Computer Science

Computer Science:

- Physical Sciences (Computer Science) PUR 2020-21 Self-Study

SI Section Templates: 1.A. Program or Unit Description, 1. B. Program or Unit Mission, 1.C. Program Learning Outcomes, 2.A. Progress on Previous Findings and Recommendations, 3. A. Technical Programs (AAS degrees and Certificates; Allied Health Programs only), 3.B. Transferability, 3.C. Student-centered Offerings, 3.D. Accessibility of Instructional Materials, 4.A. Curriculum Mapping, 4.B.1 Evidence of Program Learning Outcomes Assessment, 4.C. General Education Outcomes Assessment, 4.D. Five-year Course Assessment Cycle, 5.A. FTE, Section Count, Course Fill Rate, and Unsuccessful Enrollment Attempts, 5.B. Student Demographics: Ethnicity, Gender, Credit Load, Student Status, and Age Range, 6.A. Course Completion, 6.B. Graduation and Transfer, 7.A. Faculty Achievement, 7.B. FT/PT Faculty and Student Credit Hours Taught, 7.C. Support Staff, 7.D. Facilities and Technology, 8.A. Five Year Plan, 9.A. Resource Requests, Academic Standards and Assessment Committee Findings and Recommendations, Dean's Findings and Recommendations, Vice President of Academic Affairs' Findings and Recommendations

Date: 09-07-2022

Sorted by: Section

1.A. Program or Unit Description

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Briefly describe the program/unit, including but not limited to the following: academic division that the program/unit belongs to, the academic area(s) represented, degrees/certificates offered, average student enrollment, number of full-time faculty, type of curriculum or pedagogical approaches, and any other pertinent aspect of the program/unit.

The Computer Science (CS) program is included in the Physical Sciences Department within the Math and Physical Sciences Division. The CS program offers a 2-year transferable degree: the Associate of Science, Computer Science. There are 2 full-time faculty tied to the CS program; the Physical Sciences Department, as a whole, is composed of 9 full time faculty. Student enrollment in CS classes is approximately 250 students/semester. CS classes employ a variety of pedagogical approaches: lecture, lab, small group work, problem based learning, hybrid and as of mid-spring 2019 remote learning classes.

1.B. Program or Unit Mission

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State the department's or unit's mission. Describe how it aligns to the College's Mission, and how program learning outcomes (PLOs) for degrees and certificates offered, or for the unit, align to the department/unit mission. If your department or unit does not currently have a mission statement, please discuss among your colleagues and develop one.

The mission of the Physical Sciences Department is to provide students the basic principles of modern astronomy, physics, chemistry, computer science, environmental science, geology, geography, engineering and computer science in order to establish a foundation for those pursuing degrees in the natural sciences and engineering fields, as well as the prerequisite courses for students seeking degrees in biology and the allied health professions. As such, the Physical Sciences Department supports student success and academic excellence by offering college transfer courses in all areas, providing prerequisite classes for allied health and pre-professional programs, and supporting TMCC's general education requirements in the natural sciences.

1.C. Program Learning Outcomes

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Program Learning Outcomes (PSLOs or PLOs)
Computer Science
PSLO
Associate of Science, Computer Science
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution. (Active from Fall 2010)
PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem. (Active from Fall 2010)
PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal. (Active from Fall 2010)

2.A. Progress on Previous Findings and Recommendations

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Describe your progress on the major findings and recommendations for the program/unit from the last PUR, any annual progress reports (APRs), and if applicable, external reviews, (e.g. advisory boards, articulation committees, and program accreditors).

- **Which findings and recommendations have the program/unit addressed?**
- **Which have yet to be accomplished? Which are no longer relevant, and why?**
- **Has the program/unit undergone any major changes as a result or that would impact the findings and recommendations since the last PUR?**

The last CS PUR was completed as part of the Computer Technologies (CT) Department PUR in 2011. The CT PUR of 2011 was highly focused on non-transferable, technician training which was the main focus of the CT department at the time. Most of the findings and recommendations from the 2011 PUR did not apply to CS. There was little discussion of the CS program as a standalone program. It was noted that the CS program was growing and that a sustainable support network for student transfer between TMCC and UNR should be considered and a 2+2 articulation agreement was on the horizon. At that time Problem Based Learning (PBL) was be used in CS 135 and being integrated into CS 202. Problem based learning is still being utilized by one of the full time faculty and has been integrated into a self-paced modular format in CS 105. The 2011 PUR also indicated a local need for more classes on database programming and development for mobile devices.

The CS program migrated from the CT department to the Physical Sciences department around 2016. CS is now housed in a department where all science based programs lead to transfer programs at the university. As the Physical Sciences underwent a PUR in 2012, this is the first PUR completed for CS as part of the Physical Sciences department and its first evaluation as its own program.

3.A. Technical Programs (AAS degrees and Certificates; Allied Health Programs only)

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Describe how your program(s) are meeting labor market demands and industry curriculum needs by answering the accompanying questions. The following are potential resources for labor market data, though other sources may be referenced.
Nevada Department of Employment Training and Rehabilitation (DETR) (https://detr.nv.gov/)
Economic Development Authority of Western Nevada (EDAWN) (http://edawn.org/)
U.S. Bureau of Labor Statistics (http://www.bls.gov/)

- **What is the evidence for the regional need for the program (DETR and EDAWN data)?**
- **What is the evidence that program curriculum meets the latest industry trends or workforce needs?**

N/A

3.B. Transferability

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- **Which Bachelor's degrees(s), especially within the Nevada System of Higher Education, does the program's AA or AS degree(s) align?**
- **Does the AA or AS transfer seamlessly in a 2+2 agreement without a loss of credits or a substantial amount of courses counting only as general electives? Please reference the appropriate transfer agreement in the receiving institution’s catalog and explain.**

The AS, Computer Science aligns with the BS in Computer Science and Engineering (CSE) at UNR, but not seamlessly. The program provides students with beginning programming, theory, and mathematics courses needed for a BS degree at UNR. However, there are some issues with the transfer program, as noted below.

1. The first four semesters at UNR require 65 credits as compared to the current 60 credits at TMCC. The 60 credits for Associates degrees was mandated by the Board of Regents. It would benefit the program to petition for this credit limit to be increased to 62 for a more seamless

transfer. The four semester AS course offering scenario that aligns exactly with UNR's program is shown below.

2. Three courses in the first four semesters at UNR are 300-level courses: CS 365 (Mathematics of Computer Science), CPE 301 (Embedded Systems Design), and CS 302 (Data Structures). These courses are not currently offered at TMCC, but with the recent addition of 300-level courses to other AS degrees, these courses should be developed and implemented at TMCC.

3. A fourth course in the fourth semester, EE220 (Circuits 1), is not currently offered at TMCC. This course has a prerequisite of PHYS 181/181L, and would also benefit students in the AS, Engineering program who are planning on majoring in Electrical, Biomedical, Mechanical, and Materials Science Engineering as it is required by all of those programs. However, both Electrical and Biomedical Engineering require the laboratory portion of the course, EE220L, so this may require additional resources.

The proposed new Recommended Course Sequence is as follows:
Semester 1:
CS 135 - Computer Science I 3 Semester units: 16
ENG 101 - Composition I
or ENG 113 - Composition I for International Students 3
ENGR 100 - Introduction to Engineering Design 3
Math 181 - Calculus I 4
Diversity/Fine Arts* 3

Semester 2:
CS 202 - Computer Science II 3 Semester units: 17
CPE 201 - Digital Design 3
ENG 102 - Composition II
or ENG 114 - Composition II for International Students. 3
Math 182 - Calculus II 4
Physics 180 - Physics for Scientists and Engineers I & 180L 4

Semester 3:
CS 219 - Computer Organization 3 Semester units: 17
CS 302 - Data Structures 3
Math 283 - Calculus III 4
CH 201 - Ancient and Medieval Cultures
or CH 202 - The Modern World 3
Physics 181 - Physics for Scientists and Engineers II. & 181L 4

Semester 4: Semester units: 12
CS 365 - Mathematics of Computer Science 3
EE 220 - Circuits I 3
CH 203 - Am Experiences and Constitutional Change** 3
CPE 301 - Embedded Systems Design 3

Total Credits: 62

*Diversity/Fine Arts double dip
**CH203 double dips as U.S Constitution/Social Science requirements.

3.C. Student-centered Offerings

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- **Is the program Information In the catalog up-to-date?**
- **Does the program's suggested course sequence in the catalog allow for completion of degrees within 2 years and/or certificates within 2 semesters for full-time students? Is there a recommended sequence for part-time students?**
- **Describe how courses are scheduled and faculty teaching schedules are assigned. How does the department/unit schedule its course offerings in a student-centered manner that meets student demand and allows for efficient completion? How are teaching assignments determined so that they are equitable for faculty?**

The program information in the catalog is in need of updating. At UNR, CS 105 is no longer offered as a option to ENGR 100. TMCC was working on having CS 105 reinstated as a viable transfer course it previously was vetted as satisfying Silver Core requirements. Should this be unsuccessful, this class should be removed from the program of study. The class is still used by the CT department programs so should continue to be offered.

The CS program can be improved to the benefit of the TMCC CS student through the addition of new classes now that TMCC is able to teach 300 level courses. The suggested course sequence in the catalog does allow for completion of the CS degree in 2 years. This will hold true with the newly proposed sequence as well. There is not a recommended sequence for part-time students - the courses mainly run in sequence based on prerequisites so it makes sense for a part-time student to fit in what they can in the required programming, math, science course sequences as they can. Most of the CS courses are offered every semester, which allows students who are off-cycle to complete the degree.

Two classes with the CS prefix are currently taught by members of the Computer Information Technologies (CIT) department. CS151 - Introduction to Cybersecurity and CS 251 - Digital Forensics Fundamentals. These two classes were developed by the CS program faculty in conjunction with the CSE program at UNR while the CS program was housed in the CIT department. These two classes were being taught by CIT faculty when CS moved to the Physical Sciences department and the existing faculty wished to continue teaching them. The CIT department faculty have been teaching these two classes since their inception. These two classes are offered at TMCC and UNR but are not part of the AS/BS required course list. These

courses are part of a minor in Cybersecurity available at UNR and may be used by students wishing to pursue an MS in Cybersecurity coming from an outside area.

3.D. Accessibility of Instructional Materials

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What is the department/unit currently doing or planning to help ensure that instructional materials are accessible to students with disabilities? For example, have all full-time faculty attended accessibility workshops? Have full-time faculty used the accessibility purchase checker when purchasing new curricular materials? Has the department/unit taken steps to ensure part-time faculty are using accessible instructional materials?

Accessibility training is offered during professional development days each semester. The Disability Resource center helps students and faculty in need and coordinates student needs with faculty. Currently student cases are handled on a case by case basis. This has worked to date.

One faculty member has completed Quality Matters training and follows QM accessibility standards. This member has partially attended the TMCC accessibility workshop though did not complete it.

In going remote during the Spring 2020 semester, the online interactive Zybooks textbooks have been introduced in two CS classes (CS 135 and CPE 201). Zybooks is a Wiley product and they adhere to Web Content Accessibility Guidelines (WCAG 2.0 AA): https://www.zybooks.com/accessibility/. The Microsoft programming development environment VS Code was recommended to students for home use as it is available for Windows, Mac and Linux installation. Microsoft takes the accessibility of its products seriously: https://code.visualstudio.com/docs/editor/accessibility.

4.A. Curriculum Mapping

Computer Science

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		Truckee Meadows								Tru Me s

		ISLO/PSLO Summary Map by Course/Context					
Truckee Meadows	Truckee Meadows						
Truckee Meadows							
ISLO/PSLO Summary Map by Course/Context	ISLO/PSLO Summary Map by Course/Context						
ISLO/PSLO Summary Map by Course/Context							
	Map Origin: Associate of Science, Computer Science **Map Target:** Associate of Science, Computer Science			**Map Origin:** Associate of Science, Computer Science		**Ma Tar** Ass e o Sci Co er Sci
Map Origin: Associat							

e of Science, Computer Science										
Map Target: Associate of Science, Computer Science										
	CSLOs Associate of Science, Computer Science PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution. PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem. PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal. **CPE201** 1. Students will apply formal concepts ,(Boolean algebra, finite state machines) to digital logic design. X (DM) 2. Students will design, implement, and analyze combinational logic with digital gates and sequential circuits with Flip-Flops. X (DM) X (DM)			CSLOs	CSLOs	Associate of Science, Computer Science			Associate of Science, Computer Science	PS Ha the abi to a kno ge cor ng log rea ng nec ry t ana a pro and ide for e a use app ate ana al s to obt sol

	3. Students will design, implement, and troubleshoot logic circuits through laboratory experimentation and analyze and interpret their results X (DM) X (DM) **CS105** 1. Students will analyze and discuss the history, present circumstances and future implications of computers and technologies on individuals and society. X (PR) 2. Students will conduct hands-on interaction with hardware and software related to Computer Science and Engineering X (DM) X (PR) X (PR)							
CSLOs	CSLOs	Associate of Science, Computer Science			Associate of Science, Computer Science			
CSLOs								
Associate of Science, Computer Science								
PSLO1: Have the ability to apply knowledge of computing and	PSLO1: Have the ability to apply knowledge of computing and	PSLO2: Have the ability to design and implement a	PSLO2: Have the ability to design and implement a	PSLO3: Have the ability to communicate and work	PSLO3: Have the ability to communicate and work			

logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.	logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.	computer program to meet desired specifications for a problem.	computer program to meet desired specifications for a problem.	effectively on a team to achieve a common goal.	effectively on a team to achieve a common goal.	
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.						
PSLO2: Have the ability to						

design and implement a computer program to meet desired specifications for a problem.								
PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.								
CPE201	**CPE201**							
CPE201								
1. Students will apply formal concepts , (Boolean algebra, finite state machines) to digital	1. Students will apply formal concepts , (Boolean algebra, finite state machines) to digital	X (DM)	X (DM)					

logic design.	logic design.							
1. Students will apply formal concepts , (Boolean algebra, finite state machines) to digital logic design.								
X (DM)								
2. Students will design, implement, and analyze combinational logic with digital gates and sequential circuits with Flip-Flops.	2. Students will design, implement, and analyze combinational logic with digital gates and sequential circuits with Flip-Flops.	X (DM)	X (DM)			X (DM)	X (DM)	
2. Students will design, implement, and analyze combina								

tional logic with digital gates and sequential circuits with Flip-Flops.								
X (DM)								
X (DM)								
3. Students will design, implement, and troubleshoot logic circuits through laboratory experimentation and analyze and interpret their results	3. Students will design, implement, and troubleshoot logic circuits through laboratory experimentation and analyze and interpret their results	X (DM)	X (DM)			X (DM)	X (DM)	
3. Students will design, implement, and troubleshoot logic circuits through laboratory experim								

entation and analyze and interpret their results								
X (DM)								
X (DM)								
CS105	**CS105**							
CS105								
1. Students will analyze and discuss the history, present circumstances and future implications of computers and technologies on individuals and society.	1. Students will analyze and discuss the history, present circumstances and future implications of computers and technologies on individuals and society.					X (PR)	X (PR)	
1. Students will analyze and discuss the history, present								

circumstances and future implications of computers and technologies on individuals and society.								
X (PR)								
2. Students will conduct hands-on interaction with hardware and software related to Computer Science and Engineering	2. Students will conduct hands-on interaction with hardware and software related to Computer Science and Engineering	X (DM)	X (DM)	X (PR)	X (PR)	X (PR)	X (PR)	
2. Students will conduct hands-on interaction with hardware and software related to Comput								

er Science and Engineering									
X (DM)									
X (PR)									
X (PR)									
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		Truckee Meadows ISLO/PSLO Summary Map by Course/Context							Tru Me s ISL LO Su y M by Co Co
Truckee Meadows ISLO/PSLO Summary Map by Course/Context	Truckee Meadows	ISLO/PSLO Summary Map by Course/Context							
Truckee Meadows	ISLO/PSLO Summary Map by Course/Context								

	CSLOs Associate of Science, Computer Science PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution. PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem. PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal. 3. Students will identify ethical conflicts involving real-world computing and engineering conditions and argue for or against different positions offered by a given ethical circumstance X (PR) 4. Students will identify, analyze and interpret contemporary issues related to the impact of Computer Science and Engineering at the local through global levels X (PR) 5. Students will interact and work with various other students to examine varied computing issues at the local, national and global levels X (PR) **CS135** 1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and projects. Many of the labs and projects describe the problem	CSLOs	CSLOs	Associate of Science, Computer Science	Associate of Science, Computer Science	PS Ha the abi to a kno ge cor ng log rea ng nec ry t ana a pro and ide for e a use app ate ana al s to obt sol

	but leave the design and implemenation details to students X (DM) X (DM) 2. Students will design a multi-part project of their own choosing. The final project is comprehensive and implementation will span several weeks. X (DM) X (DM) **CS202**							
CSLOs	CSLOs	Associate of Science, Computer Science			Associate of Science, Computer Science			
CSLOs								
Associate of Science, Computer Science								
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulat	PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulat	PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.	PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.	PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.	PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.			

e and use the appropriate analytical skills to obtain a solution.	e and use the appropriate analytical skills to obtain a solution.					
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.						
PSLO2: Have the ability to design and implement a computer program to meet desired specifications						

for a problem.								
PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.								
3. Students will identify ethical conflicts involving real-world computing and engineering conditions and argue for or against different positions offered by a given ethical circumstance	3. Students will identify ethical conflicts involving real-world computing and engineering conditions and argue for or against different positions offered by a given ethical circumstance					X (PR)	X (PR)	
3. Students will identify ethical conflicts involvin								

g real-world computing and engineering conditions and argue for or against different positions offered by a given ethical circumstance								
X (PR)								
4. Students will identify, analyze and interpret contemporary issues related to the impact of Computer Science and Engineering at the local through global levels	4. Students will identify, analyze and interpret contemporary issues related to the impact of Computer Science and Engineering at the local through global levels					X (PR)	X (PR)	
4. Students will								

identify, analyze and interpret contemporary issues related to the impact of Computer Science and Engineering at the local through global levels								
X (PR)								
5. Students will interact and work with various other students to examine varied computing issues at the local, national and global levels	5. Students will interact and work with various other students to examine varied computing issues at the local, national and global levels					X (PR)	X (PR)	
5. Students will interact								

and work with various other students to examine varied computing issues at the local, national and global levels								
X (PR)								
CS135	**CS135**							
CS135								
1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and projects. Many of the labs and projects	1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and projects. Many of the labs and projects	X (DM)	X (DM)	X (DM)	X (DM)			

describe the problem but leave the design and implementation details to students	describe the problem but leave the design and implementation details to students							
1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and projects. Many of the labs and projects describe the problem but leave the design and implementation details to students								
X (DM)								
X (DM)								

2. Students will design a multi-part project of their own choosing. The final project is comprehensive and implementation will span several weeks.	2. Students will design a multi-part project of their own choosing. The final project is comprehensive and implementation will span several weeks.	X (DM)	X (DM)	X (DM)	X (DM)			
2. Students will design a multi-part project of their own choosing. The final project is comprehensive and implementation will span several weeks.								
X (DM)								
X (DM)								

CS202	**CS202**							
CS202								
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Truckee Meadows	ISLO/PSLO Summary Map by Course/Context							

	CSLOs Associate of Science, Computer Science PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution. PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem. PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal. 1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and projects. Many of the labs and projects describe the problem but leave the design and implementation details to the students. X (DM) X (DM) 2. Students will design a multi-part project of their own choosing. The final project is comprehensive and implementation will span several weeks. X (DM) X (DM) **CS219** 1. Students will describe the overall system architecture and digital components of a digital computer. 2. Students will present and discuss examples of assembly language programming X (PR) X (PR)	CSLOs	CSLOs	Associate of Science, Computer Science	Associate of Science, Computer Science	PS Ha the abi to a kno ge cor ng log rea ng nec ry t ana a pro and ide for e a use app ate ana al s to obt sol

	3. Students will use and analyze data representation, digital logic and illustrate processor programming with respect to a digital computer X (PR) 4. Students will use coding schemes such as ASCII, EBCDIC and Unicode to represent binary data X (PR) **ENGR100**							
CSLOs	CSLOs	Associate of Science, Computer Science			Associate of Science, Computer Science			
CSLOs								
Associate of Science, Computer Science								
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulat	PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulat	PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.	PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.	PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.	PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.			

e and use the appropriate analytical skills to obtain a solution.	e and use the appropriate analytical skills to obtain a solution.					
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.						
PSLO2: Have the ability to design and implement a computer program to meet desired specifications						

for a problem.								
PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.								
1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and projects. Many of the labs and projects describe the problem but leave the design and implementation details to the students.	1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and projects. Many of the labs and projects describe the problem but leave the design and implementation details to the students.	X (DM)	X (DM)	X (DM)	X (DM)			

1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and projects. Many of the labs and projects describe the problem but leave the design and implementation details to the students.								
X (DM)								
X (DM)								
2. Students will design a multi-part project of their own choosing. The final	2. Students will design a multi-part project of their own choosing. The final	X (DM)	X (DM)	X (DM)	X (DM)			

project is comprehensive and implementation will span several weeks.	project is comprehensive and implementation will span several weeks.							
2. Students will design a multi-part project of their own choosing. The final project is comprehensive and implementation will span several weeks.								
X (DM)								
X (DM)								
CS219	**CS219**							
CS219								
1. Students will describe	1. Students will describe							

the overall system architecture and digital components of a digital computer.	the overall system architecture and digital components of a digital computer.							
1. Students will describe the overall system architecture and digital components of a digital computer.								
2. Students will present and discuss examples of assembly language programming	2. Students will present and discuss examples of assembly language programming	X (PR)	X (PR)	X (PR)	X (PR)			
2. Students will present and discuss exampl								

es of assembly language programming								
X (PR)								
X (PR)								
3. Students will use and analyze data representation, digital logic and illustrate processor programming with respect to a digital computer	3. Students will use and analyze data representation, digital logic and illustrate processor programming with respect to a digital computer	X (PR)	X (PR)					
3. Students will use and analyze data representation, digital logic and illustrate processor programming								

with respect to a digital computer								
X (PR)								
4. Students will use coding schemes such as ASCII, EBCDIC and Unicode to represent binary data	4. Students will use coding schemes such as ASCII, EBCDIC and Unicode to represent binary data	X (PR)	X (PR)					
4. Students will use coding schemes such as ASCII, EBCDIC and Unicode to represent binary data								
X (PR)								
ENGR1	**ENGR1**							

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ENGR100								
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Truckee Meadows	ISLO/PSLO Summary Map by Course/Context							

	CSLOs Associate of Science, Computer Science PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution. PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem. PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal. 1. Students will demonstrate an understanding of the engineering process by designing, constructing, and testing a prototype. Students will be teamed together to produce a prototype. Potentially each team could end up with a different solution to the design X (PR) X (DM) X (DM) 2. Students will investigate the skill sets required for at least one engineering discipline. X (DM) 3. Students will learn to work successfully as part of an engineering team. X (DM) **MATH181** 1. Compute simple definite integrals by applying the Fundamental Theorem of Calculus and interpret the results. 2. Compute the derivative of a	CSLOs	CSLOs	Associate of Science, Computer Science	Associate of Science, Computer Science	PS Ha the abi to a kno ge cor ng log rea ng nec ry t ana a pro and ide for e a use app ate ana al s to obt sol

	function at a point and interpret the result as an instantaneous rate of change. 3. Evaluate the limit of a function graphically, algebraically, and by using L'Hopital's rule. 4. Compute derivatives using the rules for differentiation. **MATH182**							
CSLOs	CSLOs	Associate of Science, Computer Science			Associate of Science, Computer Science			
CSLOs								
Associate of Science, Computer Science								
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and	PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and	PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem	PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem	PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.	PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.			

identify, formulate and use the appropriate analytical skills to obtain a solution.	identify, formulate and use the appropriate analytical skills to obtain a solution.	.	.			
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.						
PSLO2: Have the ability to design and implement a computer program to meet desired						

specifications for a problem.								
PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.								
1. Students will demonstrate an understanding of the engineering process by designing, constructing, and testing a prototype. Students will be teamed together to produce a prototype. Potentially each team	1. Students will demonstrate an understanding of the engineering process by designing, constructing, and testing a prototype. Students will be teamed together to produce a prototype. Potentially each team	X (PR)	X (PR)	X (DM)	X (DM)	X (DM)	X (DM)	

could end up with a different solution to the design	could end up with a different solution to the design							
1. Students will demonstrate an understanding of the engineering process by designing, constructing, and testing a prototype. Students will be teamed together to produce a prototype. Potentially each team could end up with a different solution to the design								
X (PR)								
X (DM)								
X (DM)								

2. Students will investigate the skill sets required for at least one engineering discipline.	2. Students will investigate the skill sets required for at least one engineering discipline.					X (DM)	X (DM)	
2. Students will investigate the skill sets required for at least one engineering discipline.								
X (DM)								
3. Students will learn to work successfully as part of an engineering team.	3. Students will learn to work successfully as part of an engineering team.					X (DM)	X (DM)	
3. Students will learn to work								

successfully as part of an engineering team.								
X (DM)								
MATH181	**MATH181**							
MATH181								
1. Compute simple definite integrals by applying the Fundamental Theorem of Calculus and interpret the results.	1. Compute simple definite integrals by applying the Fundamental Theorem of Calculus and interpret the results.							
1. Compute simple definite integrals by applying the Fundamental Theorem of Calculus								

and interpret the results.								
2. Compute the derivative of a function at a point and interpret the result as an instantaneous rate of change.	2. Compute the derivative of a function at a point and interpret the result as an instantaneous rate of change.							
2. Compute the derivative of a function at a point and interpret the result as an instantaneous rate of change.								
3. Evaluate the limit of	3. Evaluate the limit of							

a function graphically, algebraically, and by using L'Hopital's rule.	a function graphically, algebraically, and by using L'Hopital's rule.							
3. Evaluate the limit of a function graphically, algebraically, and by using L'Hopital's rule.								
4. Compute derivatives using the rules for differentiation.	4. Compute derivatives using the rules for differentiation.							
4. Compute derivatives using the rules for differentiation.								

MATH182	**MATH182**									
MATH182										
						Page 4 of	6			
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		Truckee Meadows ISLO/PSLO Summary Map by Course/Context								Truckee Meadows ISLO/PSLO Summary Map by Course/Context
Truckee Meadows ISLO/PSLO Summary Map by Course/Context	Truckee Meadows	ISLO/PSLO Summary Map by Course/Context								
Truckee Meadows	ISLO/PSLO Summary Map by Course/Context									

	CSLOs Associate of Science, Computer Science PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution. PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem. PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal. 1. Students will develop an appropriate integral form to solve a specific applied problem in geometry, physics, or probability. 2. Students will evaluate indefinite and definite integrals by selecting and correctly applying appropriate integration technique,(s). 3. Students will utilize appropriate theory and computational techniques to construct Taylor series with its interval of convergence for use in a variety of applications such as approximating values of a function, creating series for new functions, and study **MATH283** 1. Students will apply the techniques of multivariable calculus to problem in mathematics, the physical sciences, and engineering.	CSLOs	CSLOs	Associate of Science, Computer Science	Associate of Science, Computer Science	PS Ha the abi to a kno ge cor ng log rea ng nec ry t ana a pro and ide for e a use app ate ana al s to obt sol

	2. Students will compute derivatives and integrals of real valued and vector valued functions of several variables. 3. Students will interpret geometrically the derivatives and integrals of real valued and vector valued functions of several variables.								
CSLOs	CSLOs	Associate of Science, Computer Science			Associate of Science, Computer Science				
CSLOs									
Associate of Science, Computer Science									
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessa	PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessa	PSLO2: Have the ability to design and implement a computer program to meet	PSLO2: Have the ability to design and implement a computer program to meet	PSLO3: Have the ability to communicate and work effectively on a team to achieve	PSLO3: Have the ability to communicate and work effectively on a team to achieve				

ry to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.	ry to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.	desired specifications for a problem.	desired specifications for a problem.	a common goal.	a common goal.	
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.						
PSLO2: Have the ability to design and implement a						

computer program to meet desired specifications for a problem.								
PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.								
1. Students will develop an appropriate integral form to solve a specific applied problem in geometry, physics, or probability.	1. Students will develop an appropriate integral form to solve a specific applied problem in geometry, physics, or probability.							
1. Students will develop an appropriate								

integral form to solve a specific applied problem in geometry, physics, or probability.								
2. Students will evaluate indefinite and definite integrals by selecting and correctly applying appropriate integration techniqueue,(s).	2. Students will evaluate indefinite and definite integrals by selecting and correctly applying appropriate integration techniqueue,(s).							
2. Students will evaluate indefinite and definite integrals by selecting and correctly								

applying appropriate integration techniqu e,(s).								
3. Students will utilize appropriate theory and computational techniques to construct Taylor series with its interval of convergence for use in a variety of applications such as approximating values of a function, creating series for new functions, and study	3. Students will utilize appropriate theory and computational techniques to construct Taylor series with its interval of convergence for use in a variety of applications such as approximating values of a function, creating series for new functions, and study							
3. Student								

s will utilize appropriate theory and computational techniques to construct Taylor series with its interval of convergence for use in a variety of applications such as approximating values of a function, creating series for new functions, and study								
MATH283	**MATH283**							
MATH283								
1.	1.							

Students will apply the techniques of multivariable calculus to problem in mathematics, the physical sciences, and engineering.	Students will apply the techniques of multivariable calculus to problem in mathematics, the physical sciences, and engineering.							
1. Students will apply the techniques of multivariable calculus to problem in mathematics, the physical sciences, and engineering.								
2. Students will compute derivatives and	2. Students will compute derivatives and							

integrals of real valued and vector valued functions of several variables.	integrals of real valued and vector valued functions of several variables.							
2. Students will compute derivatives and integrals of real valued and vector valued functions of several variables.								
3. Students will interpret geometrically the derivatives and integrals of real valued and vector valued functions of several	3. Students will interpret geometrically the derivatives and integrals of real valued and vector valued functions of several							

variables.	variables.										
3. Students will interpret geometrically the derivatives and integrals of real valued and vector valued functions of several variables.											
						Page 5 of	6				
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											Tru Me

		Truckee Meadows ISLO/PSLO Summary Map by Course/Context						s ISL LO Su y M by Co Co
Truckee Meadows ISLO/PSLO Summary Map by Course/Context	Truckee Meadows	ISLO/PSLO Summary Map by Course/Context						
Truckee Meadows	ISLO/PSLO Summary Map by Course/Context							
	Attainment Levels: M: Mastered RM: Reinforced/Mastered IR: Introduced/Reinforced DM: Demonstrate/Mastery PR: Practiced/Reinforced IRD: Introduced/Reinforced/Demonstrated IPD: Introduced/Practiced/Demonstrate							

	d DP: Practiced/Demonstrated D: Demonstrated IP: Introduced/Practiced P: Practiced R: Reinforced I: Introduced							

Truckee Meadows	Truckee Meadows
Truckee Meadows	
ISLO/PSLO Summary Map by Course/Context	ISLO/PSLO Summary Map by Course/Context
ISLO/PSLO Summary Map by Course/Context	

Truckee Meadows	

ISLO/PSLO Summary Map by Course/Context	

Map Origin: Associate of Science, Computer Science
Map Target: Associate of Science, Computer Science

CSLOs	CSLOs	Associate of Science, Computer Science
CSLOs		
Associate of Science,		

Computer Science				
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.	PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.	PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.	PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.	PSLO3: Have ability to communicate work effective team to achie common goal.
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.				
PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.				
PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.				
CPE201	**CPE201**			
CPE201				
1. Students will apply formal concepts , (Boolean algebra, finite state machines) to digital logic design.	1. Students will apply formal concepts , (Boolean algebra, finite state machines) to digital logic design.	X (DM)	X (DM)	
1. Students will apply				

formal concepts , (Boolean algebra, finite state machines) to digital logic design.				
X (DM)				
2. Students will design, implement, and analyze combinational logic with digital gates and sequential circuits with Flip-Flops.	2. Students will design, implement, and analyze combinational logic with digital gates and sequential circuits with Flip-Flops.	X (DM)	X (DM)	
2. Students will design, implement, and analyze combinational logic with digital gates and sequential circuits with Flip-Flops.				
X (DM)				
X (DM)				
3. Students will design, implement, and troubleshoot logic circuits through laboratory experimentation and analyze and interpret their results	3. Students will design, implement, and troubleshoot logic circuits through laboratory experimentation and analyze and interpret their results	X (DM)	X (DM)	
3. Students will design, implement, and troubleshoot logic circuits through laboratory experimentation and analyze and interpret their results				
X (DM)				
X				

(DM)				
CS105	**CS105**			
CS105				
1. Students will analyze and discuss the history, present circumstances and future implications of computers and technologies on individuals and society.	1. Students will analyze and discuss the history, present circumstances and future implications of computers and technologies on individuals and society.			
1. Students will analyze and discuss the history, present circumstances and future implications of computers and technologies on individuals and society.				
X (PR)				
2. Students will conduct hands-on interaction with hardware and software related to Computer Science and Engineering	2. Students will conduct hands-on interaction with hardware and software related to Computer Science and Engineering	X (DM)	X (DM)	X (PR)
2. Students will conduct hands-on interaction with hardware and software related to Computer Science and Engineering				
X (DM)				
X				

(PR)	
X (PR)	

CSLOs

Associate of Science, Computer Science

PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.

PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.

PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.

CPE201

1. Students will apply formal concepts ,(Boolean algebra, finite state machines) to digital logic design.

X
(DM)

2. Students will design, implement, and analyze combinational logic with digital gates and sequential circuits with Flip-Flops.

X
(DM)

X

(DM)
3. Students will design, implement, and troubleshoot logic circuits through laboratory experimentation and analyze and interpret their results
X (DM)
X (DM)
CS105
1. Students will analyze and discuss the history, present circumstances and future implications of computers and technologies on individuals and society.
X (PR)
2. Students will conduct hands-on interaction with hardware and software related to Computer Science and Engineering
X (DM)
X (PR)
X (PR)

Truckee Meadows ISLO/PSLO Summary Map by Course/Context	Truckee Meadows	ISLO/PSLO S
Truckee Meadows	ISLO/PSLO Summary Map by Course/Context	

Truckee Meadows	ISLO/PSLO Summary Map by Course/Context

CSLOs	CSLOs	Associate of Science, Computer Science		
CSLOs				
Associate of Science, Computer Science				
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.	PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.	PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.	PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.	PSLO3: Have ability to communicate work effective team to achie common goal
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.				
PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.				
PSLO3: Have the ability to communicate and work effectively on a team to achieve a				

common goal.				
3. Students will identify ethical conflicts involving real-world computing and engineering conditions and argue for or against different positions offered by a given ethical circumstance	3. Students will identify ethical conflicts involving real-world computing and engineering conditions and argue for or against different positions offered by a given ethical circumstance			
3. Students will identify ethical conflicts involving real-world computing and engineering conditions and argue for or against different positions offered by a given ethical circumstance				
X (PR)				
4. Students will identify, analyze and interpret contemporary issues related to the impact of Computer Science and Engineering at the local through global levels	4. Students will identify, analyze and interpret contemporary issues related to the impact of Computer Science and Engineering at the local through global levels			
4. Students will identify, analyze and interpret contemporary issues related to the impact of Computer Science and Engineering at the local through global levels				
X (PR)				

5. Students will interact and work with various other students to examine varied computing issues at the local, national and global levels	5. Students will interact and work with various other students to examine varied computing issues at the local, national and global levels			
5. Students will interact and work with various other students to examine varied computing issues at the local, national and global levels				
X (PR)				
CS135	**CS135**			
CS135				
1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and projects. Many of the labs and projects describe the problem but leave the design and implemenation details to students	1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and projects. Many of the labs and projects describe the problem but leave the design and implemenation details to students	X (DM)	X (DM)	X (DM)
1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and projects. Many of the labs and projects describe the problem but leave the design and implemenation details to students				

X (DM)				
X (DM)				
2. Students will design a multi-part project of their own choosing. The final project is comprehensive and implementation will span several weeks.	2. Students will design a multi-part project of their own choosing. The final project is comprehensive and implementation will span several weeks.	X (DM)	X (DM)	X (DM)
2. Students will design a multi-part project of their own choosing. The final project is comprehensive and implementation will span several weeks.				
X (DM)				
X (DM)				
CS202	**CS202**			
CS202				

CSLOs

Associate of Science, Computer Science

PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.

PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.

PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.

3. Students will identify ethical conflicts involving real-world computing and engineering conditions and argue for or against different positions offered by a given ethical circumstance
X (PR)
4. Students will identify, analyze and interpret contemporary issues related to the impact of Computer Science and Engineering at the local through global levels
X (PR)
5. Students will interact and work with various other students to examine varied computing issues at the local, national and global levels
X (PR)
CS135
1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and projects. Many of the labs and projects describe the problem but leave the design and implemenation details to students
X (DM)

X (DM)
2. Students will design a multi-part project of their own choosing. The final project is comprehensive and implementation will span several weeks.
X (DM)
X (DM)
CS202

Truckee Meadows ISLO/PSLO Summary Map by Course/Context	Truckee Meadows	ISLO/PSLO S
Truckee Meadows	ISLO/PSLO Summary Map by Course/Context	

Truckee Meadows	ISLO/PSLO Summary Map by Course/Context

CSLOs	CSLOs	Associate of Science, Computer Science		
CSLOs				
Associate of Science, Computer Science				
PSLO1: Have the ability to apply	PSLO1: Have the ability to apply	PSLO2: Have the ability to design and	PSLO2: Have the ability to design and	PSLO3: Have ability to

knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.	knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.	implement a computer program to meet desired specifications for a problem.	implement a computer program to meet desired specifications for a problem.	communicate work effective team to achie common goal
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.				
PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.				
PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.				
1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and projects. Many of the labs and projects describe the problem but leave the design and implementation details to the students.	1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and projects. Many of the labs and projects describe the problem but leave the design and implementation details to the students.	X (DM)	X (DM)	X (DM)
1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and				

projects. Many of the labs and projects describe the problem but leave the design and implementation details to the students.				
X (DM)				
X (DM)				
2. Students will design a multi-part project of their own choosing. The final project is comprehensive and implementation will span several weeks.	2. Students will design a multi-part project of their own choosing. The final project is comprehensive and implementation will span several weeks.	X (DM)	X (DM)	X (DM)
2. Students will design a multi-part project of their own choosing. The final project is comprehensive and implementation will span several weeks.				
X (DM)				
X (DM)				
CS219	**CS219**			
CS219				
1. Students will describe the overall system architecture and digital components of a digital computer.	1. Students will describe the overall system architecture and digital components of a digital computer.			
1. Students will describe the overall system architecture				

and digital components of a digital computer.				
2. Students will present and discuss examples of assembly language programming	2. Students will present and discuss examples of assembly language programming	X (PR)	X (PR)	X (PR)
2. Students will present and discuss examples of assembly language programming				
X (PR)				
X (PR)				
3. Students will use and analyze data representation, digital logic and illustrate processor programming with respect to a digital computer	3. Students will use and analyze data representation, digital logic and illustrate processor programming with respect to a digital computer	X (PR)	X (PR)	
3. Students will use and analyze data representation, digital logic and illustrate processor programming with respect to a digital computer				
X (PR)				
4. Students will use coding schemes such as ASCII, EBCDIC and Unicode to represent	4. Students will use coding schemes such as ASCII, EBCDIC and Unicode to represent	X (PR)	X (PR)	

binary data	binary data			
4. Students will use coding schemes such as ASCII, EBCDIC and Unicode to represent binary data				
X (PR)				
ENGR100	**ENGR100**			
ENGR100				

CSLOs
Associate of Science, Computer Science
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.
PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.
PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.
1. Students will demonstrate their understanding of key concepts by writing program code via weekly labs and projects. Many of the labs and projects describe the problem but leave the design and implementation details to the students.
X (DM)
X (DM)
2. Students will design a multi-part project of their own choosing. The final project is

comprehensive and implementation will span several weeks.

X
(DM)

X
(DM)

CS219

1. Students will describe the overall system architecture and digital components of a digital computer.

2. Students will present and discuss examples of assembly language programming

X
(PR)

X
(PR)

3. Students will use and analyze data representation, digital logic and illustrate processor programming with respect to a digital computer

X
(PR)

4. Students will use coding schemes such as ASCII, EBCDIC and Unicode to represent binary data
X (PR)
ENGR100

Truckee Meadows ISLO/PSLO Summary Map by Course/Context	Truckee Meadows	ISLO/PSLO S
Truckee Meadows	ISLO/PSLO Summary Map by Course/Context	
Truckee Meadows	ISLO/PSLO Summary Map by Course/Context	

CSLOs	CSLOs	Associate of Science, Computer Science		
CSLOs				
Associate of Science, Computer Science				
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the	PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the	PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.	PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.	PSLO3: Have ability to communicate work effective team to achie common goal

appropriate analytical skills to obtain a solution.	appropriate analytical skills to obtain a solution.			
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.				
PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.				
PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.				
1. Students will demonstrate an understanding of the engineering process by designing, constructing, and testing a prototype. Students will be teamed together to produce a prototype. Potentially each team could end up with a different solution to the design	1. Students will demonstrate an understanding of the engineering process by designing, constructing, and testing a prototype. Students will be teamed together to produce a prototype. Potentially each team could end up with a different solution to the design	X (PR)	X (PR)	X (DM)
1. Students will demonstrate an understanding of the engineering process by designing, constructing, and testing a prototype. Students will be teamed together to produce a prototype. Potentially each team				

could end up with a different solution to the design				
X (PR)				
X (DM)				
X (DM)				
2. Students will investigate the skill sets required for at least one engineering discipline.	2. Students will investigate the skill sets required for at least one engineering discipline.			
2. Students will investigate the skill sets required for at least one engineering discipline.				
X (DM)				
3. Students will learn to work successfully as part of an engineering team.	3. Students will learn to work successfully as part of an engineering team.			
3. Students will learn to work successfully as part of an engineering team.				
X (DM)				
MATH181	**MATH181**			
MATH181				
1. Compute simple definite integrals by	1. Compute simple definite integrals by			

applying the Fundamental Theorem of Calculus and interpret the results.	applying the Fundamental Theorem of Calculus and interpret the results.			
1. Compute simple definite integrals by applying the Fundamental Theorem of Calculus and interpret the results.				
2. Compute the derivative of a function at a point and interpret the result as an instantaneous rate of change.	2. Compute the derivative of a function at a point and interpret the result as an instantaneous rate of change.			
2. Compute the derivative of a function at a point and interpret the result as an instantaneous rate of change.				
3. Evaluate the limit of a function graphically, algebraically, and by using L'Hopital's rule.	3. Evaluate the limit of a function graphically, algebraically, and by using L'Hopital's rule.			
3. Evaluate the limit of a function graphically, algebraically, and by using L'Hopital's rule.				
4. Compute derivatives using the rules for differentiation.	4. Compute derivatives using the rules for differentiation.			

4. Compute derivatives using the rules for differentiation.				
MATH182	**MATH182**			
MATH182				

CSLOs
Associate of Science, Computer Science
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.
PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.
PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.
1. Students will demonstrate an understanding of the engineering process by designing, constructing, and testing a prototype. Students will be teamed together to produce a prototype. Potentially each team could end up with a different solution to the design
X (PR)
X (DM)
X (DM)
2. Students will investigate the skill sets required for at least one engineering discipline.

X
(DM)

3. Students will learn to work successfully as part of an engineering team.

X
(DM)

MATH181

1. Compute simple definite integrals by applying the Fundamental Theorem of Calculus and interpret the results.

2. Compute the derivative of a function at a point and interpret the result as an instantaneous rate of change.

3. Evaluate the limit of a function graphically, algebraically, and by using L'Hopital's rule.

4. Compute derivatives using the rules for differentiation.
MATH182

Truckee Meadows ISLO/PSLO Summary Map by Course/Context	Truckee Meadows	ISLO/PSLO S
Truckee Meadows	ISLO/PSLO Summary Map by Course/Context	

Truckee Meadows	ISLO/PSLO Summary Map by Course/Context

CSLOs	CSLOs	Associate of Science, Computer Science		
CSLOs				
Associate of Science, Computer Science				
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary	PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary	PSLO2: Have the ability to design and implement a computer program to meet desired specifications	PSLO2: Have the ability to design and implement a computer program to meet desired specifications	PSLO3: Have ability to communicate work effective team to achie

to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.	to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.	for a problem.	for a problem.	common goal
PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.				
PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.				
PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.				
1. Students will develop an appropriate integral form to solve a specific applied problem in geometry, physics, or probability.	1. Students will develop an appropriate integral form to solve a specific applied problem in geometry, physics, or probability.			
1. Students will develop an appropriate integral form to solve a specific applied problem in geometry, physics, or probability.				
2. Students will evaluate indefinite	2. Students will evaluate indefinite			

and definite integrals by selecting and correctly applying appropriate integration technique, (s).	and definite integrals by selecting and correctly applying appropriate integration technique, (s).			
2. Students will evaluate indefinite and definite integrals by selecting and correctly applying appropriate integration technique, (s).				
3. Students will utilize appropriate theory and computational techniques to construct Taylor series with its interval of convergence for use in a variety of applications such as approximating values of a function, creating series for new functions, and study	3. Students will utilize appropriate theory and computational techniques to construct Taylor series with its interval of convergence for use in a variety of applications such as approximating values of a function, creating series for new functions, and study			
3. Students will utilize appropriate theory and computational techniques to construct Taylor series with its interval of convergence for use in a variety of applications such as approximating values of a function, creating series for new functions, and study				
MATH283	**MATH283**			

MATH283				
1. Students will apply the techniques of multivariable calculus to problem in mathematics, the physical sciences, and engineering.	1. Students will apply the techniques of multivariable calculus to problem in mathematics, the physical sciences, and engineering.			
1. Students will apply the techniques of multivariable calculus to problem in mathematics, the physical sciences, and engineering.				
2. Students will compute derivatives and integrals of real valued and vector valued functions of several variables.	2. Students will compute derivatives and integrals of real valued and vector valued functions of several variables.			
2. Students will compute derivatives and integrals of real valued and vector valued functions of several variables.				
3. Students will interpret geometrically the derivatives and integrals of real valued and vector valued functions of	3. Students will interpret geometrically the derivatives and integrals of real valued and vector valued functions of			

several variables.	several variables.			
3. Students will interpret geometrically the derivatives and integrals of real valued and vector valued functions of several variables.				

CSLOs

Associate of Science, Computer Science

PSLO1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.

PSLO2: Have the ability to design and implement a computer program to meet desired specifications for a problem.

PSLO3: Have the ability to communicate and work effectively on a team to achieve a common goal.

1. Students will develop an appropriate integral form to solve a specific applied problem in geometry, physics, or probability.

2. Students will evaluate indefinite and definite integrals by selecting and correctly applying appropriate integration technique,(s).

3. Students will utilize appropriate theory and computational techniques to construct Taylor series with its interval of convergence for use in a variety of applications such as approximating values of a function, creating series for new functions, and study

MATH283

1. Students will apply the techniques of multivariable calculus to problem in mathematics, the physical sciences, and engineering.

2. Students will compute derivatives and integrals of real valued and vector valued functions of several variables.

3. Students will interpret geometrically the derivatives and integrals of real valued and vector valued functions of several variables.

Truckee Meadows ISLO/PSLO Summary Map by Course/Context	Truckee Meadows	ISLO/PSLO S
Truckee Meadows	ISLO/PSLO Summary Map by Course/Context	

Truckee Meadows	ISLO/PSLO Summary Map by Course/Context

Attainment Levels:
M: Mastered
RM: Reinforced/Mastered
IR: Introduced/Reinforced
DM: Demonstrate/Mastery
PR: Practiced/Reinforced
IRD: Introduced/Reinforced/Demonstrated
IPD: Introduced/Practiced/Demonstrated
DP: Practiced/Demonstrated
D: Demonstrated
IP: Introduced/Practiced
P: Practiced

R: Reinforced
I: Introduced

Once your map is complete, please analyze the following:

- **PLOs: Do all PLOs still reflect what you want students to demonstrate once they complete the program? Are there any PLOs that need to be updated?**
- **Potential gaps and redundancies: Are there any PLOs that are not addressed in the curriculum? Are there any unwanted redundancies of PLOs in the curriculum?**
- **CLO alignment: Is there a need to modify any course learning outcomes so that courses better support PLOs?**
- **Course sequencing: Is there a need to modify the course sequencing, so students have a more seamless learning experience?**
- **Curriculum and learning opportunities: Is it necessary to introduce new learning opportunities to reinforce learning? These could be modules or assignments in courses, additional courses, and/or co-curricular opportunities that would be required of all students in the program.**
- **Other?**

The PLOs are suitable for the current CS program. The PLOs should be reexamined when the program is updated. Please see 3B for proposed course additions - these course additions will greatly enhance learning opportunities, reinforce learning and more readily prepare students for transfer to UNR and any other CS program. The curriculum will need updating with the addition of any new course introductions and the PLOs will need to be revisited to see how the new courses fit in and if any adjustments are needed at that time.

4.B. Evidence of Program Learning Outcomes Assessment

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

Now that you have completed your curriculum map, summarize the most significant *program* assessment results since your last PUR. These will come from any data we have available in eLumen as well as past assessment reports. Please discuss these findings as they relate to the program

and program learning outcomes, not just individual courses.

Program Student Learning Outcome #1: Have the ability to apply knowledge of computing and logical reasoning necessary to analyze a problem and identify, formulate and use the appropriate analytical skills to obtain a solution.

All five of the CS/CPE courses currently in the CS program assess PLO #1. Problem solving is fundamental to computing sciences and this is seen by its focus within every class in our program focusing at least one and up to three SLOs for the classes. This outcome is assessed via explorations, labs, larger projects and exams in varied classes. Analytical skills appropriate for the course level are utilized by the student. The faculty focusing on Problem Based Learning techniques leaves the student solution to software design/implementation up to the student's individual interpretation - this allows the student to embrace their own creative solution and "gut feeling" of how to solve a problem. This process builds self-efficacy and belief in one's ability to solve difficult problems.

Related SLOs, by class, for PLO#1:
Course #1: CS 105 - The student will conduct hands-on interaction with hardware and software related to CSE.

Course #2: CS 135 - The student will demonstrate understanding of key concepts by writing programming code via labs and projects. The design and implementation details are left up to the student. The student will design a multi-part project of their own choosing. The final project is comprehensive and implementation spans several weeks.

Course #3: CS 202 - The student will demonstrate understanding of key concepts by writing programming code via labs and projects. The design and implementation details are left up to the student. The student will design a multi-part project of their own choosing. The final project is comprehensive and implementation spans several weeks.

Course #4: CPE 201 - The student will apply formal concepts (boolean algebra, finite state machines) to digital logic design. The student will design, implement and analyze combinational logic with digital gates and sequential circuits with flip-flops. The student will design, implement and troubleshoot logic circuits through lab experiments and analyze and interpret their results.

Course #5: CS 219 - The student will present and discuss examples of assembly language programming. The student will use and analyze data representation, digital logic and illustrate processor programming with respect to a digital computer. The student will use schemes to represent binary data.

Program Student Learning Outcome #2: Have the ability to design and implement a computer program to meet desired specifications for a problem.

Both CS135 and CS202 focus on high-level programming language skill development - they each have the students design and implement a solution to a complex problem over the course of several weeks. Students draw on the concepts learned over the course of an entire semester and previous semester's learning to produce a software product that solves their problem. Students are afforded the freedom of exploration and experimentation with programming in a playful, inviting setting in CS105. They are introduced to assembly language in CS219 - a language specific to hardware that we say is "close" to the machine upon which it is used.

The addition of CS302 - Data Structures - as discussed in 3B would be beneficial to students. It

would ease the ability to work through the troika of foundational programming classes in three sequential semesters. It would further strengthen a student's mastery of foundational programming skills.

Related SLOs, by class ,for PLO#2:
Course #1: CS105 - The student will conduct hands-on interaction with hardware and software related to CSE.

Course #2: CS135 - the student will demonstrate understanding of key concepts by writing programming code via labs and projects. The design and implementation details are left up to the student. The student will design a multi-part project of their own choosing. The final project is comprehensive and implementation spans several weeks.

Course #3: CS202 - the student will demonstrate understanding of key concepts by writing programming code via labs and projects. The design and implementation details are left up to the student. The student will design a multi-part project of their own choosing. The final project is comprehensive and implementation spans several weeks.

Course #4: CS219 - The student will present and discuss examples of assembly language programming.

Program Student Learning Outcome #3: Have the ability to communicate and work effectively on a team to achieve a common goal.

Upon examination of the curriculum map, we recommend that PLO #3 be reviewed by CS faculty. Currently it is directly represented in only one - CS 105. CS 105 was created with the idea of teamwork and collaboration at its foundation. All modules are completed in pairs or small teams of people. Teamwork is used in CPE 201 for all the lab assignments but this is not explicitly expressed in the SLOs for that class. With the introduction of new faculty teaching this class in spring 2022 the use of teamwork in CPE 201 may fall away unless it is expressly added to an existing, or new, SLO. Other CS classes may benefit from teamwork - a discussion is needed and this important PLO should be addressed in any new courses added to the program. The class ENGR 100 is a substitute for CS 105 and it does satisfy this PLO quite well also with students working as a team to produce a hovercraft prototype. In the event that CS105 is removed from the CS program (see 3B)

Related SLOs, by class, for PLO#3:
Course #1: CS 105 - The student will conduct hands-on interaction with hardware and software related to CSE. The student will interact and work with various other students to examine varied computing issues at the local, national and global levels.

Course #2: CPE 201 - The student will design, implement and analyze combinational logic with digital gates and sequential circuits with flip-flops. The student will design, implement and troubleshoot logic circuits through lab experiments and analyze and interpret their results.

Course #3: ENGR 100 - The students will work successfully as a team.

Describe how plans were implemented to try and improve teaching and learning. What changes did you make to the program based on assessment results and improvement plans?

The Physical Sciences department meets each semester to present and review course assessments for all courses being assessed that semester. The ensuing discussions help the presenting faculty formulate any changes to SLOs and/or materials. The CS program has always focused on hands-on practice and our assessments support that this is beneficial for those students who do engage. The faculty involved in Problem Based Learning (PBL) studied and implemented changes focusing on students who fail to engage for reasons outside themselves.

Problem based learning (PBL) was being utilized during the previous CS PUR. The goal at that time was to integrate PBL into all the CS classes. This was not accomplished. But, analysis of its use in several of the CS classes showed that student success fit to a bi-modal distribution. Students who actively engaged in PBL did well - with grades of A or occasional Bs. Students who chose not to engage usually failed or came close to failure. Faculty studied and implemented techniques for encouraging/facilitating engagement/support of students. Life coaching training was completed by one faculty member and those techniques were introduced into the classroom. These techniques have been shown to help individuals determine their goals and help them move when presented with a barrier. Not engaging in a class is often not due to lack of interest but many outside influences/roadblocks. Coaching helps the student see and embrace their individual desires and can offer a new perspective on other influences. The implementation of PBL has morphed over the years with the evolution of the faculty involved and the infusion of coaching techniques. Much more student wellbeing and self-efficacy has been integrated into the CS program due to this transition.

Both CS faculty have complete ACUE training and included ACUE proven teaching techniques to improve teaching and learning into their classrooms. Interestingly, many coaching techniques overlap with the ACUE training. As with the transition to student centered focus, ACUE helps faculty focus on an individual's personal development. The CS philosophy has become one of supporting the individual and the content knowledge will follow.

Many programs in the Physical Sciences use pre/post tests to help gauge student learning over the course of the semester. Following this example a pre/post test was created for CS105, in 2019, to help with assessment analysis. Unfortunately, with the remote transition in spring 2020 CS105 coursework became a cafeteria of modules with some being required, some student selected and the pre/post test no longer fit as all students did not explore the same material set. The modularization of the course has opened it up to student exploration and experimentation based on individual interests - which is well received and exciting for faculty to see. A pre/post assessment may be possible that looks, not at CS content so much, as student self-efficacy. This class, should it continue in the program (see 3B) fits in well with that idea. Other CS courses are assessed via project/lab submissions rather than pre/post tests - this fits in well with our PLOs and we don't see need to modify this at this time.

With the transition to remote learning, some classes have changed dramatically. Some of these changes appear to be good, some not so much. Examination of classes appears to show that overall student success has decreased. As courses return to face-to-face we see the opportunity to play with some of our new changes and assess potentially "new" ways to presenting material developed during remote learning and integrating some of these transitional changes into our "old" ways of doing things. This integration, based on necessity, will be an exciting time to explore new ways to improve teaching and learning.

4.C. General Education Outcomes Assessment

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

- **Identify which general education learning outcomes (GELOs) you assessed and summarize the most significant assessment results.**
- **Describe how plans were implemented to try and improve teaching and learning in general education (GE). What changes did you make assessment results and improvement plans? Do any CLOs need to be changed to meet GE assessment requirements?**

N/A

4.D. Five-year Course Assessment Cycle

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

The CS course assessment plan has been reviewed for correctness through Spring 2025.

Class	F20	S21	F21	S22	F22	S23	F23	S24	F24	S25	
CPE 201					X					X	
CS 105		X					X				
CS 135		X					X				
CS 151					X					X	
CS 202				X				X			
CS 219		X				X				X	
CS 252				X					X		

This question has not been answered yet

5.A. FTE, Section Count, Course Fill Rate, and Unsuccessful Enrollment Attempts

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

The Computer Science program has shown a dramatic increase in enrollment of approximately 58% over the last 6 years from an FTE of 51.9 in 2015-2016 to 88.8 in 2020-2021. During the same time period, TMCC's FTE had an average decline of -6%. The section count fluctuated between 14 per year in 2016-2017 to 20 per year in 2020-2021, with an average fill rate of 80.2% during that time period.

Unsuccessful attempts occurred in all courses, but predominantly in CS 135 (with ~20 unsuccessful attempts per year), a course that is part of not only the general Associates of Science program, but also the AS in Math and Computer Information Technology programs.

Please analyze and discuss the trends you see in FTE and section counts, including how they compare to those of the division and College. Discuss any factors that could have led to significant trends or shifts in enrollment and sections offered.

Please analyze the default settings first. Then, you may use the drop-down menus to examine more disaggregated data sets. If you describe any trends in these more specific data, please include a screen shot of the data to accompany your discussion.

Please see the first section.

Please analyze and discuss the trends or shifts you see. Discuss any factors that could have led to significant trends or shifts in course fill rate and unsuccessful enrollment attempts.

Please analyze the default settings first. Then, you may use the drop-down menus to examine more disaggregated data sets. If you describe any trends in these more specific data,

please include a screen shot of the data to accompany your discussion.

Please see the first section.

5.B. Student Demographics: Ethnicity, Gender, Credit Load, Student Status, and Age Range

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

Over the last five years, the Computer Sciences courses have seen a slight decrease in the percentage of Caucasian students from an average of ~58% to ~53% and an increase in both Hispanic students (from ~20% to ~25%) and Asian students (from ~8% to ~11%). The program serves slightly fewer Hispanic students and more Asian students than the general TMCC population. The number of Black students has decreased from ~6% to ~2%, while TMCC as a whole has maintained a population of ~2-3% Black students. The Computer Sciences courses are not out of line in terms of ethnicity as compared to TMCC and there appears to be no disparity within the courses.

The CS courses, however, are much more skewed when it comes to the gender demographics. Approximately 82% of the students identify as male as compared to approximately 46% in the general TMCC population. The gender gap reflects a similar gap in the computer science industry (~74% male in 2013 as described by the Bureau of Labor and Statistics). The gender gap in the CS courses is unusually disparate considering that we have a female faculty member in the program, but may also reflect a lack of marketing to the female population in the last five years.

The majority of students in CS courses are in the 18-24 range (~58%), with the second highest age group in the 25-34 range (~32%). These levels are higher than the TMCC general population, which has more students in both the younger and older populations. The number of high school students who are participating in dual-enrollment has remained steady, around 4%, which is lower than the TMCC general population. This could be a reflection of the prerequisites for the courses, which at the entry level require MATH 127, which many high school students have not completed.

Approximately 40% of the students taking CS courses are full time students (down from ~52% in 2016-2017), which is well above the TMCC average of ~27%. Most of the students (~91%) are continuing students (higher than the general population of 73%), with very few new or transfer students in the courses. The lower level of new students may reflect a lack of marketing of the program to new students, but also the prerequisite of MATH 127 which most students do not complete prior to attending TMCC.

Briefly describe the typical student profile in terms of ethnicity, gender, credit load, student status, and age in your program/unit. Please note and discuss any reasons why the demographics of students in your program noticeably differ from TMCC's student demographics. Please note any potentially underserved student populations and the reasons why they may exist.

Please see the first section.

6.A. Course Completion

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

The five-year average for the course completion rate in computer sciences is 73%, with 63% of the students successfully completing courses. The completion rates are slightly higher for the CPE course, with an 82% completion rate and 74% successful completion rate. The computer science rates are lower than the general TMCC population, 79% for completion and 69% for successful completion.

There are some gaps in completion/successful completion based on ethnicity, specifically for Hispanic students and Asian students. Hispanic students complete at 63% with only 53% successfully completing. Asian students complete at 71% with only 58% successfully completing. Black and international students complete at higher rates than the rest (79% and 88% respectively), but Black students only show a 60% successful completion. At this time, there is no reason for why these gaps are occurring, but it does suggest that more support is needed not only to ensure successful completing but specifically to support Hispanic, Asian, and Black students.

Likewise, there are some minor gaps in completion/successful completion for female students vs. male students. Students identifying as female complete at 69% with 60% successfully completing on average.

There appears to be no difference for full-time vs. part-time students, nor are there any differences for the primary age groups (18-24 and 25 - 34) in the courses. Interestingly, nearly 100% of the 50+ age group both complete and successfully complete CS and CPE courses.

Please describe any substantial trends or shifts that you see in overall course completion rates and successful completion (C or better). What might these trends or shifts mean? Discuss any factors that could have led to these trends or shifts in the data. Next, disaggregate the data by student demographics and describe any substantial trends. An educational equity gap is where there is a significant and persistent disparity in educational attainment between different groups of students. Are there any equity gaps in

course completion or successful completion rates?

Please see the first section.

6.B. Graduation and Transfer

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

Please discuss any trends or shifts that you see in overall graduation and transfer. Next, disaggregate the data by student demographics and describe any substantial trends. An educational equity gap is where there is a significant and persistent disparity in educational attainment between different groups of students. Are there any equity gaps in graduation or transfer?

In the Physical Sciences department, approximately 74% of the students who graduate transfer to other institutions. Of those, 84% transfer to other NSHE institutions, and 16% transfer to non-NSHE institutions.

The Computer Science program gradates between 5 and 11 graduates a year, for a total of 41 graduates in the last 5 years. This comprises 38% of the graduates in the Physical Science department between 2016 and 2020.

The majority of the graduates are Caucasian (23 total, 56%), with 9 Hispanic (22%), and 5 Asian (12%). Only 3 of the 41 graduates were female (~7%). Most of the graduates are in the 18 - 34 range (37, 90%). These totals reflect the same disparities as noted earlier in the demographics of the program, though even fewer female students complete the degree than are enrolled in the courses.

7.A. Faculty Achievement

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

Describe the program/unit's full-time (FT) faculty credentials, experience, and highlights of significant activities and/or contributions to TMCC. Please use the format below for each FT faculty member.

- **Faculty Name, FTE**
- **Degree(s) or professional certification(s) awarded, discipline, awarding institution**

- **Substantial accomplishments or contributions to the community, especially those related to education or your discipline (e.g. mentoring, community service) (please limit to 3)**
- **Number of years teaching at TMCC**
- **Total number of years in academia**
- **Primary courses taught**
- **Significant activities or contributions made to TMCC (Please limit to 3)**

Judith R. Fredrickson, 1.0 FTE (retires Dec. 2021)
- B.S. Mathematics (University of Nevada, Reno); M.S. Computer Science (Florida State University); Ph.D. Computer Science and Engineering (UNR)
- Director of Training DPBL NSF grant- education of hundreds of faculty across the country in Problem Based Learning; Mentor for ACM MentorNet program for multiple years - female students considering/in computing sciences; Elementary school volunteer - Math Fun - bringing math/cs activities/explorations to students for several years.
- years at TMCC: 14
- years in academia: > 30
- primary courses taught: currently CS 105, CS 135, CPE 201
- Extensive contributor of professional development training over the years - mainly PBL, flipped classroom, coaching; Problem Based Learning training to multiple cohorts of TMCC faculty and WebCollege FastTrack faculty; Responsible faculty overseeing the CS program since its inception in 2008.

Edward Corbett, 1.0 FTE (leaving TMCC at the end of AY 21-22)
-B.S. in Engineering Geoscience (University of California-Berkeley); M.S. in Geological Engineering (University of California-Berkeley); Ph.D. in Geophysics (California Institute of Technology, Pasadena)
-years at TMCC: 19 (5 years in tenure-track position)
-years in academia: 19

7.B. FT/PT Faculty and Student Credit Hours Taught

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

Currently there are two full-time faculty in the Computer Sciences program with one full-time faculty member from the Computer Information Technology (CIT) program who teaches the cybersecurity courses. On an average year, both Computer Science full-time faculty teach full loads, and occasionally overloads depending on the semester and course offerings. The CIT faculty (Steve Bale) teaches the cybersecurity courses as an overload, and there is occasionally 1 - 2 part-time faculty depending on course offerings.

Example of FTE taught based on AY 2020-2021:
Judy Fredrickson: 34 (average 17/semester), 3 - 4 courses each semester
Ed Corbett: 32.8 (average 16.4/semester), 4 courses each semester

Steve Bale: 13 (average 6.5/semester), 1 - 2 course each semester
Qiping Yan (PT): 9, 2 courses in the spring semester

Total: 88.8

Currently, 90% of the sections are taught by full-time faculty.

As a note, Judy Fredrickson will be retiring in December 2021, and Ed Corbett will be leaving at the end of AY 2021-2022. A search is underway to replace Judy Fredrickson with the hope of hiring in time for the spring 2022 semester. Damien Ennis from the math department will be teaching two courses for CS in the Spring 2022 semester.

Describe the trends or shifts in the number of full-time (FT) and part-time (PT) faculty, and the number of student credit hours (SCH) taught by FT and PT faculty since the last program/unit review. What Impact, if any, have these trends or shifts had on the program/unit?

Please see the first section.

7.C. Support Staff

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

Describe the program/unit's support staff, including their FTE, major duties, and any specialized credentials necessary to carry out their duties. Is the number of staff adequate to support the program/unit? Explain.

The Physical Sciences department is currently searching for an Administrative Assistant III (1.0 FTE).

The department is supported part-time (0.53 FTE) by a Laboratory Manager dedicated to the Physical Sciences. The Lab Manager, Ms. Sydnee Franzwa, oversees the day-to-day operations of the Prep lab by ensuring that materials are prepared for all lab classes. This position requires that the employee meet the criteria of a Laboratory Technician II, as defined by the State of Nevada. Also, the Laboratory Manager serves on the Chemical Safety Committee. Due to the potential increase in workload to the addition of new chemistry labs in October 2021, additional personnel support may be needed.

7.D. Facilities and Technology

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

Describe the facilities and technology used by the program/unit, and discuss any unique requirements. These may include labs, studios, off-campus sites, computer classrooms, specialized equipment, etc. Are program/unit facilities and technology adequate to support the program? Explain.

The CS classes are held in computer labs in the Sierra building, primarily in SIER 106, 110, and 101. Currently the computer rooms are shared with the CIT program and other computer based classes on campus. At this time, the current facilities are sufficient to handle all the CS classes.

8.A. Five Year Plan

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

The Computer Science program has the potential to expand to meet the growing industry, especially if the following goals are reached.

1. Update the program to match the course sequence at UNR.
As stated in section 3B, the AS, Computer Science is not in line with the first two years of the program at UNR. For seamless transfer, the program should be adjusted to meet the transfer requirements. This includes removal of CS 105 and the introduction of CS 301, CS 302, CS 365, and EE 220. The program adjustments should be completed in consultation with new faculty in the program during AY 2022-2023.

2. Update the current AS, Computer Science PSLOs.
As mentioned in section 4B, some adjustment of the PSLOs may need to occur with the program update and to further refine assessment of the program.

3. Research and introduce two new programs/tracks--Cybersecurity and Data Science.
Both of these areas are expanding fields for which TMCC does not currently have programs. The 2011 PUR for CIT mentioned the development of a data science program, but this was not completed or followed up on. The development of these two new programs would require collaboration with the CIT program, the introduction of new courses, and additional computer lab space. The program expansion should be completed in consultation with new faculty in the program during AY 2023-2024.

4. With the retirement of Judy Fredrickson and departure of Ed Corbett, new faculty will need to be hired.
A search is scheduled for the fall 2021 semester with the anticipated hire starting in January 2022. An additional search will be needed in the spring 2022 semester. If the program is expanded to include the 300-level courses and the potential addition of the two other course sequences (Cybersecurity and Data Science) additional faculty will be required for course development and implementation.

5. Develop an advisory committee.
The advisory committee can help keep the CS program up-to-date with industry needs and will

make the program eligible to receive Perkins Funding. The Perkins Funding would help with #7 as described below.

6. Expand the project-based learning (PBL) to the majority of CS courses.
Currently only one faculty member in the program utilizes PBL on a regular basis. This pedagogy is ideally suited to CS courses as it allows students to gain experience not just in the techniques but also pursue specialized interests. Curriculum would be required to be consistent for all sections of a course, with a designated lead faculty member among the full-time faculty for each course. With other projects in the works, the revitalization of PBL should take place over the next 5 years as the new faculty in the program teach and modify each course.

7. Introduce an open lab work space staffed by student workers.
Similar to what the Graphic Arts & Media Technology program does for their students, an open lab staffed by senior students in the program should be set-up in a designated computer lab (such as SIER 106) when the lab is not in use or classes. CIT is currently using an open entry model for many of their classes, and such a lab space could be shared by CIT students as well. Students who need additional help can come in during open lab hours with all of the appropriate software already present on the computers and any physical components required for projects in the room. During that time, they can consult with senior students as they complete projects for their courses. Providing this low-stress, easily accessible environment would help increase student completion and success rates for CS courses.

Using the most significant curriculum and assessment-driven findings, and considering any internal or external factors anticipated to impact your program, discuss strategies to sustain or improve student learning. This may also include deactivating existing or introducing new courses or programs to meet student and/or Industry demand.

Please see the first section.

After considering the most significant enrollment findings, and any internal or external factors anticipated to impact future enrollment, discuss strategies, if needed, to improve enrollment or address these factors. These may include, more efficient scheduling, streamlining pathways to completion, outreach to underserved students, etc.

Please see the first section.

With respect to course pass rate, graduation, and transfer, discuss strategies to enhance student success. These may include curriculum changes, streamlining pathways to completion, Improving advising, mentoring, and retention efforts, etc. Address any equity gaps. How does the department or unit plan to improve degree/certificate

completion and/or course completion if the department or unit does not offer any degrees/certificates?

This question has not been answered yet

Considering the above strategies, what are the major goals that the department/unit hopes to accomplish in the next 5 years? How does the department or unit plan align with the Academic Affairs Strategic Plan or the College's Strategic Master Plan? Include an estimated timeline of goal completion.

This question has not been answered yet

9.A. Resource Requests

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

For each request, please indicate whether the request is for an additional faculty and/or staff position, capital improvements (facilities), technology or specialized instructional resources, or professional development and address the following items:

- **Request (Additional faculty/staff, capital improvements, technology or other specialized instructional resources, or professional development)**
- **Estimated time to hire or time the request will be made**
- **Projected measurable outcomes: What does the program hope to introduce, develop, improve, enhance, accomplish, etc. as a result of the request? Which PLOs and/or student success metrics does the department hope to improve as a result of the request?**
- **Alignment to the Academic Affairs and College's Strategic Plan**
- **Institutional Funding Priority: Indicate which of the following institutional funding priorities your request addresses:**

1. **Compliance with mandates and requirements.**
2. **Address and/or mitigate issues of liability.**

3. **Address compensation equity.**
4. **Improve efficiency and/or effectiveness.**
5. **Leverage resources, investments with returns.**
6. **Promote professional development.**

Request 1: Fill both positions in computer science
1. Estimated timeline: Fall 2021, Spring 2022
2. Projected outcome: filling positions with CS faculty will be essential to the continuation of the program as we will not have any full-time faculty if the two positions are not filled. As we have seen in the past, programs without full-time tenure-track faculty tend to wither.
3. Alignment: Academic Master Plan Objectives 3, 4, and 5.
4. Institutional Funding Priority: 1, 4

Request 2: Development of an open lab from an existing computer lab, funds to support senior student instructional assistants/tutors.
1. Estimated timeline: Spring 2023 or as soon as possible
1. Projected outcome: increase student access to informal tutoring and improve student success in computer science courses.
1. Alignment: Academic Master Plan Objectives 3
2. Institutional Funding Priority: 4

Academic Standards and Assessment Committee Findings and Recommendations

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

Academic Standards and Assessment Committee's Findings:

This question has not been answered yet

Program Strengths:

1. **Computer Science is one of the fastest growing industries, and students are often employable in entry-level positions after completing the first two years while working towards completing a bachelor's degree; thus, the AS Computer Science puts students on a trajectory towards a high probability of employment.**
2. **Enrollment: Program enrollment is robust and represents ~34% of declared majors in the Physical Sciences department. Average fill rates in CS and CPE courses are high, ranging from 86-89%.**
3. **Indirect PLO assessment, such as comparing course grades between students engaged or not engaged in problem-based learning, has taken place, and the results of these indirect assessments are used to improve the program.**
4. **The AS Computer Science program has robust completion with 45 graduates in the past 5 years.**

The program's 5-year plan presents clear strategies to update PLOs, align with UNR's BS degree, continue supporting PBL, establish an advisory board, and introduce specializations like data science.

Areas of Concern or Improvement:

1. **The mission presented is that of the Physical Sciences department and does not necessarily reflect the specifics of the AS Computer Science nor align with the AS Computer Science PLOs.**
2. **Transfer: The current 2+2 agreement between the AS Computer Science and UNR's BS Computer Science might show inaccurate information. It shows 4 credits of electives and 3 credits of science, which may be reversed. Also, CS 105 is no longer an option for the BS Computer Science.**
3. **PLOs: PLOs are generally well-written and align to CS, CPE, and ENGR CLOs but are from 2010 and may need revisions. The mapping of CLOs from CS and CPE courses to PLO3 (teamwork) seemed questionable.**
4. **PLO assessment: There is little to no indication that direct assessment of PLOs is occurring in the degree, including no presentation of assessment data nor examples of how direct PLO assessment results were used to improve the program.**
5. **As acknowledged in the self-study, there is a disparity in CPE course completion among females and among Hispanic and Asian students in CS courses compared to all students in these courses. Furthermore, no strategies for trying to mitigate these disparities (equity gaps) were presented.**
6. **With the anticipated retirement of one FT faculty member in December and the departure of the other at the end of AY 2022, there will be no FT faculty to oversee the program.**

Recommendations:

1. **Develop a mission statement specific to the AS Computer Science. This might be the purview of new faculty member(s) hired in the program.**
2. **Review PLOs for the AS Computer Science and revise as needed. Revise CLOs in CS and CPE courses as needed to align with any new PLOs. As with the mission statement, this might be the purview of new faculty member(s) hired in the program.**
3. **Implement a plan of PLO assessment as soon as possible following the hiring of new program faculty.**
4. **Review the 2+2 agreement with UNR's BS Computer Science to ensure accuracy in the number of elective and science credits and whether offering two 300-level courses might streamline the agreement further. Revise the agreement as needed.**
5. **Remove CS 105 from the AS Computer Science.**
6. **Develop strategies with timelines to mitigate equity gaps in CPE and CS course completion among female and Hispanic and Asian students, respectively, and include these in the program's 5-year plan.**
7. **Seek approval to hire full-time program faculty replacements.**

Other comments:

The role of CS 252 is unclear, as it is not required of the AS Computer Science and does not appear to be used by the CIT department.

Dean's Findings and Recommendations

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

Academic Dean’s Findings:

The Computer Science Program has not undergone a program unit review since it became part of the Physical Science Program and was considered a standalone program. It is difficult to assess how the program has addressed the findings of the last PUR, since they are no longer relevant. Although the program is mainly a transfer program, Computer Science was recently approved as a CTE program and eligible for Perkins Funding. This allows the program to be viewed through a dual lens. While full-time employment as a computer scientist is the ultimate goal, and necessitates a Bachelor’s degree, students are often employable in entry level position after completing the first two-years of the program and while working toward completion of a Bachelor’s Degree.

The current structure of the program does not align well to UNR, and revisions will need to be made. Revisions to PLOs will go hand and hand with program alignment. New courses will need to be added, and CS 105 will need removed from the course sequence.

The Computer Science Program has the second highest enrollment in the Academic Division. Jobs in Computer Science are outpacing the national job growth. This is one of the fastest growing industries. As access to more data is available, computer programmers and data analytics and data scientists will be in ever more demand. This is very high wage profession where employment is almost guaranteed with a Bachelor's degree.

The program is a viable and healthy program. It has become is an important cornerstone program of Physical Sciences Department, with the second high number of declared majors in the division, approximately 34%. The current course offerings will need to be reconsidered if the program is restructured. The CLOs may also need to be reestablished to map to any revised PLOs. The number of graduates suggest a low yielding program, but transfers rate remain high at 74%.

Fill rates are relatively strong in the current course structure, but this will need to be reviewed with any revisions to the program. There are obvious future directions this program needs to go, and it will be important that TMCC makes the adjustments to strengthen the program and stay ahead of any trends in computer science, and take into account that UNR emphasizes 3 areas of in their CS program (1) Intelligence and Autonomous System, (2) Data and Software System and (3) Cybersecurity and Network.

Strengths:

It seems the program has found its place in the Physical Sciences Department. The other courses needed in this degree are in this division, and the move allows for better cross-discipline conversations to happen.

The program is a viable and healthy program. It needs to remain, as it is an important cornerstone program of Physical Sciences Department. The current course offerings will need to be reconsidered if the program is restructured. The CLOs may also need to be reestablished

to better align to PLOs and transferability.

The program has high demand and strong fill rates. In the past the program strongly utilized and integrated Project Based Learning (PBL) into their classes. Judy Fredericksen spear-headed this integration, and data suggests that students that engaged in PBL did better. While, the sample is small, and course specific, PBL as a learning model for students can have many benefits, and can be integrated nicely in to CS curriculum. I recommended finding ways to integrate PBL in the classroom environment.

Areas for Improvement:

1. Assessment:
Assessment of the program has been lagging. While the current courses map to the PLOs, the PLOs could be updated, and will need to be if the program sequence is better suited to align with UNR. There is not strong evidence of assessment of PLOs or CSLOs for some time. The only assessment results would have been done internally, are there are no assessment reports available in eLumen. The courses that fit GE outcome needs to also be assessed. Even with this lag, I suggest with the upcoming changes in faculty, that the assessments of these courses be postponed until the program has stable faculty to conduct the assessment.

2. Program realignment:
The program needs to align better with UNR. I support the proposed new course sequence.

3. More faculty:
This is crucial for the life of this program. Dedicated, high quality, forward thinking, with a pulse on transferability and industry needs are imperative! I support searching for another CS instructor immediately to be ready for Fall 2022. We have one search in progress, a second is strongly needed.

4. Program Advisory Board needs established:
As the program is now eligible for Perkins Funding, a program advisory committee needs to be established.

Summary Action Recommended (Continue program(s), significantly revise, discontinue, etc. followed by explanation):

Continue the AS in Computer Science, but revise the program to align with UNR as proposed. Research and introduce two new programs/tracks--Cybersecurity and Data Science

Recommendations and Implementation Timeline:

I recommend the following in order of importance

The Computer Science program has the potential to expand to meet the growing industry, especially if the following goals are reached.

1. With the retirement of Judy Fredrickson and departure of Ed Corbett, 2 new faculty will need

to be hired this year to be ready for Fall 2022. One search is currently in progress.
2. Update the program to match the course sequence at UNR and in conjunction update the current AS, Computer Science PSLOs.
3. Research and introduce two new programs/tracks--Cybersecurity and Data Science.
5. Develop an advisory committee.
The advisory committee can help keep the CS program up-to-date with industry needs and will make the program eligible to receive Perkins Funding. The Perkins Funding would help projects, such as a dedicated Computer Lab or Computer Science Summer Boot Camps.

Resources Necessary for Implementation of Recommendations:

Resources may be needed to support faculty to research and develop two new programs/tracks--Cybersecurity and Data Science, and potential new faculty to support the programs.

Impact of Recommendations on Division Planning:

All changes align with the division plan to continue quality programs, serve the demands of the students, and think forward and implement changes to meet the needs of the workforce, as well as, prepare students to successfully transfer and completed a 4-year degree.

Impact of Recommendations on Program/Unit Faculty:

All changes align with the division plan to continue quality programs, serve the demands of the students, and think forward and implement changes to meet the needs of the workforce, as well as, prepare students to successfully transfer and completed a 4-year degree. (Objective 3, Academic Affairs Strategic Plan)

Vice President of Academic Affairs' Findings and Recommendations

Computer Science

Physical Sciences (Computer Science) PUR 2020-21 Self-Study

VPAA's Findings:

Computer Sciences is a program with strong enrollment and it lends strength to the Physical Sciences overall. Its success depends upon finding capable FT faculty to manage and support a robust program of learning outcomes delivery and assessment. The inclusion of Project/Problem Based Learning is an asset, and its utility should be explored and its effectiveness assessed.

Strengths:

The program's leading strengths are its value to the economy and the marketability of its graduates. The program has a high rate of fill, completion, and transfer to university, but chiefly among male students. The addition of Life Coaching to the curriculum is very intriguing and VPAA would be very glad to learn more about this. Does data exist? Adopting this across other programs could be very beneficial.

Areas for Improvement:

The program's curriculum requires updating, which will bring about a need to reevaluate the program assessment efforts as well.
Much work needs to be done to recruit, retain, and see female students graduate. With perhaps 18% of enrolled students identifying as female, and just 3 of 41 graduates who are female, there is ample space to target and enroll females in order to grow and complement the existing male student cohort. Importantly, this involves looking beyond course enrollments to target major declarations. The curriculum should also be examined closely and independently to identify possible unconscious biases that may dissuade female registrants or majors. Classroom climate and conduct should also be studied to ensure that female students feel welcome and valued. TMCC is not alone in this work, so best practices from around the country should be studied carefully and their lessons adopted and adapted as needed. Outside reviewers should be consulted in order to glean insights that may be difficult or impossible to learn for ourselves.

The following recommendations made by the Academic Standards and Assessment Committee and Dean are upheld, and/or additional recommendations include the following: (Please include an implementation timeline, and indicate how these recommendations align to the Academic Affairs Strategic Plan and/or the College's Strategic Master Plan.)

VPAA supports the removal of CS 105, the adoption of a CS-specific mission statement, and the revision of PLOs assessment.

VPAA also supports, developing 300-level courses in CS in order to match UNR's CS curriculum, but the program should proceed carefully, as this will succeed only if sufficient enrollment is sustained. A corollary campaign to boost declared majors and support their retention is vital to this effort.

The following recommendations made by the Academic Standards and Assessment Committee and Dean are not upheld: (Please provide an explanation.)

The ASA Committee writes that "Computer Science is one of the fastest growing industries," but the response to PUR question 3.1 about "meeting labor market demands and industry curriculum needs" reads "N/A." While this question is aimed at CTE programs, VPAA contends that this field is sufficiently technical as to warrant the inclusion of job market data and industry needs. This section of the PUR should be revised to ask for such data from any program with direct marketability, particularly in order to assess whether the learning outcomes are sufficient for employment with an Associate degree.

VPAA does not support raising the CS degree credit count above 60. Given UNR's decisions to

add 300 level CS courses and also an Electrical Engineering course, achieving precise parity is unlikely. Even if our program adds parallel 300 level CS courses, graduates who earn the AS in CS will likely need to complete a small number of credits at UNR in preparation for junior year. Chasing every innovation in UNR's curriculum risks making our program unnavigable and unsustainable. The EE220 course, if pursued, will need to be added to the curricula of other AS programs in order to ensure it will generate sufficient enrollment -- this will require careful study and collaboration.

In order to implement recommendations towards program improvement, the following resource requests are upheld, and/or additional recommended resources include the following:

The program is presently pursuing a FT faculty search, as of March 2022.
The VPAA recently presented the proposal for AS Data Science to the ARSA Committee, where it was approved, March 2022.

The following resource requests are not upheld: (Please provide an explanation.)

There are none.

Summary Action Recommended (Continue program, significantly revise, or discontinue, followed by explanation):

Definitely continue this program, with a revised curriculum that maximizes articulated transfer ability to UNR, as outlined above.