

Computer Science

Program Review Presentation

March 18, 2022

Mission: *

The mission of the Computer Science Department is multifaceted and diverse.

The department offers an “Associate in Science Degree for Transfer (AS-T)”, which provides a **pathway** to the California State University (CSU). Students awarded an AS-T degree are guaranteed admission with junior standing in the CSU system and given priority admission consideration to their local CSU campus or to a program that is deemed similar to their community college major.

Also, **the mission of the Computer Science** program is to provide **up to date Computer Science classes** that will “**Lead to employment**” after receiving an AS/T degree.

Also, it also provides classes in “**Essential Computer Science knowledge**”, for all majors studying at Canada College. In today’s modern world, nearly ALL majors need to understand computers. It is recommended that all student at Canada College take CIS 118 – Introduction to Computer Science, to help achieve this goal.

Next, it provides the ability to take individual classes to enable individuals to “**Update their existing work skills**”.

There is a Computer Science Degree and four certificates offered to achieve these goals.

- Computer Science AS/T
- Swift Programming certificate - For Apple computer
- C++ Programming certificate - For serious scientific computing
- Java Programming certificate - For Web base programming
- Oracle Cloud Computing certificate - For Cloud base computing.

Specifically, these mission goals are achieved by offering the following classes:

CIS 118 Introduction to Computer Science – Recommend course for ALL majors.

CIS 122 Introduction to Programming: Python

CIS 242 Computer Architecture and Assembly Language

CIS 250 Introduction to Object Oriented Programming: C++

CIS 252 Introduction to Data Structures - C++

CIS 262 Discrete Mathematics for Computer Science
CIS 284 Introduction to Object Oriented Programming- Java
CIS 286 Introduction to Data Structures - Java
CIS 294 Introduction to Object Oriented Programming: Swift
CIS 295 Amazon Web Services (AWS) and Introduction to Cloud Computing
CIS 296 Amazon Web Services (AWS) and Database Essentials in the Cloud
CIS 297 Amazon Web Services (AWS) and Cloud Compute Engines
CIS 298 Amazon Web Services (AWS) and Cloud Security
CIS 321 iPhone Programming: Swift
CIS 695 Independent Study

Over all, the computer science course offerings have been generally spread across different modalities: online, hybrid and on campus courses. Additionally, there have been daytime and evening classes on campus. The modalities and times address the need of the diverse workforce found in the Bay Area.

With the advent of the pandemic in the beginning of 2020, all Computer Science course offering have been successfully converted into online course. With the diminishing of the crisis, starting Spring 2022, the times and modalities will begin to return to normal.

The Computer Science department strongly supports the Institutional Learning Objectives (ILO's). Critical Thinking, Creativity, Communications, Community and Quantitative Reasoning, by explicitly teaching how to create, validate and use ones Volitional Conceptual Facility. Only when an individual knows how to think, then they can be truly efficacious in their creativity, reasoning, communication and interaction with those in your community.

The Computer Science Department mission is to welcome and support all individuals, from all countries.

Articulation: *

The Computer Science Department works closely with the Articulation Officer and Curriculum committee to maintain established articulation agreements and update courses when needed in order to address any articulation concerns that may arise. Moreover, regularly updated articulation agreements are imperative in order for students to successfully transfer to 4-year institutions once entering Cañada from high school or to enable a career or academic directional change. The core computer science courses are articulated with the CSU's and UC's. There are no articulation changes needed at this time for existing agreements.

The Canada College Computer Science Department has numerous articulation agreements.

An easy way to view the details of the articulation agreements is by viewing them on <https://www.assist.org/>.

Community & Labor Needs: *

Analysis of Community labor needs and course offered.

* The program advisory committee meets as needed, and at least once annually in the Spring. It addresses the community and labor needs of the community in offering computer science courses. It will be attended by the following distinguished members:

Advisory Members

Ameer Thompson Dean Science and Technology Canada College, Bio Science

Nadine Ferguson Computer Science Professor San Jose State University and Canada College

Kirk Tramblee Computer Science Professor Canada College, Engineering and Computer Science

William Schwarz Computer Science Professor Canada College, Software Engineering, Security

James Hoffman Computer Science Professor Canada College, Computer Scientist, Programmer

The core course topics for the Computer Science AS/T are recommended nationally by the Association for Computing Machine (ASM) and followed the Cal State Chancellor office. See Document folder: ACM Computer Curriculum 2020 Guidelines and ACM Computer Science 2013 Curriculum Guidelines. For an AS Computer Science Programming degree, the recommendation content and semester unit hours are:.

4 units - ACM 0 – Introduction to Computer Science
3 units - ACM 1 – Object oriented Programming
3 units - ACM 2 – Data Structures
3 units - ACM 3 – Computer Architecture
3 units – ACM 4 – Discrete Structure

Note: We can customize the ASM course recommendations to accommodate the labor needs for specific computer programming languages. The analysis of labor needs noted three is a strong demand for specific core computer programming languages. C++, Java and Swift. To accommodate the labor need, the Computer Science AS/T degree has three language tracts: C++, Java or Swift.

* Next, to accommodate those student only seeking a quick study, there are three certificate offered with just the core courses and the selection of a language tract: C++, Java and Swift.

* Also, in conjunction with the Canada College Marketing Department, there was noted a strong labor need for Amazon Web Services (AWS) and Cloud Computing Training. Professor Kirk Tramblee has developed a series of four courses for a Certificate in “Amazon Web Services and Cloud Computing”. It is now being taught at Canada College. The Amazon Web Services (AWS) coursed are being renamed to be consistent. The course titles now all contain: Amazon Web Services (AWS).

CIS 295 Amazon Web Services (AWS) and Introduction to Cloud Computing
CIS 296 Amazon Web Services (AWS) and Database Essentials in the Cloud
CIS 297 Amazon Web Services (AWS) and Cloud Computer Engines
CIS 298 Amazon Web Services (AWS) and Cloud Security

* Also, there was noted a strong labor demand for the programming Language of Python. Python is a major Object Oriented language used in the Development in Machine Learning and Artificial Intelligence (AI). The course CIS 122: Introduction to programming: Python, was developed and is now taught at Canada College.

The labor market data, as applicable to computer science.

* According to US Bureau of Labor Statistics (<https://www.bls.gov>). As of May, 2020, California and specifically the Bay Area is the highest employer of technical computer users in the USA. There are over 450,000+ employed in California

alone. (https://www.bls.gov/oes/current/oes_ca.htm)

The US Bureau of Labor notes strong labor market demand for CS majors. The strong labor demand supports the likelihood that the courses for the AS degree and the CS certificates will have growing and sufficient enrollment.

Representative Sample of labor for 'common' computer science fields" in [California](#), May 2020, US Bureau of Labor:

Count Growth

Computer and Information Research Scientists	7,170	10.1%
Computer Network Support Specialists	15,390	5.1%
Computer User Support Specialists	75,950	2.6%
Computer Network Architects	19,650	6.3%
Network and Computer Systems Administrators	31,430	3.0%
Database Administrators and Architects	15,600	4.5%
Computer Programmers	21,800	7.3%
Software Developers and Software ...		
... Quality Assurance Analysts and Testers	249,700	3.5%
Web Developers and Digital Interface Designers	22,020	4.6%
Computer Occupations, All Other	83,170	2.8%

It should be noted that Computer Science majors commonly have DUAL majors.

Employers look for and prefer labor who have a Subject Matter Expertise (SME) and knowledge of Computer Science, so they can 'process' the subject Matter Data. The statistics given by the US Bureau of Labor Statistics' data does not reflect this reality. Thus the actual Labor count listed above are undercounted and the true demand for computer science labor is under represented.

It should be **recommend** too many majors at Canada College that employer's prefer graduates with a knowledge of Computer Science.

Other majors should be encouraged to have a dual major in Computer Science or at the very least a minor in Computer Science. There is a strong labor demand for graduates to have a knowledge of Computer Science.

Curricular Changes: *

The Computer Science Department works closely with the Articulation Officer and Curriculum committee to maintain/update published and established course curriculum when needed

**** Website Review ****

The Computer Science Website at <https://canadacollege.edu/computerscience/degree.php>

Faculty Contact: William Schwarz

Action: No update needed - Fully updated with all degree, certificates, and courses. Fall 2020

**** SLO and PLO's update Contacts ****

Faculty Contacts: William Schwarz, Krik Tramblee, Nadine Ferguson, James Hoffman

Admin Contact: Jose Perez Curriculum

Department Contact: Dean Science and Technology Ameer Thompson

The SLO's are all updated for all classes, except CIS 284 SLO 3.. Its Update is in progress.

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Impact of Resource Applications: *

The completion of Building 23 with it two dedicate Computer Science 'Smart' classrooms, and 20+ computers in each room has filled a major Resource need for the Computer Science Department. It has made a significant impact. Students can either bring their own PC to class, or utilize the class room PCs.

*** Recurring Software resources updates:**

Mainly there is the need to periodically update the following software on all the computers in the two computer department class rooms: 23-140 and 23-141.

* BlueJ - Java IDE

- * Microsoft Visual Studios - IDE for C, C++, Java, Python
- * Microsoft Office - Full Edition
- * Eclipse - Java IDE
- * Maria Simulator - For Assembly Programming
- * ASM - For Assembly Programming
- * - For Python Programming
- * CPU-Z for hardware inquiry
- * Web Browsers: Firefox, Brave, TOR

Working closely with Canada College's Information Technology Services department, the Software updates are made as needed.

Additionally, Technology Services updates software in the STEM center and Library computers so they can be used by Computer Science Students.

Impact of Staffing Changes: *

** Staff changes **

There has been a steady level of staffing for the Computer Science program for the last 4+ years

Staff Name: Nadine Ferguson

Faculty: Adjunct

Staff Name: Kirk Tramblee

Faculty: Adjunct

Staff Name: James Hoffman

Faculty: Adjunct

Staff Name: William Schwarz

Faculty: Full Time Tenured

There may be a need to hire a new adjunct faculty. There are is a possible need to offer CIS 242 and CIS 262 twice a year instead of once a year. There is also the possible need to offer CIS 294 and CIS 321 Swift programming courses, so students can complete the SWIFT - Apple programming language tract.

There is a definite need for the dean to review how to deal with the above mentioned issues.

There may be a simple resolution: Ask existing Adjuncts to teach the newly offered sections for those classes.

The existing faculty have demonstrated the flexibility to staff additional classes in the past.

Enrollment Trends: *

The enrollment trend for the Computer Science Department is increasing.

The Program Review Data Packet, for Computer Information Systems, the Computer Science Department, shows that the number are mostly increasing for the last three years for 3 measurable outcomes: Course Enrollments, FTEF, Section Count. **The load dipped but is back up in 2020-2021.**

Year	Course Enrollments:
2018-2019	549
2019-2020	565
2020-2021	661

Year	FTEF
2018-2019	5
2019-2020	6
2020-2021	7

Year	Section Counts
2018-2019	22
2019-2020	25
2020-2021	27

Year	Load
2018-2019	391
2019-2020	338
2020-2021	382

The analysis it that the demand for labor "with knowledge of computer science" is increasing and that the population is aware of this, and are signing up for classes.

Significant Changes in Your Program: *
There are three significant changes to the program.

* **First**, a significant change to the program is the addition of the **Amazon Web Services (AWS) and Cloud Computing Certificate**. Professor Kirk Tramblee has developed a series of four courses for a Certificate in “Amazon Web Services and Cloud Computing”. It is now being taught at Canada College.

CIS 295 Introduction to Cloud Computing
CIS 296 Database Essentials in the Cloud
CIS 297 Amazon Web Services (AWS) and Cloud Compute Engines
CIS 298 Amazon Web Services (AWS) and Cloud Security

* **Second**, there was noted a strong labor demand for the programming Language of Python. Python is a major Object Oriented language used in the Development in Machine Learning and Artificial Intelligence (AI). The course CIS 122: Introduction to programming: Python, was developed by Nadine Ferguson and is now taught at Canada College.

* **Third**, all courses are now Distance Education compliant in Curricunet, and can be/are taught fully online. This change was largely driven by the all classes going online as necessitated by the pandemic.

* There are no other significant program changes.

Classes of Students - Analysis of the Reasons for their Performance and Retention

A) Analysis - The retention and performance: Ethnic Hispanic, Black, Pacific Islander, male and female students report the reasons that effect their performance and retention in the computer science classes. To those diverse students, these are SERIOUS issues that cause the inequity performance gaps, which are personal to them. Do not ignore them. The 8 top reasons that interfere with their success/performance, that the gap students explicitly and repeatedly reported, to the departments' professors:

A) Analysis - What are the ISSUES:

1* Work requirements

Percentage of Canada College Students surveyed May 2021 reported:

24% work > 20 hours per week

11% work >11-30 hours per week

16% work 11-20 hours per week

11% work 6-10 hours per week

25% work 0 hours per week - None

The fact that student work so hard show their STRENGTH in solving many of their problems !

2* **Family life and support issues** - these are disproportionally reported by female students.

3* **Lack of timely Tutoring Support** Issues outside of the class room

4* **Personal Health Issues** / and the 'Pandemic' of 2020 and 2021

5* **Monies** issues

6* **Transportation** issues

7* **Study habits/Logical Thinking**

8* **Mental Health** Issues

Analysis and SOLUTIONS:

There are current solutions that help diverse gap discussed in the PRIE gap students. Canada college addresses/has solutions for many of the STUDENT identified and Canada College Identified, reasons for the above PRIE GAP issues. There are many serious programs, and money and effort expended to close/reduce the gaps issues. These students are STRONG and they can be part of the

solution._

1) Many of the issues might be mitigated to different degrees by a gap student contacting a Canada College Counselor: Academic or personal. Professors need to point students to resources at Canada that might help. To help in this, Faculty and Staff need to inform gap students to go speak with a counselor and tell them their issues so they can get the help they may need.

2) The STEM center, the Canvas System WEB tutor link, and other Tutoring centers at Canada College, should be give more resources and advertising to let the gap student know they are there to help with their class success and performance. The Computer Science department professors do tell the gap students that these types of tutoring are available. When student engage with tutors they become STRONGER.

3) Monies issues may be addressed by the Career Center and the Job fairs it holds. Today there is a shortage of workers... There are job posting everywhere. This should be a non-issue at this time. Need a Job? Go to T-Mobile, they have a signing bonus of \$2,000. Also, they should direct students to apply for scholarships. The NSF scholarships are a great source of scholarship for STEM computer science. Additionally, gap students should be informed of internships available. Currently Computer Science professors put links and information on their Canvas web site inform gap diverse students of these opportunities. The STEM center actually holds sessions that walk them through many of these financial opportunities.

4) Health issues should directed to the Student Health center. When healthy and stronger, they can perform better.

5) Transportation issues... monies for free bus transportation or carpools with other students.

6) Study Habits and methodologies. Many gap students are first generation college students, and have a need to learn an effective study method.

a) There are courses at Canada College that help, contact the library.

b) Part of the course content for many computer science classes is for students to learn a clear cut study method based on Modern Cognitive Psychology and its teaching pedagogy.

* Learning to create, evaluate, identify valid and invalid concepts, and use concept.

* Learn to write a summary of key concepts.

* Learn to integrate key concepts to a conceptual hierarchy/knowledge tree, to promote:

Validation, long term retention, and use.

7) Mental Health Issues, direct a student to the Personal Counseling Center.

8) No lack of computing resources or computers to be used by gap Students of the computer science dept.

a) The library loans out computers.

b) Some programs give out free computers...that the student can keep !

c) The computer Science Department has two dedicated class rooms to teach computer classes.

In each of the two room are 20+ computers available for the student to use.

d) The Tech Support installs computer science need software on available computers in the STEM Center and Library, and learning centers.

9) Support of family members, especially children can be helped by a Day Care Center at Canada College. Stress issues may be helped by a mental health center at Canada College.

Other support issues for ailing family member, are not addressed.

10) There are so many programs and resources at Canada College that help diverse gap students... the list is LONG. The fact that many PRIE gap students participate in the programs shows their STRENGTH and effort they exert to succeed.

The diverse equity gap latinx students, and other gap students, need to be more informed of all the resources available at Canada College, to further reduce the PRIE statistical gaps.