

PROGRAM REVIEW: ENGINEERING

FALL 2023



Program Review - Engineering (2023)

SECTION 1: Program Overview

1.1 - Introduction - List the names of full-time and adjunct faculty in the program, along with any staff members and their titles/roles. Note major changes in personnel since the last program review.

Note: This program review covers the seven-year period between 2015-2022.

The following instructors currently teach courses within the SCC Engineering Program:

Full-time faculty

Melanie Lutz (Ph.D., UC Berkeley), full-time since 2000

Adjunct faculty

Scott Berta (M.S., UC Berkeley), adjunct since 2017

Sana Vaziri (Ph.D., UC Davis), adjunct since 2022

The following instructors taught courses within the Engineering Program within the reporting period, but are no longer associated with the program:

Tom MacMullen (Ph.D., University of Arizona), adjunct 1995-2016

Other associated staff included:

Richard Crapuchettes (B.S., San Jose State), laboratory technician for all of the Physical Sciences, 1987-2020; note that there was no lab technician associated with this program between Spring 2020 and Spring 2023, inclusive.

1.1a - Briefly summarize any large, substantive changes made to the degrees/certificates since the last program review, and what prompted those changes. Note also any organizational changes (for example, if the program is now in a different School/Division than before). If changes have already led to noticeable improvement, please describe.

The Engineering Department at Solano Community College traces itself back to the very start of the college in 1945. In accordance with the statewide master plan for higher education, the Engineering program has always been focused on preparing students to transfer to an engineering major at a four-year university. In recent years, we have transferred about fifteen students per year, mostly to UC Davis, Sacramento State, and UC Berkeley. Some go on to pursue graduate degrees after receiving their B.S. degree, and most eventually find highly paid and productive jobs in Solano and nearby counties.

A new Associate in Science Degree in Engineering was created in 2018, and has been offered since 2019. Successful completion of this degree will provide an adequate background for employment in many technological and scientific areas, and provide a firm foundation for students planning to pursue a baccalaureate degree in engineering.

The Associate in Science Degree in Engineering consists of sixty units of courses, which include seven required courses in science, mathematics, and engineering (31 units), six elective engineering, science, and technical courses, at least three of which must be taken (10-13 units). The remainder of the sixty units must be filled by general education courses, such as are

required for the specific university and major to which the student intends to transfer. The general education courses listed in the table below are examples of courses that might be taken.

Category	Course No.	Course Name	Units	CSU-GE	IGETC
These seven courses are required	MATH 020	Analytic Geometry and Calculus I	4	B4	2A
	MATH 021	Analytic Geometry and Calculus II	4	B4	2A
	MATH 022	Analytic Geometry and Calculus III	4	B4	2A
	MATH 023	Differential Equations	4	B4	2A
	PHYS 006	Physics for Science & Engineering I	5	B1, B3	5A, 5C
	PHYS 007	Physics for Science & Engineering II	5	B1, B3	5A, 5C
	CHEM 001	General Chemistry	5	B1, B3	5A, 5C
At least three courses from these seven courses. Note: DRFT 045 or DRFT 058, but not both.	ENGR 017	Introduction to Electrical Engineering	5		
	ENGR 026 /MATH 026	Math and Engineering Problem Solving with Matlab	4		
	ENGR 030	Engineering Mechanics: Statics	4	B1, B4	
	ENGR 045	Properties of Materials	4		
	DRFT 045	Introduction to Computer-Aided Drafting (CAD)	3		
	DRFT 058	Solid Modeling with Solidworks	3		
	CIS 022	Introduction to Programming	3		
General Education courses	ENGL 001	College Composition	4	A2, A3	1A, 8A
	ENGL 002	Critical Thinking and Writing About Literature	4	A2, A3	1B, 8B
	COMM 001	Introduction to Public Speaking	3	A1	1C, 8A
	SPAN 001	First Semester Spanish	5	C2	6A

Required Technical Courses	31 units
Elective Technical Courses	10-13 units (at least)
Completion of CSU-GE Breadth or IGETC pattern	16-19 units (i.e., enough to reach 60 units)
TOTAL UNITS	60 (at least) units

The largest growth area in engineering, and in the sciences and professional world more broadly, is the field known as Data Science. According to a report published in the Annual Review of Statistics and its Application (2017, 4:15-30), “Data Science is experiencing rapid and unplanned growth, spurred by the proliferation of complex and rich data in science, industry, and government.” Demand for data scientists is high, and starting salaries are very competitive. Data Scientist has been called “the most promising career” by LinkedIn, and the “best job in America” by Glassdoor.

In response to this new opportunity, an A.S. degree in Data Science was created and approved in 2022, along with a Certificate of Achievement in Data Science. The first specific course in our Data Science program is being offered in Fall 2023. This new A.S. degree will train students in the fundamentals of Data Science, and prepare them to transfer to four-year universities at which they can earn a B.S. that will allow them to enter the burgeoning data science job market. The Certificate of Achievement is aimed at people with diverse backgrounds who want to retrain in the field of Data Science.

The Associate in Science Degree in Data Science consists of sixty units of courses, which include eight required courses in science, math, and engineering (31 units), and three

elective data science courses, at least one of which must be taken (4 units). The remainder of the sixty units must be filled by general education courses, such as are required for the specific university and major to which the student intends to transfer.

The course structure for the A.S. Degree in Data Science is shown in the following table. The general education courses listed in the table are examples of GE courses that might be taken.

Category	Course No.	Course Name	Units	CSU-GE	IGETC
These eight courses are required (31 units)	MATH 011	Elementary Statistics	4	B4	2
	MATH 020	Analytic Geometry and Calculus I	4	B4	2
	MATH 021	Analytic Geometry and Calculus II	4	B4	2
	MATH 022	Analytic Geometry and Calculus III	4	B4	2
	MATH 040	Introduction to Linear Algebra	3	B4	2
	ENGR 007 (C-ID ENGR 120)	Python Programming for Scientists and Engineers	4		
	ENGR 008	Data Science with Python for Scientists and Engineers	4		
	ENGR 012 (C-ID MATH 160)	Discrete Mathematics for Scientists and Engineers	4		
One of these three elective courses (4 units)	ENGR 010	Machine Learning with Python for Scientists and Engineers	4		
	ENGR 011	Deep Learning with Python for Scientists and Engineers	4		
	ENGR 014	Introduction to Statistical Programming in R for Scientists and Engineers	4		
General Education courses (25 units)	COMM 001	Introduction to Public Speaking	3	A1	1C
	ENGL 001	College Composition	4	A2	1A
	LR 010	Information Skills for College and Beyond	1		
	ENGL 002	Critical Thinking and Writing About Literature	4	A3	1B
	ASTR 010	General Astronomy	3	B1	5A
	ASTR 020	Astronomy Laboratory	1	B3	5C
	SOC 001	Introduction to Sociology	3	D	4
	SPAN 001	First Semester Spanish	5	C2	6
	KINE 002A	Swimming - Beginning	1	E	

Required Technical Courses 31 units

Elective Technical Courses 4 units

Completion of CSU-GE Breadth or IGETC pattern 25 units

TOTAL UNITS 60 units

The focus of the SCC Certificate in Data Science is to introduce students to the tools, methods, and conceptual approaches used to support modern data analysis and decision-making in professional and applied research settings. The pre-requisite skills that are required to enter this program are limited to high-school level algebra and trigonometry; there are no other specific requirements.

To earn the SCC Certificate in Data Science, students must:

- (1) Complete the following five required courses: MATH 011, ENGR 007, ENGR 008, ENGR 012, and ENGR 014.
- (2) Complete one of the following two elective courses: ENGR 010, ENGR 011.
- (3) Complete the above-mentioned courses with a minimum grade point average of 2.0.

The course structure for the Certificate of Achievement in Data Science is shown in the following table:

Category	Course No.	Course Title	Units	Sequence
These five required courses (20 units)	MATH 011	Elementary Statistics	4	Term 1
	ENGR 007 (C-ID ENGR 120)	Python Programming for Scientists and Engineers	4	Term 1
	ENGR 008	Data Science with Python for Scientists and Engineers	4	Term 2
	ENGR 012 (C-ID MATH 160)	Discrete Mathematics for Scientists and Engineers	4	Term 1
	ENGR 014	Introduction to Statistical Programming in R for Scientists and Engineers	4	Term 2
One of these two elective courses (4 units)	ENGR 010	Machine Learning with Python for Scientists and Engineers	4	Term 2
	ENGR 011	Deep Learning with Python for Scientists and Engineers	4	

1.1b - CTE Programs: Describe the membership of the program's advisory board. Describe how the program requirements are influenced by the advisory board, accrediting institutions, and other external organizations. Note how the membership might be expanded to get more helpful, diverse voices in the field.

The first external member who has agreed to serve on our Advisory Board for the Certificate of Achievement in Data Science is Doug Sherman, Director of Engineering at the Sacramento-based company Stratovan, a leading developer of interactive visual analysis software for 3D imaging for the medical, life science, and threat detection markets. We are currently in discussion with other local technology companies to join our Advisory Board.

1.1c - CTE Programs: Provide advisory board minutes from the past two years [upload to the blue folder in the upper right corner of Section 1]. If minutes are unavailable, please describe what meetings have taken place, noting dates if possible, along with attendees' names and professional positions.

The Advisory Board for the Certificate of Achievement in Data Science met on Thursday, December 8, 2022. This meeting was attended by Melanie Lutz and Joe Ryan of SCC. The Advisory Board also met on Thursday, June 8, 2023, and discussed the SCC Data Science website, and the lack of available faculty to teach some of the new Data Science courses.

1.2 – Future Outlook: describe conditions (inside the college, or beyond) that may affect the future of the program in the coming years. For example, note what factors may put a strain on the program or give it a boost in the next five years.

The 2022 Physics Program Review stated that “There is only one course that shows a data-driven need to add an additional section: this would be to add an extra section of PHYS 002 in the Spring semester.” Unfortunately, this clear directive has been ignored, and a new section of PHYS 007 has been added in the Spring in Vacaville, taught by an instructor with no Engineering background. Students who take PHYS 007 with an instructor who lacks a connection to Engineering do not receive encouragement and motivation to consider Engineering as a career path. The immediate consequence of this new course addition has been that enrollment in our key transferable Engineering courses, such as ENGR 017, ENGR 030, and ENGR 045, has plummeted, and consequently, once-per-year offerings of ENGR 030 and ENGR 045 were cancelled in Fall 2023. This left many of our students unable to satisfy their TAG agreement obligations to the UC system. Essentially, we are losing half of our traditional stream of potential Engineering majors. The only way to resolve this is to eliminate the Spring PHYS 007 section. The motivation of having added this new section, which was presumably to allow students to take all of their courses at Vacaville, is having the effect of destroying our Engineering program. Please note that there will never be enough Engineering students to justify having sections of our Engineering courses at Vacaville and/or Vallejo.

Furthermore, students who start their Physics sequence with PHYS 006 in the Fall, and then take PHYS 007 in the Spring, must wait another year before taking courses such as ENGR 017, ENGR 030, and ENGR 045. Counselors must advise Engineering majors to start with PHYS 006 in the Spring and PHYS 007 in the Fall, as is currently specified in the Guided Pathway for Engineering.

According to the U.S. Bureau of Labor Statistics Employment Projections, growth in nationwide engineering employment will be roughly 8%, over the next ten-year period (<https://data.bls.gov/search/query/results?cx=013738036195919377644%3A6ih0hfrgl50&q=engineers>), which is higher than the average for all job categories. Moreover, the BLS points out that the median wage for engineers is “more than *twice* the median wage for all workers”.

The outlook for the engineering profession in California is even stronger than that for the U.S. as a whole. According to Tassel (<https://welcome.solano.edu/tassel-engineering/>), engineering jobs in California will increase by 12.6% over the next decade. The median annual salary for engineers in California, \$117,000, is 77% higher than the median annual salary for all California employees.

Having said this, it is nevertheless the case that enrollment in “traditional” engineering programs has been declining throughout the country, in both community colleges and four-year universities, for the past few years. Specifically, total undergraduate enrollment in U.S. engineering programs declined by 6.5% between 2019 and 2022 (<https://www.thespacereport.org/>).

Within the broader sphere of engineering, growth is expected to be focused in those areas of engineering that rely heavily on data science and machine learning. For this reason, we have developed a new A.S. Degree in Data Science, along with a Certificate of Achievement in Data Science.

Employment prospects for Data Scientists are even more encouraging than those for engineers in general. According to the Bureau of Labor Statistics, “employment of data scientists is projected to grow 35 percent from 2022 to 2032, much faster than the average for all occupations” (<https://www.bls.gov/ooh/math/data-scientists.htm>). Moreover, average

annual salaries for Data Scientists, currently \$120,000, are 82% higher than the mean salary of all occupations (<https://welcome.solano.edu/data-science/>).

According to Tassel, job growth for Data Scientists in California will be 45% over the coming decade, higher yet than the overall U.S. Data Science growth rate of 36% (<https://solano.tasselup.com/occupation/15-2051.00>).

Unfortunately, the new requirement that all online instructors undertake an additional six hours each year of LMS and online pedagogy training places an unreasonable burden on adjuncts, and is already making it difficult to find adjuncts willing to teach our Data Science courses. All online instructors have already completed 80 hours of training in online instruction. New LMS/Canvas changes could be accommodated via optional training courses, as needed.

The inquiry-based learning offered to our students in the laboratory components of our Engineering courses is heavily dependent on having a skilled, dedicated lab technician. The previous lab technician, Richard Crapuchettes, who worked with the Physics, Engineering, Geology, Geography, Astronomy, and Physical Science Departments, retired in Spring 2020. A replacement, Joshua Ang, was hired in July 2023, and is currently being trained. It is imperative for the continued health of the Engineering Program that this position continues to be supported and funded. It is also imperative for Tom MacMullen to continue to be employed through December 2026, which will extend through the period of disruption of the Engineering program due to the remodeling of Building 300.

1.2a - CTE programs: Review the provided labor market data, including employment and wage projections for employees in fields related to the program [upload any additional data to the blue folder in the upper right-hand corner of Section 1]. Comment on any areas that appear especially relevant to the program and its graduates.

According to the Labor Market Information Report on Data Science Occupations, that was prepared for SCC in December 2022 by the San Francisco Bay Center of Excellence for Labor Market Research, “Based on all available data, there appears to be an “undersupply” of Data Science workers compared to the demand for this cluster of occupations in the Bay region and in the North Bay sub-region (Marin, Napa, Solano, Sonoma counties).”

1.3 Population - Address how the population of students majoring in the program and/or taking classes in the program differ from the college as a whole; note what demographics (age, race, gender, etc.), are more or less represented, if any.

The following table shows the racial/ethnic breakdown of SCC students taking Engineering courses, contrasted with the corresponding breakdown for SCC as a whole:

	Asian	Black	Hispanic	Other	2 or more	White
SCC	15%	15%	13%	3%	29%	26%
Engineering	20%	7%	11%	2%	33%	28%

For most categories (Hispanic, White, Two or more, Other), the percentage of that group in the Engineering cohort closely mirror the percentages for SCC as a whole. The two discrepancies are that Black students are under-represented in Engineering, and Asian students are over-represented. Although Black students are under-represented in the SCC Engineering program, this is similar to nationwide statistics. In fact, the 7% Black component of our program is larger than the nationwide figure of 5% of undergraduate

Engineering degrees being awarded to Black students (<https://ira.asee.org/wp-content/uploads/2019/07/2018-Engineering-by-Numbers-Engineering-Statistics-UPDATED-15-July-2019.pdf>). The percentage of Black students in Engineering in SCC has increased from the value of 5.5% that was reported in the previous Engineering Program Review of 2015, to 7% in the current reporting period.

The following table shows the gender breakdown of SCC students taking Engineering courses, contrasted with the corresponding breakdown for SCC as a whole:

	Male	Female	Other or Not-reporting
SCC	44%	53%	3%
Engineering	80%	18%	2%

The gender breakdown for the SCC Engineering student population is quite different from that for SCC as a whole. Women are under-represented, relative to their proportion of the student-age population as a whole, in Engineering programs throughout the country. However, we can report that the percentage of female Engineering students at SCC has increased to 18%, from the value of 14% that was reported in the 2015 Engineering Program Review. This percentage (18%) is close to the figure of 22% of undergraduate Engineering degrees that are being awarded to female students (<https://ira.asee.org/wp-content/uploads/2019/07/2018-Engineering-by-Numbers-Engineering-Statistics-UPDATED-15-July-2019.pdf>).

The age distribution of Engineering students at SCC is nearly the same as the distribution for SCC as a whole. Both distributions peak at about age 19, and more than half of the students are in the age range of 17-21.

1.3a – In the student survey, students were asked to identify why they were taking Program courses. Please summarize and briefly discuss the results.

In the most recent student survey, 75% of the respondents said that they were “taking this course as a requirement for the major”, 12.5% reported that they were “taking this course as an elective”, and 12.5% reported that they were “taking this course as a requirement for my job”.

Program Overview – Goals

Note new or ongoing program-related goals (goals to delete, add, or significantly modify degrees/certificates); for each, note actions to be taken, person(s) responsible, priority, and time frame.

For priority, note that “urgent” means that a program cannot properly function without changes made. For time frame, note that “short term” means within an academic year, and “long term” means within five years.

Program Goals	Actions to be Taken	Persons Responsible	Priority (Important or Urgent)	Time Frame (Long term or Short term)
No changes foreseen at this time	NA	NA	NA	NA

END OF SECTION 1: PROGRAM OVERVIEW GOALS

SECTION 2: COURSES IN DEPARTMENT (TABLE)

2.1 Course Offerings - Specify which courses in the department and/or degree/certificate have been deleted or added since the last program review, and what prompted those changes. If these changes have already led to improvement, please describe.

As of the time of the previous program review in 2015, the Engineering Department offered four courses: ENGR 001 (Introduction to Engineering), ENGR 017 (Introduction to Electrical Engineering), ENGR 030 (Engineering Mechanics: Statics), and ENGR 045 (Properties of Materials).

Eight new courses have been introduced since the previous Program Review: ENGR 003 (Introduction to Ethics in Engineering, 3.0 Units), ENGR 007 (Python Programming for Scientists and Engineers, 4 units), ENGR 008 (Data Science with Python for Scientists and Engineers, 4 units), ENGR 010 (Machine Learning with Python for Scientists and Engineers, 4 units), ENGR 011 (Deep Learning with Python for Scientists and Engineers, 4 units), ENGR 012 (Discrete Mathematics for Scientists and Engineers, 4 units), ENGR 014 (Introduction to Statistical Programming in R for Scientists and Engineers, 4.0 Units), and ENGR 026 (Mathematics and Engineering Problem Solving Using Matlab, 4 units). These new courses are discussed in more detail below.

ENGR 003 (Introduction to Ethics in Engineering) was introduced in 2021, and has been taught once each year since then. ENGR 003 has received IGETC and CSU GE approval. It has consequently proven to be very successful, and attracts about 25 students each year, including many non-engineering students who take it as a GE course. This is the first course devoted to Ethics in Engineering to be approved at any California community college.

ENGR 007 (Python Programming for Scientists and Engineers) was approved in December 2022. It has been offered for the first time in Fall 2023, and has an enrollment of 19, with a class maximum of 30. Python is the main computer programming language used in the field of Data Science, and is not taught in any other transferable courses within SCC. This new course is therefore a key component of our new Data Science A.S. degree, and our new Data Science Certificate of Achievement. This course has been submitted for articulation to the four-year colleges, and for C-ID approval (C-ID ENGR 120).

ENGR 008 (Data Science with Python for Scientists and Engineers) was approved in December 2022. This course provides the main introduction to the field of data science, and will therefore be a key component of our new Data Science A.S. degree, and our new Data Science Certificate of Achievement. This course has been submitted for articulation to the four-year colleges.

ENGR 010 (Machine Learning with Python for Scientists and Engineers) was approved in December 2022. Machine Learning is one of the most powerful tools in the new field of data science, and will therefore be a key component of our new Data Science A.S. degree, and our new Data Science Certificate of Achievement.

ENGR 011 (Deep Learning with Python for Scientists and Engineers) was approved in December 2022. Deep Learning is a branch of Artificial Intelligence, and will be a useful elective course within our new Data Science program.

ENGR 012 (Discrete Mathematics for Scientists and Engineers) was approved in December 2022. Discrete Mathematics underpins many of the concepts and tools used in the field of data science, and much of this material is not covered in other SCC Math courses. This course has

been submitted for articulation to the four-year colleges, and for C-ID approval (C-ID MATH 160).

ENGR 014 (Introduction to Statistical Programming in R for Scientists & Engineers) was developed and approved in 2021, and was offered once in Spring 2022, but was cancelled due to low enrollment. R is a statistical programming language that is widely used in the biological sciences, and in data science more generally. This course is an elective course in the Data Science A.S. Degree, and a required course in the Data Science Certificate of Achievement. Once these degrees/certificates are fully up and running, we expect enrollment in ENGR 014 to be healthy.

ENGR 026 (Mathematics and Engineering Problem Solving Using Matlab), was created in 2016, and has been taught twice since 2017. This course is co-listed with the Math Department as MATH/ENGR 026. Matlab is a computing language that is widely used in the engineering field, and is not taught in the CIS Department. Its addition has strengthened and broadened our Engineering program. However, this course has been cancelled several times due to low enrollment, which was probably due to the fact that the course did not articulate to UC Davis. After several years of bureaucratic delay, we finally received confirmation by UC Davis on Nov. 17, 2023, that ENGR 026 now articulates to ENG 006 at UC Davis, effective Fall 2023. Once the course is included in the TAG agreements with UC Davis for various engineering majors, we expect enrollments to increase.

Several other important changes were made to our Engineering courses during the period of time covered by this program review. Specifically, we obtained C-ID approval for several existing courses:

ENGR 017 (Introduction to Electrical Engineering) received approval for C-ID ENGR 260 and ENGR 260L.

ENGR 026 (Mathematics and Engineering Problem Solving Using Matlab) received approval for C-ID ENGR 220.

ENGR 030 (Engineering Mechanics: Statics) received approval for C-ID ENGR 130.

ENGR 045 (Properties of Materials) received approval for C-ID ENGR 140B.

Additionally, ENGR 001 was changed from 1 unit to 2 units, by expanding the course from one hour per week to two hours per week. This change, which allowed more time to be devoted to each topic in the curriculum, enabled us to obtain C-ID approval for this course. This approval (C-ID ENGR 110) was obtained in Fall 2019.

We are currently in the process of obtaining C-ID approval for ENGR 007 (C-ID ENGR 120) and ENGR 012 (C-ID MATH 160).

The full list of currently-offered Engineering courses is as follows, as taken from the 2023-24 SCC Catalog:

ENGR 001: Introduction to Engineering (2.0 Units)

Course Advisory: ENGL 001

C-ID: ENGR 110

Transferable to both UC and CSU

A first, non-technical course for engineering students and students considering majoring in engineering. Introduction to different engineering fields, the campus life of engineering students, schedule guidelines, opportunities in engineering, engineers' roles in society, ethics in

engineering, and strategies and approaches required to survive math, science, and engineering courses. Develops communication skills pertinent to the engineering profession. Possible field trips.

ENGR 003: Introduction to Ethics in Engineering (3.0 Units)

General Education: IGETC: Area 3B; CSU: Area C2

Transferable to both UC and CSU

Development of techniques of moral analysis and their application to ethical problems encountered by engineers, such as professional employee rights and whistle blowing; environmental issues; ethical aspects of safety, risk and liability; conflicts of interest. Emphasis on developing the capacity for independent ethical analysis of real and hypothetical cases.

ENGR 007: Python Programming for Scientists and Engineers (4.0 Units)

C-ID: ENGR 120 (approval in progress)

Transferable to both UC and CSU

Introduction to programming for scientists and engineers, utilizing the Python language and environment. Topics covered include object-oriented programming, elementary data structures, modules, algorithms, recursion, data abstraction, code style, documentation, debugging techniques, and testing. Also covers the interface between software and the physical world (i.e., sensors).

ENGR 008: Data Science with Python for Scientists and Engineers (4.0 Units)

General Education: CSU: Area B4

Transferable to both UC and CSU

This course covers the three main aspects of data science: inferential thinking, computational thinking, and real-world relevance. Topics include critical concepts and skills in computer programming and statistical inference, and the analysis of real-world datasets, as well as social issues surrounding data analysis such as privacy and design. This course will be taught in Python.

ENGR 010: Machine Learning with Python for Scientists and Engineers (4.0 units)

Transferable to both UC and CSU

Machine Learning encompasses the study of algorithms that learn from data. It has been a key component in a number of problem domains including computer vision, natural language processing, computational biology, and robotics. This class will introduce the fundamental concepts and algorithms in machine learning (supervised as well as unsupervised learning), as well as best practices in applying machine learning to practical problems.

ENGR 011: Deep Learning with Python for Scientists and Engineers (4.0 Units)

Transferable to both UC and CSU

Deep Learning is a branch of Artificial Intelligence (AI) that is based on the architecture of Neural Networks. When the number of hidden layers in a neural network is extended, it becomes a 'Deep Learning' Neural Network. This course will cover the basic concepts and tools of Neural Networks and Deep Learning, including the TensorFlow and Keras interfaces.

ENGR 012: Discrete Mathematics for Scientists and Engineers (4.0 Units)

C-ID: MATH 160 (approval in progress)

Transferable to both UC and CSU

General Education: CSU: Area B4.

Discrete mathematics: set theory, logic, Boolean algebra, methods of proof, mathematical induction, number theory, discrete probability, combinatorics, functions, relations, recursion, algorithm efficiencies, graphs, trees.

ENGR 014: Introduction to Statistical Programming in R for Scientists and Engineers (4.0 Units)

Transferable to both UC and CSU

Advances in computing power have enabled scientists to amass huge amounts of data on everything from genetics to climate science, but there is a need for someone to make sense of this data. In this class we will learn how to perform basic statistical analysis such as writing data frames, creating functions, using variables, statements, and loops and employing statistical concepts such as exploratory data analysis, probabilities, hypothesis tests, regression modeling and data visualization, using the statistical software R.

ENGR 017: Introduction to Electrical Engineering (5.0 Units)

C-ID: ENGR 260 and ENGR 260L

Transferable to both UC and CSU

A study of basic DC circuit analysis techniques including Kirchhoff's laws, mesh-currents, node-voltages, Thevenin and Norton equivalent circuits, transient and steady-state response of AC passive circuits, power calculations, active circuit elements including operational amplifiers and semiconductor devices. Construction and measurement of electrical circuits using multimeters, oscilloscopes, power supplies, and function generators. Introduction to circuit simulation software.

ENGR 026: Mathematics and Engineering Problem Solving Using Matlab (4.0 Units)

C-ID: ENGR 220

Transferable to both UC and CSU

Covers methodologies for solving mathematics and engineering problems. Students will learn to perform mathematics and engineering computation and visualization using the MATLAB language. Students will write a variety of programs in the MATLAB language. Same as MATH 026.

ENGR 030: Engineering Mechanics: Statics (4.0 Units)

C-ID: ENGR 130

General Education: SCC: Area A; IGETC: Area 5A

Transferable to both UC and CSU

A study of the principles of statics of particles and rigid bodies as applied to equilibrium problems of two and three-dimensional structures, and the principles of friction, virtual work, and stability of equilibrium.

ENGR 045: Properties of Materials (4.0 Units)

C-ID: ENGR 140 B

General Education: IGETC: Area 5A, 5C; CSU: Area B1, B3

Transferable to both UC and CSU

Covers the application of basic principles of physics and chemistry to the structure and properties of engineering materials. Special emphasis is devoted to the relationship between microstructure and the mechanical properties of metals, polymers and ceramics, and the electrical, magnetic, and optical properties of materials.

2.1a - Describe what new course or courses are planned and provide reasons for these new offerings, including how these courses might address issues of equity and student success. CTE programs: Note how advisory board input has led to planned course changes. Please add any new course plans to the Course Goals table at the end of Section 2.

There are currently no plans to add any additional new courses to our Engineering / Data Science degrees or department.

2.2 Scheduling, Sequencing, and Fill - Describe the student survey feedback related to course scheduling. What barriers to enrollment do students report? In terms of timing, location, and instructional format of course offerings, what changes are suggested by the survey responses?

(Be sure to add any goals which address these survey responses to the Course Goals table at the end of Section 2.)

The Student Survey was sent out in Spring 2022. In that survey, 75% of the students who responded reported that “I have not experienced any barriers enrolling in courses in this program/department”, whereas 25% reported that “the course(s) I needed were not offered this semester”.

2.2a - For courses with low enrollment numbers, note possible causes (such as the type of class, scheduling, etc.).

ENGR 001 and ENGR 003 easily surpass the 60% enrollment target. These two courses are generally taken as GE courses, and are not required for the Engineering major. The main Engineering courses that are required for the Engineering A.S. degree, ENGR 017, 030, and 045, have had average enrollments (during this current reporting period) of 15, 14, and 13, respectively. Although the class maxima in each of these cases is 30, these maxima have never been realistic, and have never come close to being achieved in the twenty-five years of our current institutional memory.

Unfortunately, in contradiction to the clearly-stated directive contained in the 2022 Physics Program Review, a new section of PHYS 007 has been added in the Spring in Vacaville, taught by an instructor with no Engineering background. Students who take PHYS 007 with an instructor who lacks a connection to Engineering do not receive encouragement and motivation to consider Engineering as a career path. The immediate consequence of this new course addition has been that enrollment in our key transferable Engineering courses, such as ENGR 017, ENGR 030, and ENGR 045, has plummeted. Essentially, we are losing half of our traditional stream of potential Engineering majors. The best way to resolve this is to strongly encourage Engineering majors to take PHYS 006 in the Spring and PHYS 007 in the Fall, as is already prescribed in the Guided Pathway for Engineering.

2.2b - Note if there is a preferred sequence of classes that students should take in the department/degree/certificate, or if there is no preferred sequence, and how students are informed of your preferred sequence (if any). Describe any work done to support PACE/Guided Pathways and inform counselors.

Sample Course Sequence for the Engineering A.S. degree:

Course No.	Course Name	Units	Sequence
MATH 020	Analytic Geometry and Calculus I	4	Year 1, Fall
MATH 021	Analytic Geometry and Calculus II	4	Year 1, Spring
MATH 022	Analytic Geometry and Calculus III	4	Year 2, Fall
MATH 023	Differential Equations	4	Year 2, Spring
PHYS 006	Physics for Science & Engineering I	5	Year 1, Spring
PHYS 007	Physics for Science & Engineering II	5	Year 2, Fall

CHEM 001	General Chemistry	5	Year 1, Fall
ENGR 017	Introduction to Electrical Engineering	5	Year 2, Spring
ENGR 030	Engineering Mechanics: Statics	4	Year 2, Fall
CIS 022	Introduction to Programming	3	Year 2, Spring
ENGL 001	College Composition	3	Year 1, Fall
ENGL 002	Critical Thinking and Writing About Literature	4	Year 1, Spring
COMM 001	Introduction to Public Speaking	3	Year 2, Fall
SPAN 001	First Semester Spanish	5	Year 2, Spring

Year 1, fall term	Year 1, spring	Year 2, fall term	Year 2, spring term
MATH 020 (5)	MATH 021 (5)	MATH 022 (4)	MATH 023 (4)
ENGL 001 (3)	PHYS 006 (5)	PHYS 007 (5)	ENGR 017 (5)
CHEM 001 (5)	ENGL 002 (4)	ENGR 030 (4)	CIS 022 (3)
		COMM 001 (3)	SPAN 001 (5)
13 units	14 units	16 units	17 units

TOTAL UNITS: 60 units

Sample Course Sequence for the Data Science A.S. degree:

Course No.	Course Name	Units	Sequence
MATH 011	Elementary Statistics	4	Year 1, Spring
MATH 020	Analytic Geometry and Calculus I	4	Year 1, Fall
MATH 021	Analytic Geometry and Calculus II	4	Year 1, Spring
MATH 022	Analytic Geometry and Calculus III	4	Year 2, Fall
MATH 040	Introduction to Linear Algebra	3	Year 2, Spring
ENGR 007	Python Programming for Scientists and Engineers	4	Year 1, Spring
ENGR 008	Data Science with Python for Scientists and	4	Year 2, Fall
ENGR 010	Machine Learning with Python for Scientists and	4	Year 2, Spring
ENGR 012	Discrete Mathematics for Scientists and Engineers	4	Year 1, Fall
ENGL 001	College Composition	4	Year 1, Fall
LR 010	Information Skills for College and Beyond	1	Year 1, Fall
ENGL 002	Critical Thinking and Writing About Literature	4	Year 1, Spring
SOC 001	Introduction to Sociology	3	Year 1, Fall
COMM 001	Introduction to Public Speaking	3	Year 2, Spring
ASTR 010	General Astronomy	3	Year 2, Fall
ASTR 020	Astronomy Laboratory	1	Year 2, Fall
SPAN 001	First Semester Spanish	5	Year 2, Spring
KINE 002A	Swimming – Beginning	1	Year 2, Fall

Year 1, fall term	Year 1, spring term	Year 2, fall term	Year 2, spring term
MATH 020 (4)	MATH 011 (4)	MATH 022 (4)	MATH 040 (3)
ENGR 012 (4)	MATH 021 (4)	ENGR 008 (4)	ENGR 010 (4)
ENGL 001 (4)	ENGR 007 (4)	ASTR 010 (3)	SPAN 001 (5)
LR 010 (1)	ENGL 002 (4)	ASTR 020 (1)	COMM 001 (3)

SOC 001 (3)		KINE 002A (1)	
16 units	16 units	13 units	15 units

TOTAL UNITS: 60 units

Sample Course Sequence for the Data Science Certificate of Achievement:

Course No.	Course Title	Units	Sequence
MATH 011	Elementary Statistics	4	Term 1
ENGR 007	Python Programming for Scientists and Engineers	4	Term 1
ENGR 008	Data Science with Python for Scientists and Engineers	4	Term 2
ENGR 010	Machine Learning with Python for Scientists and	4	Term 2
ENGR 012	Discrete Mathematics for Scientists and Engineers	4	Term 1
ENGR 014	Introduction to Statistical Programming in R for Scientists and Engineers	4	Term 2

Term 1	Term 2
MATH 011 (4)	ENGR 008 (4)
ENGR 007 (4)	ENGR 010 (4) or ENGR 011 (4)
ENGR 012 (4)	ENGR 014 (4)
12 units	12 units

Our Engineering Program has traditionally received excellent support from SCC counselors, particularly Amy Dauffenbach, who is extremely knowledgeable about our Engineering program. In addition, Adjunct Counselor and SCC articulation officer Ashlie Lawson provided crucial assistance in creating the new Data Science A.S. degree. Ashlie Lawson's work as Articulation Officer provides a pillar for the College, without which it could not function as well as it does. Articulation of courses is crucial to the health of the Engineering (and other) programs, and so it is imperative that the position of Articulation Officer be made a full-time position.

The pipeline of Engineering students at SCC is very leaky, and only a small fraction of declared Engineering majors eventually take our key ENGR courses. As mentioned above, it is imperative that counselors strongly encourage Engineering majors to take PHYS 006 in the Spring, and PHYS 007 in the Fall, as is already prescribed in the Guided Pathway for Engineering. This will allow these students to move directly to our core Engineering courses (ENGR 017, ENGR 030, ENGR 045), without having to wait one or two semesters, as is the case if they start with PHYS 006 in the Fall. These points have recently been brought to the attention of Interim Dean of Counseling, Ashlie Lawson, in November 2023. Lastly, it would be very beneficial if the Research and Planning Department would track each Engineering major, to find out why we are losing so many students from the Engineering pipeline.

2.3 Prerequisites, Course Advisories, and Placement. Review and summarize student survey feedback regarding prerequisites. Note how advisories and pre- and co-requisites might be changed to get students better prepared for classes in the program. Be sure to add any goals that address these survey responses to the Course Goals table at the end of Section 2.

The Student Survey was sent out in Spring 2022. In that survey, 72% of students who responded said that they “strongly agreed” (57%) or “agreed” (14%) with the statement that “This course builds on the material presented in the prerequisite (or previous) class.”

Course Goals:

Course Goals	Actions to be Taken	Person(s) Responsible	Priority (Important or Urgent)	Time frame (short term or long term)
Faculty are discussing adding "hybrid" as a possible permanent mode of delivery for all of our lab-based courses.	Create curriculum proposals.	Melanie Lutz	Important	Short Term

END OF SECTION 2: COURSE GOALS

SECTION 3: ASSESSMENT OF PLOS & SLOS (TABLES)

Assessment of PLOs (Note that the A.S. degree in Data Science was not offered during the period 2015-2022 that is covered by this Program Review)

PLOs for ENGR A.S. degree	Expected Performance	Performance
PLO 1: Demonstrate analytical problem-solving skills in Math, Physics, Chemistry, and Engineering.	70%	92.3%
PLO 2: Conduct experiments and critically assess the data.	70%	100%
PLO 3: Write professional laboratory reports and /or give oral presentations.	70%	100%

3.1 Program Learning Outcomes (PLOs) - Summarize the student survey feedback related to PLOs. To what extent do majors understand the PLOs, find the classes effective in preparing them to succeed in the PLOs, and feel they are able to achieve the PLOs?

According to the Student Survey that was sent out in Spring 2022, 87.5% of the respondents said that they understood the PLOs. However, only 62.5% of the respondents found the classes to be effective in preparing them to succeed in the PLOs. The negative responses pertained mainly to the PLOs that related to laboratory experiments, and correspond to the period when our lab experiments were “online”. We expect that these responses will improve as the labs return to face-to-face mode.

Assessment of SLOs

SLOs for ENGR 001	Expected Performance	Performance
SLO 1: Develop a general knowledge of the tasks and responsibilities of engineers in various fields.	70%	86%
SLO 2: Understand the role of engineers in today's world and the importance of ethical issues in decision-making processes.	70%	82%
SLO 3: Demonstrate the ability to effectively communicate engineering ideas and information through an oral presentation.	70%	75%
SLOs for ENGR 003		
SLO 1: Demonstrate the capacity to think analytically, critically, and creatively about ethical issues in engineering.	70%	88%
SLO 2: Know some of the classic cases in engineering ethics and some of the typical ethical and professional issues that arise in engineering.	70%	78%
SLO 3: Demonstrate skills in effective communication, both oral and written.	70%	72%
SLOs for ENGR 017		
SLO 1: Apply Kirchhoff's Laws and Thevenin's and Norton's Theorems to analyze electrical circuits.	70%	92.3%
SLO 2: Analyze electrical circuits with active circuit elements such as op-amps.	70%	96.2%
SLO 3: Utilize phasor techniques to analyze AC circuits.	70%	96.2%
SLOs for ENGR 030		
SLO 1: Students will be able to use the principles of statics to analyze the equilibrium of rigid bodies in two and three dimensions.	70%	96.3%
SLO 2: Students will be able to use the principles of statics to analyze beams and determine their shear and moment diagrams.	70%	96.3%
SLO 3: Students will be able to use energy methods such as virtual work and potential energy to determine the equilibrium and stability of rigid bodies.	70%	96.3%
SLOs for ENGR 045		
SLO 1: Students will be able to explain the microscopic mechanisms that underlie the macroscopic behavior of engineering materials.	70%	100%
SLO 2: Students will be able to explain the	70%	100%

relationship between microstructure and material properties and the impact of processing on microstructure and material properties.		
SLO 3: Students will be able to perform lab experiments and write up professional lab reports.	70%	100%

3.2 Student Learning Outcomes (SLOs) - Review the current status of SLOs in your program. Note if all course SLOs are written and up-to-date (at least two per course). Identify which courses have not been assessed in over two years, and note which of these courses have not been offered in over two years.

All course SLOs are complete and up to date, and can be found in the Course Outline of Record (COR) within eLumen. Five of the six courses in the Engineering Department that were active during the reporting period of 2015-2022 were offered at least once each year, and were each assessed within the past two years. The sole exception is ENGR 026, which has been cancelled in the past two years due to low enrollment, and consequently its SLOs have not recently been assessed. The SLOs for this course will be assessed in Spring 2024, provided that the Dean and the Academic VP allow the course to run.

3.2a - Describe collaborative efforts among faculty to assess SLOs. For example, note if SLO assessments in online and face-to-face courses have been compared, and what these comparisons indicate. Note if rubrics have been used in different sections of the same course, or across courses, to aid SLO assessment.

None of our Engineering courses have been taught by more than one instructor, and none of these courses have more than one section per year. Hence, it was not necessary to correlate assessments between different sections. In those cases for which we can compare the success rates for sections taught face-to-face, against sections taught online (albeit in different years), the success rates were roughly similar, to within $\pm 6\%$.

SECTION 4: STUDENT SUCCESS (by RACE/ETHNICITY and GENDER – TABLES)

4.1 Student Success and Support - Describe the student survey feedback related to success. What barriers did students identify, and what did they find helpful? How did students address the question of equity and emotional safety?

The only barriers to success that were identified in the student survey pertained to the lack of face-to-face labs during the Covid era. For example, one such comment was “The lack of labs in engineering and physics courses significantly impacts the learning experience of students. Science and engineering courses are provided with a lab element to provide hands on, practical experience with the concepts delivered in the lecture portion. Online lab exercises, whether via simulation or demonstration by another are NOT equal substitutes.” This issue will disappear as we return to face-to-face labs.

With regards to aspects that helped them to succeed, several students mentioned “Prof. Lutz”. One student mentioned that Prof. Lutz “pushes students to their potential. Other classes offer a standard approach. Having experienced both, one method provided a quality education, and motivates students to succeed. The other method sets low expectations, and prepares students to fail when challenged.”

75% of the responding students responded affirmatively to the question "The courses (online or face-to-face) in this program/department provide an emotionally safe, supportive learning environment, where I can explore ideas and express myself". No specific comments were provided in response to this question.

4.2 Success by Population - Review the student success rates in the program/department, if available. If possible/applicable, review student success in general education classes (across specific populations) with student success in degree-specific courses. Note if certain groups are significantly more or less successful than their peers, and if there have been any clear trends upward or downward since the last program review. Provide possible reasons for higher or lower success rates.

The success rate for all courses taught in the Engineering Department, over the entire reporting period of 2015-2022, was 82%. This success rate was substantially higher than the success rate for SCC as a whole, which was 75%.

The Engineering Department's success rate of 82% shows an improvement from the 79% success rate that was reported in the previous 2015 Program Review.

The overall success rate in those Engineering courses that are required for the major was 91%, whereas the success rate for the two GE courses, ENGR 001 and ENGR 003, was 74%. The success rate for the two GE courses was essentially the same as the success rate for SCC as a whole (74% vs. 75%).

The following table shows the racial/ethnic breakdown of the success rates of SCC students taking Engineering courses, contrasted with the corresponding breakdown for SCC as a whole:

	Asian	Black	Hispanic	Other/Unknown	2 or more	White
ENGR	79%	NA	83%	NA	79%	87%
SCC	79%	65%	73%	73%	73%	78%

The success rate for each racial/ethnic group in Engineering was in all cases at least as high, and in most cases higher, than the success rate for that group in SCC as a whole. Note that there seems to be an error in the http://solano.edu/research_planning/worksheet1test.php database, since the Student Success page shows no data for Engineering in the "Black" or "Other" categories, whereas, for example, the Demographic page indicates 24 Black Engineering students.

The next table shows the gender breakdown of the success rates of SCC students taking Engineering courses, contrasted with the corresponding breakdown for SCC as a whole:

	Male	Female
ENGR	83%	80%
SCC	74%	75%

The success rate in Engineering for female students (80%) was only slightly lower than the success rate for male students (83%). The success rates for both male and female students in Engineering were each substantially higher than the corresponding success rates in SCC as a whole.

4.3 Degrees/Certificates Awarded (if applicable). Review the number of degrees and certificates awarded over the past five years, if available, and address any clear upward or

downward trends. If students are leaving the program before earning the degree/certificate, note whether certain courses are a stumbling block, or if students don't need all the courses in the program to achieve their goals. If possible, note if certain populations of students are having greater difficulty completing the program.

The Engineering Department has been offering an A.S. degree since 2015. The number of degrees awarded each year is shown in the following table:

Academic Year	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	Average
No. of degrees	7	5	6	9	7	8	7

The number of Engineering degrees awarded has been relatively stable during the period covered by the Program Review, at about seven per year. The percentage of Engineering A.S. degrees awarded to women was 19% (8 out of 42), which is very close to the national figure of 22% of undergraduate Engineering degrees that are awarded to female students (<https://ira.asee.org/wp-content/uploads/2019/07/2018-Engineering-by-Numbers-Engineering-Statistics-UPDATED-15-July-2019.pdf>). Also worth noting is the fact that 17% (7 out of 42) of our Engineering degrees were awarded to Veterans.

4.4 Preparation for the Future - Describe how students are informed about future options, such as the kinds of schools they might transfer to, the kinds of employment available in their field, and what further degrees might be useful to get into a particular profession. CTE programs: Note also if any agreement or MOU exists with employers to place graduates.

The Transfer Center at SCC provides prospective transfer students with direction and assistance in navigating the transfer process. The services that they offer include connecting students with university representatives, holding transfer-related workshops and transfer fairs, helping students access information on transfer websites, and assisting students with researching colleges, and arranging campus tours. SCC counselors and individual Engineering instructors also give advice to students regarding career pathways, transfer opportunities, and degree options, that will help them to achieve their goals.

4.4a CTE programs: Note if there are any statewide, local or national tests that students should take, after leaving your program, in order to get employed or be more competitive in the job market. Note also if students need additional study or coursework (not provided by the college) before they are ready to take those tests. Explain how students are informed about these requirements.

NA

SECTION 5: OUTREACH

5.1 Outreach for Equity - Describe outreach efforts since the last program review to attract and retain under-represented populations (such as diversified curriculum or guest lecturers).

- SCC Engineering student Erin Nebel attended the Conference for Undergraduate Women in Physics (CUWiP), at UCLA, January 13-17, 2017.

- Engineering instructor Melanie Lutz met with Mark Asta, Chairman of the Materials Science and Engineering Department at UC Berkeley, about creating pathways for students at SCC to transfer into MSE at UC Berkeley, on July 27, 2017.
- SCC Engineering was listed in “Top 100 for Asians and Minorities in Engineering”: <http://diverseeducation.com/top100/pages/AssociatesDegreeProducers2018.php>.
- Scott Berta presented information about the new SCC AS Degree in Engineering, at the SCC High School Counselors Conference, on March 8, 2018.
- Three SCC Engineering students, Leena Hussein, Kathleen Matsumoto-Elliott, and Kelsey Balella, attended the American Physical Society Conference for Undergraduate Women in Physics at UC Davis on January 18-20, 2019.
<http://www.solano.edu/president/insidesolano/2019/Inside012819.pdf>.
- Faculty member Katie Berryhill, and former SCC Engineering student Nicole Peacock, participated in the SCC Women in STEM Panel, on March 21, 2019.
<https://www.dailyrepublic.com/all-dr-news/solano-news/fairfield/solano-college-to-host-stem-panel-discussion/>.
- Scott Berta gave a presentation at the SCC High School Counselors Conference, about the Physics and Engineering programs, on March 3, 2022.

5.2 Outreach on Campus - Describe how the program has connected with the campus community. Include any cross-discipline collaborations, student clubs, or other activities that connect students in the program to the college as a whole. Note whether there is currently need for more coordination with Counseling.

- A group of nineteen students from the SCC Welding Department were invited to our Engineering lab, to participate in a tensile test experiment, on April 25, 2016.
- Engineering student Geff Freire distributed flyers about the SCC Engineering Program at STEM CLUB DAY, on Oct. 27, 2016.
- Engineering student Geff Freire distributed Engineering flyers at Club Promo Day on Feb. 1, 2017.
- Scott Berta presented information about the new SCC AS Degree in Engineering, at the SCC High School Counselors Conference, on March 8, 2018.
- Engineering adjunct instructor Scott Berta set up a table to promote our Engineering Program at the SCC Majors Fair on March 20, 2018 on the Fairfield campus.
- Engineering adjunct instructor Scott Berta set up a table to promote our Engineering Program at the SCC Majors Fair on March 20, 2019 on the Fairfield campus.
- Engineering instructor Melanie Lutz invited DRFT 058 instructor Cynthia Jourgensen to visit ENGR 030 in Fall 2021 to inform our students about Solid Works.
- Engineering adjunct instructor Scott Berta gave a presentation about the Physics and Engineering Programs at the SCC High School Counselors Conference on March 3, 2022.
- Engineering adjunct instructor Scott Berta spoke at a UC Berkeley alumni event that took place on Dec. 3, 2022.

5.3 Outreach to the Community - Describe how the program has connected with the larger community. Provide examples of activities, field trips, and community/classroom partnerships since the last program review. Note who has been brought into the classroom, and where students have been brought, beyond the classroom.

- Engineering instructor Melanie Lutz spoke to high school teachers and counselors about pre-engineering opportunities at SCC, as part of an Engineering Pathway Partner Workshop, Friday, on March 4, 2016.
- Engineering instructor Melanie Lutz hosted 40 students from Engineering Academy High School in Vallejo to tell them about the pre-Engineering program at SCC, on March 23, 2016.
- A group of ten students from Buckingham Charter Magnet High School in Vacaville, along with their teacher, former SCC Engineering student Ben Pochop, were invited SCC to participate in a tensile test experiment, in Spring 2016.
- SCC Engineering student Geff Freire attended a robotics outreach event for high school students at St. Mary's Church in Vacaville on Sept. 25, 2016, and distributed the SCC Engineering Brochure.
- Engineering instructor Melanie Lutz and Engineering student Geff Freire gave presentations about the SCC Engineering Program to two groups of 6th, 7th, and 8th graders from the Matt Garcia Career and College Academy on Oct. 26, 2016.
- US Air Force representative Sgt. Rolando Lora was invited to speak to our PHYS 007 students about opportunities for Engineering majors in the Air Force, on Nov. 18, 2016.
- Engineering Student Geff Freire spoke to 30 DSP high school students from Fairfield about studying CIS, Computer Science, and Engineering at SCC, on March 16, 2017.
- Engineering instructor Melanie Lutz spoke to 25 students from Vallejo High School, about the SCC Engineering Program, on May 5, 2017.
- Engineering instructor Melanie Lutz invited two US Navy Representatives to a session of PHYS 006 (one of the key courses in our Engineering A.S. degree) on February 21, 2018, to inform students about job opportunities in Nuclear Engineering in the US Navy.
- SCC Engineering students Heath Muskat and Jered Bell served as mentors to students from Winters High School for their senior project involving rocket building, 2018-19.

Outreach Goals

Outreach Goals	Actions to be taken	Person(s) Responsible	Priority (Important or Urgent)	Time Frame (Short term or Long term)	Funding (N/A, One-time, Ongoing)	Cost
Faculty will continue to participate in SCC outreach activities to promote the Engineering / Data Science programs	Participate in SCC outreach activities	Faculty / lab technician	Important	Long term	N/A	\$0

END OF SECTION 5: OUTREACH GOALS

SECTION 6: RESOURCES

6.1 Human Resources - Describe the current staffing levels in the program, and whether they are currently adequate to meet students' needs. If the program has been functioning for a while without needed faculty/staff, note how long has this position been needed, and how this gap has affected the program's health.

Full-time Engineering instructor Melanie Lutz, and adjunct Engineering instructor Scott Berta, teach our "traditional" engineering courses, ENGR 001, ENGR 003, ENGR 017, ENGR 030, and ENGR 045. We have now been rolling out our new Data Science courses (ENGR 007, ENGR 008, ENGR 010, ENGR 011, ENGR 012, and ENGR 014), and Dr. Sana Vaziri was hired in Fall 2022 to help teach these courses. However, we do not currently have a sufficient number of adjuncts to teach the full suite of our new Data Science courses. We eventually need to hire a full-time instructor to teach our new Data Science courses; until then, we need two additional adjuncts.

For the three years following the retirement of our laboratory technician Richard Crapuchettes in Spring 2020, our Engineering program was functioning without a lab tech. A replacement, Joshua Ang, was hired in July 2023, and is currently being trained by former SCC Engineering instructor Tom MacMullen. It is imperative for the continued health of the Engineering Program that this full-time lab technician position continues to be supported and funded. It is also imperative for Tom MacMullen to continue to be employed through December 2026, which will extend through the period of disruption of the Engineering program due to the remodeling of Building 300.

6.1a - Note what gaps will need filling within the next year, and within the next five years, and why new or replacement faculty/staff will be needed.

In the short term, we need to hire two adjuncts who are qualified to teach some of our new Data Science courses. In the longer term (*i.e.*, within the next five years), we will need to hire a full-time instructor to teach some of our new Data Science courses, and to help direct the growth of the Data Science program.

6.2 Technology - If the program has been functioning for a while without needed technology (IT, software, hardware), note how long the technology/equipment has been needed, and how this gap has affected the program's health.

Although most of our laboratory equipment is old, it is still functional, and suitable for its purpose. This equipment, along with the desktop and laptop computers used in the labs, needs to be, and is, maintained and upgraded as needed. Maintaining our aging equipment will require the continued employment of a lab technician, as has been discussed elsewhere in this Program Review.

6.2a - Note what new or special technology will be needed in the next year, and the next five years, and why it will be needed.

No new technology will be needed at Fairfield for our "traditional" engineering program, aside from normal maintenance and upkeep of our existing laboratory equipment and lab software. Based on input from Doug Sherman of Stratovan, who is the chairman of the external Advisory Board of our new Data Science program, we need a main server that runs the Jupyter Hub that students log into (<https://www.thinkmate.com/system/gigabyte-g292-2g0/623931>), and an additional

server to store data for students (<https://www.thinkmate.com/system/stx-nl-xe12-12s3-10g/623932>). The estimated cost of this hardware is \$36k. We are in discussion with Stratovan regarding the possibility that they provide and manage (for a fee) some of the computer technology that will be needed for our Data Science program.

6.2b - Describe survey feedback describing students' experiences with technology in the classroom.

In the Student Survey that was sent out in Spring 2022, the vast majority of respondents (72%) commented that the statement: "The classroom facilities, equipment, and physical space support student learning in this class" was not applicable to them, as they were taking the course online. During the past three calendar years, 2020-23, all of our Engineering courses have been delivered online, and no issues have been reported by students with the Zoom or Canvas technology that has been used.

6.3 Facilities & Equipment - Note what classrooms, buildings, and other facilities the program currently uses/occupies. Describe how the existing facilities/equipment serve the program's needs, and in what ways the existing facilities are inadequate to meet students' needs. If the program has been functioning for a while with inadequate facilities/equipment, note how this has affected the program's health.

Currently, all Engineering courses are taught either online, or at the Fairfield campus in Room 302. This room, and its associated prep room, are perfectly suited to the needs of this program, for the near future.

In the near term, there are plans to remodel Building 300, which will force our ENGR courses to relocate for at least three semesters (Fall 2024 through Fall 2025). Unfortunately, despite numerous e-mails to Dean Ryan and Vice President of Facilities Lucky Lofton, the Engineering (and Physics and Astronomy) faculty are not being allowed to have any input into this process, and so it is not clear if the remodeled space will be fit for purpose.

As has been mentioned in the Physics, Physical Science, and Astronomy Program Reviews, the long-term ambition is to build a new STEM Center, with a domed planetarium, on the Fairfield campus, that will house Mathematics, Physics, Engineering, Astronomy, Physical Science, along with our new Data Science Program. This new STEM Center, which will contain a state-of-the-art computer lab, was mentioned in Section 4.4 of the 2016 Astronomy Program Review: "For the longer term, the Astronomy Department faculty, along with the Physics and Engineering Departments, have been advocating the construction of a new dedicated Physical Sciences building, which would include a domed planetarium."

6.3a - Note what new facilities/equipment will be needed in the coming years.

As mentioned above, our long-term plans are to move the Engineering program at Fairfield into a new STEM Center, which will house the Physics, Astronomy, Engineering, Physical Science, and Mathematics Departments. Until this time, the facilities in Building 300 are perfectly suitable for our Engineering Program.

6.3b - Describe survey feedback describing students' experiences with the Program's facilities/equipment.

In the Student Survey that was sent out in Spring 2022, the vast majority of respondents (72%) commented that the statement: “The classroom facilities, equipment, and physical space support student learning in this class” was not applicable to them, as they were taking the course online.

6.4 Library and Student Support Resources - Note how the program uses tutors and other specific support for student learning. Include any plan to change or expand student support in the goals list below.

Many students from our Engineering program have served as tutors in the MAC lab, and at the Academic Success and Tutoring Center (ASTC).

6.4a - Review the college’s discipline-specific library resources with a librarian. Summarize the current status of the library resources and plans to supplement the collection. Upload the librarian’s collection evaluation form to the blue folder in the upper right-hand corner of Section 6.

Copies of all textbooks used in the Engineering program are kept on file in the SCC Library.

6.5 Other Resources - Note the program’s routine or special costs not addressed above, such as regularly contracted services. Note whether any of the funds for these goods/services come from a special source; if so, note if the funding will run out or will continue for the foreseeable future, and potential impact on the program.

Our program needs continued support from the Administration to make our Engineering and Data Science programs successful. In this regard, we thank James Thomas Media for helping is to create our websites, and Irving Chin of Tassel for helping with the content of our websites, and for his sage advice.

6.6 Resources Leading to Improvement - Using specific examples, describe how changes to staffing, faculty, technology, equipment, facilities, library collection, student support, and/or funding have led to an improved experience for students and greater student equity. CTE programs: Address specifically any improvements funded by Perkin’s money or other sources.

Since the previous Engineering Program Review, we have hired two adjunct instructors, Sana Vaziri and Scott Berta, who are now teaching courses within our Engineering Program. Specifically, Sana Vaziri is teaching ENGR 007, and Scott Berta has been teaching ENGR 001 and ENGR 003. Both of these instructors are SCC Engineering graduates, and bring with them diverse educational and personal backgrounds, which are already helping to inspire and motivate our students.

Resources: Hiring Goals

Resource Goals	Actions to be Taken	Person(s) Responsible	Priority (Important or Urgent)	Time frame (short term or long)	Funding (N/A, One-time, Ongoing)	Cost

				term)		
1. Hire additional adjuncts to teach some of our Data Science courses.	Post job advert	HR/Dean	Urgent	Short term	Ongoing	TBD
2. Hire a full-time instructor to teach our Data Science courses.	Post job advert	HR/Dean	Urgent	Long term	Ongoing	TBD
3. Extend the current contract of Tom MacMullen through 31 Dec 2026.	Approval by Academic VP and Governing Board.	Dean, Academic VP	Urgent	Short term	One-time	TBD

Resources: Technology Goals

Resource Goals	Actions to be Taken	Person(s) Responsible	Priority (Important or Urgent)	Time frame (short term or long term)	Funding (N/A, One-time, Ongoing)	Cost
1. Purchase or lease servers for our Data Science Program	Consult with Advisory Board	Melanie Lutz	Important	Short term	One-time	TBD
2. Upgrade Logger-Pro Software in Fairfield	Order new software	IT/Lab Tech	Important	Long term	Ongoing	TBD
3. Upgrade desk-top and laptop computers in Building 300	Place request to IT	IT/Lab Tech	Important	Long term	Ongoing	TBD

Resources: Facilities and Equipment Goals

Resource Goals	Actions to be Taken	Person(s) Responsible	Priority (Important or Urgent)	Time frame (short term or long term)	Funding (N/A, One-time, Ongoing)	Cost
1. ENGR, PHYS, and ASTR faculty must have input to plans for remodeling Bldg 300	Meeting needs to be set up with architects	Lucky Lofton	Urgent	Short term	N/A	\$0
2. Add on/off light switch in room 302	Place work order to Facilities	Melanie Lutz	Urgent	Short term	One-time	TBD

Resources: Student Support Goals

Resource Goals	Actions to be Taken	Person(s) Responsible	Priority (Important or Urgent)	Time frame (short term or long term)	Funding (N/A, One-time, Ongoing)	Cost
1. Our new Data Science A.S. degree and Certificate of Achievement to be approved for inclusion in the CA Virtual Campus	Submit all six courses to the DE committee	ENGR faculty	Important	Long term	N/A	\$0
2. Supply desk copies of all textbooks for 2-hr reserve to library	Contact publishers for desk copies	ENGR faculty	Important	Long term	N/A	\$0
3. Counselors must require ENGR students to follow the course sequence in the Guided	As in Column 1	Counseling Department	Urgent	Short term	N/A	\$0

Pathway						
4. ENGR majors must be tracked to understand why we are losing so many students between PHYS 006 and our ENGR courses	Counseling Dept. and Research & Planning Dept. must implement a plan as described in Column 1.	Counseling Dept. and Research & Planning Dept.	Urgent	Short term and Long term	N/A	\$0

Resources: Other Resource Goals

Resource Goals	Actions to be Taken	Person(s) Responsible	Priority (Important or Urgent)	Time frame (short term or long term)	Funding (N/A, One-time, Ongoing)	Cost
1. The CIS courses that are aimed at STEM transfer students must be brought into the Math/Science Division as a newly formed CS Department	Decisive action by SCC leadership	Superintendent-President, VP of Academic Affairs, Deans	Urgent	Short Term	N/A	\$0

END OF SECTION 6: HR GOALS, TECHNOLOGY GOALS, FACILITIES GOALS, STUDENT SUPPORT RESOURCES GOALS, OTHER RESOURCES GOALS

SECTION 7: CONCLUSION

7.1 Need for Improvement and Support - Summarize the program's top two or three areas most in need of improvement and support.

1. It is imperative that our core Engineering courses, which are taught only once each year and are part of our TAG agreements, not be cancelled, as several were in Fall 2023. These cancelations drive our students to other community colleges, and lead to an almost irreversible weakening of our program.

2. Another major issue that is driving students away from our Engineering program is that the CIS department does *not provide proper training to our transfer students*. This problem was brought to the attention of the administration starting in 2019, in a series of e-mails, presentations, and other documents, which included testimonials from eighteen current and former SCC students. This problem is widely acknowledged throughout higher education. According to an ACM Education Policy Committee report published in 2018, "the majority of Computer Science programs at community colleges fall into the "technician" category —

designed for certification, not vertical transfer to four-year colleges, the way other science and engineering STEM programs are designed.” To solve this problem, those CIS courses that are aimed at transfer students must be brought into the Math/Science Division, and appropriately upgraded; the courses aimed at students obtaining terminal associate degrees should remain in the Applied Technology and Business (ATB) Division. The SCC administration needs to provide decisive leadership, and act promptly to facilitate the upgrading of our computer science courses for Engineering and other STEM transfer students. (Please see the set of letters from SCC students appended at the end of this document).

3. As explained above in sections 1.2 and 2.2a, it is imperative that PHYS 007 be offered only once per year, in the Fall semester in Fairfield, to stem the loss of students entering into our Engineering Program.

4. Additional adjuncts (two, at minimum), and eventually a new full-time instructor, are needed to teach our new Data Science courses, and drive our Data Science program forward.

5. It is imperative that we retain our classroom 302 on the Fairfield campus, and its associated prep rooms, 330 and 331. If any changes are to be made to these rooms, full-time Engineering and Physics instructors at the Fairfield campus **must** be included in the planning meetings. Our longer-term plan is to move face-to-face Engineering teaching at the Fairfield campus into the planned new STEM Center with domed planetarium.

6. It is critically important that the Data Science program be explicitly listed and easily found on the web-based and pdf versions of the SCC catalog. This is currently not the case in the 2023-24 catalog.

7.2 Improvement, Success, and Strength - Summarize the program’s top two or three areas of improvement, success, and strength.

Among the improvements made in the SCC Engineering program over the period 2015-22 are the following:

- A new Associate in Science degree in Engineering was developed, and has been offered since 2019.
- A new suite of Data Science courses has been created and approved within the Engineering Department, along with a new A.S. degree and a Certificate of Achievement in Data Science.

Among the many notable success stories of our Engineering Program have been the following:

Faculty:

- Engineering instructor Melanie Lutz received the SCC Presidential Recognition Award in 2015.
- Melanie Lutz published two papers in refereed scientific journals:
 1. “Effect of the interphase zone on the conductivity or diffusivity of a particulate composite using Maxwell’s homogenization method”, M. P. Lutz and R. W. Zimmerman, *Int. J. Eng. Sci.*, vol. 98, pp. 51-59, 2016.
<https://www.sciencedirect.com/science/article/pii/S0020722515001056>
 2. “The effect of pore shape on the Poisson ratio of porous materials”, M. P. Lutz and R. W. Zimmerman, *Math. Mech. Solids*, vol. 26(8), pp. 1191-1203, 2021.
<https://journals.sagepub.com/doi/full/10.1177/10812865211023535>

Students:

- Nicole Peacock participated in the NASA Community College Aerospace Scholars Program, 2016
 - Arthur Ingraffia did a Field Engineering Internship at Flatiron West, Inc., 2016
 - Mark Delarosa did a Summer REU Internship at Louisiana State University, 2016
 - Michael Lostica did a Summer REU Internship at Brandeis University, 2017
 - Erin Nebel did a Summer REU Internship at UT Austin, 2017
 - Sean Casey did an Engineering Internship with the City of Napa, 2017
 - Morgan Renner did an Engineering Internship with the City of Napa, 2018
 - Heath Muscat participated in the NASA Community College Aerospace Scholars Program, 2018
 - Jered Bell participated in the NASA Community College Aerospace Scholars Program, 2018
 - Jered Bell and Heath Muscat did NASA Goddard Space Center Internships, 2018
 - Kathleen Matsumoto-Elliott did a Summer REU Internship at Arizona State University, 2020
 - Duncan Koelzer participated in the NASA Community College Aerospace Scholars Program, 2020
 - Joseph Penrose did an Engineering Internship with Genentech, 2020
 - Andrea Solis-Olguin did an Engineering Internship at the Fairfield Suisun Sewer Treatment Plant, 2022
- (Please see the media articles appended at the end of this document).

Graduates:

- SCC Engineering graduate Dan Wiese received a Ph.D. in Mechanical Engineering from MIT in 2016, and founded his own biomedical device start-up company in Boston
- (Please see the media articles appended at the end of this document).

7.3 Signature Page - The following faculty in the program (or in a related program) have read this self-study report and have had the opportunity to provide feedback:

Melanie Lutz, full-time
Scott Berta, adjunct
Sana Vaziri, adjunct



February 9, 2020

SCC Governing Board
Fairfield, CA 94534-3197

<http://www.solano.edu>

Dear Governing Board,

It has been estimated that California will need over 100,000 computer science graduates within the next ten years. Recent published papers (*i.e.*, Lighting the Path: From Community College to Computing Careers, ACM Education Policy Committee, 2018) show that community colleges are falling far short of providing enough transfer students in computer science to help reach this goal.

According to this ACM report, "A factor contributing to the gap is that the majority of CS programs at community colleges fall into the technician category". It is widely understood that future computer scientists and engineers need to be trained in a division that caters to transfer students, not one whose priority is the training of technicians.

Solano Community College currently offers a set of Computer Science Courses that are geared towards the training of computer technicians, rather than for students who intend to transfer to four-year colleges to major in computer-related fields. In order to fill this huge gap in our course offerings, the Engineering Department has been trying to create a new set of Computer Engineering courses. Five of the proposed new Computer Engineering courses will be taught in the Python programming language, which is currently not offered in the Computer and Information Science (CIS) Department. This language is emerging as the main language of Data Science, the fastest-growing area in STEM. We need to have a focus on Data Science, which is a combination of Computer Science and Statistics, for which there is no current expertise within CIS.

Although several of our CIS courses formally articulate to Sacramento State and UC Davis (although *not* to UC Berkeley), our Computer Science/Engineering students who transfer to four-year colleges have been complaining for years that these courses fall far short of providing them with the necessary preparation for upper division computer courses. I have appended *eighteen* letters from former SCC students, which detail the unsuitability of our current CIS courses for science/engineering transfer students, and endorse the creation of the proposed new courses.

The creation of these new courses is crucial for moving SCC into the future with regards to STEM education, and is fully in-line with Governor Newsom's emphasis on STEM training and education. Although this initiative is supported by many members of the faculty, it is being held back by a small number of faculty, and is not being energetically pushed forward by the college leadership. In keeping with our commitment to put the needs of our students first, I urge you to do what you can to break this logjam, and thereby to position Solano Community College at the forefront of STEM training in California.

Sincerely,

Dr. Melanie Lutz
Physics and Engineering Departments
Solano Community College

Letters from SCC Students in Support of New Computer Engineering Courses

Surname	Given Name	SCC graduation	Next/current destination
Sherman	Doug	2015	BS, UC Davis, 2017; MS, UC Davis, 2018
Vig	Cody	2019	Undergraduate student, UC Berkeley
Sherman	Nick	2015	BS, UC Davis, 2018; currently PhD student, UC Berkeley
Bell	Jered	2018	Undergraduate student, Cal Poly SLO
Ireland	Robert	2018	Undergraduate student, UC Davis
Renner	Morgan	2018	Undergraduate student, UC Davis
Vega Lojo	Borja Daniel	2020	Will transfer to CSU San Jose, Fall 2020
Pierce	Taylor	2018	Undergraduate student, UC Davis
Nicosia	Salvatore	2017	BS, CSU San Jose, 2019
Martin	Hunter	2017	Undergraduate student, UC Berkeley
Wiese	Dan	2009	BS, UC Davis, 2011; PhD, MIT, 2016
Barton	Eddie	2017	BS, UC Merced, 2018; currently PhD student, University of Wisconsin-Madison
Miranda	Andre	2014	BS, UC Davis, 2016
Gomez	Michael	2018	Undergraduate student, CSU Sacramento
Muskat	Heath	2019	Undergraduate student, UC Irvine
Salazar	Anthony	2015	BS, UC Berkeley, 2017; currently PhD student, UC Berkeley
Vaziri	Sana	2009	BS, UC Berkeley, 2012; currently PhD student, UC Davis
Cabugwas	Marlon	2016	BS, CSU Sacramento, 2019

January 5th, 2020

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

Dear Sir/Madam:

I am writing with regards to my experience with the CIS courses at Solano Community College.

During my tenure at SCC, I took CIS 1, 20, 22, and 23 as preparation to transfer to UC Davis for Computer Science. To ensure I was well-prepared for UC Davis, I worked very hard in these courses, and eventually received an A in each. However, I quickly found out that even though I was well-versed in the subjects taught in these courses, I was grossly under-prepared for UC Davis—even the lower-division ECS 60 Data Structures and Algorithms.

My CIS courses started with CIS 1 which was simple enough and had no real relevance to my future in Computer Science. CIS 20 was an assembly programming course that was far too outdated to be of any use moving forward. This would be much more useful if it were taught using ARM or even MIPS architecture. Also, since CIS 22 was taught in C# and used Visual Studio, it has also shown to not be useful for transferring to UC Davis or current projects in industry.

Finally, CIS 23 was the last course by SCC which is a pre-requisite to a UC Davis course of the same name, Data Structure and Algorithms. Though, the material that was covered in CIS 23 turned out to be very different from corresponding course at UC Davis. I found out that this was because we were not covering the topics in the SCC curriculum such as linked lists, arrays, and other standard data structures. When I asked the professor if we would talk about any topics on “data structures” or “algorithms”, they simply laughed. Even after telling the Dean of this, the instructor’s response was to spend two lectures quickly showing us the Wikipedia pages of all the missed topics. Moreover, when we asked the instructor standard algorithm questions, such as the complexity of a sorting algorithm, they would respond with answers like “it doesn’t matter because computers are so fast now that we don’t need to understand this”. Instead of covering the curriculum, the instructor chose to cover something they were admittedly more experienced with, how to do animations inside Visual Studio. A skill I have yet to use in my education, research, or in industry. The final exam was to use these animations to implement a linked list, which most of the students struggled intensely with, or didn’t finish at all, since none of us had any experience with any data structures until this point.

The very first programming assignment I was assigned from UC Davis was to implement a basic data structure in C++. This was still a lower-division course, and this assignment was supposed to be a review of previous courses, so this was expectedly a breeze for most of the students. However, this is where I found out that, although I aced all the SCC pre-requisites to this course, I was grossly unprepared for this course. I spent almost 80 hours on this assignment and still did not finish it by its due date. Moreover, the use of Visual Studio in the SCC classes ensured that any relevant skills I had developed in programming would need to be re-learned if I were to be successful at UC Davis, because Visual Studio is a proprietary tool that hides the inner workings of code compilation and linking. So, when we were expected to understand topics like compilation, linking, and developing on Linux (the industry standard), I was years behind the other students who had already learned this in their previous courses. The only reason I succeeded at UC Davis is because I asked my instructor to re-teach everything I should have learned at SCC; thankfully, he obliged.

In retrospect, using Visual Studio and Windows in my earlier classes greatly hindered my foundation for object oriented programming. Both Visual Studio and Windows are rarely used in industry, and it was expected in both my education and in industry that I understand compilation and linking; a skill that is not taught again in later courses. Moreover, not only are most major development projects today using higher level languages like Python, but both Data Scientists and Analysts need skills in Python and R to succeed. Overall, the Computer Science course offerings at CIS department did not prepare me for transferring to UC Davis nor help build my foundation as a Machine Learning Engineer in industry today.

In summary, I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely,

A handwritten signature in dark ink, appearing to read 'Douglas Sherman', enclosed within a large, horizontal, oval-shaped flourish.

Douglas Sherman
(SCC student, 2013-2015)
804 4th St.
Woodland, CA 95695

cc: Dr. Melanie Lutz, SCC

December 31, 2019

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

Dear Sir/Madam:

I am writing with regards to my experience with the CIS courses at Solano Community College.

My name is Cody. I am a Physics and Mathematics double major at UC Berkeley and a former student at Solano Community College. I took CIS 022 in the Spring semester of 2018 and received an A. My belief is that the CIS curriculum at SCC provides insufficient preparation for transfer students interested in perusing careers in the STEM fields. According to the course description, "[CIS 022's] content will include 'hands-on' development of structured algorithms and programs through top-down design, modular and object oriented programming, and standardized control structures." More precisely, the class teaches students basic programming syntax, how to use loops and if-statements, and what data structures are. We learn very little about the difference between modular and object-oriented programming, and much less about how to think like a programmer. The examples used to introduce concepts are often contrived and have no real-world significance, and as a result, the level at which these concepts are explained is reminiscent of a high school computer class.

While it seems the level at which the course is taught is appropriate for a curious, non-technical student, the class left me underprepared compared to my peers at UC Berkeley regarding how to apply computational techniques in STEM. For instance, the Physics and the Mathematics departments at UC Berkeley both have degree-specific introductory courses in computer programming. These courses teach students content similar to that of CIS 022, but woven in the narrative of real-world problems. Computers are used extensively in the STEM fields to solve problems that are too complicated to be solved by hand, or to automate processes that would be tedious and non-substantive if done otherwise. The students who took these classes (as opposed to the ones who took something reminiscent of CIS 022) have a stronger understanding of how computers are used in such applications. As a result, they are more desirable to professors for undergraduate research and for research internships. Such research experience is essential for science students who want to attend graduate school.

Furthermore, much of modern scientific research is done in the language of Python. Currently, SCC does not offer courses in Python, and that puts some of its transfer students

at an enormous disadvantage. UC Berkeley, for comparison, uses Python in the first class of its introductory computer science sequence. In addition, SCC does not offer a course in discrete mathematics, which is a lower division course required for both computer science majors and mathematics majors. This further puts some SCC transfer students at a disadvantage, as they will need to spend one out of the four semesters allotted to them taking an additional lower division course.

SCC is a great school. The Math/Science division teach at a level consistent with what is taught at UC Berkeley. As a result, transfer students are well-prepared for upper division mathematics and science classes. The existing CIS curriculum at SCC, however, does not prepare their transfer students appropriately. I believe teaching computer science to students in STEM using problems in the real world as a catalyst will provide much stronger motivation for computer science and will therefore lead to a much better prepared transfer student.

In summary, I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'Cody Vig', written in a cursive style.

Cody Vig
(SCC student, 2015-2019)
235 Tahoe Drive
Rio Vista, CA 94571

cc: Dr. Melanie Lutz, SCC

December 31, 2019

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

Dear Sir/Madam:

I am writing with regards to my experience with the CIS courses at Solano Community College.

While at SCC, I took the courses CIS 1, 20, 22, and 23, and I earned an A in all four courses. Taking these courses allowed me to earn an internship in computational physics the summer before transferring to UC Davis, where I double majored in applied math and physics, and I minored in computer science.

My lack of preparation in computer science became apparent initially during my internship, when I needed to run my program on a Linux machine. I initially assumed that using the Linux OS was something unique to physics, and so I didn't think much of this. During this summer, I collaborated with a member, Trithep, in my group to write a program to study quantum entanglement in quantum spin systems. Trithep had already developed a code base that handled studying spin systems, and I needed to modify it to study quantum entanglement. I was overwhelmed. His code was not written in visual studio, the only way I knew how to write a program from my time at SCC. I didn't know how to compile his program, and I didn't know how to run it. He used a makefile to build his code, and the program needed to be built and run from the console. Fortunately, Trithep showed me these techniques, and I was able to begin development on my project.

To develop my code, I had to add a class into the framework that Trithep had developed. I needed to develop a derived class from an abstract data type, as he wrote his spin system code in a polymorphic manner. I had seen the notion of a class in my time at SCC very briefly. However, most of my code at SCC was written inside the main function, and I had not seen abstract data typing, nor polymorphism. I asked Trithep how he knew all these techniques about programming, I assumed he must have double majored in computer science. When he told me that he learned them in his lower-division computer science courses, I was utterly embarrassed. Without Trithep, my internship would have been a disaster.

During my time at UC Davis, I now knew my computer science skills were subpar at best. This inspired me to earn a minor in computer science, on top of my already overloaded schedule double majoring. My first required course was a course in data structures and algorithms. I tried to skip this course, since CIS 23 was also a course in data structures and algorithms, but UCD didn't allow this; I assumed the course would be a free A, but I was mistaken. This course turned out to be the hardest course I had ever taken. The first assignment was a freebie for any student that had an adequate advanced C++

course, what CIS 23 articulated to UCD as. As part of the assignment, I had to develop a dequeue to handle names and ID's for customers. I had to develop a class to do this, and I was very fortunate I had learned this from Trithep, but I had never heard of a dequeue data type. We also needed to access the data from a server on campus. I did not know how to use SSH nor SCP to access the data. Moreover, To check how well my program performs, the instructor wrote a bash script that will auto generate your grade on the assignment, but I had also never seen this before. I went to office hours to learn these techniques. The instructor asked if I had transferred from a community college, and then gave me many resources to help fill in my gaps. To succeed in this course, I was forced to stay up all night working on the coding projects, this was the only time in my academic career where this was necessary.

Today, I am a Ph.D student in physics at UC Berkeley, and advanced computation skills is required for my work. I am blessed that I have had great mentorship along the way to teach me the skills necessary to succeed, but it saddens me to say that it was not SCC that prepared me for my computer science requirements. The math and physics courses at SCC made my transition to UCD as smooth as one could hope for, but the CIS department left holes in my foundation that I still feel today. Computer science penetrates all aspects of STEM, and is as important, if not more important, than mathematics for these disciplines. I have always viewed SCC as a forward thinking institution, and I am confident you will make the right decision to prepare the next generation of scholars.

In summary, I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely,



1/5/2020

Nicholas Sherman
(SCC student, 2012-2015)
1601 Allston Way
Berkeley, CA 94703

cc: Dr. Melanie Lutz, SCC

January 5th, 2019

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

Dear Sir/Madam:

I am writing with regards to my experience with the CIS courses at Solano Community College.

During my time at SCC I successfully completed MATLAB and dropped out of the C++ introduction course. Unfortunately, in both of these programming classes, I was given a course that was underwhelming and simply verified the general consensus among students that the programming (more specifically, CIS) classes at SCC lack the depth and breadth needed. While I took the MATLAB course in the first semester it was offered, the lack of administrative preparation and learning goals for the class (along with the fact only five students enrolled) exemplified the importance of these classes to the college.

In my first week of the C++ course I found a series of videos by Stanford online for free and dropped the C++ class so I could have more time to teach myself at home. This decision wasn't difficult to make because my peers that had completed the SCC course agreed that my time was better spent being self-taught. I was finally convinced to drop the class by the outdated curriculum and high-school expectation of coursework. Regretfully, in retrospect, I would not have done anything differently and believe that I did the right thing for my future success.

In summary, I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely yours,



Jered Bell
(SCC student, 2016-2018)
165 Cerro Vista Circle
San Luis Obispo, CA 93410

cc: Dr. Melanie Lutz, SCC

January 6, 2020

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

Dear Sir/Madam:

I am writing with regards to my experience with the CIS courses at Solano Community College.

I would like to start by saying that I have taken all of the required CIS courses at SCC in order to transfer to UC Davis with a major in Computer Engineering. Computer Engineering requires fewer programming courses than the Computer Science major, so my opinion of my level of preparation with Solano's CIS courses will definitely be different from a student who is or was a computer science or computer programming student at a University.

The CIS courses currently offered by SCC are both good and bad. If your goal is to enter the workforce upon leaving SCC with an AS degree, then SCC's CIS programming courses provide a good understanding of C++, and especially in the Visual Studio IDE, and it would be useful to employers who have their own computer programs for sale. However, if your goal it to transfer to a four-year university, my programming experience at UC Davis has shown that much more Linux terminal shell command understanding is required than Solano had prepared me for. The ECS 36C (Program Design and Data Structures) class at UC Davis, which comes after CIS 021 (Discrete Structures) at Solano, was an incredibly difficult class for me. I had to drop the course while at UC Davis after the first twenty days because I was too far behind the curve in my understanding of graphs, Big O time complexity analysis, trees, search/sort algorithms, and other more advanced topics that I ended up learning a little about at Diablo Valley College (DVC) the next quarter/semester. I also dropped my ECS 36C course because I was taking 14 units at the time, and I not only overestimated my programming knowledge and skills, but I underestimated the difficulty of each of the courses that I had enrolled in that quarter.

I decided that since I was not very well prepared for UC Davis's advanced data structures course, and since it was an undergraduate course, I needed to find a community college that offered it online so I could spend more time reading the textbook and going over examples. Luckily, DVC offered COMSC 210 (Program Design and Data Structures), which was exactly what I needed, and assist.org showed that it was equivalent and transferrable to UC Davis. Since UC Davis allows students to take courses from community colleges, I enrolled and completed the online course at DVC during the spring 2019 semester.

Students prefer DVC over Solano, because they offer a larger variety of courses than Solano's CIS department does, such as the essential COMSC 210, or many of the ENGR courses Dr. Lutz is proposing to add. In addition, their COMSC 210 and COMSC 260, (Assembly Programming), articulate to UC Berkeley, and none of the CIS courses do.

ECS 36C was the class at Davis that I was very unprepared for. The CIS courses at Solano did not prepare me very well for ECS 36C at UC Davis. With the existence of the newly proposed ENGR 006, "Program Design and Data Structures", this entire issue would never have surfaced, especially if ENGR 006 is taught at the level of ECS 36C.

Even though I got an A+ in my ECS 122A algorithms class at UC Davis, I felt very unprepared for that class the entire time. Understanding dynamic programming/algorithms, recursive programming/algorithms, depth first search DFS algorithms, breadth first search (BFS), Dijkstra's algorithms, and all the others is much more important in my mind than understanding a single programming language's data structures. Many of the algorithms that we looked at solved a difficult optimization problem in a way that reduced the total run time of the program from being $O(2^n)$ exponential time complexity (using a brute force approach) to being $O(n)$ linear or something quick like that, with an elegant algorithm that didn't try every possible combination to find the correct answer. DVC's COMSC 210 was important for preparing me for Big O time complexity analysis, which was used heavily in ECS 122A.

Although I am almost done with my Bachelor's degree in Computer Engineering at UC Davis, I am greatly dissatisfied about one major thing, my artificial intelligence (AI) knowledge. If Solano had offered an AI course, I would have enrolled in a heart-beat. AI programming will also be an essential skill for any computer programmer in the near future. The new SCC courses ENGR 010 (Machine Learning) and ENGR 011 (Deep Learning) should attract a lot of students.

I was also recently talking to someone about how important programming was, and how I wished I could have been required to write computer programs in my STEM courses at Solano. I'm very excited to learn that Dr. Lutz is making plans to do exactly that. Students will hopefully one day learn to write calculator programs in each of their calculus courses with their TI-84 graphing calculators, but until more math and science professors understand programming, Dr. Lutz's ENGR courses are an excellent set of courses to prepare Solano's students for both the modern university and work level of understanding that is required. And with the workforce becoming more automated every day, the more programming that students can be exposed to, the more valuable they will be in any career they end up in.

In summary, I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely yours,



Robert Ireland Computer Engineer
(SCC student, 2011-2018)
4614 Aria Place
Fairfield, CA 94534

cc: Dr. Melanie Lutz, SCC

January 7, 2020

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

Dear Sir/Madam:

I am writing with regards to my experience with the CIS courses at Solano Community College.

I am a fourth year Civil Engineering student at UC Davis. After separating from the military in 2015, I pursued my education in hopes that I would obtain an engineering degree from the California college system. While residing in Vacaville, I attended Solano Community College (SCC) and Diablo Valley College (DVC), in order to fulfil transfer requirements to attend a UC school. I believe that where I am today is due to the faculty and staff of the junior colleges that I have attended.

Understanding how competitive University would be, I sought to pursue the best education that would prepare me for the next step in my career. At times this meant commuting from Vacaville to Diablo Valley College, bypassing SCC, the very institution I truly love, and where I took the majority of my courses. The main purpose of this letter is to provide an insight on the strengths and weaknesses I experienced during the transfer process.

The computer-based classes that I took at SCC were Intro to Computer Science (CIS 001), Introduction to Computer Programing (CIS 022), Introduction to CAD (DRFT 045), Math/Engineering Problem Solving (ENGR 026), and Solid Modeling (DRFT 058). In CIS 001 and 022, Microsoft Visual Basic is the platform used. This platform is not used in the engineering field at the university level. CIS 001 and CIS 022 do provide an introduction to basic syntax, but cater largely to an audience who are not engineers. AutoCAD, Solidworks, (Solid Modeling), and MATLAB are programs implemented in internships and research. Other computer software that I must consistently use at UC Davis and in internships include ArcGIS. Using ArcGIS, data must me imported from Microsoft Excel and Python. Python is the most commonly used software, and it is not currently offered at SCC.

Amongst the computer programming classes taken at Solano, the only notable course was ENGR 026, Math/Engineering Problem Solving, taught by Professor Darryl Allen. This course was in the development stages and I and the four other students taking the course were guinea pigs. This course implemented platforms such as Linux, and MatLab. This course was helpful because it was the only course that taught students the computer

platforms that would be used at University. Five students out of the entire engineering group is not acceptable. Nor is it acceptable for SCC to allow your students to continue to the next level without proper education.

For me, undergraduate research in the Civil/Environmental Dynamics Lab (EDL) started during my third year at Davis. Interpreting mass quantities of data using Python, Statistical Analysis, and downloading/plotting raw data with MATLAB, proved to be my greatest struggle. My comprehension of Computational Data Science was vacant. Solano had prepared me in nearly all engineering courses, except these. For the first and only time SCC had failed me. Spending countless weeks and to this day reviewing old textbooks and online tutorials, I still feel inadequate compared the progress of my peers who received lower division Computer Science education from other community colleges such as DVC.

From quarter to quarter the greatest struggle I am faced with is the ability to analyze computational data. Students that have taken their Computer Science coursework at DVC have this skill set, and they often applaud the quality of the Computer Science program at this institution. The newly proposed courses ENGR 007, 008, 009 and 014 are exactly what are needed for Civil Engineering students of the 21st century.

In summary, I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely yours,



Morgan Renner
(SCC student, 2015-2018)
1659 Drew Circle
Davis, CA 95618

cc: Dr. Melanie Lutz, SCC

January 18, 2020

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

Dear Sir/Madam:

I am writing with regards to my experience with the CIS courses at Solano Community College.

I started my studies at Solano Community College in Fall 2016, and took most of the computer science classes such as CIS 001, 022, 021, 023, and 020. From my experience with these classes, I feel I am not prepared to transfer, due to the lack of organization in those classes. Before taking these classes, I had learned the basics of computer programming in my native country, Switzerland. As I started my CIS classes at SCC, I was expecting to gain a lot of knowledge in this area, since it is located in the state of California, which is considered to be the place with the most advanced technologies in this area. Unfortunately, I did not acquire the new knowledge and skills that I had expected. I think it is unfortunate that Solano Community College does not have CIS classes that can correctly prepare students majoring in computer sciences. I am currently considering taking an advanced CIS class at Diablo Valley College, to get the skills I lack before transferring.

In summary, I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'B. Vega', with a stylized flourish at the end.

Borja Daniel Vega Lojo
(SCC student, 2016-2020)
906 Shadow Tree Ct
Vacaville, CA 95687

cc: Dr. Melanie Lutz, SCC

January 1, 2020

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

Dear Sir/Madam:

I am writing with regards to my experience with the CIS courses at Solano Community College.

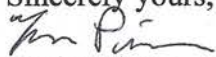
During my time at SCC, I enrolled in both CIS 001, and CIS 022- primarily in order to fulfill transfer requirements. While these courses offer a great introduction to the basics of programming, they were clearly not targeting students hoping to garner deeper understanding of the programming and computer science field.

I have since transferred to UC Davis (Fall 2018) in Electrical Engineering- working adjacent to many computer science programs. Upon transferring, I joined a junior level design course and quickly found myself struggling to provide much support for my team. Most early prototyping procedures required programming of multiple devices, and my unfamiliarity with these more engineering focused tasks limited my ability to contribute.

Additionally, in applying for internships- a vital component to my future success in engineering- I found most positions, even those outside the computer science field, required or strongly preferred a relatively firm grasp on programming in C++ or Python. My lack of such foundational knowledge severely limited my options in this pursuit.

In summary, I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely yours,



1-1-20

Taylor Pierce

(SCC student, 2016-2018)

625 Cantrill Dr, Apt 442

Davis, CA 95618

cc: Dr. Melanie Lutz, SCC

January 7, 2019

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

Dear Sir/Madam:

I am writing with regards to my experience with the CIS courses at Solano Community College.

During my years at Solano Community College as a CIS major, I had to take all of the required CIS courses to fulfill the requirements to transfer to a four-year university. Although I had taken many CIS courses at SCC, when I transferred, most of the courses were not transferable because they lacked in content and were not comparable to the courses offered at San Jose State University (SJSU). Because of this, I was forced to retake most of the CIS courses at SJSU which postponed my graduation. In addition, because of the lack of quality of the CIS courses offered at SCC, my preparation was not the strongest when I had to retake the courses at SJSU. As result, I had felt as if I had never learned anything from the SCC CIS courses and forced me to properly relearn many of the important topics in computer science such as data structures and algorithms to succeed in the programming computer engineering courses at SJSU.

In summary, I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'Salvatore Nicosia', with a stylized flourish at the end.

Salvatore Nicosia
(SCC student, 2013-2017)
63 S 9th St Apt 1
San Jose, CA 95112

cc: Dr. Melanie Lutz, SCC

January 5th, 2020

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

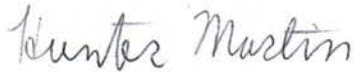
Dear Sir/Madam:

I am writing with regards to my experience with the CIS courses at Solano Community College. When I started taking classes at SCC, I was initially interested in becoming a computer science major, with the intention of transferring to a 4-year institution to finish a bachelor's degree. However, after meeting with academic advising staff at SCC to build a 2-year plan, I discovered that a lot of the available CIS courses at SCC would not transfer to a lot of the schools that I was considering, and that I would have to go to Diablo Valley College to obtain transferrable CIS credits. As someone who was already commuting half an hour from Vacaville to the main campus daily at that point, the thought of trying to bounce between SCC and DVC daily was a very daunting one. Luckily, I had fallen in love with math and physics during my second semester at SCC and decided to switch majors. This decision meant that I no longer had to worry about balancing two different schools at once, which was a great relief, and I was able to make the most of my time at SCC. However, I have friends who were able to transfer as computer science majors from SCC, and they told me that they had to re-learn everything from lower division computer science classes because SCC's CIS courses did not prepare them well enough for 4-year institutions. Furthermore, the fact that SCC did not have a transferrable CIS program always puzzled me, as the school had a good reputation for strong transfers in physics, math, engineering, and biology. This is particularly puzzling given the proximity to Silicon Valley and the size of the job market in those industries.

Offering competitive, transferable computer science courses also goes a lot further than just supporting computer science students. In a lot of areas of STEM research, including physics, astronomy, math, biology, and chemistry, knowledge of strong computing skills is a great benefit. I am currently conducting research in the field of cosmology, a field dominated by large data sets and simulations that require strong coding skills to build and run computations on. Currently, I am a self-taught programmer with no formal classroom coding experience. If I had the opportunity to take a programming class at SCC that was equivalent to one of UC Berkeley's lower division computer science courses, I would have done so in a heartbeat. This is because demonstrating that I have learned those programming skills in a formal setting would have set me apart from other applicants when I applied for internships and transfer institutions.

In summary, I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely yours,

A handwritten signature in cursive script that reads "Hunter Martin".

Hunter Martin
(SCC student, 2015-2017)
5816 Laguna Vale Way
Elk Grove, CA 95758

cc: Dr. Melanie Lutz, SCC

January 5, 2020

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

Dear Sir/Madam:

I am writing with regards to my experience with the CIS courses at Solano Community College.

I attended SCC full-time before transferring to UC Davis where I graduated in 2011 with degrees in mechanical and aerospace engineering, and finally to MIT where I completed my PhD. I've since started a company at the intersection of consumer technology and human physiology where computer science, software engineering, and data science are among the primary fields over which mastery has been crucial for our success. These are also some of the same fields which continue to make up some of the highest paying and fastest growing job opportunities for new graduates in the country.

In my nearly decade of academic and professional experience since having left SCC the classical engineering courses which I took there have more than provided me an equivalent education to that which I would have received at any other university. In fact, I've been better prepared than my peers by having taken my lower division engineering courses at SCC. Unfortunately, the same has not been true with respect to computer science.

CIS 022, which I took in the spring of 2007, was the only course in this department that I took. I transferred from SCC without proper knowledge of algorithms, data structures, resource management, security, or any of the other computer science fundamentals. I would hope that these topics would be covered in CIS 001 or other CIS classes, but knowing that these concepts are not part of the program outcomes for CIS is highly concerning. Furthermore, no part of the CIS curriculum is geared towards data science, machine learning, computational biology, physics, and material science, or towards scientists and engineers. In short, the existing CIS curriculum is leaving students grossly underprepared to transfer to four-year universities and to ultimately fill some of the best jobs available today.

SCC needs to adapt to support these crucial and growing needs. New courses must be created to properly educate students with the skills they need to be successful in the world of tomorrow. Not doing so would do a tremendous disservice to SCC students and drive them elsewhere in search of the education they need.

In summary, I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'D. Wiese', with a stylized flourish at the end.

Daniel Wiese
(SCC student, 2007-2009)
25 Lee Street #1
Cambridge, MA 02139

cc: Dr. Melanie Lutz, SCC

January 1, 2020

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

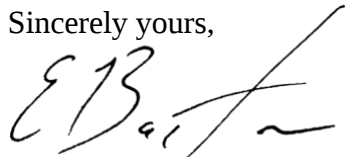
Dear Sir/Madam:

My name is Edward Barton. I am writing with regards to the CIS courses at Solano Community College. I am a PhD student and Teaching Assistant in the Department of Computer Sciences at the University of Wisconsin–Madison. I transferred from SCC to UC Merced in 2017 where I completed my BS in December 2018. I have five years of experience in industry coinciding with my undergraduate studies, most recently spending 1.5 years with Intel.

When I graduated from high school in 2012, I searched for a community college program that had the coursework required for Computer Science transfers for most UCs and CSUs. Upon recommendation from university advisors and students I met on university trips, Diablo Valley College ended up as my selection. The consensus among those I spoke with was that DVC students were among the best prepared students coming out of the Bay Area community colleges at the time. I completed the remainder of my lower division credits at SCC. SCC has a great opportunity to become a staple CCC for computer science preparation and can attract students with a well-designed and implemented program. The long-term effects of such a program would be high transfer rates to the university level and acknowledgement by industry professionals of producing high-performing interns and later engineers. This will gain SCC similar recognition to DVC in the North Bay, and Foothill and De Anza in the South Bay.

Recently, my former engineering instructor, Dr. Melanie Lutz, informed me that she is proposing a Computer and Data Sciences program within the Department of Engineering at SCC. CDS courses taught with similar breadth, depth, and rigor to the engineering courses will ensure that students will be highly competitive at the tier-1 university level and in industry. I again encourage the reforming of the current computer science program at SCC as I did to the Governing Board back in May 2017. I believe the proposed program will fill holes currently present for computer science and engineering, as well as data and computational sciences which have become increasingly popular.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'E. Barton', with a stylized flourish at the end.

Edward Barton
eabarton@cs.wisc.edu

cc: Dr. Melanie Lutz, SCC

January 5, 2019

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

Dear Sir/Madam:

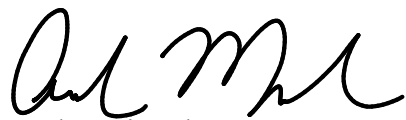
I am writing with regards to my experience with the CIS courses at Solano Community College.

I attended Solano Community College from 2011 to 2014 at which point I transferred to UC Davis starting Fall 2014. I graduated with a degree in Electrical Engineering from Davis in Fall of 2016.

As part of the requirements to transfer to UC Davis in Electrical Engineering I took CIS 22 at Solano Community College. Passing this class at Solano Community College was a prerequisite for taking ECS 40 Software and Object Oriented Programming at UC Davis. But CIS 22 at Solano Community College did not adequately prepare me for ECS 40 at UC Davis and I failed the course the first time I took it and then had to retake the course.

In summary, I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'Andre Miranda', with a stylized, cursive script.

Andre Miranda
(SCC student, 2011-2014)
906 Shelduck Ct.
Suisun City, CA 94585

cc: Dr. Melanie Lutz, SCC

December 31, 2019

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

Dear Sir/Madam:

I am writing with regards to my experience with the CIS courses at Solano Community College.

I am currently a senior computer engineering student at Sacramento State. I did not feel adequately prepared by the CIS courses at Solano, and had a lot of catching up to do when I transferred. I ended up taking an introductory C++ course through City College of San Francisco in the summer before my first semester at CSU Sacramento, because I felt that my programming foundation was lacking. Considering the strength of the engineering program that Dr. Lutz has so painstakingly built at Solano, it is really a shame that the computer science offerings are not up to par.

In summary, I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely yours,

Michael Gomez

Michael Gomez
Solano CC student from 2017 - 2018
4301 14th Ave
Sacramento, CA
95820

cc: Dr. Melanie Lutz, SCC

December 30, 2019

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

Dear Sir/Madam:

I am writing with regards to my experience with the CIS courses at Solano Community College.

During my extended stay at Solano Community College (SCC) I have taken many courses in a variety of fields from Engineering and CIS to Photography and Ceramics. Of all the courses I found the CIS courses the least impactful as a whole. The courses were limited and primitive in the information given making for a poor foundation for a student to expand upon. I have since taken another CIS course at U.C. Irvine in which I would personally not have felt as prepared for these upper division courses as compared to the other engineering courses: If I had not already had an interest in the subject and had been exposed to the material through my own exploration, these courses would have been a struggle to excel in.

Many modern upper division engineering courses revolve around the comprehension of computer calculational aids. Adding the suggested courses can only better prepare SCC students with more exposure, a better understanding, and a greater level of confidence upon transferring in their respective fields of study. If given the opportunity in the future I can see myself returning to SCC to enroll in some of the suggested courses.

In summary, I fully support the initiative to create a new set of engineering courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely,



Heath Muskat
(SCC student, 2015-2019)
13406 Heritage Way
Tustin, CA 92782

cc: Dr. Melanie Lutz, SCC

January 6, 2019

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Dear Sir/Madam:

I am writing with regards to my experience with the CIS courses at Solano Community College.

As a successful graduate of UC Berkley's college of engineering I can say first hand that the CIS courses offered at Solano Community College do not prepare students for success in computation, programing or data science at the level expected for a four year university student. Although students are able to get programming exposure through C++ I found that this was not helpful when learning MATLAB and Python at the university level. I struggled significantly when it came to computational and programing classes because of this. Many courses require programing to complete homework problems. This makes the learning curve for SCC students quite steep and ends up resulting in poor performance in the first year after transferring and often a delay of graduation.

After my experience as a transfer student my number one recommendation to students considering transferring to UC Berkeley is to learn Python. Having Python and MATLAB equivalent courses at SCC is the best thing the administration can do to support and prepare its students for success as a transfer students.

In summary, I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely yours,

Anthony C. Salazar
(SCC student, 2012-2015)
2627 Virginia St.
Berkeley Ca, 94534

A handwritten signature in black ink, appearing to read 'Anthony C. Salazar', with a stylized, flowing script.

December 28th, 2019

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

Dear Sir/Madam:

I am writing with regards to my experience with the CIS courses at Solano Community College.

I was enrolled at SCC from approximate Spring 2003 to Spring 2009. In the Fall of 2009, I transferred as a junior to the University of California, Berkeley (UCB) where I completed my Bachelor's degree in Electrical Engineering and Computer Sciences.

While at SCC, I took CIS 01 (Intro to Computers), CIS 22 (Intro to Programming), CIS 61 (Creating Web Pages) and CIS 62 (Flash). At the time I was a student at SCC, there was no data structures or machine structures courses offered. As I recall, CIS 22 did not transfer and thus did not count towards my degree. Upon transferring, I took the following UCB lower-division courses as a part of my major requirements: CS 61A (Structure and Interpretation of Computer Programs), CS 61B (Data Structures), CS 61C (Machine Structures), and CS 70 (Discrete Mathematics). While I was a student at SCC, there were no equivalent courses for these. However, as I understood, nearby colleges like Diablo Valley College did offer courses in data structures, machine structures, and discrete math. Thus, I was at a disadvantage compared to students transferring from these colleges who did not have to complete these additional courses in the two-and-a-half year period allotted to junior transfer students. This not only slowed down my progress towards my degree, but also prevented me from taking more upper-division and specialized courses during my time at UCB.

I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering,

computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely yours,

A handwritten signature in black ink that reads "Sana Vaziri". The script is fluid and cursive, with the first name "Sana" and last name "Vaziri" clearly distinguishable.

Sana Vaziri
(SCC student, 2003-2009)
1759 Sarah Drive
Pinole, CA 94564

cc: Dr. Melanie Lutz, SCC

January 12, 2020

Academic Senate
Solano Community College
4000 Suisun Valley Road
Fairfield, CA 94534-3197

Re: CIS courses at SCC

Dear Sir/Madam:

During my transfer to CSU Sacramento, virtually none of the computer languages that I learned at SCC transferred very well to any of the upper division classes for the Computer Engineering / Computer Science majors. The languages of Java and Visual Basic come to mind. I feel that a lot of the existing CIS classes are in need of an update/refresh. There are plenty of Computer Engineering / Computer Science areas that SCC does not touch at the moment. Things like machine learning, AI, cloud, cybersecurity, and modern web design. Teaching more modern and widely used languages such as Python, Javascript, C++, R, etc., would be fantastic, and more indicative of the real world. Plus, adding courses that relate to in-demand fields like AI, data science, and cyber, would help students gain a better grasp of what jobs are actually out there.

I fully support the initiative to create a new set of ENGR courses within the Math/Science Division, that will properly prepare SCC science and engineering students for university-level courses in computer science, computer engineering, software engineering, computational data science and engineering, computational physics, computational materials science, and related fields.

Sincerely yours,



Marlon Cabugwas
(SCC student, 2013-2016)
38 Dawn Rose Way
Suisun City, CA 94585

cc: Dr. Melanie Lutz

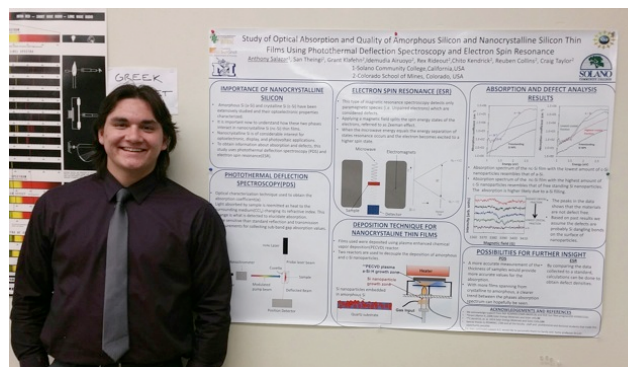
Internship leads to presentation

Materials research internship findings could lead to better, cheaper solar power

Qhianna Sanchez, Staff Writer

March 18, 2015

Better cheaper solar power may soon be on its way to becoming a reality, as scientists study ways to make this happen. Sometimes, students help create this reality, as with Anthony Salazar, a Solano Community College student, who acquired an internship last year studying various mixtures of silicon's energy absorbency.



Salazar participated in the research during his internship with the Colorado School of Mines. Melanie Lutz, professor of physics and engineering at SCC, helped Salazar gain this internship.

Salazar poses with the poster he created during his summer internship. The poster will be on display April 8 at the Marriot Marquis in San Francisco.

Salazar completed his internship with [Craig Taylor](#), director of the renewable energy materials research science and engineering center at the [Colorado School of Mines](#). Taylor "presented the Mott Lecture in 2005, which is the most prestigious lecture in the field of amorphous and nanocrystalline semiconductors," according to his biography found on Department of Physics website at the Colorado School of Mines.

"I performed electron paramagnetic resonance and photothermal deflection spectroscopy on nanocrystalline silicon thin films," said Salazar in an email. He explained that "nanocrystalline silicon is a semi-conducting material composed of silicon nanocrystals embedded in an amorphous silicon matrix." Spectroscopy is the measurement of the energy absorption rate of various materials. Various science lab classes at SCC include the use of a spectroscopy machine.

Thin films of material, such as silver, silicon, or ceramics, are used to conduct electricity, protect other materials from corrosion, or create the reflection used in mirrors. In this case, the thin films are made of nanocrystalline silicon.

According to Salazar's abstract on the 2015 Materials Research Society Spring Meeting and Exhibit website, the research acquired "absorption spectra for mixed two phase nanocrystalline silicon thin films." The researchers "found that the absorption can be tuned, based on the amount of silicon nanocrystals deposited in the thin film." This research may help develop durable solar cells absorbing maximum sunlight at low cost.

As part of his internship, Salazar created a poster of his findings and will present it April 8 during the MRS spring meeting and exhibit at the Marriot Marquis in San Francisco. Salazar's presentation is one of about 5,300 accepted abstracts.

"The program helped me understand that I am capable of working and thinking with the greatest minds in the world," Salazar said in an e-mail. He has secured a similar internship for summer 2015 at [Northwestern University](#).

Houston to Solano: Solano Tempest April 1, 2015

SCC engineering student to participate in Aerospace Scholars Program at Johnson Space Center

Qhianna Sanchez

Staff Writer

qsanchez@solanotempest.net

The first in his family to attend college, Arthur Ingrassia, SCC student, is eager to work with NASA at the Lyndon B. Johnson Space Center in Houston, Texas, for three days in April.

"I don't know too much about what I'm supposed to do there but I know I'll be in a team of ten," Ingrassia said. However, Ingrassia said he knows it will be a competition between four teams, with 10 community college students in each, for a proposed Mars mission.

Ingrassia applied to NASA's National Community College Aerospace Program on the advice of Melanie Lutz, professor of physics and engineering at SCC. To be accepted, students need to be taking

at least nine college units and be enrolled in a STEM class (science, technology, engineering, or mathematics,) Ingrassia said.

It was intensive taking the online course while also taking 14 units at SCC and working 34 hours per week as a sales associate at a furniture store, Ingrassia said.

"Once I finished the program, I had so much time, I was like 'whoa' this is weird," Ingrassia said. "But I was well prepared for it because I took Dr. Lutz's three classes last semester in the fall."

The first step of the program was a five-week intensive online course on past and present Mars missions, future Mars missions, and the geology of Mars.

A 10-question quiz at the end of each module weeded out a lot of students, as participants were expected to have a score of at least

90 percent, Ingrassia said.

The final part of the online course was to create a document proposing a planned mission to Mars, including information such as the persons working on it, the goals of the mission, the type of robot and landing method, and so on. Ingrassia designed and named his mission MESDOM, which stood for Mars Exploration & Scientific Discovery of Olympus Mons. He planned to have the robot explore Mars' largest volcano, Olympus Mons, which he chose using Google Mars.

Scott Paniccia, an SCC student who participated in the aerospace program a few months earlier, said Ingrassia is "the hardest working person that I know."

Ingrassia plans to transfer to Sacramento State University in Fall of 2016 because he says their mechanical engineering program

is very hands-on. Although he could have gone there straight out of high school, the 2012 Vanden High graduate choose to attend SCC first. "I'm actually glad I got to come here. I'm glad I got to take Dr. Lutz's classes," Ingrassia said.

"He is just interested in everything," Lutz said. "Interested in the world around him, he's dynamic, he has so much energy. He's just always thinking of better ways to improve things. He's got all these skills of being a great engineer," Lutz said.

In his spare time, Ingrassia likes to implement new technology in his life. He recently installed a private cloud drive at his home to access his movie collection. Ingrassia can also be found playing Frisbee with other STEM majors outside the 300 building.



Arthur Ingrassia

"He's just always thinking of better ways to improve things. He's got all these skills of being a great engineer,"

—Melanie Lutz, SCC physics and engineering professor

Genius and former dropout lands physics internship at Davis

Qhianna Sanchez, Staff writer

qsanchez@solanotempest.net

May 6, 2015



Nicholas Sherman poses with his Excellence in Achievement award presented to him by SCC and his professor Melanie Lutz.

Imagine a secret message system that could detect the presence of eavesdropping and automatically abort the message. With quantum mechanics, this is actually possible.

Nick Sherman, age 23 and a current Solano Community College student with a 3.94 GPA, is heading this summer to U.C. Davis for a Research Experience for Undergraduates (REU) in the physics department. Sherman will be working closely with Rajiv Singh, physics professor, on entanglement in quantum spin systems.

Entanglement is connecting or entangling electrons in such a way that their measurements correspond to each other. "If I know something about one electron and it's entangled to another electron, I automatically know something about that other electron," Sherman said.

There are many uses for entanglement, including quantum cryptography and quantum computing.

Quantum cryptography is "being able to send a message without someone else being able to isolate it. Say the government wants to send a message from one place to another place but wants to ensure that someone isn't spying on the information, quantum entanglement can allow that to happen," Sherman said. If the message is spied on, it destroys the message through incorrect measuring of the electron, which changes the measured quality of the other electron in the system, Sherman said.

Another application is quantum computing. Our classical computers, desktops, laptops, etc., seem pretty fast, but "when I'm actually doing scientific calculations, limitations are being reached really fast," Sherman said. A simple calculation involving only 10 electrons takes "just over two hours" on a classical computer, Sherman said. Each electron added to the calculation multiplies the time to calculate by eight, "so if I wanted to add one more electron, it would be sixteen hours," Sherman said.

Quantum computers are showing some promise to be able to get around this problem via quantum entanglement,

Sherman said. It's possible to be able to have faster and stronger and better computers that can compute these properties that classical computers can't compute.

However, Sherman said of his Davis research experience, "I'm just working on studying how entangled certain systems are in the field of quantum information."

"What's awesome about it is how, experimentally, it's never been shown to be wrong, yet it gives such weird, strange results," Sherman said. "Quantum mechanics has never been shown to be wrong. Even things like Newton's laws of motions have limitations, where in quantum mechanics this hasn't happened yet, which says that this is a pretty good model," Sherman said.

Sherman chose to major in physics because he enjoys math, which is his other major. "I always loved math. I just never really thought that it had any application until I heard about physics and realized that's really just math. It's all math. Math is definitely meaningful and useful," Sherman said.

He became interested in working with Singh on entanglement because of the math. "The math involved in order to do it was something that I was really interested in. When you're calculating any quantity, whether it's entanglement or thermodynamic quantities or something, it's all kind of the same framework and that frame work is what I wanted to learn," Sherman said.

He acknowledges that there are many different areas of study in physics and it's still too early to tell where he will head with physics. "Every time I learn something new in physics, I really like that and want to keep doing that, but then I get to the next class or do the next thing and I'm like 'oh I want to do this'," Sherman said.

Sherman, who had dropped out of high school, was working a good paying job as a car salesman before deciding to attend college. "I knew after my first semester that I belonged in college and I just loved doing this," Sherman said.

Two of his favorite teachers at Solano are Melanie Lutz, physics instructor, and Darryl Allen, math instructor.

Lutz has "done more for me than anybody else has in my entire life. She's been a great mentor, taught me how to think like a scientist, pushed me to see how capable I really am," Sherman said.

Allen "knows a lot of the math behind the things that I study. It's nice to be able to have someone to talk to and bounce ideas around with. He's pushed me to learn things that are beyond the scope of the material that I learned just at Solano," Sherman said.

Lutz said of Sherman, "Nick is the type of student that comes along once in a teacher's career. He's a genius. He reminds me of a young Richard Feynman, who was the Nobel Prize winner from Cal Tech. I believe very much that that could be Nick in the future. He has that potential. He's got an incredible mind."

Although accepted to Berkeley, Sherman is considering transferring to Davis this fall 2015 to continue his relationship with the physics department. "I have such a good one-on-one mentorship with Singh," Sherman said.

For fun, Sherman does math, physics, and the occasional video game. "MIT offers video lectures for courses that they offer there. I watch those for fun," Sherman said.

"I'm really just in love with quantum mechanics," Sherman said. "I just really enjoy what I do and do lots of it."



Hard Work Pays Off for SCC Engineering Student



When Nicole Peacock went back to school after a six-year break, she says she “never imagined” she’d have an opportunity to one day be invited to attend the NASA Community College Aerospace Scholars (NCAS) Onsite Workshop at the Armstrong Flight Research Center in Palmdale, CA. But sure enough, despite being enrolled in 19 units and being the mother of two small children, that’s exactly what she will do in April.

Peacock, a 4.0 engineering student at Solano Community College, applied for the program in December, 2015. In January, she and 216 other community college students from around the country were accepted to a rigorous, five-week online course covering six modules with a quiz at the end of each. For her final project, she designed a Mars Rover in a 3D program. Those who scored 70 percent in the course were invited to apply for the onsite workshop. Peacock scored 100 percent. At the workshop, she’ll “have the opportunity to work in a team lead by a real NASA engineer” and compete in Rover competitions, as well as touring the NASA facility and other activities. In addition to plans for transferring to UC Davis in Fall 2016, Peacock hopes to engage in a future internship at NASA.

“With the help and support of my husband and Dr. Melanie Lutz,” Peacock says, “I’m achieving more than I have dreamed I could.”

Inside Solano



STAYING COMMITTED + CONNECTED

MAY 9, 2016

Education Collaboration

A unique collaboration of educators, students, theatrical set designers and lighting specialists, and paint producers was held at Solano Community College on April 28, giving all an opportunity to expand their knowledge of set painting. Rosco Scenic Paints, Sacramento Theatrical Lighting, and the SCC Theatre Department came together with local theater teachers and students to conduct a workshop in "Creative Painting Techniques for Architecture".

SCC Theatre instructor Darsen Long helped organize the event led by Rosco International Paint Product Manager Jenny Knott. Participants used four different texturing products that made cardboard look like brick, stone, and wood. Long said the two-day event is popular with theatre programs around the area and that it was also held last year at Solano Community College.



Excellence in Engineering

Physics and Engineering instructor Melanie Lutz has proudly announced the successes of two of her students—one former and the other current. Dan Wiese transferred from Solano Community College to UC Davis in the Spring of 2009. He graduated from UC Davis with a double major in Mechanical/Aerospace Engineering in the Spring of 2011, finishing at the top of his class of 1,054. On June 3, Lutz will travel to Boston to attend his graduation from M.I.T., as he receives in Ph.D. in Mechanical Engineering.

Lutz says that Wiese came to Solano after working for two years after high school, in an auto body repair shop. "His potential for greatness was immediately obvious to me" she says. Clearly, others agree. Wiese was accepted as a grad student at M.I.T., with a full-ride scholarship, including tuition waiver and \$25,000 stipend.

Lutz' current student, Nicole Peacock, will be transferring to UC Davis, with a major in Mechanical Engineering in the Fall. Just last week, Peacock was informed that she was chosen, out of 1,800 applicants, to receive the Society of Women Engineers, Mary V. Munger Memorial Scholarship for 2016-17. The scholarship is in the amount of \$2,750. As Lutz says, "This is an amazing honor for a future woman in Engineering."





SOLANO
COMMUNITY COLLEGE

Inside Solano

STAYING COMMITTED AND CONNECTED

AUGUST 15, 2016



Behind the camera

When you pick up a camera to take a digital photo of that great sunset, you might want to thank SCC student Eddie Barton and others like him. In addition to being a student at Solano Community College, Barton also works remotely for Bolex, a Swiss camera company. The average person using a camera probably has no idea what all goes into making those beautiful photographs, but Barton, an engineering student at SCC, has just written a technical report describing his contribution to the image processing of the camera.

“At the heart of every digital camera is an image sensor covered with dyes that filter light to red, green, and blue within a certain range of wavelengths,” says Barton. “The problem is that these image sensors and color dyes don’t ‘see’ color like humans do.” The color images we see when we use our cameras is not what the sensors actually see. Barton says that his job was to create a sequence of transforms that converts what our specific image sensor sees into an image that resembles cinema film negatives.

If this is still confusing, you’re not alone, but Barton’s accomplishments are to be commended. His SCC professor, Dr. Melanie Lutz, says Barton will be at Solano for another year before he transfers as an EECS student to the University of California.

Greetings from Dr. Celia Esposito-Noy

Welcome to the fall, 2016 semester. To those of you who have been away, I hope you had a relaxing and rejuvenating summer break. To those who have been on campus all summer, I hope you had a chance for at least a small break, and that everyone is ready for the new term.

Lots of things are happening on our campuses this fall, including the Auto Technology groundbreaking ceremony on Wednesday evening. We also have our Annual Benefit Gala, and our ongoing Self-Study for Reaffirmation of Accreditation.

Most important of all, of course, is our students. Please join me in welcoming them to campus and to our classes and services. As always, I encourage us all to work together to provide them with a stimulating and rewarding college experience. Thanks to the SCC community for all you do for our students and our college.



Vallejo Automotive Technology Building Groundbreaking

Staff and faculty are invited to the Groundbreaking Ceremony for SCC’s new Automotive Technology facility in Vallejo on Wednesday, Aug. 17 at 5 p.m. The 31,000 square foot building will feature automotive repair and alignment instructional bays, automotive testing areas, student lounge, two “smart” classrooms, a tutoring center/conference room, and offices. It will be a state-of-the-art facility, which will become the standard bearer for all community colleges. The site will also provide opportunities for current and future industry partnerships.

The Groundbreaking Ceremony will kick off twelve months of construction. The building is located at 1687 Ascot Parkway, Vallejo.



Inside Solano

STAYING COMMITTED AND CONNECTED

SEPTEMBER 6, 2016



SCC student shines at LSU

SCC electrical engineering student Mark Delarosa was invited to be an intern at Louisiana State University this past summer. SCC Board of Trustees student trustee Larry Bartlow, who knows Delarosa, said, "I have personally seen Mark studying well into the late evenings. Mark studies diligently to achieve outstanding grades in our science department in the disciplines of calculus, materials science, and advanced and applied physics. On many occasions I would see him studying until 9 p.m. on Friday nights, until he was told by the custodian that he would have to leave, and lock up the building."

Delarosa's project on interface Cogs at LSU received great reviews from his mentor, and his diligence was ever-present. "I adopted a first-one-in-last-one-out mentality," he says. "At some points I would be in the lab from 8 a.m. until midnight." And, his work continues to be rewarded. "I was one of four students selected from the program to receive an award. They thought mine was the best. As a result, they nominated me to an REU symposium in Virginia to represent their program. I am truly humbled and honored to potentially attend the symposium and not only represent LSU, but Solano as well. My stay in Baton Rouge helped bolster belief and confidence in myself for years to come."

Be sure to attend the Groundbreaking Ceremony for the new Solano Community College Horticulture Center on Wednesday, Sept. 7 at 5 p.m. on campus!

The upgrades to the existing center will include new power, data, water and sewer lines for future buildings, as well as paved paths to define areas for growing vegetables and produce that can be offered at a new Farmer's Market pavilion.

The infrastructure being installed in this project will support a future greenhouse, restroom building, and a much-needed storage building, which are slated for Phase 2 of construction, likely to begin next year.

The District's Board members and other local dignitaries will be on hand at the Groundbreaking Ceremony to kick-off this long-awaited project.

Caught Doing Something Good ...

Debbie Graham, Student Services generalist, helping a mother of a student complete an application at 6:30 p.m. Debbie gets off work at 6 p.m. and never once made the mom feel like she was rushed. *Great customer service at the Vacaville Center!*

Sandra Therrien (from student Sharayah King): I needed help with my essay papers and was running around campus asking for help to print them out. Every printer seemed to be unavailable and then I wandered into a building and found Sandra Therrien. She helped me and another classmate of mine who had the same trouble. I wanted to do something in return for her kindness and so I am writing about her *outstanding character and generosity*.



STAYING COMMITTED AND CONNECTED

MAY 1, 2017

Physics and Engineering Students Win Prestigious NSF Internships

Dr. Melanie Lutz of the Physics and Engineering Departments is happy to report on the success that three SCC students have recently had in obtaining summer research internships. Michael Lostica, Hunter Martin, and Erin Nebel have each been awarded a National Science Foundation Research Experiences for Undergraduates (REU) internship. These highly competitive internships, which pay a stipend of \$5000, will allow the students to conduct a ten-week scientific research project, working within research groups at leading research universities.

Michael Lostica will work with Prof. Bing Xu in the Materials Research Science and Engineering Center at Brandeis University. Michael's research will be on the heterotypic self-assembly of peptides. These materials have shown promise to have potential use in anticancer therapy and drug delivery. Michael says that he "is looking forward to be immersed full-time in a research setting, and to connect with my mentor, the students in my cohort, and other Brandeis students. Research aside, I look forward to biking along the Charles River to Cambridge, visiting Boston's Museum of Fine Art, and eating oblivion-seeking heaps of falafel." Michael will be transferring to UC Berkeley in the Fall of 2017, with a major in Chemistry.



Hunter Martin will work with Prof. David Wittman in the observational cosmology group at UC Davis. His research will utilize the Fisher Information Matrix, a mathematical tool that allows one to predict the value of an experiment, and determine how much one could potentially learn from it, before it is conducted. According to Hunter, "I can utilize the Fisher Information Matrix in one of two projects: analyzing the value of measuring the velocity of a cluster of galaxies with respect to the sky, or analyzing the value of a new method of measuring the bending of light due to gravity as it travels through space". Hunter will be transferring to UC Berkeley in the Fall of 2017, with a Math/Physics double major.



Erin Nebel will be working with Prof. Charles Werth at the University of Texas in Austin, on the exciting new technology of geological carbon sequestration. Carbon dioxide is one of the primary greenhouse gases that contribute to global warming, and being able to store it safely underground would greatly mitigate this problem. Erin explains that "the objectives of the project include determining the effects of carbon dioxide injection on the rock formation's permeability and other physical properties. The project will involve laboratory experimentation, with an interdisciplinary approach that makes use of concepts and techniques from geochemistry, materials science, and civil engineering." Erin will be transferring to the Colorado School of Mines in the Fall of 2017, with a major in Civil and Environmental Engineering.





STAYING COMMITTED AND CONNECTED

OCTOBER 23, 2017

Solano Student Visits Johnson Space Center in Houston



Taylor Pierce, an engineering student at Solano Community College, just returned from a four-day trip in September, to the Johnson Space Center, in Houston, Texas, (yes, as in, "Houston, we have a problem!"), as part of the NASA Community College Aerospace Scholars (NCAS) program.

The program involved a five-week course covering topics ranging from NASA's process of collecting information about the Earth, to how NASA is planning its manned missions to Mars.

While there, Taylor was placed in a team that formed a makeshift company, whose goal was to create a simple Mars rover for

accomplishing various goals on a mock-up area. This was set up as a competition, with his team competing against three others.

While the rover project was a significant portion of the experience, the entire group was also given several tours of the facility, and they met with many members of the Johnson Space Center staff.

One of the most notable members that they met with was Jerry Woodfill (shown in the photo above, with Taylor), a 50-year NASA veteran who won the Presidential Medal of Freedom for his role in the Apollo 13 rescue. According to Taylor, "Woodfill gave a riveting speech covering the many failures he experienced in his educational career, and how he rebounded after every one. Jerry was one of the many staff members at the Johnson Space Center who clearly loved their job, and did everything in their power to inspire us to pursue our dreams."

Over the four days that Taylor spent in Houston, he met with several interns, ranging from aspiring engineering students to self-taught web designers, who all spoke about immediately contributing to major NASA projects after entering their internship. "This was an amazing experience that was arranged for me with the help of Professor Melanie Lutz, and has provided me with a great path to explore the STEM field," said Taylor, who plans to apply for a summer-long internship at one of the NASA sites next summer, and will transfer after spring 2018 as an electrical engineering major.



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To submit information to Inside Solano, please email kristie.west@solano.edu



STAYING COMMITTED AND CONNECTED

DECEMBER 4, 2017

Engineering Students Visit Fairfield-Suisun Wastewater Treatment Plant



Left to right: SCC student Federico Lucero, SCC student Andrew Stassen, Sr. Environmental Engineer Jordan Damerel, SCC student Corey Lum, SCC student Ryan Seidlitz, and SCC Engineering Instructor Scott Berta.

On Monday, November 27, students from Engineering 001 visited the Fairfield-Suisun Wastewater Treatment Plant, with Engineering Instructor Scott Berta. In the photo below, they pose with Sr. Environmental Engineer Jordan Damerel, in the control room of the plant. Mr. Damerel led the class on a tour of the plant, covering the various steps in the wastewater treatment process. The facility treats about 10-15 million gallons per day (MGD) of wastewater. The plant is committed to energy efficiency and self-sustainability. Over the summer, the plant installed fine bubble diffusers in two aeration basins. These new diffusers provide air more efficiently to the aerobic digestion process, and reduce the energy use associated with air compression and distribution. The plant's renewable generation portfolio includes 1.4 megawatts (MW) of cogeneration from the anaerobic digesters, 1.0 MW from photovoltaic (PV) solar panels, and 200 kilowatts (kW) of wind turbine generation.



STAYING COMMITTED AND CONNECTED

APRIL 30, 2018

Successful Physics & Engineering Students

Physics and Engineering Instructor Melanie Lutz is happy to share some good news about three of her former students, who transferred from SCC in the Spring of 2015:



Rustin Domingos will be graduating from UC Berkeley as a Physics/Math double major in the Spring of 2018. He has been accepted into the PhD Program in Physics at MIT. While at Solano, Rustin received the award for Best Physics Student in the Spring of 2015.



Anthony Salazar graduated from UC Berkeley with a major in Materials Science and Engineering in the Spring of 2017. He has recently been accepted into a PhD program in Materials Science and Engineering at the UC Berkeley. While at Solano, Anthony received the Materials Science Scholarship in 2015. In addition, Anthony was the Commencement Speaker at the 2015 SCC graduation.



Nick Sherman will be graduating Summa Cum Laude from UC Davis as a Physics/Math double major in the Spring of 2018. At Davis, Nick published three papers as first author in peer-reviewed journals. Nick has now been accepted into the PhD program in Physics at UC Berkeley. While at Solano, Nick received the Best Overall Student Award in the School of Math and Science, in the Spring of 2015.



STAYING COMMITTED AND CONNECTED

MAY 21, 2018

SCC Alumna to Get Degree in Mechanical Engineering



Nicole Peacock, who transferred from Solano Community College in the Spring of 2016, will graduate in June from UC Davis, with a bachelor's degree in Mechanical Engineering.

Nicole has been awarded the **Outstanding Senior Award** and the **Department Citation Award** from the UC Davis Department of Mechanical Engineering. Her senior design project involved the design of large sailboats that use wind energy to extract hydrogen from the ocean.

The sailboats each have a hydrokinetic turbine attached below their hull, which generates electricity and powers an electrolyzer. The electrolyzer takes the ocean water and separates it into oxygen and hydrogen, thus providing a method of gathering hydrogen that does not require any fossil fuel. Nicole's role in the project was to design, manufacture, and install the hydrofoil system for the sailboats. The hydrofoil helps to lift the hull of the boat out of the water when the boat sails, which reduces drag and allows for the ships to travel at faster speeds.

Nicole's design can be seen at the UC Davis Senior Design Showcase, on June 7, from 1:30-4:30 p.m. in the ARC Pavilion on the UC Davis campus. After graduation, Nicole has been offered a job as a mechanical engineer at Chevron, at a starting salary of \$110,000 per year.



STAYING COMMITTED AND CONNECTED
2018

November 5,

SCC Engineering Students visit the John C. Stennis Space Center as Part of the NASA Community College Aerospace Scholars Program



NASA Community College Aerospace Scholars at the Stennis Space Center in Mississippi in October 2018. Jered Bell is marked by A; Heath Muskat is marked by B.

Two Solano Community College engineering students, Heath Muskat and Jered Bell, attended the NASA Community College Aerospace Scholars program in October at the John C. Stennis Space Center in Mississippi – NASA's largest rocket testing facility. To take part in the on-site visit, they first had to pass a twenty-hour online course involving lectures and quizzes on the history of NASA and space exploration, culminating with a final project. Choosing from the three options for the final project, both Heath and Jered opted to design and model a custom rover for Mars, from scratch with real-world hardware, and write a ten-page report on its functions and capabilities. Based on their success in this online portion of the program, they were invited to visit the Stennis Space Center.

The five-day visit was comprised of tours, networking, and a two-day Lego robotics competition, in which the forty participants were split into four teams. Each team had to keep track of the expenses for their "rover", and competed at the end of each day by attempting to retrieve target objects from an uneven terrain. The robots had to be programmed to run autonomously, with each member on the team being responsible for a different aspect of the robot, such as design, manufacturing, testing, and programming. At the end of the week, each team gave a ten-minute presentation detailing their experiences.

One of the days of the visit was spent touring two facilities at Stennis – the rocket engine construction plant at Aerojet Rocketdyne, and the engine test stand A-2 (pictured in the photo). At Aerojet Rocketdyne, they were shown several flight-ready engines, including the repurposed space shuttle main engine, also known as the RS-25. This is the engine that will, along with three other RS-25s, propel NASA's new Space Launch System rocket in 2020 to the International Space Station, the Moon, and beyond. The tour of engine test stand A-2 provided incredible sights, a towering eleven-story tall testing stand with the capacity to pump 300,000 gallons of water per minute during testing to cool the engine exhaust.

Heath is a Mechanical Engineering major, and Jered is a Mechanical/Aerospace Engineering major; both are hoping to transfer to UC Davis in Fall 2019. Both of them found the entire program to be a fantastic experience, and thank Dr. Melanie Lutz for helping them to apply for it and get accepted.



STAYING COMMITTED AND CONNECTED

May 6, 2019

Former SCC Student Accepted Into PhD Program in Computer Science



Physics and Engineering Instructor Melanie Lutz is very happy to announce that Eddie Barton, a graduate of our pre-engineering program, has been accepted into the Ph.D. program in Computer Science at the University of Wisconsin in Madison.

Eddie attended SCC from 2014 through 2016, and then entered the Computer Science program at UC Merced. He graduated with a B.S. degree in Computer Science Engineering in December 2018, winning the Outstanding Student in CSE Award.

Eddie is an expert in the field of image and video processing and computer vision. While studying at SCC, he worked as a Color Engineer at Digital Bolex, and as a Software Engineering Intern at Copart. During his undergraduate studies at UC Merced, he worked as a software engineering intern at Intel, where he designed and implemented full stack system development life cycle management software for 5G mobile trial platforms.

Eddie will be starting his PhD at Wisconsin in September, working with Prof. Mohit Gupta in the Computer Vision Lab.



STAYING COMMITTED AND CONNECTED

May 13, 2019

SCC Student Returns from NASA Internship

SCC student Jered Bell has just returned from a four-month long internship at NASA's Goddard Space Flight Center in Greenbelt, MD, where he was part of the group working on Next Generation X-Ray Optics (NGXO).

While at NASA, Jered worked on three main projects. In the first project, Jered designed a machine that can take tiny Silicon rods (~0.1" diameter) and sand a 4-degree angle onto one end, using 4000 grit sandpaper.

In the second project, Jered created a holding system for the mirrors of NASA's X-ray telescopes.

In the third project, Jered worked on automating the process of fabricating the pieces of silicon that are used in the mirrors.

During this internship, Jered was exposed to a broad range of experiences including mechanical design, manufacturing, materials science, programming, controls/sensors, and more, and contributed to the industrialized production of the world's best polished surfaces, which are required for future X-Ray telescopes. His work will have a direct impact on the future of X-Ray astronomy.

Jered was paid \$12,000 for his four months at NASA, and made such a good impression on them during his internship, that he has been invited to return to NASA for Summer 2019.

Jered will be transferring to either UC San Diego or Cal Poly San Luis Obispo, as a junior in Aerospace Engineering, in Fall 2019.





STAYING COMMITTED AND CONNECTED

October 21, 2019

SCC Engineering Student Attends NASA Community College Aerospace Scholars Program



Omar Shishani with his Mars rover prototype.

Engineering instructor Melanie Lutz is happy to report that Omar Shishani, an engineering student at Solano Community College, recently attended the NASA Community College Aerospace Scholars Program (NCAS) at the Marshall Space Flight Center, in Huntsville, Alabama during the week of September 23-27, 2019. Omar was selected from applicants from across the U.S. to be part of the NCAS onsite experience, in which students interact with NASA engineers and officials as they learn about careers in science and engineering. For their final project, students formed teams and established fictional companies interested in Mars exploration. Each team was responsible for developing and testing a prototype rover, building a company infrastructure, managing a budget, and developing communications and outreach.

Omar reports that “I was not expecting to have such a rich experience at my trip to the NASA Marshall Space Flight Center. The part of the experience that stood out the most to me was the dynamics of our teamwork. It was a great experience working together with nine other people who I had just met. It was very difficult and extremely frustrating at times for us to work together - and to work efficiently - especially in the beginning. My experience at NCAS showed me how important it is to have leadership that was able to coordinate efforts in a practical way. Without proper management, a team will end up wasting a lot of time debating unimportant decisions, instead of focusing on their individual duties, and specializing on their individual tasks in the most productive way.”

“The speakers at NCAS were very inspiring, and there were many more speakers than I had expected. Every day we got to hear stories from NASA employees. They told us about their career paths and goals, and they opened many new ideas about science and technology to me. It was satisfying to have completed our goal as a team at the end of each NCAS rover competition. There were a few times, especially in the middle of the second competition, where I was sure that we had no chance of completing our rover in time. In spite of my worries, we were able to pull through, and achieve awesome results with our models. I will remember my trip to Alabama forever. It was an experience that showed me great truths about what can be accomplished and learned when working in a team to achieve a great goal.”

Omar hopes to transfer to UC Davis with a major in Civil Engineering, in Fall 2021.

SCC Engineering Student wins First Prize in NASA Rover Design Competition

In Fall 2019, SCC Engineering student Duncan Koelzer was accepted to take part in the NASA Community College Aerospace Scholars (NCAS) program. The first step in this program involved the completion of an online course, in which he investigated NASA's past, present, and future projects concerning space exploration and experimentation involving space. This information ranged from NASA's new SLS rocket, to how NASA was using the International Space Station to study climate change. For his final project, Duncan researched two habitation systems, and made suggestions to improve the technology that would be necessary for future space exploration.

After successfully completing the online course, Duncan was invited to NASA's Ames Research Center at Moffett Field, CA, for an onsite competition in February 2020. There, he was placed into one of the small teams that were tasked with designing, building, programming, and testing a Lego rover. For the competition, the rover needed to be fully autonomous, and to be able to identify and collect rocks, identify "minerals," and to make turns on the constructed course. Duncan's team won first place in the rover competition, due to their rover's exceptional performance. As part of the NCAS program, Duncan toured some of the labs at Ames, such as their fluid dynamics lab and the Vertical Motion Simulator. After networking with some of the amazing scientists and engineers that work at Ames, Duncan feels that this experience could help jump-start his career in the very competitive field of space science.

Duncan plans to transfer to Cal Poly San Luis Obispo, as an Aerospace Engineering major, in Fall 2020.



Duncan Koelzer holding his team's prize-winning rover vehicle, at NASA Ames Research Center.

October 17, 2022

SCC Student Helps Fight Effects of Climate Change



When Engineering Instructor Melanie Lutz received an e-mail from the Fairfield-Suisun Sewer District informing her about an internship opportunity, she immediately knew that it would be a perfect fit for SCC engineering major, Andrea Solis Olguin.

Andrea is an international student who is deeply committed to environmental science, the human landscape, and sustainability. She is also the President of the SCC Beta Mu Gamma chapter, and is co-founder of Solano Community College's STEM Club. She engages in community work by volunteering at the local wildlife center, and will now be working as an Outreach Intern with the Fairfield-Suisun Sewer District.

Her tasks as an intern with FSSD will revolve around engineering and nature-based solutions to resiliency projects taking place in Suisun City. She will be working with engineering firms and government entities to communicate resiliency efforts to community members in vulnerable areas that are susceptible to the effects of climate change. Andrea hopes to transfer to a four-year university in the fall, and eventually earn her Bachelor's degree in Civil and Environmental Engineering.

The Fairfield-Suisun Sewer District has evolved from being a technical engineering entity into a valuable resource manager, a partner in local economic development, and an active member of the watershed community. The District has taken numerous actions to shift traditional thinking about the way wastewater utilities are run. They strive to obtain as much energy as possible from waste products, and to obtain renewable energy through solar power, wind turbines, and cogeneration engines.

SCC Engineering Program - Student Tracking Data, 2015-2022		
2015		
Transfers	Emmanuel Ontiveros	San Francisco State, Mathematics
	Clifford Freeman	Sacramento State, Computer Engineering
	Ivor Maasin	San Jose State, Civil Engineering
	Eduardo Yanez	Sacramento State, Mechanical Engineering
	Spencer Wert	Sacramento State, Mechanical Engineering
	Anthony Salazar	UC Berkeley, Materials Science & Engineering
	Nick Sherman	UC Davis, Physics/Mathematics
	Doug Sherman	UC Davis, Computer Science/Mathematics
	Rustin Domingos	UC Berkeley, Physics/Mathematics`
	Scott Paniccia	UC Davis, Mechanical Engineering
	Josh Dory	UC Davis, Mechanical Engineering
	Cesiah Diaz	Sacramento State, Civil Engineering
	Mel Sancada	Sacramento State, Civil Engineering
	Felix Fagan	UC San Diego, Electrical Engineering
	Matthew Hsiung	San Jose State, Mechanical Engineering
	Jared Jolley	Sacramento State, Mechanical Engineering
	Nathan Jenest	UC Berkeley, Mechanical Engineering
	Rafael Martinez	Sacramento State, Computer Science& Engineering
	Edwin Gonzalez	San Diego State, Mechanical Engineering
	Alden McLean	Brigham Young University, Mechanical Engineering
	Kylie Ahlstrand	Sacramento State, Civil Engineering
	Robynne Paldi	UC Merced, Materials Science
	Andrew Cloud	San Jose State, Biomedical Engineering
	Andy Qutami	Sacramento State, Civil Engineering
BS Degrees	Francis Ambion	B.S., Electrical Engineering, UC Davis
	Andrew Esperto	B.S., Math/ Computer Science, UC Davis
	Javier Flores	B.S., Electrical Eng & Computer Science, UC Davis
	John Meeker	B.S., Electrical Engineering, UC Davis
	Jobylyn Pineda	B.S., Chemical Engineering, San Jose State
	Julio Sanchez	B.S., Electrical Engineering, UC Santa Cruz
	Khan Tram	B.S., Civil Engineering, UC Davis
	Jerica Duey	B.S., Materials Science & Engineering, UC Berkeley
	Timothy Trujillo	B.S., Mechanical Engineering, UC Riverside
	Sejie Lin	B.S., Electrical Eng & Computer Engineering, UC Davis
	Antonio Cruz	B.S., Materials Science & Engineering, UC Davis
	Sterling DeMille	B.S., Computer Engineering, UC Berkeley
	Silvia Murguia	B.S., Mechanical Engineering, U. Texas at San Antonio

Beyond	Francis Ambion	Accepted into M.S. Program, UC Davis, EE
	John Meeker	Hired as Applications Engineer, National Instruments
	Jerica Duey	Accepted into M.S. program, UC Berkeley, MSE
	Julio Sanchez	Hired at VERSA Engineering and Technology
	Sterling DeMille	Founded a company, Sterling Computer Systems
	Jobylyn Pineda	Hired at RheoSense, Inc.
	Jonathan Roldan	Hired at ACK Engineering
	Caleb Morrison	Hired at Hill Engineering, LLC
2016		
Transfers	Matt Salts	Sacramento State, Civil Engineering
	Michelle Dungan	Sacramento State, Civil Engineering
	Christine Bochynski	Humboldt State, Biochemistry
	Sarah Roudin	Sacramento State, Mechanical Engineering
	Brandon Kitelinger	Sacramento State, Mechanical Engineering
	Marlon Cabugwas	Sacramento State, Electrical Engineering
	Daniel Rudy	Sacramento State, Computer Science
	Maddy Cunningham	UC Davis, Chemical Engineering
	Basil Michael	UC Davis, Biochemistry
	William Nefzger	UC Davis, Chemistry
	Nick Orfitelli	Sacramento State, Computer Engineering
	Omar Hashem	UC Davis, Mechanical Engineering
	Alex Hubbel	Sacramento State, Civil Engineering
	Maxwell Dories	UCLA, Physics
	Nicole Peacock	UC Davis, Mechanical Engineering
	Ryan Carter	UC Irvine, Mechanical Engineering
	Kevin Perez	UC Berkeley, Nuclear & Chemical Engineering
	Jordan Rayburn	Cal Poly SLO, Electrical Engineering
	Richard Coucoules	UC Irvine, Chemical Engineering
	Travis Kendall	UC Davis, Computer Science
	Tan Ho	San Jose State, Mechanical Engineering
	Ivan Soria	Sacramento State, Computer Engineering
	Angelica Smith-Evans	Sacramento State, Computer Engineering
	Zach Shulman	Sacramento State, Mechanical Engineering
	Arthur Ingrassia	Sacramento State, Mechanical Engineering
BS Degrees	Parsa Mahmoudieh	B.S., Mechanical & Electrical Eng., UC Berkeley
	Alec Murchie	B.S., Ceramic Engineering, MUST (Missouri)
	Edgar Guzman	B.S., Electrical Engineering, UC Riverside
	Justin Duhow	B.S., Mechanical Engineering, UC Davis

	Galen Anderson	B.S., Biological Systems Engineering, UC Davis
	Jimmyhee Quach	B.S., Civil Engineering, Cal Poly SLO
	Thomas Bock	B.S., Computer Engineering, Sacramento State
	Andre Miranda	B.S., Electrical Engineering, UC Davis
	Tyler Chilson	B.S., Mechanical Engineering, UC Davis
	Matthew Escalante	B.S., Mechanical Engineering, UC Davis
	Nicholas K. Sherman	B.S., Mechanical Engineering, UC Davis
	Jesus Beltran	B.S., Electrical Engineering, UC Davis
	Christopher Ellis	B.S., Computer Engineering, UC Davis
	Arthur Castillo	B.S., Civil Engineering, Sacramento State
	Nestor Ibarra	B.S., Mechanical Engineering, Sacramento State
	Gitano Raumer	B.S., Civil Engineering, Sacramento State
	Calen McLean	B.S., Mechanical Engineering, Brigham Young Univ.
	Christian Ogden	B.S., Psychology, UC Santa Cruz
	Robynne Paldi	B.S., Materials Science, UC Merced
	Jeston Mitchell	B.S., Electrical Engineering, Cal Poly SLO
Beyond	Parsa Mahmoudieh	Accepted into M.S. Program, UC Berkeley, EECS
	Antonio Cruz	Accepted into Ph.D. Program, UC Irvine, Mater Sci
	Daniel Wiese	Ph.D., Mechanical Engineering, MIT
	Daniel Wiese	Co-founder of wearable technology start-up, Humon
	James Morad	Ph.D., Physics, UC Davis
	Jimmyhee Quach	Hired, Truebeck Construction, Oakland, CA
	Jeston Mitchell	Hired, Texas Instruments
	Nestor Ibarra	Accepted into M.S. Program, Sac State, Mech Eng
	Arturo Castillo	Hired, Pankow Builders, Oakland, CA
	Jeremy Conway-	Obtained Professional Engineering License
	Aaron Werneke	M.S., EE, Sacramento State; hired at Power Pros
	Sejie Lin	Hired, EAvision
	Gitano Raumer	Hired, Granite Construction
	Francis Ambion-	M.S., Electrical and Computer Engineering, UC Davis
	Alec Murchie-	Accepted into Ph.D. program, MUST, Ceramic Eng
	Justin Duhow	Hired, Hill Engineering, LLC
	Robynne Paldi	Accepted into Ph.D. program, Purdue, Materials Sci
	Mark Rogers	Hired, Symbio Robotics
2017		
Transfers	Joseph Salazar	Sacramento State, Civil Engineering
	Ryan Smith	UC Davis, Mechanical Engineering
	Eddie Barton	UC Merced, Computer Science and Engineering
	Angelia Fanning	Sacramento State, Mechanical Engineering
	Erin Nebel	University of Colorado Boulder, Civil Engineering

	Emily Wong	UC Davis, Biomedical Engineering
	Tracy Camacho	UC Davis, Mathematics
	Rhea Crawford	Cal State East Bay, Chemistry
	Darrin Edwards	San Francisco State, Biochemistry
	Salvatore Nicosia	San Jose State, Computer Engineering
	Tyler Olson	Sacramento State, Mechanical Engineering
	Geoffrey Freire	Sacramento State, Computer Engineering
	Raymond Domingos	San Jose State, Electrical Engineering
	Tim LaPoint	Sacramento State, Mechanical Engineering
	Michael Lostica	UC Berkeley, Chemistry
	Hunter Martin	UC Berkeley, Mathematics / Physics
	Meina Cipollone	UC Berkeley, Bioengineering
	Mark Delarosa	UC Irvine, Electrical Engineering
	Scott O'Hair	Sacramento State, Computer Science
	Kevin Truong	UC Irvine, Computer Science
	Nick Newman	UC Santa Cruz, Mathematics / Physics
BS Degrees	Ian Helman-Wylie	B.S., Electrical Engineering, Cal Poly SLO
	Josh Dory	B.S., Mechanical Engineering, UC Davis
	Robynne Paldi	B.S., Materials Science, UC Merced
	Sebastian Bloem	B.S., Computer Engineering, UC Davis
	Anthony Salazar	B.S., Materials Science and Engineering, UC Berkeley
	Eduardo Yanez	B.S., Mechanical Engineering, Sacramento State
	Spencer Wert	B.S., Mechanical Engineering, Sacramento State
	Doug Sherman	B.S., Computer Science / Mathematics, UC Davis
	Suwadi Yuniar	B.S., Electrical Engineering, SF State
	Ivor Maasin	B.S., Civil Engineering, San Jose State
	Natalie Wagner	B.S., Electrical Engineering, UC Davis
	Shristi Thakur	B.S., Civil Engineering, Sacramento State
	Andy Qutami	B.S., Civil Engineering, Sacramento State
Beyond	Tyler Chilson	Accepted into M.S. Program, UC Davis, Mech Eng
	Parsa Mahmoudieh	M.S., EECS, UC Berkeley
	Sebastian Bloem	Hired, Northrop-Grumman
	Jerica Duey	M.S., Materials Science, UC Berkeley
	Jerica Duey	Hired, Google X
	Scott Berta	Obtains PE License
	Zack Dobson	Obtains PE License
	Christopher Ellis	Hired, IQM
	Thomas Bock	Hired, Facebook
	Natalie Wagner	Accepted into M.S. Program, UC Davis, Electrical Eng
	Spencer Wert	Hired, Jensen Hughes

	Mark Rogers	M.S., Mathematics, S.F. State
	Eduardo Yanez	Hired, Frank M. Booth, Inc.
	Nick K. Sherman	Hired, Energy Experts International
	Shristi Thakur	Hired, Mark Thomas
	James Morad	Ph.D., Physics, UC Davis
	James Morad	Hired, Cosylab
	Calen McLean-	M.S., Mechanical Engineering, University of Michigan
	Josh Dory	Hired, Chevron
	Ian Hellman-Wylie	Hired, Eichleay, Inc.
	Andy Qutami	Hired, Caltrans
	Caroline Parworth	Ph.D., Agricultural & Environ'l Chemistry, UC Davis
2018		
Transfers	Alexandria Canales	Sacramento State, Mechanical Engineering
	Brenda Lieu	UC Irvine, Mechanical Engineering
	Dustin Snedeker	Sacramento State, Computer Engineering
	Andrew Escalante	Sacramento State, Mechanical Engineering
	Aria Mahmoudieh	UC San Diego, Chemical Engineering
	Kailan Oliva	San Francisco State, Electrical Engineering
	Sean Casey	Sacramento State, Mechanical Engineering
	Gabriel Castro	Sacramento State, Computer Engineering
	Arturo Gonzalez	UC Davis, Physics
	Alex Padilla	Cal Poly SLO, Biomedical Engineering
	Taylor Pierce	UC Davis, Electrical Engineering
	Ben Plumb	UC Davis, Electrical Engineering
	Curtis Pufford	Sacramento State, Mechanical Engineering
	Morgan Renner	UC Davis, Civil Engineering
	Ryan Seidlitz	Sacramento State, Mechanical Engineering
	Alex Wallace	Sacramento State, Civil Engineering
	Denise Amado	Sacramento State, Civil Engineering
	Lanea Azevedo	UC San Diego, Nano Engineering
	Michael Gomez	Sacramento State, Computer Engineering
	Robert Ireland	UC Davis, Computer Engineering
	Rajan Mundi	Sacramento State, Electrical Engineering
	Payton Coe	UC Davis, Geology
	Chelsea Breaw	UC Davis, Civil Engineering
BS Degrees	Kylie Ahlstrand	B.S., Civil Engineering, Sacramento State
	Rafael Martinez	B.S., Electrical Engineering, Sacramento State
	Marlon Cabugwas	B.S., Electrical Engineering, Sacramento State
	Nick Sherman	B.S., Math/Physics, UC Davis
	Rustin Domingos	B.S., Math/Physics, UC Berkeley

	Nicole Peacock	B.S., Mechanical Engineering, UC Davis
	Scott Paniccia	B.S., Mechanical Engineering, UC Davis
	Arthur Ingrassia	B.S., Mechanical Engineering, Sacramento State
	Eddie Barton	B.S., Computer Science and Engineering, UC Merced
	Emmanuel Ontiveros	B.S., Mathematics, San Francisco State
	Alex Hubbell	B.S., Civil Engineering, Sacramento State
	Cesiah Diaz	B.S., Civil Engineering, Sacramento State
	Brandon Kitelinger	B.S., Mechanical Engineering, Sacramento State
	William Nefzger	B.S., Chemistry, UC Davis
	Omar Hashem	B.S., Mechanical Engineering, UC Davis
	Nathan Jenest	B.S., Mechanical Engineering, UC Berkeley
	Michelle Dungan	B.S., Civil Engineering, Sacramento State
	Tan Ho	B.S., Mechanical Engineering, San Jose State
	Travis Kendall	B.S., Computer Science, UC Davis
	Ryan Carter	B.S., Mechanical Engineering, UC Irvine
	Sarah Roudon	B.S., Mechanical Engineering, Sacramento State
	Nick Orfitelli	B.S., Computer Engineering, Sacramento State
	Christine Bochynski	B.S., Molecular Biology, Humboldt State
	Basil Michael	B.S., Biochemistry, UC Davis
	Dan Rudy	B.S., Computer Science, Sacramento State
Beyond	Nicole Peacock	Hired, Chevron
	Natalie Wagner	M.S., Electrical Engineering, UC Davis
	Arthur Ingrassia	Hired, ACCO Engineered Systems
	Nick Sherman	Accepted into Ph.D. program, UC Berkeley, Physics
	Rustin Domingos	Accepted into Ph.D. program, MIT, Physics
	Alex Hubbell	Appointed Officer in US Navy (Civil Engineer)
	Anthony Salazar	Accepted into Ph.D. program, UC Berkeley, Mater Sci
	Doug Sherman	M.S., Computer Science, UC Davis
	Andre Miranda	Hired, Banks Integration Group
	Matt Escalante	Hired, Banks Energy Experts International
	Ivor Maasin	Hired, KPFF Consulting Engineers
	Scott Paniccia	Hired, Navair
	Omar Hashem	Hired, Boosted Boards
	Nathan Jenest	Accepted into M.S. program, SJ State, Mechanical Eng
	Silvia Murguia	M.S., Materials Science, University of North Texas
	Brandon Kitelinger	Hired, Basalite Concrete Products
	Ryan Carter	Hired, Ss Brewtech
	Kylie Ahlstrand	Hired, Project Engineer, O.C. Jones & Sons, Inc.
	Tyler Chilson	M.S., Mechanical Engineering, UC Davis
	Antonio Cruz	Hired, Engineer, Redwood Electric Group

	Cesiah Diaz	Hired, Hensel Phelps
2019		
Transfers	Cody Vig	UC Berkeley, Physics/Math
	Heath Muskat	UC Irvine, Materials Science and Engineering
	Altia Picott	Sacramento State, Mechanical Engineering
	Faraj Al Badani	UC Riverside, Chemical Engineering
	Joseph DiMarino	Sacramento State, Computer Science
	Christian Claudio	UC Berkeley, Chemical Engineering
	Ian James	Sacramento State, Civil Engineering
	James Woolsey	Sacramento State, Mechanical Engineering
	Diego Andrade	Cal Poly SLO, Computer Engineering
	Kevin Castillo	Sacramento State, Electrical Engineering
	Jered Bell	Cal Poly SLO, Aerospace Engineering
	Angelina Johnson	UC Berkeley, Mathematics
	Robin Furtado	San Francisco State, Computer Science
	Kelsey Balella	UC Davis, Applied Physics
	Chris Bob	Sacramento State, Mechanical Engineering
	Audrey de Leon	UC San Diego, Cognitive Science
	Andrew Foster	Long Beach State, Civil Engineering
	Zhanglin Ma	UC Davis, Mechanical Engineering
	Joshua Martinez	Sacramento State, Mechanical Engineering
	Usman Sidiqi	Sacramento State, Electrical Engineering
BS Degrees	Zach Shulman	B.S., Mechanical Engineering, Sacramento State
	Raymond Domingos	B.S., Electrical Engineering, San Jose State
	Richard Coucoules	B.S., Materials Science and Engineering, UC Irvine
	Meina Cipollone	B.S., Bioengineering, UC Berkeley
	Ryan Smith	B.S., Mechanical Engineering, UC Davis
	Tracy Camacho	B.S., Mathematics, UC Davis
	Tyler Olson	B.S., Mechanical Engineering, Sacramento State
	Salvatore Nicosia	B.S., Computer Engineering, San Jose State
	Angelia Fanning	B.S., Mechanical Engineering, Sacramento State
	Maddy Cunningham	B.S., Chemistry, UC Davis
	Emily Wong	B.S., Biomedical Engineering, UC Davis
	Scott O'Hair	B.S., Computer Science, Sacramento State
	Mark Delarosa	B.S., Electrical Engineering, UC Irvine
	Tim LaPoint	B.S., Mechanical Engineering, Sacramento State
	Dan Rudy	B.S., Computer Engineering, Sacramento State
	Alex Padilla	B.S., Biomedical Engineering, Cal Poly SLO
	Darrin Edwards	B.S., Biochemistry, San Francisco State

