 2 \\ 4 \end{bmatrix}$$

(a) u only.

(b) v only.

(c) u and w only.

(d) v and w only.

6. Which of the following sets of vectors are linearly independent?
I. $\{(1,-2,1),\ (0,1,1),\ (0,0,0)\}$
II. $\{(1,-2,1),\ (0,1,1),\ (-2,4,-2)\}$
III. $\{(1,0,0),\ (1,1,1),\ (0,0,3),(3,-15,5)\}$

(a) None.

(b) I only.

(c) II and III only.

(d) II only.

7. Which of the following declares a variable that can use dynamic binding? (**Mammal** is a class, **Dog** is a subclass of **Mammal** that contains virtual methods.)

(a) Dog fido;

(b) Mammal fido;

(c) Mammal * fido = new Dog;

(d) None of the above.

8. Let $C(x)$ be the statement "x has passed the College Algebra" and let $T(x,y)$ be the statement "x has tutored y", where the domain of the variables x and y consist of all the students at WVSU. Which of the following propositions expresses the statement "Every student who has passed the College Algebra has been tutored by some other student".

(a) $\forall x \exists y\ (C(x) \rightarrow T(x,y))$

(b) $\exists x \forall y\ (C(x) \rightarrow T(x,y))$

(c) $\forall x \exists y\ (C(x) \rightarrow T(y,x))$

(d) $\exists x \forall y\ (C(x) \rightarrow T(y,x))$

9. Which of the following would be the postfix representation of $(4 + 3) * 2$?

   (a) 4 3 2 + *
   (b) 4 3 + 2 *
   (c) 4 3 * 2 +
   (d) + 4 3 * 2

10. Consider the following code fragment:

```
for ($i=1, $j=8; $i < 10, $j > 4 ; $i++, $j--) {
     $k = $i + $j; # line I
     $m = 1/(6-$k); # line II
     print "$m\n"; # line III
} # line IV
```

    A run-time error happens when this is executed. Where should code for exception handling be inserted?

    (a) Immediately after line I.
    (b) Immediately after line II.
    (c) Immediately after line III.
    (d) Immediately after line IV.

11. Let $F(x, y)$ be the statement "x runs faster than y" and let $L(x, y)$ be the statement "x likes y", where the domain of the variables x and y consist of all the students at WVSU. Which of the following propositions expresses the statement "Jenny does not like any student who runs faster than Jim."

    (a) $\forall x\ (F(x, Jim) \rightarrow \neg L(Jenny, x))$
    (b) $\forall x\ (\neg L(Jenny, x) \rightarrow F(x, Jim))$
    (c) $\neg(\forall x\ (F(x, Jim) \rightarrow L(Jenny, x)))$
    (d) $\neg(\forall x\ (L(Jenny, x) \rightarrow F(x, Jim)))$

12. What is the height of a balanced tree with n nodes?

    (a) 5
    (b) $\log_2(n)$
    (c) $\frac{1}{2}\log_2(n)$
    (d) $n/2$

13. Consider the following program:

```
/* I  */
#include <iostream.h>

int main()
{
    /*  II  */
    float cel;
    float fahr;

    cout << "Please enter the fahrenheit temperature:  "; /* III  */
    cin >> fahr; /* IV  */
    cel = 5.0*(fahr-32)/9.0; /* V  */
    cout << "The celsius temperature is " << cel << endl; /* VI  */
    return 0;
}
```

Comments:

A. calculate the output value	D. declare the variables
B. a program to convert fahrenheit to celsius	E. prompt for user input
C. output the value	F. get the user input

The order in which comments A-F go in locations I-VI is

(a) B,D,F,E,A,C
(b) B,D,C,F,A,E
(c) B,D,E,F,A,C
(d) D,B,C,F,A,E

14. Which of the following data structures is tpically used to implement function calls?

(a) Array
(b) Linked list
(c) Binary tree
(d) Stack

15. Consider the following code fragment.

```
int x;
cout << "Please enter an integer: ";
cin >> x;
if(x > 14)
{
    if(x < 57)
    {
        cout << "no" << endl;
    }
    else
    {
        cout << "yes" << endl;
    }
}
else
{
    cout << "maybe" << endl;
}
```

Which set of integers used as possible inputs would cause all lines of code to be executed?

(a) $\{1, 14, 15\}$

(b) $\{14, 15, 57\}$

(c) $\{14, 57, -2\}$

(d) $\{14, 15, 16\}$

16. What is the time-complexity of the following code fragment to operate on a three-dimensional array?

```
for(int i = 0; i < n; i*=2)
    for(int j = 0; j < n; j*=3)
        for(int k = 0; k < n; k++)
            a[i][j][k] *= 2;
```

(a) $O(n^3)$

(b) $O(n^2)$

(c) $O(n)$

(d) $O(3n)$

Exhibit 2: Computer Science Curriculum with New General Education Curriculum

Degree Program: B.S. in Computer Science	Total number of credit hours required for graduation: 120
Professional society that may have influenced the program offering and requirements:	

Courses Required in Major (by course number and title)	Hours	Additional Credit Required in Major	Hours	Courses Required in Related Fields	Hours	Courses Required in General Education and Elective Hours	Hours
						First Year Experience	3
CS 101 – Fund. Of Programming	3	Any four of the following course:		MATH 205 – Discrete Math.	3	Written Communication	6
CS 102 – Object-Oriented Paradigm	3	CS 309 – Software Engineering	3	MATH 206 – Calculus I	4	Oral Communication	3
CS 210 – Operating Systems	3	CS 310 – Comp. Architecture	3	MATH 207 – Calculus II	4	Math	3-4
CS 230 – Database Man. Systems	3	CS 335 – Systems Analysis	3	MATH 222 – Stats for Nat	3	Scientific Reasoning	3
CS 240 – Data Comm. & Networking	3	CS 365 – GUI Programming	3	Sci.			
CS 250 – Data Struct. & Algorithms	3	CS 410 – Systems Administration	3	MATH 307 – Linear Algebra.	3	Arts	3
CS 311 – Object-Oriented Program.	3	CS 415 – Theory of Computing	3			Humanities	3
CS 336 – Scripting Languages	3	CS 425 – Compiler Design	3	BIOL 120 – Fund. Of Biology	4	Natural Sciences	3-4
CS 405 – Algorithms	3	CS 445 – Embedded Systems	3			Social Science	3
CS 408 – Senior Seminar	2	Math 404 – Numerical Analysis	3	Or		International Perspectives	3
						Histories	3
				CHEM 105 – Chemistry I	3	Wellness	2
				CHEM 107 – Chem. Lab I	2		
						Free Elective	24- 32
				Or			
				PHY 231 – Physics I	4		
Total Required Major Hours:	**29**	Total Additional Major Hours:	**12**	Total Cognate Hours:	**21-22**	Total Gen. Ed. / Elective Hours:	**64-70**

Note: