Rio Salado College

Programming and Mobile Apps Program Review

Review Period: Academic Years 2018-2022

Review Conducted: AY2022-23

Rio's Academic Program Review Process is an essential component of the College's Strategic Plan. The 2020-2023 work is guided by the following college-wide goals:

Rio Strategic Goal 1: Increase student goal attainment 23% by 2023 with innovative and world-class experiences

Rio Strategic Goal 2: Offer 23 new micro-credentials by 2023

Rio Strategic Goal 3: Foster a culture of diversity, equity, inclusion, and belonging

Data relating to successful course completion, persistence, credentials awarded, and equity in program- and college-level outcomes across all student populations are aligned with the college-wide metrics that measure progress toward achieving the goals of the College's Strategic Plan.

I. Degrees and Certificates in the Programming and Mobile Apps Program

CCL, Programming: The Certificate of Completion (CCL) in Programming is designed to prepare the student to work in the programming field. Courses focus on programming theory, Java programming, Visual Basic programming, and web programming.

CCL, Programming and Systems Analysis Level I: The Certificate of Completion (CCL) in Programming and Systems Analysis Level I provides an exploration of different computer language and technical skills. The CCL includes, but is not limited to the following: operating systems, local area networks, business communication, team roles, and dynamics. A Certificate of Completion (CCL) in Programming and Systems Analysis Level II, Certificate of Completion (CCL) in iOS App Development and an Associate in Applied Science (AAS) in Programming and Systems Analysis are also available.

CCL, Programming and Systems Analysis Level II: The Certificate of Completion (CCL) in Programming and Systems Analysis Level II provides an in-depth exploration of different computer language and technical skills. This CCL includes, but is not limited to the following: local area

networks, team roles, and dynamics. A Certificate of Completion (CCL) in iOS Application Development and an Associate in Applied Science (AAS) in Programming and Systems Analysis are available.

AAS, Programming and Systems Analysis: The Associate in Applied Science (AAS) in Programming and Systems Analysis program provides an in-depth exploration of different computer language and technical skills. The AAS includes, but is not limited to the following: operating systems, local area networks, business communication, team roles, and dynamics. Certificate of Completions (CCLs) in Programming and Systems Analysis Level I and Level II and iOS App Development are also available.

AAS, Mobile App Development: The Associate in Applied Science (AAS) in Mobile App Development provides students with the design and programming skills necessary for entry-level coding, programming, and software development positions with an emphasis on mobile apps. Students will be prepared for transfer to selected BAS programs. Students will be prepared to take the App Developer with Swift Certification Level 1, Microsoft C# Software Essentials, and Associate Android Developer certifications. A Certificate of Completion (CCL) in iOS Application Development, Android Application Development, Windows Application Development, Web App Development, Native Mobile App Development, Cross-Platform App Development, Foundations of Mobile App Development and Mobile App Development are also available.

CCL, Foundations of Mobile App Development: The Certificate of Completion (CCL) in the Foundations of Mobile App Development prepares students for employment in entry-level coding, programming, and software development positions with foundational experience in a variety of platforms, including iOS, Android, Windows and web app development. Courses in this certificate can apply toward the Associate in Applied Science (AAS) in Mobile App Development and Certificate of Completion (CCL) in Mobile App Development.

II. Program Purpose and Mission

The Programming and Mobile Apps program is designed to provide students with the design and programming skills necessary for entry-level coding, programming, and software development employment opportunities. Students will become familiar with a variety of platforms, including iOS, Android, Windows and web app development using different languages such as Python, C#, and Visual Basic.

The Programming and Mobile Apps Program's mission directly supports the College's mission to "transform the learning experience through: Customized, high-quality courses and programs; and …Flexibility, affordability, and innovation". The STEM Department relentlessly improves the curriculum with regular course development to stay current.

III. Student Population

a. Student Data Analysis

Student Demographics

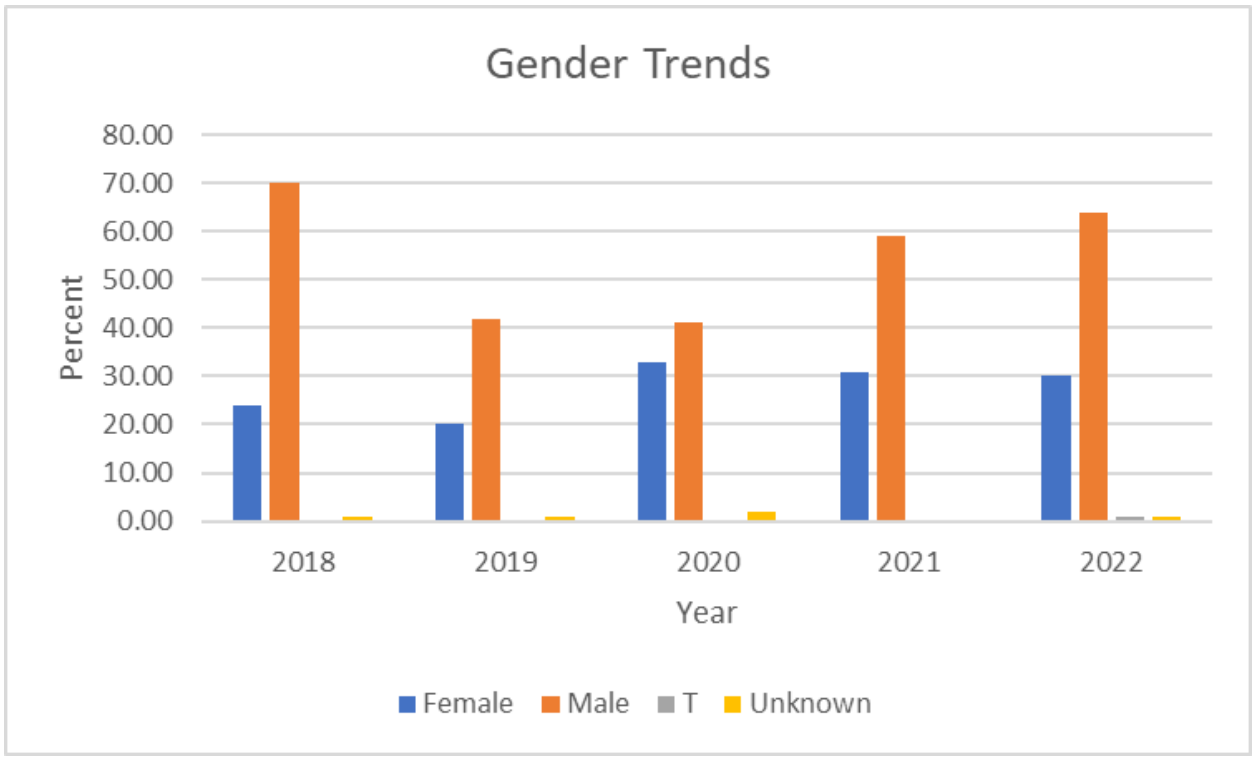
	2018		2019		2020		2021		2022	
Race/Ethnicity	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
American Indian/Alaska Native	3	3.2%	1	1.6%	1	1.3%			1	1.0%
Asian	3	3.2%	2	3.2%	4	5.3%	3	3.4%	5	5.2%
Black/African American	7	7.4%	5	7.9%	6	7.9%	9	10.1%	12	12.5%
Hispanic/Latino	26	27.4%	17	27.0%	23	30.3%	34	38.2%	37	38.5%
Native Hawaiian/Oth Pac Isla..									1	1.0%
Not Specified	6	6.3%	3	4.8%	2	2.6%	3	3.4%	6	6.3%
White	50	52.6%	35	55.6%	40	52.6%	40	44.9%	34	35.4%

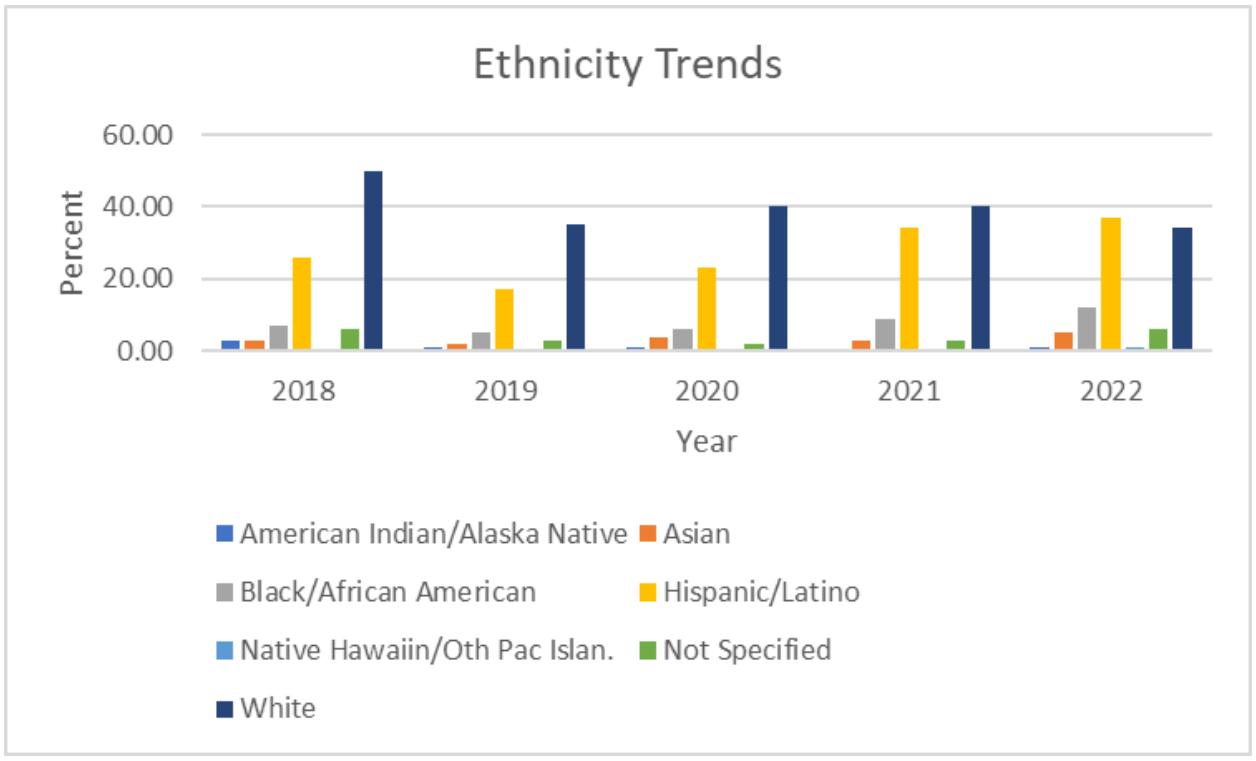
Gender	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Female	24	25.3%	20	31.7%	33	43.4%	31	34.8%	30	31.3%
Male	70	73.7%	42	66.7%	41	53.9%	59	66.3%	64	66.7%
T									1	1.0%
Unknown	1	1.1%	1	1.6%	2	2.6%			1	1.0%