Beyond	Alex Wallace	Hired, Unique Scaffolding
	Scott O'Hair	Hired, Embedded Systems Engineer at Irijule
	Eddie Barton	Accepted into Ph.D. program, U Wisconsin, Comp Sci
	Nick Orfitelli	Appointed 2 nd Lieutenant, Hanscom AFB
	Michelle Dungan	Accepted into M.S. program, UC Davis, Environ. Eng
	Basil Michael	M.S., Health Science, Touro University
	Marlon Cabugwas	Hired, San Francisco Dept. of Technology
	Emily Wong	Hired, Genentech
	Salvatore Nicosia	Accepted into M.S. program, SJ State, Computer Eng
	Nathan Jenest	M.S., Mechanical Engineering, San Jose State
	Angelia Fanning	Hired, Project Engineer, RES, Sacramento
	Nathan Jenest	Hired, Astranis Space Technologies
	Edgar Guzman	Hired, Application Engineer, Nucleonics Corp.
2020		
Transfers	Tyler Heal	San Jose State, Chemical Engineering
	Peter Reynolds	UC Davis, Computer Science and Engineering
	Blake Gella	UCLA, Electrical Engineering
	John Cango	Sacramento State, Electrical Engineering
	Jamal Nasim	UC Davis, Chemical Engineering
	Kath Matsumoto-Elliott	UC Irvine, Materials Science and Engineering
	Oscar Santamaria	Sacramento State, Electrical Engineering
	Nick Ward	U of Nevada at Reno, Mathematics / Computer Sci
	Matthew Mackamul	UC Davis, Electrical Engineering
	Daniel Borja-Lojo	UC San Diego, Mathematics / Computer Science
	Duncan Koelzer	UC Davis, Aerospace Engineering
	Anthony Pelayo	UC Davis, Statistics
BS Degrees	Denise Amado	B.S., Civil Engineering, San Francisco State
	Rajan Mundi	B.S., Electrical Engineering, Sacramento State
	Altia Picott	B.S., Mechanical Engineering, Sacramento State
	Hunter Martin	B.S., Physics / Mathematics, UC Berkeley
	Lanea Azevedo	B.S., Nano Engineering, UC San Diego
	Morgan Renner	B.S., Civil Engineering, UC Davis
	Ryan Seidlitz	B.S., Mechanical Engineering, Sacramento State
	Sean Casey	B.S., Mechanical Engineering, Sacramento State
	Michael Lostica	B.S., Chemistry, UC Berkeley
	Ben Plumb	B.S., Electrical Engineering, UC Davis
	Felix Fagan	B.S., Electrical Engineering, UC San Diego
	Andrew Escalante	B.S., Mechanical Engineering, Sacramento State
	Brenda Lieu	B.S., Mechanical Engineering, UC Irvine

	Mark Delarosa	B.S., Electrical Engineering, UC Irvine
	Robert Ireland	B.S., Computer Engineering, UC Davis
	Erin Nebel	B.S., Civil Engineering, University of Colorado
	Angelica Smith-Evans	B.S., Computer Engineering, Sacramento State
Beyond	Angelica Smith-Evans	Hired, IT Associate, Calif. Dept. of State Hospitals
	Mark Delarosa	Hired, Electronics Engineer, Northrop Grumman
	Taylor Pierce	Accepted into Ph.D. program, UCSD, EECS
	Morgan Renner	Hired, Civil Engineer, California Geological Survey
	Tracy Camacho	Accepted into M.A. program, SF State, Mathematics
	Sana Vaziri	Ph.D., Computer Science, UC Davis
	Scott O'Hair	Hired, Software Engineer, Apple
	Ryan Seidlitz	Hired, San Luis & Delta-Mendota Water Authority
	Michael Lostica	Accepted into Ph.D. program, Stanford, Chemistry
	Hunter Martin	Accepted into Ph.D. program, U of Waterloo, Physics
	Erin Nebel	M.S., Geotechnical Engineering, U of Colorado
	Erin Nebel	Hired, Geotechnical Engineer, BGC Engineering, Inc.
	Brenda Lieu	Hired, Systems Engineer, Navy Surface Warfare Ctr.
	Salvatore Nicosia	Hired, Software Engineer, Cisco
2021		
Transfers	Martin de Guzman	San Jose State, Mechanical Engineering
	Carryann Mendiola	San Jose State, Computer Engineering
	Daniel Delgado	UC Berkeley, Electrical Engineering & Computer Sci
	Dulce Payan	San Jose State, Electrical Engineering
	William Hawkins	UC Davis, Mechanical Engineering
	Ryan Kazimer	UC Davis, Mechanical Engineering
	Eduardo Vasquez	Sacramento State, Computer Engineering
	Jordan Fowler	Sacramento State, Electrical Engineering
	Greg Harvey	Sacramento State, Mechanical Engineering
	Aaron Hollister	Sacramento State, Mechanical Engineering
	Brian Berryhill	UC Davis, Aerospace / Mechanical Engineering
	Grace Baird	UC Davis, Biomedical Engineering
	Luke Goddard	UC Davis, Biomedical Engineering
	Joseph Penrose	Cal Poly SLO, Mechanical Engineering
	Ryan Quan	UC Santa Cruz, Computer Engineering
	Phi Le	San Jose State, Mechanical Engineering
	Emon Kandahari	San Jose State, Mechanical Engineering
	Thomas Gentry	UC Irvine, Aerospace Engineering
	Sebastian Teodoro	UC Berkeley, Civil Engineering
BS Degrees	Kailan Oliva	B.S., Electrical Engineering, San Francisco State

	Chris Bob	B.S., Electrical Engineering, Sacramento State
	Usman Sidiqi	B.S., Electrical Engineering, Sacramento State
	Faraj Al Badani	B.S., Chemical Engineering, UC Riverside
	Payton Coe	B.S., Geology, UC Davis
	James Woolsey	B.S., Mechanical Engineering, Sacramento State
	Joshua Martinez	B.S., Mechanical Engineering, Sacramento State
	Dustin Snedeker	B.S., Computer Engineering, Sacramento State
	Zhanglin Ma	B.S., Mechanical Engineering, UC Davis
	Cody Vig	B.S., Mathematics, UC Berkeley
	Michael Gomez	B.S., Computer Engineering, Sacramento State
	Gabriel Castro	B.S., Computer Engineering, Sacramento State
Beyond	Tan Ho	M.S., Mechatronics, San Jose State
	Tan Ho	Hired, Software Systems Engineer, Rivian
	Faraj Al-Badani	Accepted in Ph.D. program, Notre Dame, Chem Eng
	Sarah Roudon	Hired, Mechanical Engineer, Tri Tool Inc.
	Salvatore Nicosia	M.S., San Jose State, Computer Engineering
	Alec Murchie	Ph.D., UMIST, Ceramic Engineering-
	Alec Murchie	Hired, Advanced Materials Eng., ReLogic Research
	Denise Amado	Hired, Underground Construction Co.
	Dustin Snedeker	Hired, System Validation Engineer, Intel
	Chris Bob	Accepted into M.S. program, SF State, Mech Eng
	Robynne Paldi	Accepted into Ph.D. program, Purdue, Materials Sci
	Michelle Dungan	M.S., UC Davis, Environmental Engineering
	Meina Piao (Cippilone)	M.Eng., UC Berkeley, Bioengineering
	Michelle Dungan	Hired, Environmental Eng., Blankinship & Assoc, Inc.
	James Woolsey	Hired, Air Systems Service & Construction
	Joshua Martinez	Hired, Project Engineer, EnviroCare Int., Inc.
2022		
Transfers	Suaese Utu	Sacramento State, Mechanical Engineering
	Ian Weber	Chico State, Computer Science
	Ashley Tigues	UC Berkeley, Bioengineering
	Tyler Kincaid	Cal Poly Pomona, Chemistry
	Mirwais Lodin	UC Berkeley, Mechanical Engineering
	Kenny Vo	Sacramento State, Electrical Engineering
	Ahmad Aljoher	Sacramento State, Mechanical Engineering
	Daniel Corcoran	Sacramento State, Mechanical Engineering
	Dat Nguyen	UC Merced, Aerospace Engineering
	Dung Nguyen	UC Davis, Chemical Engineering
	Bert Prestoza	UC Davis, Computer Science
	Tate Allen	Cal Poly SLO, Aerospace Engineering

	David Reyes	UC Irvine, Biomedical Engineering
	James Alsip	UC Berkeley, Civil Engineering
BS Degrees	Jered Bell	B.S., Aerospace Engineering, Cal Poly SLO
	Diego Andrade	B.S., Computer Engineering, Cal Poly SLO
	Christian Claudio	B.S., Chemical Engineering, UC Berkeley
	Tyler Heal	B.S., Chemical Engineering, San Jose State
	Kelsey Balella	B.S., Chemical Engineering, UC Davis
	Anthony Pelayo	B.S., Statistics, UC Davis
	Andrew Foster	B.S., Civil Engineering, Long Beach State
	Duncan Koelzer	B.S., Aerospace Engineering, UC Davis
	Daniel Borja-Lojo	B.S., Mathematics / Computer Science, UC San Diego
	Peter Reynolds	B.S., Computer Science and Engineering, UC Davis
	Audrey de Leon	B.S., Cognitive Science, UC San Diego
	Kath Matsumoto-Elliott	B.S., Materials Science and Engineering, UC Irvine
	Heath Muskat	B.S., Materials Science and Engineering, UC Irvine
Beyond	Andrew Foster	Officer in Training, U.S. Coast Guard
	Kelsey Balella	Hired, Structural Engineer, Ashley Vance
	Kath Matsumoto-Elliott	Accepted in Ph.D. program, UC Irvine, Materials Sci
	Heath Muskat	Hired, Cascade Optical Center Corporation
	Parsa Mahmoudieh	Ph.D., UC Berkeley, EECS
	Parsa Mahmoudieh	Hired, Research Engineer, Google Deepmind
	Dustin Snedeker	Hired, System Validation Engineer, Intel



Labor Market Information Report

Data Science Occupations

Solano College

Prepared by the San Francisco Bay Center of Excellence for Labor Market Research

December 2022

Recommendation

Based on all available data, there appears to be an “undersupply” of Data Science workers compared to the demand for this cluster of occupations in the Bay region and in the North Bay sub-region (Marin, Napa, Solano, Sonoma counties). There is a projected annual gap of about 1,177 students in the Bay region and 27 students in the North Bay Sub-Region.

Introduction

This report provides student outcomes data on employment and earnings for TOP 0702.00 Computer Information Systems programs in the state and region. It is recommended that these data be reviewed to better understand how outcomes for students taking courses on this TOP code compare to potentially similar programs at colleges in the state and region, as well as to outcomes across all CTE programs at Solano College and in the region.

This report profiles Data Science Occupations in the 12 county Bay region and in the North Bay sub-region for exploratory purposes at Solano College. Job Postings data is not currently available from Burning Glass for Data Scientists (15-2051), therefore job postings data is provided for Statisticians (15-2041) which is the closest available occupation code. Burning Glass will be merging soon with EMSI to form “Lightcast” and job postings data will likely be available for Data Scientists in the future.

- **Data Scientists (15-2051):** Develop and implement a set of techniques or analytics applications to transform raw data into meaningful information using data-oriented programming languages and visualization software. Apply data mining, data modeling, natural language processing, and machine learning to extract and analyze information from large structured and unstructured datasets. Visualize, interpret, and report data findings. May create dynamic data reports.
Entry-Level Educational Requirement: Bachelor’s degree
Training Requirement: None
Percentage of Community College Award Holders or Some Postsecondary Coursework: NA%
- **Mathematical Science Occupations, All Other (15-2099):** All mathematical scientists not listed separately.
Entry-Level Educational Requirement: Bachelor’s degree
Training Requirement: None
Percentage of Community College Award Holders or Some Postsecondary Coursework: NA%

Occupational Demand

Table 1. Employment Outlook for Data Science Occupations in Bay Region

Occupation	2020 Jobs	2025 Jobs	5-yr Change	5-yr % Change	5-yr Total Openings	Annual Openings	25% Hourly Earning	Median Hourly Wage
Data Scientists	7,105	10,241	3,135	44%	6,290	1,258	\$59	\$77
Mathematical Science Occupations, All Other	79	162	83	105%	131	26	\$32	\$33
Total	7,185	10,403	3,219	45%	6,421	1,284		

Source: EMSI 2022.3

Bay Region includes: Alameda, Contra Costa, Marin, Monterey, Napa, San Benito, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano and Sonoma Counties

Table 2. Employment Outlook for Data Science Occupations in North Bay Sub-region

Occupation	2020 Jobs	2025 Jobs	5-yr Change	5-yr % Change	5-yr Total Openings	Annual Openings	25% Hourly Earning	Median Hourly Wage
Data Scientists	237	286	49	21%	144	29	\$39	\$59
Mathematical Science Occupations, All Other	0	0	0	0%	0	0	N/A	N/A
Total	237	286	49	21%	144	29		

Source: EMSI 2022.3

North Bay Sub-Region includes: Marin, Napa, Solano, Sonoma Counties

Job Postings in Bay Region and North Bay Sub-Region

Table 3. Number of Job Postings by Occupation for 12 months (Nov. 2021 – Oct. 2022)

Occupation	Bay Region	North Bay
Statisticians	661	29
Mathematical Science Occupations, All Other	7	0

Source: Burning Glass

Table 4a. Top Job Titles for Data Science Occupations for 12 months (Nov. 2021 – Oct. 2022) - Bay Region

Title	Bay	Title	Bay
Senior Statistician II, Late Oncology	50	Senior Statistician	8
Associate Director, Statistical Programming	20	Clinical Statistician	7
Statistician	19	Data I A Analytics Specialist	7
Senior Statistical Analyst	17	Data Operations Specialist	7

Senior Statistical Programmer	16	Senior Data Protection Specialist/Administrator In	7
Data Annotation Specialist	14	Statistical Analyst	7
Senior Data Sales Specialist	13	Prov Contract/Cofc Consult	6
Director, Statistical Programming	10	Senior/Principal Statistical Programmer	6
Anaplan Model Builder	9		

Source: Burning Glass

Table 4b. Top Job Titles for Data Science Occupations for latest 12 months (Nov. 2021 – Oct. 2022) - North Bay Sub-Region

Title	North Bay	Title	North Bay
Senior Statistician II, Late Oncology	12	Forest Biometrician	1
Senior Statistical Programmer	3	Model Validation	1
Senior Statistician II, Early Oncology	2	Principal Statistician, Structural Heart & Aortic	1
Senior Statistician, Structural Heart and Aortic	2	Remote Senior Statistical Programmer W	1
Data Evaluation Specialist	1	Senior Data Sales Specialist	1
Data Partnership Specialist	1	Senior Principal Statistician, Structural Heart & Aortic	1
Electronic Data Interchange Specialist	1	Statistical Programmer/Analyst	1

Source: Burning Glass

Industry Concentration

Industry - 6 Digit NAICS (No. American Industry Classification) Codes	Jobs in Industry (2020)	Jobs in Industry (2025)	% Change (2020-25)	% Occupation Group in Industry (2020)
Internet Publishing and Broadcasting and Web Search Portals	1,112	1,741	57%	15%
Custom Computer Programming Services	860	1,333	55%	13%
Software Publishers	345	769	123%	7%
Computer Systems Design Services	470	684	45%	7%
Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology)	374	621	66%	6%
Corporate, Subsidiary, and Regional Managing Offices	470	527	12%	6%

Table 5. Industries hiring Data Science Workers in Bay Region

Data Processing, Hosting, and Related Services	136	410	202%	4%
Research and Development in Biotechnology (except Nanobiotechnology)	219	414	89%	4%
Administrative Management and General Management Consulting Services	223	235	5%	2%
Electronic Computer Manufacturing	326	192	-41%	2%

Source: EMSI 2022.3

Table 6. Top Employers Posting Data Science Occupations in Bay Region and North Bay Sub-Region (Nov. 2021 – Oct. 2022)

Employer	Bay	Employer	North Bay
Astrazeneca	47	Astrazeneca	11
Iqvia	16	Medtronic	4
University of California	15	Astra Zeneca	3
Verizon Communications Incorporated	13	Katalyst Healthcare & Life Sciences	2
Horizon Therapeutics	12	Verizon Communications Incorporated	1
Parexel	11	Talent Software Services	1

Source: Burning Glass

Educational Supply

There are 13 community colleges in the Bay Region issuing 94 awards on average annually (last 3 years ending 2019-20) on TOP 0702.00 Computer Information Systems. In the North Bay Sub-Region, there is one (1) community college that issued 2 awards on average annually (last 3 years) on this TOP code.

There are a two (2) other CTE educational institutions in the Bay Region issuing 13 awards on average annually (last 3 years ending 2019-20) on CIP 11.0101 - Computer and Information Sciences, General. There are no other CTE educational institution in the North Bay Sub-Region issuing awards on average annually (last 3 years) on this CIP code.

Table 7a. Community College Awards on TOP 0702.00 - Computer Information Systems in Bay Region

College	Subregion	Associate Degree	High unit Certificate	Low unit Certificate	Total
Alameda	East Bay	2	0	2	4
Chabot	East Bay	3	0	0	3
Diablo Valley	East Bay	0	0	7	7
Laney	East Bay	2	0	0	2
Las Positas	East Bay	3	0	1	4
Marin	North Bay	1	0	1	2

Merritt	East Bay	11	2	13	26
Mission	Silicon Valley	10	0	6	16
Monterey	SC-Monterey	1	0	0	1
Ohlone	East Bay	0	0	9	9
San Jose City	Silicon Valley	0	0	3	3
Skyline	Mid-Peninsula	10	0	2	12
West Valley	Silicon Valley	0	0	5	5
Total		43	2	49	94

Source: Data Mart

Note: The annual average for awards is 2017-18 to 2019-20.

Table 7b. Other CTE Institutions Awards on CIP 11.0101 - Computer and Information Sciences, General in Bay Region

College	Subregion	Bachelor's degree	Total
Mills College	East Bay	5	5
Notre Dame de Namur University	Mid-Peninsula	8	8
Total		13	13

Note: The annual average for awards is 2017-18 to 2019-20.

Gap Analysis

Based on the data included in this report, there is a labor market gap in the Bay region with 1,284 annual openings for the Data Science occupational cluster and 107 annual (3-year average) awards for an annual undersupply of 1,177 students. In the North Bay Sub-Region, there is also a gap with 29 annual openings and 2 annual (3-year average) awards for an annual undersupply of 27 students.

Student Outcomes

Table 8. Four Employment Outcomes Metrics for Students Who Took Courses on TOP 0702.00 - Computer Information Systems

Metric Outcomes	Bay All CTE Programs	Solano All CTE Programs	State 0702.00	Bay 0702.00	North Bay 0702.00	Solano 0702.00
Students with a Job Closely Related to Their Field of Study	74%	63%	63%	65%	62%	N/A
Median Annual Earnings for SWP Exiting Students	\$47,419	\$32,967	\$31,982	\$40,562	\$37,896	N/A
Median Change in Earnings for SWP Exiting Students	23%	27%	19%	16%	16%	N/A
Exiting Students Who Attained the Living Wage	52%	51%	47%	49%	30%	N/A

Source: Launchboard Strong Workforce Program Median of 2017 to 2020.

Skills, Certifications and Education

Table 9. Top Skills for Data Science Occupations in Bay Region (Nov. 2021 – Oct. 2022)

Skill	Posting	Skill	Posting
SAS	275	Project Management	116
Statistics	262	Biotechnology	99
Statistical Analysis	198	Drug Development	98
Biostatistics	178	Data Science	97
Python	169	Machine Learning	97
Data Analysis	157	Oncology	95
Statistical Programming	154	Quality Assurance and Control	90
R	153	Clinical Study Reports	76
Clinical Trials	144	Simulation	75
Vaccination	134	Macros	64
Data Management	131	Statistical Reporting	60
SQL	124	Process Improvement	52
Clinical Data Interchange Standards Consortium(CDISC)	122	SAP	52
Statistical Methods	118	Customer Service	51

Source: Burning Glass

Table 10. Certifications for Data Science Occupations in Bay Region (Nov. 2021 – Oct. 2022)

Note: 88% of records have been excluded because they do not include a certification. As a result, the chart above may not be

Certification	Posting	Certification	Posting
Driver's License	39	Certified Scrum Trainer (CST)	2
Advanced Programmer Certification	10	Certified Scrum Product Owner (CSPO)	2
SAS Certification	9	SANS/GIAC Certification	1
Certified Information Privacy Professional (CIPP)	7	Microsoft Certified Solutions Associate (MCSA)	1
Certificate in Investment Performance Measurement (CIPM)	3	Lean Six Sigma Certification	1
Security Clearance	2	IT Infrastructure Library (ITIL) Certification	1

Source: Burning Glass
representative of the full sample.

Table 11. Education Requirements for Data Science Occupations in Bay Region

Education (minimum advertised)	Latest 12 Mos. Postings	Percent 12 Mos. Postings
High school or vocational training	2	0%
Bachelor's degree and higher	523	100%

Source: Burning Glass

Methodology

Occupations for this report were identified by use of skills listed in O*Net descriptions and job descriptions in Burning Glass. Labor demand data is sourced from Economic Modeling Specialists International (EMSI) occupation data and Burning Glass job postings data. Educational supply and student outcomes data is retrieved from multiple sources, including CTE Launchboard and CCCCO Data Mart.

Sources

O*Net Online

Labor Insight/Jobs (Burning Glass)

Economic Modeling Specialists International (EMSI)

CTE LaunchBoard www.calpassplus.org/Launchboard/

Statewide CTE Outcomes Survey

Employment Development Department Unemployment Insurance Dataset

Living Insight Center for Community Economic Development

Chancellor's Office MIS system

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