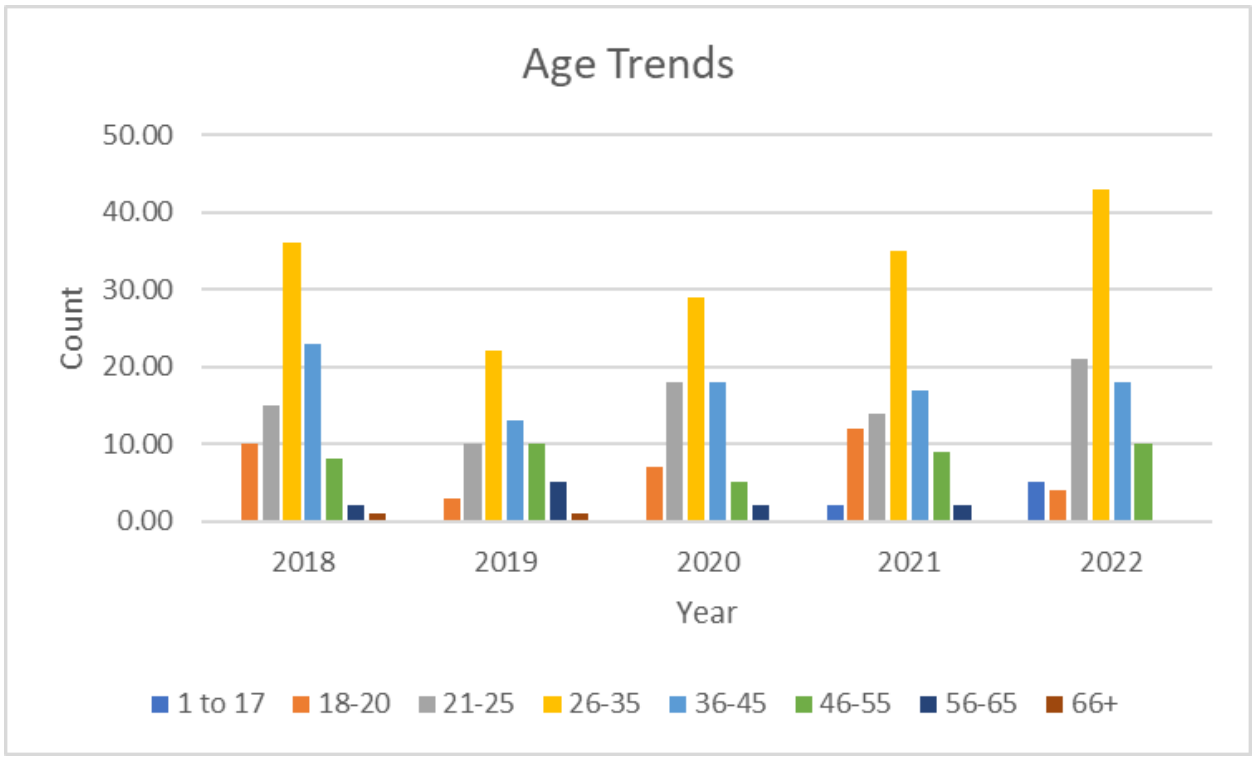
Age Groups	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
1 - 17							2	2.2%	5	5.2%
18 - 20	10	10.5%	3	4.8%	7	9.2%	12	13.5%	4	4.2%
21 - 25	15	15.8%	10	15.9%	18	23.7%	14	15.7%	21	21.9%
26 - 35	36	37.9%	22	34.9%	29	38.2%	35	39.3%	43	44.8%
36 - 45	23	24.2%	13	20.6%	18	23.7%	17	19.1%	18	18.8%
46 - 55	8	8.4%	10	15.9%	5	6.6%	9	10.1%	10	10.4%
56 - 65	2	2.1%	5	7.9%	2	2.6%	2	2.2%		
66+	1	1.1%	1	1.6%						

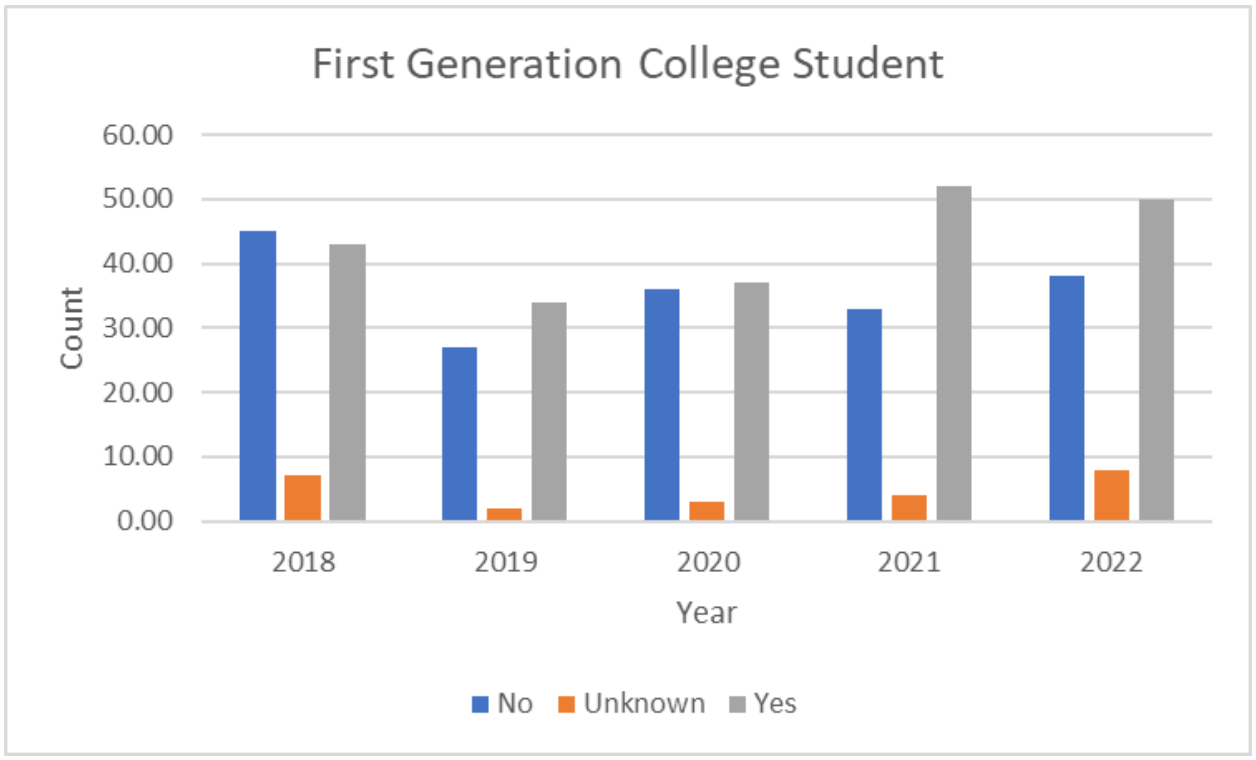
First Gen Status	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
No	45	47.4%	27	42.9%	36	47.4%	33	37.1%	38	39.6%
Unknown	7	7.4%	2	3.2%	3	3.9%	4	4.5%	8	8.3%
Yes	43	45.3%	34	54.0%	37	48.7%	52	58.4%	50	52.1%

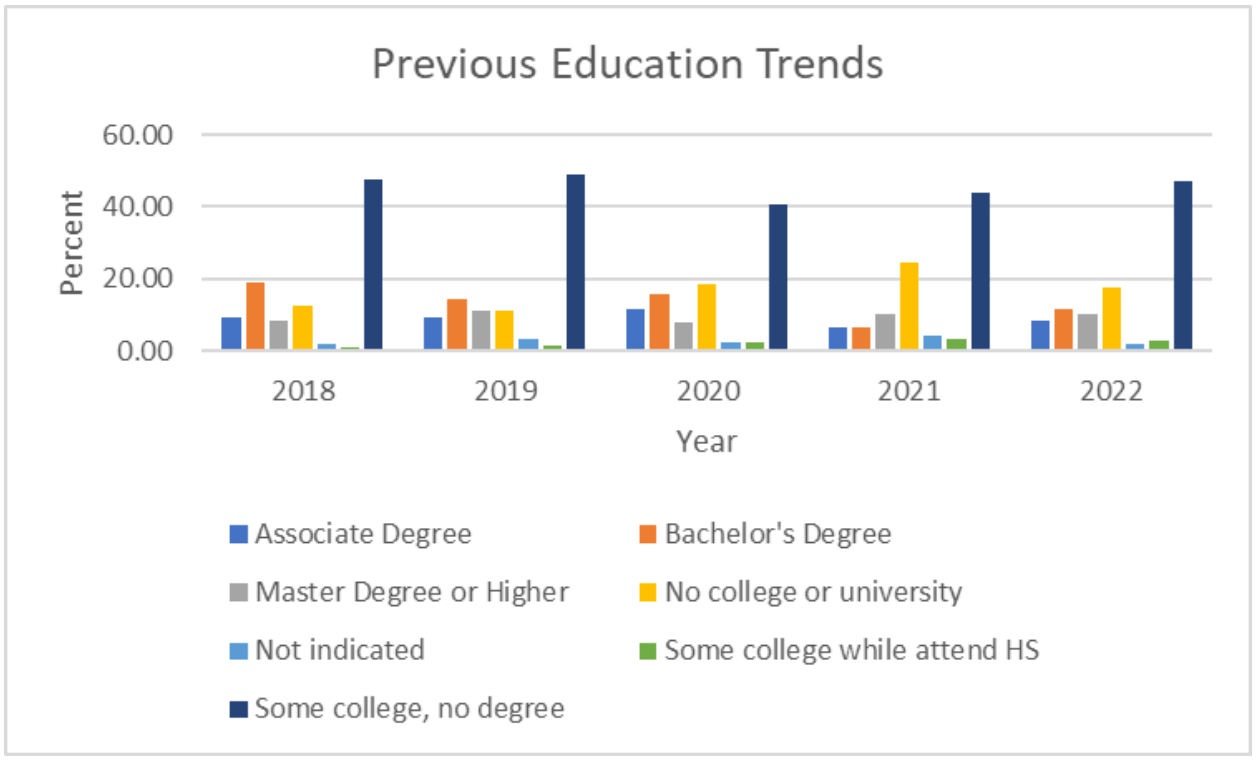
Prevous Education	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Associate degree	9	9.5%	6	9.5%	9	11.8%	6	6.7%	8	8.3%
Bachelor's degree (Ex.:BA,BS)	18	18.9%	9	14.3%	12	15.8%	6	6.7%	11	11.5%
Master degree or higher	8	8.4%	7	11.1%	6	7.9%	9	10.1%	10	10.4%
No college or university	12	12.6%	7	11.1%	14	18.4%	22	24.7%	17	17.7%
Not Indicated	2	2.1%	2	3.2%	2	2.6%	4	4.5%	2	2.1%
Some college while attend HS	1	1.1%	1	1.6%	2	2.6%	3	3.4%	3	3.1%
Some college, no degree	45	47.4%	31	49.2%	31	40.8%	39	43.8%	45	46.9%


Gender Trends
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Percent
2018
2019
2020
2021
2022
Year
Female
Male
T
Unknown


Ethnicity Trends
60.00
40.00
20.00
0.00
Percent
2018
2019
2020
2021
2022
Year
American Indian/Alaska Native
Asian
Black/African American
Hispanic/Latino
Native Hawaiin/Oth Pac Islan.
Not Specified
White


Age Trends
50.00
40.00
30.00
20.00
10.00
0.00
Count
2018
2019
2020
2021
2022
Year
1 to 17
18-20
21-25
26-35
36-45
46-55
56-65
66+


First Generation College Student
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Count
2018
2019
2020
2021
2022
Year
No
Unknown
Yes


Previous Education Trends
60.00
40.00
20.00
0.00
Percent
2018
2019
2020
2021
2022
Year
Associate Degree
Bachelor's Degree
Master Degree or Higher
No college or university
Not indicated
Some college while attend HS
Some college, no degree

This program mainly serves a mostly white, male population in the 25-36 year old age range seeking to enter, change, or advance in the job market. Most have some college experience, but no degree. About half classify themselves as first generation college students. One trend of note is that the ethnic distribution is seeing a decline in White and an increase in Hispanic/Latino. Recently, there has been a slight decline in males and an increase in females, with the first trans declared student in 2022.

The department is making specific efforts to recruit a more diverse population. One such effort is the annual "Girls Get IT" event, which attracts females to IT pathways, including programming. In 2022, Rio Salado College was accepted into the National Council on Women in Technology (NCWIT). The lead for Mobile Apps Programming is one of two college member representatives. Targeted recruiting efforts also include membership in the Computing Alliance for Hispanic Serving Institutions (CAHSI). RSC had a strong student advocate and participated in the Great Minds in STEM conference (GMiS). The department also participated in the 2023 Equity & Excellence in Education Conference by the Association on Higher Education and Disability (AHEAD) to better incorporate accessibility in all our STEM classes.

b. Enrollment Trends

Course Enrollments for Programming and Mobile Apps

	Fiscal Year				
Class	2018	2019	2020	2021	2022
CIS105	1,506	1,345	1,523	1,343	1,170
CIS120DF	155	112	137	123	99
CIS126DL				138	171
CIS133DA	224	191	175	179	146
CIS150	110	91	112	28	
CIS150AB				47	64
CIS159	92	61	55	20	21
CIS162AD	102	110	97	73	58
CIS163AA	321	265	306	275	327
CIS165	28	15	19	18	16
CIS165DA	39	31	27	29	20
CIS165DB	15	10	6	3	4
CIS190	92	70	96	128	128
CIS250	84	63	52	53	45
CIS262AD	40	31	27	22	29
CIS263AA	48	33	30	23	14
CIS265				7	5
CIS276DA	98	93	80	64	88
GBS151	542	516	497	539	487

Note: Enrollments in table above include anyone enrolled in specified classes, regardless of program status.

The highest enrollment course is CIS105, which is not surprising since it is a General Education requirement and serves multiple programs and pathways. More specific to Programming, we see the largest enrollments in CIS163AA Java Programming. Enrollment is holding steady as Java is still the preferred language for area high schools and AP Computer Science in particular. One of the newer classes has the third highest enrollment and that is CIS126DL - Linux Operating System which serves not only programming, but also the Cybersecurity pathways. Not included in these data, but also with strong enrollment is CIS156 - Python which is emerging to the levels of Java and the second preferred language, even more that CIS159 - Visual Basic and CIS162AD - C#.

In order to better understand program-specific enrollments, the data were separated by the student-declared award:

Declared Program Students

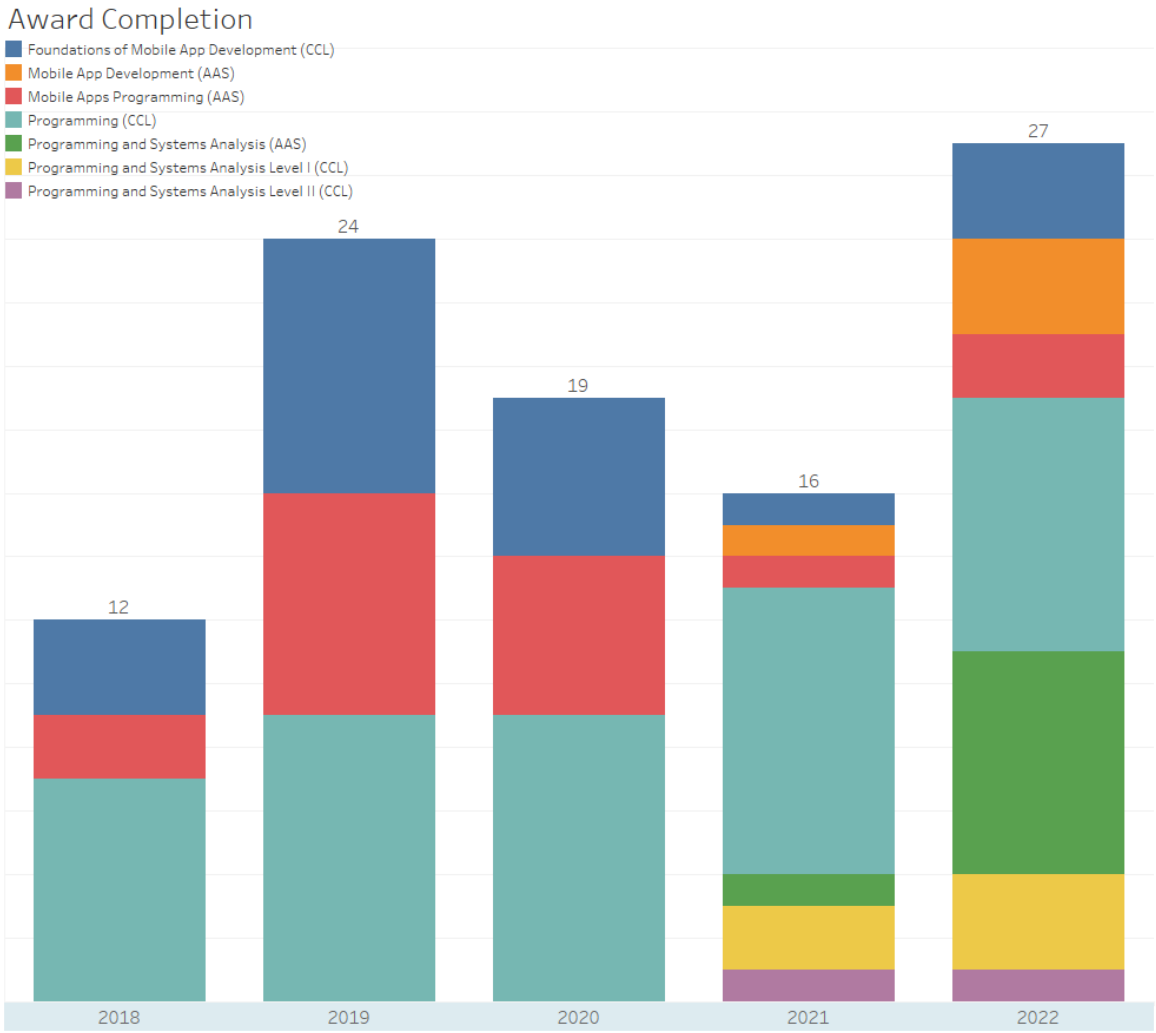
Program Title	2018	2019	2020	2021	2022
Foundations of Mobile App Development (CCL | 5793)	5	3	2	3	
Mobile App Development (AAS | 3099)				10	13
Mobile App Development (CCL | 5193)					1
Mobile Apps Programming (AAS | 3139)	32	30	29	11	4
Programming (CCL | 5047)	47	25	29	14	17
Programming and Systems Analysis (AAS | 3844)			13	40	54
Programming and Systems Analysis Level I (CCL | 5048)			1	5	4
Programming and Systems Analysis Level II (CCL | 5962)			1	3	3
Grand Total	84	58	74	85	93

These data show that although there are robust enrollments in program courses, most students are not declaring their intent to complete many of the certificates. The AAS pathways seem to be the preferred degree options. There is a slight decline in Mobile Apps in the same year Rio started offering the AAS in Programming and Systems Analysis. When combined, however, AAS enrollment is holding steady.

c. Student Graduation Data

As illustrated in the following graph, overall award completions have rebounded after declines in 2020 and 2021. The Certificate of Completion in Programming continues to be the most popular conferred award.

Students who earn AAS degrees in Mobile App Development, Mobile App Programming, and/or Programming and Systems Analysis are also eligible for the CCLs that are stacked therein. The data suggests that students are either not aware or are not taking advantage of the opportunity to earn these shorter-term credentials as they progress toward a degree. See Action Plan in Section XI.c.2 to address this concern.



Title Code	2018	2019	2020	2021	2022
Foundations of Mobile App Development (CCL)	3	8	5	1	3
Mobile App Development (AAS)				1	3
Mobile Apps Programming (AAS)	2	7	5	1	2
Programming (CCL)	7	9	9	9	8
Programming and Systems Analysis (AAS)				1	7
Programming and Systems Analysis Level I (CCL)				2	3
Programming and Systems Analysis Level II (CCL)				1	1
Grand Total	12	24	19	16	27

IV. Retention and Persistence

Data in the following tables below include anyone enrolled in specified classes, regardless of program status.

Course Success for Programming and Mobile Apps

Class		Fiscal Year 2018	2019	2020	2021	2022
CIS105	Retention Rate	90.3%	73.3%	74.4%	78.7%	74.8%
	Course Failure R..	26.7%	9.8%	6.6%	7.8%	10.0%
	Course Pass Rate	63.54%	63.50%	67.65%	70.67%	64.60%
CIS120DF	Retention Rate	97.1%	79.6%	83.1%	78.1%	76.4%
	Course Failure R..	12.6%	10.2%	8.0%	5.6%	2.1%
	Course Pass Rate	84.53%	69.43%	75.10%	72.53%	74.29%
CIS126DL	Retention Rate				73.6%	73.8%
	Course Failure R..				0.0%	7.5%
	Course Pass Rate				73.57%	66.25%
CIS133DA	Retention Rate	91.6%	73.8%	71.2%	70.6%	63.7%
	Course Failure R..	27.1%	5.5%	16.6%	20.8%	14.2%
	Course Pass Rate	64.56%	68.36%	54.60%	49.87%	49.56%
CIS150	Retention Rate	92.1%	64.9%	74.1%	71.1%	
	Course Failure R..	13.3%	3.5%	5.3%	0.0%	
	Course Pass Rate	77.58%	57.89%	68.82%	71.05%	
CIS150AB	Retention Rate				65.0%	79.5%
	Course Failure R..				3.9%	4.5%
	Course Pass Rate				61.17%	75.00%
CIS159	Retention Rate	90.6%	69.9%	80.3%	76.6%	81.5%
	Course Failure R..	22.5%	7.2%	0.0%	4.3%	3.7%
	Course Pass Rate	68.12%	62.65%	80.28%	72.34%	77.78%

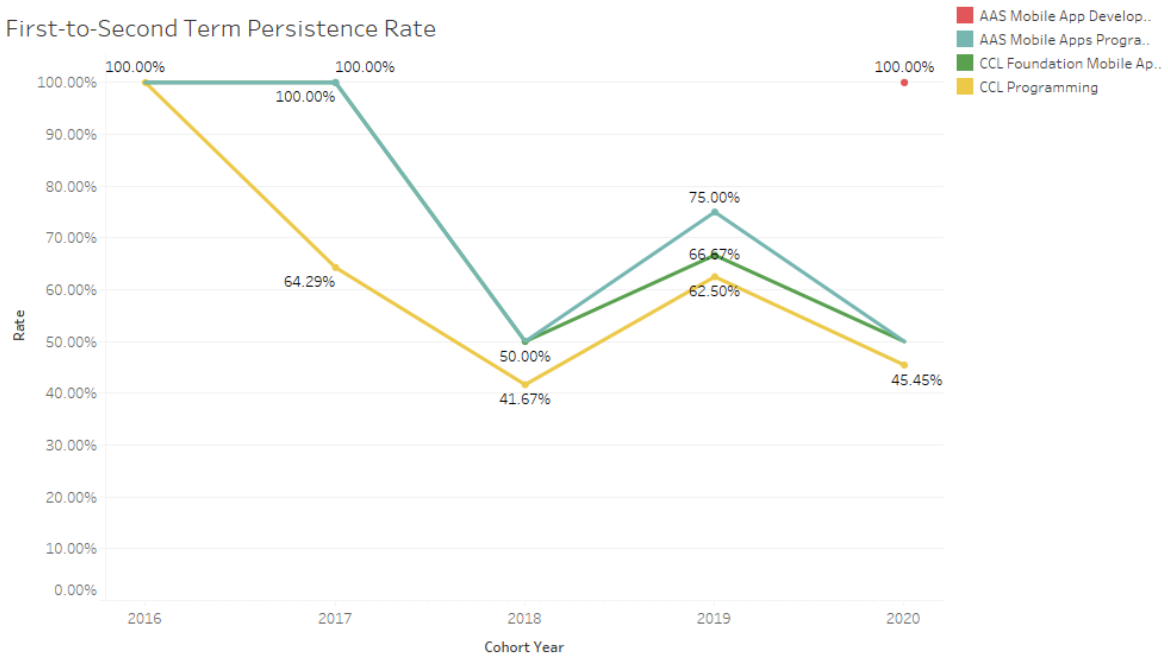
Course Success for Programming and Mobile Apps

Class		Fiscal Year 2018	2019	2020	2021	2022
CIS162AD	Retention Rate	88.1%	75.0%	70.9%	63.2%	65.7%
	Course Failure R..	26.4%	11.4%	2.2%	0.8%	1.5%
	Course Pass Rate	61.64%	63.64%	68.66%	62.40%	64.18%
CIS163AA	Retention Rate	93.6%	83.5%	90.8%	90.0%	92.7%
	Course Failure R..	9.7%	2.0%	0.8%	1.4%	2.0%
	Course Pass Rate	83.91%	80.81%	89.14%	87.21%	90.17%
CIS165	Retention Rate	98.1%	76.5%	87.9%	92.3%	52.0%
	Course Failure R..	38.5%	5.9%	9.1%	0.0%	0.0%
	Course Pass Rate	59.62%	70.59%	78.79%	92.31%	52.00%
CIS165DA	Retention Rate	88.3%	67.5%	81.6%	80.5%	53.6%
	Course Failure R..	16.7%	2.5%	0.0%	0.0%	7.1%
	Course Pass Rate	71.67%	65.00%	81.58%	80.49%	46.43%
CIS165DB	Retention Rate	100.0%	93.3%	100.0%	100.0%	100.0%
	Course Failure R..	20.7%	0.0%	0.0%	0.0%	0.0%
	Course Pass Rate	79.31%	93.33%	100.00%	100.00%	100.00%
CIS190	Retention Rate	93.8%	79.3%	74.7%	77.5%	77.9%
	Course Failure R..	37.0%	28.8%	9.7%	5.5%	6.6%
	Course Pass Rate	56.79%	50.45%	64.94%	71.96%	71.27%
CIS250	Retention Rate	87.8%	73.8%	71.8%	78.4%	83.9%
	Course Failure R..	12.2%	3.8%	1.3%	1.1%	7.1%
	Course Pass Rate	75.57%	70.00%	70.51%	77.27%	76.79%
CIS262AD	Retention Rate	98.1%	91.9%	89.7%	75.9%	76.5%
	Course Failure R..	25.9%	10.8%	0.0%	0.0%	11.8%
	Course Pass Rate	72.22%	81.08%	89.74%	75.86%	61.76%
CIS263AA	Retention Rate	96.9%	91.1%	90.5%	83.3%	86.7%
	Course Failure R..	9.2%	0.0%	0.0%	0.0%	0.0%
	Course Pass Rate	87.69%	91.11%	90.48%	83.33%	86.67%
CIS265	Retention Rate				81.8%	85.7%
	Course Failure R..				0.0%	14.3%
	Course Pass Rate				81.82%	71.43%
CIS276DA	Retention Rate	87.9%	72.6%	71.1%	59.3%	66.9%
	Course Failure R..	26.7%	6.8%	5.3%	17.1%	12.6%
	Course Pass Rate	61.21%	65.81%	65.79%	42.28%	54.33%
GBS151	Retention Rate	88.4%	74.1%	72.1%	74.7%	68.0%
	Course Failure R..	25.7%	6.8%	4.1%	5.4%	5.4%
	Course Pass Rate	62.67%	67.27%	66.58%	69.27%	62.00%

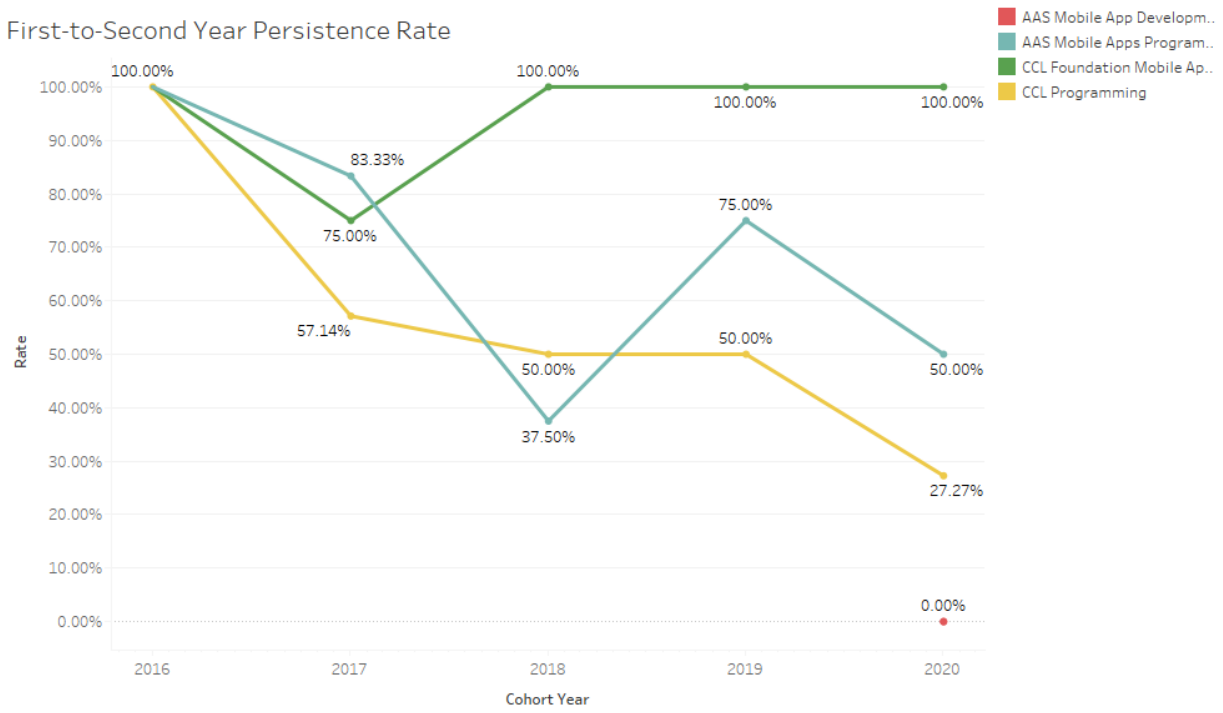
Using 70% as a target retention for analysis, the following courses fall below this level in various certificate or degree pathways:

CIS133DA - Internet Web Development Level I. This course is in the Computer Technology Department, which is not included in this review.
CIS162AD - C# Level I. This class was revised in spring of 2022, and more current data indicate significant improvement. For AY2022-23, 72.29% of students were successfully retained.
CIS165 - iOS programming. Not a large sample size here, but data is trending upwards. For AY2022-23, 80% of students were successfully retained.
CIS165DA - Android Programming. This class is also a smaller-enrollment class with improved success numbers post-review period (80.77% for AY2022-23).
CIS276DA - MySQL - This class was very out of date and was just revised in fall of 2023. AY2022-23 data showed improvement (63.83% successful retention), and the new version will be closely monitored in case early interventions are necessary.
GBS151 - Introduction to Business. This course is in the Business Department, which is not included in this review.
CIS126DL - Linux Operating System. This course moved to the Cogent platform in fall of 2023. Success rates are being monitored.

Note: The following graphs represent student cohorts based on when students first declared their academic program. For example, students who declared their program in Summer 2015, Fall 2015, and Spring 2016 are grouped into cohort year 2016.

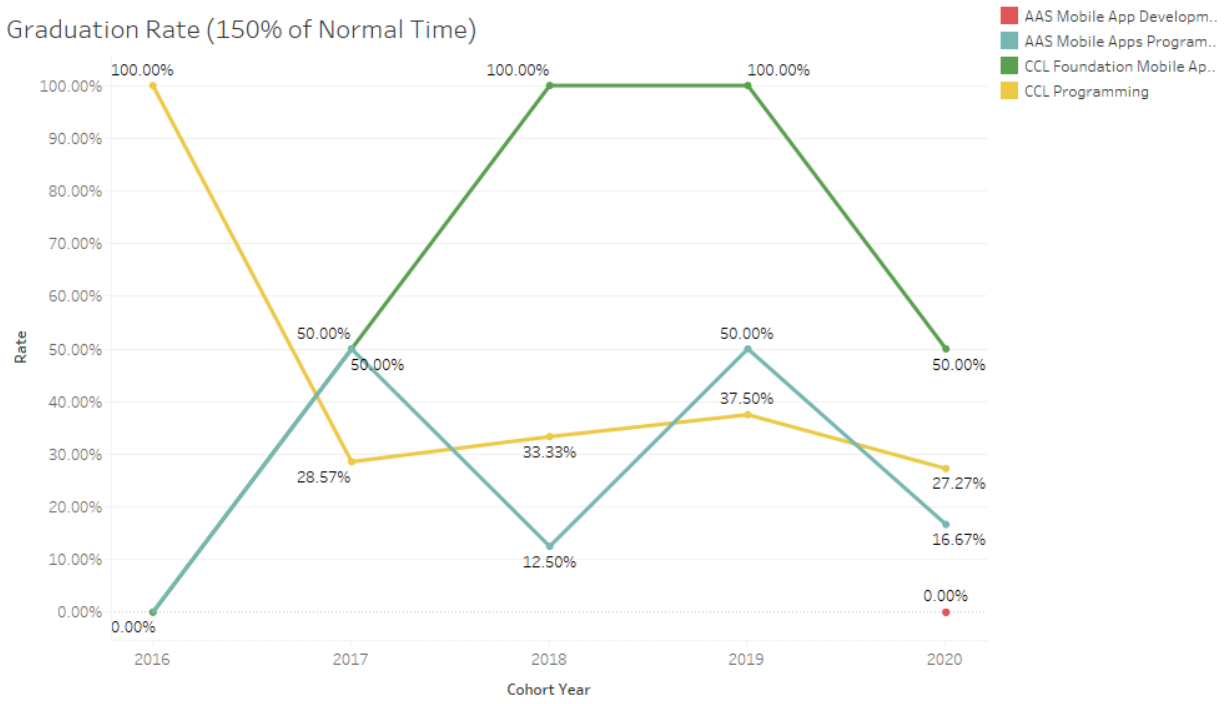


PlanTitle	2016	2017	2018	2019	2020
AAS Mobile App Development					100.00% 1
AAS Mobile Apps Programming	100.00% 2	100.00% 6	50.00% 8	75.00% 4	50.00% 6
CCL Foundation Mobile App Dev	100.00% 1	100.00% 8	50.00% 2	66.67% 3	50.00% 2
CCL Programming	100.00% 3	64.29% 14	41.67% 12	62.50% 8	45.45% 11



PlanTitle	2016	2017	2018	2019	2020
AAS Mobile App Development					0.00% 1
AAS Mobile Apps Programming	100.00% 2	83.33% 6	37.50% 8	75.00% 4	50.00% 6
CCL Foundation Mobile App Dev	100.00% 1	75.00% 8	100.00% 2	100.00% 3	100.00% 2
CCL Programming	100.00% 3	57.14% 14	50.00% 12	50.00% 8	27.27% 11

The graphics show a decline in term-to-term and year-to-year persistence. As mentioned earlier, the number of certificates students can choose from may be contributing to this decline. See Section XI.c.2 for an action plan that focuses on streamlining certificate pathways with engagement from industry and other colleges.



PlanTitle	2016	2017	2018	2019	2020
AAS Mobile App Development					0.00% 1
AAS Mobile Apps Programming	0.00% 2	50.00% 6	12.50% 8	50.00% 4	16.67% 6
CCL Foundation Mobile App Dev	0.00% 1	50.00% 8	100.00% 2	100.00% 3	50.00% 2
CCL Programming	100.00% 3	28.57% 14	33.33% 12	37.50% 8	27.27% 11

The low number of students that declared each of the awards during the review period contributed to the wide fluctuations in cohort graduation percentages. The implementation of Guided Pathways with a case management approach to academic advising will, hopefully, result in more students declaring their program(s) up-front and earning the stackable certificates for which they are eligible along on their AAS pathway.

V. Program Learning Outcomes

Mobile App Development (Learning Outcomes)

1. Design and develop a complex user interface that utilizes professional UI/UX principles. (CIS133DA, CIS120DF, CIS159, CIS162AD, CIS165, CIS165DA, CIS165DB, CIS165DC, CIS265, CIS265DA)

2. Design and develop complex applications that meet the client's needs utilizing the appropriate controls for the appropriate platform. (CIS105, CIS133DA, CIS133DA, CIS150AB, CIS156, CIS159, CIS162AD, CIS163AA, CIS165, CIS165DA, CIS165DB, CIS165DC, CIS166AA, CIS166AE, CIS225, CIS233DA, CIS262AD, CIS263AA, CIS265, CIS265DA, CIS276DA, CIS276DB)

3. Develop effective, efficient, tested code that meets complex specifications. (CIS105, CIS133DA, CIS150AB, CIS156, CIS159, CIS162AD, CIS163AA, CIS165, CIS165DA, CIS165DB, CIS165DC, CIS166AA, CIS166AE, CIS233DA, CIS263AA, CIS262AD, CIS265, CIS265DA, CIS276DA, CIS276DB)

4. Analyze complex problems using critical thinking skills and design program solutions. (CIS105, CIS133DA, CIS150AB, CIS156, CIS159, CIS162AD, CIS163AA, CIS165, CIS165DA, CIS166AA, CIS166AE, CIS225, CIS233DA, CIS263AA, CIS262AD, CIS265, CIS265DA, CIS276DA, CIS276DB)

5. Research and evaluate professional resources to effectively apply them to a complex problem. (CIS133DA, CIS150AB, CIS156, CIS159, CIS162AD, CIS163AA, CIS165, CIS165DA, CIS165DB, CIS165DC, CIS166AA, CIS166AE, CIS225, CIS263AA, CIS262AD, CIS265, CIS265DA, CIS276DA, CIS276DB)

6. Communicate in varied settings, both orally and in writing, in a culturally responsive manner to function well in a diverse and collaborative team environment. (CIS225, CIS233DA, CIS263AA, CIS262AD, CIS265, CIS265DA, CIS276DA, CIS276DB)

7. Practice industry accepted professional and ethical behavior. (CIS133DA, CIS166AA, CIS166AE, CIS225, CIS233DA, CIS262AD, CIS263AA, CIS265, CIS265DA, CIS276DA, CIS276DB)

AAS Programming and Systems Analysis (Learning Outcomes)

1. Analyze business requirements using critical thinking skills. (CIS105, CIS133DA, CIS150++, CIS151, CIS159, CIS156, CIS162++, CIS163AA, CIS165++, CIS166++, CIS225++, CIS250, CIS251, CIS256, CIS259, CIS262++, CIS263AA, CIS265, GBS211, GBS151, CRE101, ECN211, ECN212, SBU200, CRE101, [FYC], [MA], [SG], [SQ])

2. Use computer systems and networks in a responsible and ethical manner. (CIS105, CIS190, CIS225++, CIS250, CNT140AB, GBS151, MST140++)

3. Design, develop and implement database solutions to effectively manage data. (CIS119DO, CIS276++)

4. Develop and implement well-structured computer programs that solve business problems. (CIS150++, CIS151, CIS156, CIS159, CIS162++, CIS163AA, CIS165++, CIS251, CIS259, CIS256, CIS262++, CIS263AA, CIS265, [MA])

5. Utilize the software development lifecycle for application development. (CIS150++, CIS151, CIS156, CIS159, CIS162++, CIS163AA, CIS165++, CIS166++, CIS225++, CIS250, CIS251, CIS256, CIS259, CIS262++, CIS263AA, CIS265, [MA])

6. Test and debug computer programs. (CIS150++, CIS151, CIS156, CIS159, CIS162++, CIS163AA, CIS165++, CIS251, CIS259, CIS256, CIS262++, CIS263AA, CIS265, [MA])

7. Leverage the functions and architecture of an operating system to achieve business objectives. (CIS105, CIS126DL, CIS126RH, CIS165++, CIS265, MST150++)

8. Communicate professionally in formal and informal situations to diverse audiences. (CIS133DA, CIS166++, CIS225++, CIS250, CIS256, GBS211, CRE101, (COM), [FYC], [HU])

9. Write effective documentation according to industry standards. (CIS133DA, CIS150++, CIS151, CIS156, CIS159, CIS162++, CIS163AA, CIS165++, CIS166++, CIS225++, CIS250, CIS251, CIS256, CIS259, CIS262++, CIS263AA, CIS265, CRE101, [FYC], [SG], [SQ])

10. Collaborate effectively with diverse teams. (GBS151, SBU200, CRE101, (COM), [HU])

11. Apply an understanding of characteristics and principles of business processes to software application development. (CIS133DA, CIS150++, CIS151, CIS156, CIS159, CIS162++, CIS163AA, CIS165++, CIS166++, CIS224, CIS225++, CIS250, CIS251, CIS256, CIS259, CIS262++, CIS263AA, CIS265, GBS151, CRE101, [MA])

12. Design web-based applications using client-side and server-side scripting. (CIS133DA, CIS166++, CIS262++, CIS263AA)

13. Develop a project scope while considering factors such as customer requirements, project costs, return on investment, and internal/external business objectives. (CIS133DA, CIS150++, CIS151, CIS156, CIS159, CIS162++, CIS163AA, CIS165++, CIS224, CIS225++, CIS250, CIS251, CIS256, CIS259, CIS262++, CIS263AA, CIS265, GBS151, GBS211, [MA])

14. Apply relevant knowledge, skills, and habits of mind to seek career opportunities in the field. (FYE101, FYE103)

Programming and Systems Analysis Level I (Learning Outcomes)

1. Analyze business requirements using critical thinking skills. (CIS105, CIS133DA, CIS150, CIS15AB, CIS166++, GBS151, CIS156, CIS159, CIS162++, CIS163AA, CIS165++)

2. Use computer systems and networks in a responsible and ethical manner. (CIS105, GBS151)

3. Design, develop and implement database solutions to effectively manage data. (CIS119DO, CIS276DA, CIS276DB)

4. Develop and implement well-structured computer programs that solve business problems. (CIS150, CIS15AB, CIS156, CIS159, CIS162++, CIS163AA, CIS165++)

5. Utilize the software development lifecycle for application development. (CIS150, CIS15AB, CIS166++, CIS156, CIS159, CIS162++, CIS163AA, CIS165++)

6. Test and debug computer programs. (CIS150, CIS15AB, CIS159, CIS162++, CIS163AA, CIS165++)

7. Leverage the functions and architecture of an operating system to achieve business objectives. (CIS105, CIS126DL, CIS126RH, MST150++)

8. Communicate professionally in formal and informal situations to diverse audiences. (CIS133DA, CIS166++)

9. Write effective documentation according to industry standards.(CIS133DA, CIS150, CIS15AB, CIS166++, CIS156, CIS159, CIS162++, CIS163AA, CIS165++)

10. Collaborate effectively with diverse teams. (GBS151)

11. Apply an understanding of characteristics and principles of business processes to software application development. (GBS151, CIS133DA, CIS150, CIS15AB, CIS166++, CIS156, CIS159, CIS162++, CIS163AA, CIS165++)

12. Design web-based applications using client-side and server-side scripting. (CIS133DA, CIS166++)

13. Develop a project scope while considering factors such as customer requirements, project costs, return on investment, and internal/external business objectives. (GBS151, CIS133DA, CIS150, CIS15AB, CIS166++, CIS156, CIS159, CIS162++, CIS163AA, CIS165++)

Program Learning Outcomes - Mobile Apps Development

Learning Outcome	Assessment Method	Student Count	Students @ CL
Design and develop a complex user interface that utilizes professional UI/UX principles.	CIS165 Lesson 6 Project	36	85%
Design and develop complex applications that meet the client`s needs utilizing the appropriate controls for the appropriate platform.	CIS265 Final Exam Project	2	80%
Develop effective, efficient, tested code that meets complex specifications	CIS163AA Final Project	30	95%
Analyze complex problems using critical thinking skills and design program solutions	CIS163AA Final Project	37	97%
Research and evaluate professional resources to effectively apply them to a complex problem.	CIS225AB Final Project	22	89%
Communicate in varied settings, both orally and in writing, in a culturally responsive manner to function well in a diverse and collaborative team environment.	CIS225AB Final Project	22	89%
Practice industry accepted professional and ethical behavior.	CIS263AA Lesson 1 Project	16	93%

Program Learning Outcomes - Programming

Learning Outcome	Assessment Method	Student Count	Students @ CL
Analyze business requirements using critical thinking skills.	GBS151Final Exam Part 2: Final Project	6	95%
Use computer systems and networks in a responsible and ethical manner.	CIS225AB Lesson 12: At-Home Final Exam Project	154	88%
Design, develop and implement database solutions to effectively manage data.	CIS276DA Final Project	299	90%
Develop and implement well-structured computer programs that solve business problems.	CIS162AD Final Exam Project Part 2	72	76%
Utilize the software development lifecycle for	CIS150AB Lesson 3 Essay	31	97%
Test and debug computer programs.	CIS163AA Final Project	30	95%
Leverage the functions and architecture of an operating system to achieve business objectives.	CIS265 Final Exam Project	14	74%
Communicate professionally in formal and informal situations to diverse audiences.	CIS225AB At-Home Final Exam Project	22	89%
Collaborate effectively with diverse teams.	GBS151 Lesson 12 Memo assignment	7	81%
Apply an understanding of characteristics and principles of business processes to software application	CIS225AB Final Project	82	90%
Design web-based applications using client-side and server-side scripting	CIS166AA At-Home Final Exam Project	116	80%
Develop a project scope while considering factors such as customer requirements, project costs, return on	CIS225AB Final Project	82	90%

Almost all assessments show at least 80% at the College Level with two exceptions:

1. "Leverage the functions and architecture of an operating system to achieve business objectives" as measured by the CIS265 Final Exam project, and
2. "Develop and implement well-structured computer programs that solve business problems." as measured by CIS162AD Final Exam Project Part 2.

Both CIS265 and CIS162AD courses were redeveloped in AY2022-23. The updated projects will be monitored to see if college-level performance for the associated program outcomes improves.

VI. College-wide Student Learning Outcomes

In addition to the program-level outcomes addressed above, Rio Salado College places a high priority on developing core competence in the following areas:

1. **Critical Thinking:** The student will demonstrate the ability to analyze information, evaluate material, use inference to draw conclusions, and use deductive reasoning and inductive reasoning at a college level
2. **Information Literacy:** The student will demonstrate the ability to determine an information need, access successfully and evaluate critically the needed information, and organize and apply the information appropriately to accomplish a given research task.
3. **Oral Communication:** The student will demonstrate the ability to prepare and present oral communication in a variety of contexts as a college-level speaker.
4. **Reading:** The student will demonstrate the ability to comprehend a variety of materials by determining the central idea and providing textual evidence, drawing inferences or valid conclusions, analyzing the author's purpose and bias, and applying the text to a given task or course content.
5. **Writing:** On a written assignment, the student will demonstrate the ability to generate relevant and sufficient content; organize his or her thoughts coherently; adhere to the conventions of correct mechanics and sentence structure; and use correct terminology and rich vocabulary in the fulfillment, at the college level, of his or her writing assignments.

For more information:
http://www.riosalado.edu/about/teaching-learning/assessment/Pages/SLO.aspx

Student Learning Outcomes are being assessed in the following courses:

Course	Critical Thinking	Information Literacy	Reading	Writing	Oral Communication
CIS105	Y	Y	Y	Y	
CIS120DF	Y	Y	Y	Y	
CIS126DL	Y	Y	Y	Y	
CIS133DA	Y	Y	Y	Y	
CIS150		Y	Y		
CIS150AB	Y	Y	Y	Y	
CIS156	Y	Y	Y	Y	
CIS159	Y	Y	Y		
CIS162AD	Y	Y	Y	Y	
CIS163AA	Y	Y	Y		
CIS165	Y	Y	Y	Y	
CIS165DA	Y	Y	Y	Y	
CIS165DB		Y	Y		
CIS190				Y	
CIS225AB	Y	Y	Y	Y	
CIS250		Y	Y	Y	
CIS259	Y	Y	Y		
CIS262AD	Y	Y	Y	Y	
CIS263AA		Y	Y		
CIS265	Y	Y	Y	Y	
CIS276DA	Y	Y	Y		
CIS166AA		Y	Y	Y	
CIS233DA	Y	Y	Y		
GBS151	Y	Y	Y	Y	

At present, oral communication is not being assessed in the Programming curriculum. Oral communication is a crucial aspect of personal and professional development, and the absence of formal content and assessments designed to develop this skill may hinder the students' ability to express themselves confidently and articulate their thoughts and ideas effectively upon exiting the program. See Action Plan in Section XI.c.3 to address this need.

According to the data in the following section, the target of 80% of students performing at a college level in each of the student learning outcomes was exceeded for assessments aligned with Critical Thinking, Information Literacy, and Reading. Writing fell just short of the target. See Section XI.c.5 for a PDCA cycle to address the gap.

VII. Impact of Co-curricular Programming

Student participation in co-curricular activities* correlated with higher levels of performance across all college-wide learning outcomes being assessed.

Learning Outcome	All Student Assessments	Assessments at College Level	Percent of Assessments at College Level	Co-Curricular Student Assessments	Co-Curricular Assessments at College Level	Percent of Co-Curricular Assessments at College Level
Critical Thinking	63,825	51,119	80.1%	5,116	4,366	85.3%
Information Literacy	114,376	93,686	81.9%	9,145	7,863	86.0%
Oral Communication	-	-	-	-	-	-
Reading	109,879	88,037	80.1%	8,799	7,528	85.6%
Writing	76,077	58,486	76.9%	5,974	4,948	82.8%

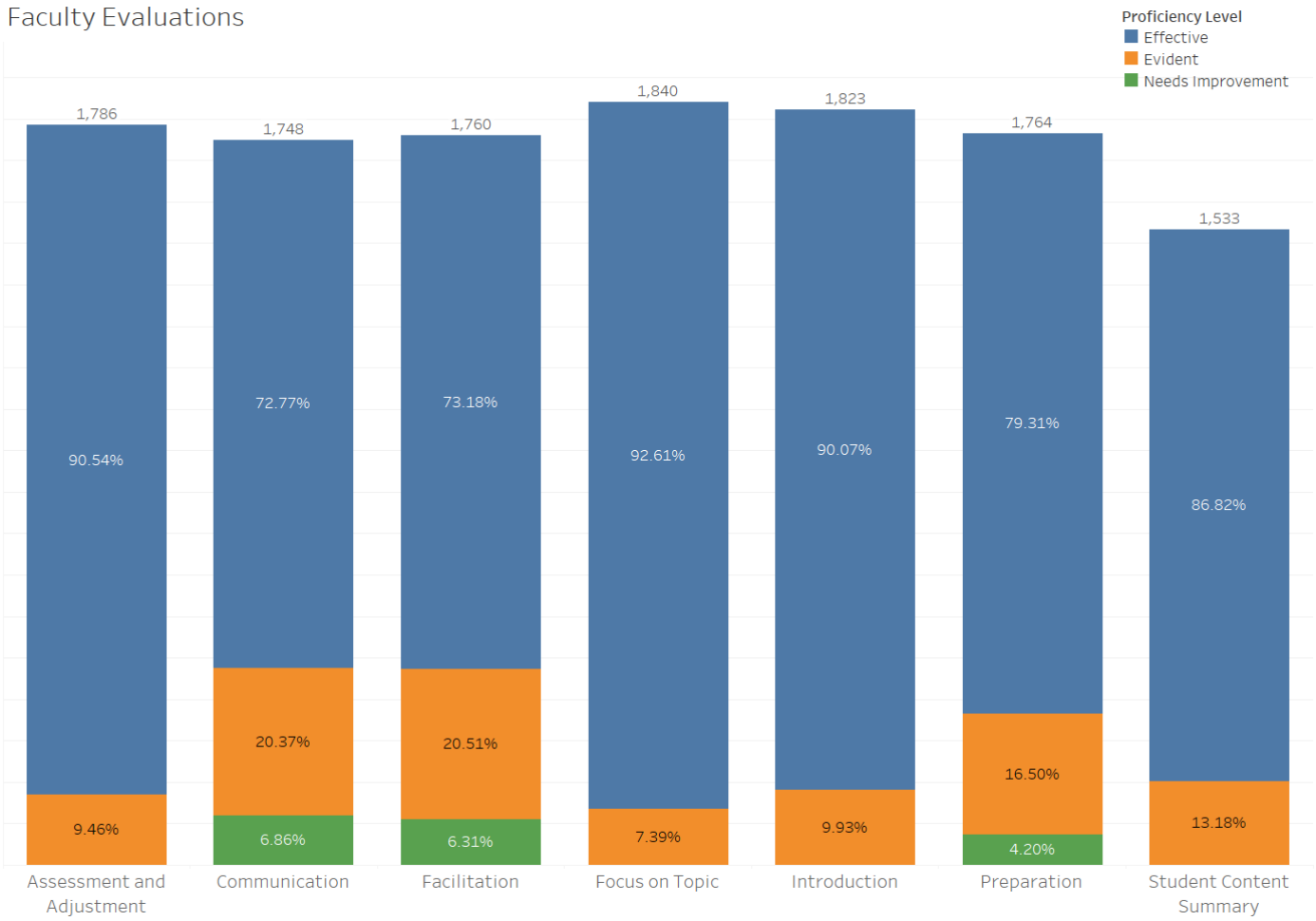
*****_Co-curricular activities include Achieving a College Education (ACE), Honors, National Society of Leadership and Success (NSLS), and Phi Theta Kappa (PTK)_

Though none of the courses within the programming pathway in the STEM department are currently offered for Honors credit, as a result of this review, an Honors-only section of CIS163AA will be available beginning spring, 2024.

VIII. Effective Teaching

The STEM faculty meet twice a year during the All-Faculty meetings for breakout and training on effective teaching strategies. All new faculty are required to complete AFD101 and are strongly encouraged to complete additional AFD courses. Faculty are invited to professional conferences, mostly regionally, but occasionally on the national level. For example, the Chair recently presented at the Cybersecurity Across Disciplines (CyAD) conference. Faculty in the department have also completed the Association of College and University Educators (ACUE) training for fostering a culture of diversity, equity, inclusion, and belonging.

Peer faculty evaluation and student end-of-course evaluation data represented below are further evidence that STEM faculty are engaging in effective teaching practices.



Student responses from end-of-course instructor evaluations indicate that students are quite satisfied with their Rio instructors, as the average total score for each question is consistently well above 4.00 on a 5.00 point scale:

End of Course Evaluations

Question	2018	2019	2020	2021	2022
My instructor communicated the course policies and procedures	4.61	4.77	4.75	4.69	4.77
My instructor demonstrated knowledge of the course material	4.54	4.74	4.71	4.66	4.69
My instructor graded assignments or imported grades within the stated timeframe	4.63	4.78	4.76	4.73	4.75
My instructor provided feedback that explained what I did well and where I had opportunities to improve	4.48	4.68	4.68	4.63	4.70
My instructor responded to questions in a timely manner	4.49	4.70	4.64	4.65	4.64
My instructor was engaging and willing to give individual help	4.42	4.62	4.57	4.55	4.61

IX. Evaluation of Curriculum

The associates degrees and related certificates of completion in this program were one of the first in the district to go through the new pathway mapping process in the district. In 2019, educators from multiple colleges and departments, including Business, Programming, Math, Counseling, and English met with mapping coaches and industry representatives to map all of the programming curriculum. For each certificate and degree pathway, specific CIP and SOC codes were selected and program descriptions created or revised. Program outcomes were created and aligned to courses within the pathway. Course outlines and competencies were reviewed, created, and revised. The sum of all these changes was approved by the Governing Board on December 10, 2019. The Programming and Systems Analysis pathway mapping occurred separately but in the same time frame. At this time, the multiple certificate options were created to meet the needs of all students at all of the Maricopa Colleges. Since three years have now passed it is time to once again convene the Industry Advisory Board and discuss changes to the pathway mapping. See Section IX.c.2 for related Action Plan.

Changes are made every year to courses in programming. Due to the evolving nature of technology, it is vital to keep ahead of the latest software versions and newest releases. For example, we implemented a cloud-based Azure Labs solution for students to access software without having to purchase and install it themselves. Visual Basic (CIS162AD) was just updated to a generic version of Visual Studio. Changes such as this are driven from the companies that make the software, but also from student feedback. CIS276DA (MySQL) was recently revised after student feedback revealed that the instructions, while manageable, were tedious and out-of-date. Every course in programming in the STEM department has been revised within the last three years.

At present the STEM department is implementing micro credentials in Blockchain, Semiconductor Manufacturing, and Optics. With the lessons learned, it is likely that programming adds some microcredentials in the future, but only after review of current efforts in other areas.

X. Program Resources

The STEM department is fortunate to have an Instructional Services Manager as of 2023. Additional personnel are not requested at this time.

There is a need to update and disseminate existing marketing assets, including webpage, flyers, videos, and pop-up banners. A request has been submitted to Institutional Advancement.

The College is exploring funding options to expand the use of Azure or other cloud-computing services to host software for students in a virtual computer lab. Doing so would increase the longevity of courses and reduce costs to students.

Textbook costs have been reduced through the use of the library's *EBSCO* and *O'Reilly for Higher Education* databases. Students can get electronic copies of many of their texts at very low (or no) cost. We also have library modules, like the Mobile Apps Reference Guide, which were specifically designed to help programming students find reliable and credible resources.

XI. Program Recommendations, Decisions, and Action Plans

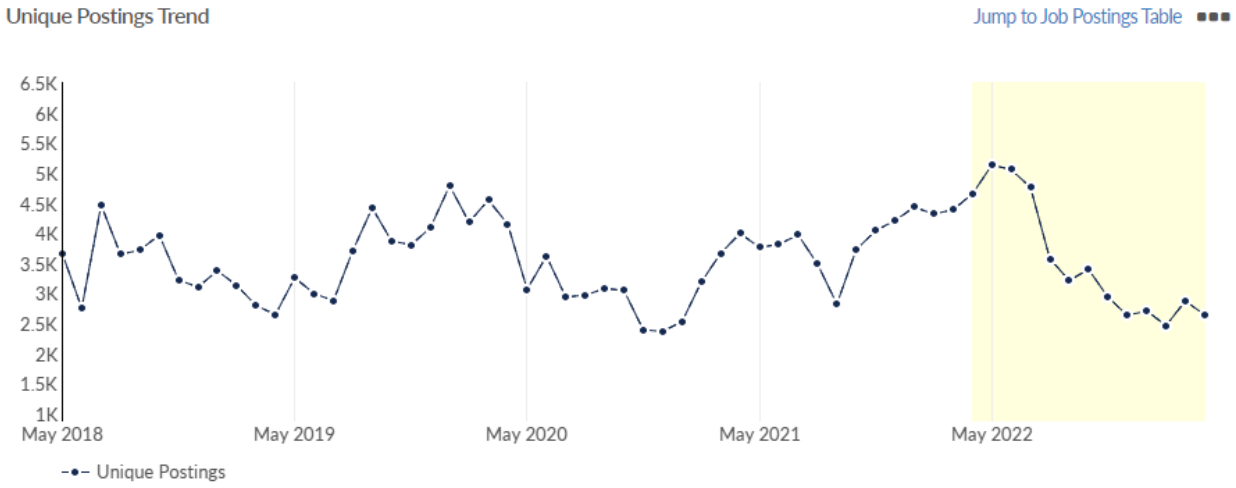
a. Program Best Practices

In order to meet the continuous changing and evolving technology requirements and software versions, the STEM department has initiated a pilot to use Azure Labs for hosting a Cloud-computing based "Virtual Computer Lab". This is indeed a best practice and the program is looking to fund an expansion of this successful pilot to additional courses and departments. A project manager has been identified to facilitate this initiative.

Continuing in this spirit of innovation, the Rio Salado College programming department applied and was selected as a beta college participant in the Carnegie-Mellon Social and Interactive Learning at Community Colleges (SAIL-CC) program for all of our CIS156 Python classes. Starting in 2023, this model will also be used for an "Introduction to Computing" class roughly aligned with CIS105. Adjuncts will participate in professional development and faculty and students will provide data to inform research on how the platform supports retention and course and program outcomes.

b. Program Viability

Occupation	Unique Postings from Apr 2022 - Apr 2023	% Change (Apr 2022 - Apr 2023)	Latest 30 Days Unique Postings	Latest 30 Days Unique Postings % Change	Median Hourly Earnings	Median Annual Earnings	Annual Median Advertised Salary	Salary Observations Count
Computer Systems Ana	6,633	(33%)	466	(2.3%)	$47.02	$97,795	$98,560	1,835
Computer Programmers	1,862	(13%)	136	19.3%	$40.18	$83,570	$80,256	629
Software Developers	30,199	(44%)	1,582	(15.5%)	$48.88	$101,665	$124,672	8,878
Software Quality Assura	3,217	(32%)	199	(9.1%)	$39.00	$81,122	$96,640	937
Web Developers	3,694	(68%)	143	(24.3%)	$30.50	$63,444	$117,632	1,183
Web and Digital Interfac	434	(55%)	22	(12.0%)	$29.84	$62,069	$70,016	125
Total Across All Occupa	46,039	(43%)	2,548	(12.0%)	$47.11	$97,987	$117,632	13,587



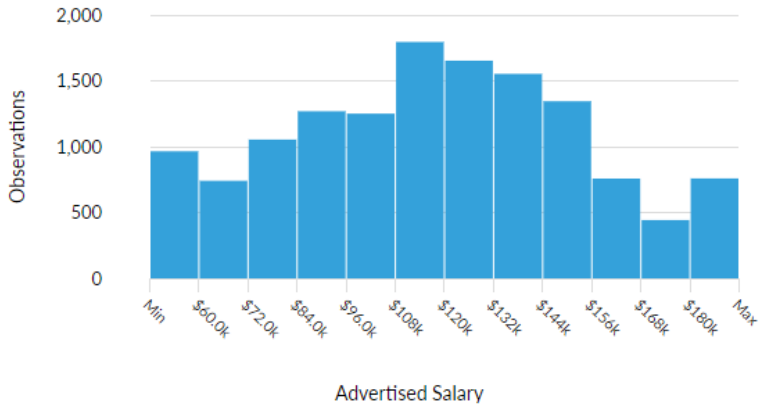
Source: https://lightcast.io/

Advertised Salary

There are 13,586 advertised salary observations (30% of the 46,039 matching postings).

$117.6K

Median Advertised Salary



Source: https://lightcast.io/

Occupation	Avg Monthly Postings (Apr 2022 - Apr 2023)	Avg Monthly Hires (Apr 2022 - Apr 2023)
Software Developers	2,323	1,512
Computer Systems Analysts	510	420
Web Developers	284	109
Software Quality Assurance Analysts and Testers	247	161
Computer Programmers	143	89
Web and Digital Interface Designers	33	100

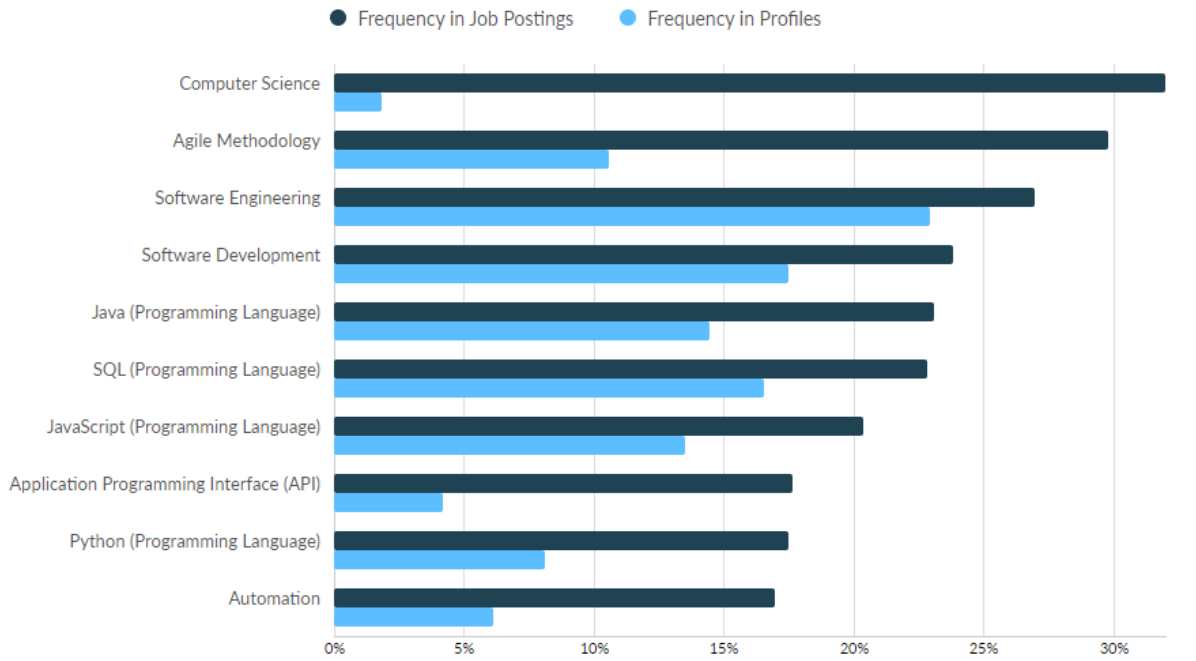
Who's Hiring

Top Companies Posting Give Feedback

Company	Total/Unique (Apr 2022 - Apr 2023)	Posting Intensity	Median Posting Duration
CyberCoders	6,582 / 1,807	4 : 1	29 days
Wells Fargo	4,104 / 973	4 : 1	27 days
UnitedHealth Group	3,024 / 959	3 : 1	23 days
Deloitte	1,600 / 949	2 : 1	27 days
Jobot	2,616 / 880	3 : 1	25 days
Raytheon Technologies	2,842 / 848	3 : 1	31 days
General Dynamics	1,425 / 694	2 : 1	24 days
Randstad	1,093 / 582	2 : 1	19 days
USAA	1,874 / 580	3 : 1	26 days
American Express	1,082 / 577	2 : 1	24 days

Source: https://lightcast.io/

Top Specialized Skills



c. Action Plans

1. Convert CIS165DB (Windows/C#) to the more modern CIS165DC MAUI.net course option. The plan is for the new course, modeled after the course materials used currently at SMCC, to be ready by Fall 2024.
2. Re-convene a pathway mapping design and development group for all of mobile apps programming with new additions from the Industry Advisory Board. Design and Development should commence no later than Spring 2024. Consider microcredentialing options, auto-awarding of certificates, working with advisors to ensure students select CCLs en route to AAS degrees, and a reduction in the number of CCL pathways.
3. RioLog funding will be used to compensate an adjunct faculty member to add an oral communication assessment in CIS163AA (Java) that is aligned with the General Education Student Learning Outcome rubric. New assessments will be in place by Fall 2024. Work in this area will be a pilot for further expansion of oral communication assessments in other level I programming courses such as CIS162AD and CIS159.
4. Offer an Honors section of CIS163AA beginning spring 2024.
5. Initiate a Plan-Do-Check-Act (**PDCA**) cycle to look at the written assessments currently aligned within programming courses to increase college-level success from the current 76.9% to at or above 80%.

    PLAN: Identify the courses and assessments currently tagged for SLO Written Communication assessment. Secure RioLOG funding for a SME to plan curricular and pedagogical changes to foster increased student success. (Fall 2023)

    DO: Implement curricular updates. (Spring 2024)

    CHECK: Pull SLO assessment data. (End of Spring 2025)

    ACT: If changes have increased improvement, expand on this in other courses and share best practices with a wider faculty cohort. If additional improvement is necessary, initiate another PDCA cycle. (Summer 2025)

d. Assessment Team Recommendation

X Continue program and implement stated action plan. Next review due AY2028.

☐ Continue program, implement stated action plan, and address comments listed below. Spotlight follow-up report due {1-2 years}.

☐ Refer to college administration to determine program viability.

☐ Discontinue program.

Comments: