Program Review - Overall Report

2024 - 2027

Instructional: Manufacturing, Machine Shop Technology, Supply Chain Technology, Electronics

2024 - 2027

Overall Trends

What overall trends do you see in success, retention, program of study, educational planning, and awards over the past 3 or more years?

Referring to the success and retention rates for MAN and SCA in the document repository (power bi data 3-19-2024) we need to grow this program. We need to fucus on retaining students, helping them specify their educational plan and encouraging them to finish the program. We believe and have already seen that students are addicted to gain more industry certifications. They state that it looks good on their resume and they want to continue with completing more industry certifications.

Please add any relevant documents here.

0956.00_Manufacturing-and-Machining_IED_Nov2023.pdf
IED_LMA_Industrial-Automation-Technology_22-23.pdf
IED_PR_Mechatronics_21-22.pdf
Industrial-Maintenance-Automation_094500_2309.pdf
power bi data 3-19-2024.pdf

Disaggregated Student Subgroups

Look at the disaggregated student subgroups in success, retention, program of study, educational planning, and awards for your area. Are there any equity gaps that you will address in the next 3 years?
If there are any concerning trends over the past 3 or more years, or if equity gaps exist, what is your action plan to address them?
Please add any relevant documents here.

Growth of the program and improve curriculum

Program/Unit Goal
Create the necessary curriculum for teaching robotics and automation along with growing the number of students in the program. Please see the Program review: curriculum section to see our ideas to help grow the program. Our main goal with the Industrial Automation programs is to serve the main industries in our area which is Amazon, Target, Home Depot, etc.

There is a significant shortage or workers going into the manufacturing field. In an article entitled "Manufacturing Labor Shortage Solutions" they detail why this shortage is happening and suggested solutions. According to the article we are doing many of the correct things. For example: Apprentice Training: "Manufacturers also need to publicly commit to long-term job training and paid internships. Replacing the highly skilled workers leaving the industry will require some kind of apprentice training that leads to journeyman status. This advanced training is a step towards a career, not just a job. If companies want to reshore production to the U.S. or bid on upcoming infrastructure projects, they will have to bite the training bullet and create the skilled workers needed. The government could help by offering apprenticeship loans to help companies finance this training."

We need to continue to work at Diversity: "Manufacturing must diversify and appeal to underrepresented groups such as women, people of color, people with disabilities, and veterans. If recruitment of women becomes a priority in manufacturing, then manufacturers will also have to address the problem of child care."

The industries that need the equipment detailed in this program review are also presented in the article. As stated in the article: "Competitive Wages: America’s corporations have been on a 40-year crusade to lower labor costs. According to the Bureau of Labor Statistics, in 2023, non-supervisory production workers in manufacturing will make a mean hourly wage of $17 per hour or $32,640 per year. To attract entry-level workers, the industry will have to match the starting wages of companies like Amazon and FedEx". The SACA training described in this program review is what companies like FedEx, Amazon, Target, Home Depot, and other companies in our area really need. Industrial Automation is what Norco College should be focused on.

As for the machining program we need to help students learn how to better measure parts using a CMM machine. Our current machine is not usable due to up keep during COVID and it does not represent what is found in industry.

Goal Cycle
2024 - 2027

What are you doing now in support of this goal?
Create the necessary curriculum for teaching robotics and automation along with growing the amount of students in the program. Please see the Program review: curriculum section to see our ideas to help grow the program. Our main goal with the Industrial Automation programs is to serve the main industries in our area which is Amazon, Target, Home Depot, etc.

As for the machining program we need to help students learn how to better measure parts using a CMM machine. Our current machine is not usable due to up keep during COVID and it does not represent what is found in industry.

What are your plans (3-year) regarding this goal?
Create the necessary curriculum for teaching robotics and automation along with growing the amount of students in the program. Please see the Program review: curriculum section to see our ideas to help grow the program. Our main goal with the Industrial Automation programs is to serve the main industries in our area which is Amazon, Target, Home Depot, etc.

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Please add any relevant documents here.

Equity

2024 - 2027

1. Which equity-related professional development trainings have members of your area participated in to improve student learning, student support, and/or college support?

2022-2023
California child abuse mandated reporter online training
Skillsbuilders: Expanding Who Benefits from Short Term Training
DEI 5C Tool kit: culturally responsive higher education curriculum assessment tool
Expanding Your CTE Programs Through Dual Enrollment
CCCAOE conference
Finding and developing open educational resources (OER) for career and technical education
Active shooter presentation
A Community Cultural Weal Approach at Riverside Community College District
Ask-Connect-Inspire-Plan (ACIP) Model
Bearing Witness as an Act of Love, Resistance, Hope, and Healing
Student Equity Plan 2022-2025
Holistic Student Support Survey (HSSS) Student Analysis
Steps on the Path: Creating a Pro-Black Culture at Norco College – Racial Justice Taskforce 2022-2023 Goals

2021 -- 2022
Foster Parent college Children with Autism
March - Humanizing your courses using Voice Thread 3/29
gp and equity lunch and learn
Industry and Inclusion March Meeting
ALL FLEX: Disrupting Inequity in the Academy
Bringing Pride to the Classroom and Affirming our LGBTQ+ Students - Ammanda Moore (Fall Flex 2021)
GP&E Lunch & Learn 2

2. What knowledge or skills/techniques have members in your area implemented from these trainings and what changes have you seen?

The machining and manufacturing program actively accommodates all students by well designed curriculum. For example, much of the curriculum in the machining presented either on video or read out loud by a voice over the Amatrol learning management system or immerse 2 learn. In other words the students have an online textbook that reads the content to them. Also, much of Amatrol also has links to definitions of words. This helps with meeting both ADA compliance and my also help with ethnicity requirements. Further, much of the machining and plc training are presented using video produced either on YouTube or by the classroom instructor.

Having text read out loud can enhance ADA compliance by making digital content accessible to individuals with visual impairments or reading disabilities. This feature ensures that people with disabilities can access and understand the content, thus meeting the accessibility standards outlined in the Americans with Disabilities Act (ADA). Other methods used to help the manufacturing be more inclusive include:

Recruitment and Outreach: Proactively recruit students from diverse backgrounds and communities to participate in your classes. This can involve targeted outreach efforts and partnerships with community organizations.

Role Models and Guest Speakers: Invite guest speakers and role models from different ethnic backgrounds to share their experiences and expertise in machining, providing diverse perspectives for your students.

Supportive Environment: Foster a supportive and inclusive classroom environment where all students feel

valued and respected regardless of their ethnic background.

Feedback and Collaboration: Encourage open communication and feedback from students to continuously improve the inclusivity of your classes. Collaborate with colleagues and experts in diversity and inclusion to enhance your teaching approach.

3. What additional equity-related professional development/trainings do you seek to better support your area?

In the first two weeks of March, we are joining with OEWeek (Open Education Week) nationwide to help students and faculty learn more about open education resources (OER) and Zero Textbook Cost (ZTC) courses. On March 5th, we will have a booth for students to learn more about the opportunities to take ZTC classes at Norco College and on March 14th, we have an amazing Zoom presentation for faculty from one of the foremost leaders in OER in California, Michelle Pilati. Please mark your calendars and join us for this opportunity during college hour on 3/14!

OEWeek 2024 continues with a faculty focused presentation from Michelle L. Pilati, PhD.

Michelle has been actively involved in the Academic Senate for California Community Colleges (ASCCC) for over a decade, representing the ASCCC in various capacities and playing a role in a wide array of state-level endeavors, including Open Educational Resources (OER), Zero Textbook Cost (ZTC), guided pathways, C-ID, Statewide Career Pathways, the Student Success Task Force, and the implementation of SB 1440.

Previously she served as the Psychology Editor for MERLOT (Multimedia Resource for Learning and Online Teaching) and was a founding Editorial Board member and served as Co-editor of the MERLOT Journal of Online Learning and Teaching (JOLT), a peer-reviewed online publication that launched in 2005. Before her involvement in statewide work, she served as Curriculum Chair and Distance Education Coordinator at her college.

Title: Exploring Open Educational Resources (OER) and Zero Textbook Cost (ZTC)

Day: March 14, 2024

Time: 12:50 PM - 1:50 PM

Zoom registration link: https://rccd-edu.zoom.us/webinar/register/WN_tBPjg9stQ1-zUWSZ5lj1cA

Navigating the landscape of OER involves addressing barriers such as concerns about quality, availability, and the perceived complexity of integration. How do you evaluate the quality of educational materials? Are there OER resources tailored to your field? While adopting OER may present challenges, is the endeavor ultimately worthwhile, especially in the context of achieving zero textbook cost (ZTC) for students? Join this session for insights into these queries and gain clarity on your OER-related inquiries.

Please add any relevant documents here.

2024 - 2027

Are all your courses current (within four years)?

No

What percentage of your courses are out of date?

More than 25%

If you have courses that are not current, are they in the curriculum process?

No

For out of date courses that are not already in progress of updating, what is your plan?

Update the following courses excluding MAN 56, 57, 60, 61 and 64

MAN 35 -- Computer Aided Manufacturing-Mastercam -- 4/15/2014

MAN 36 -- General machine shop and theory of machining -- 4/17/2018

MAN 55 -- Occupational Safety and Health Administration (OSHA) Standards for General Industry -- 12/12/2017

MAN 56 -- CNC Machine Set-Up and Operation -- 12/13/2022

MAN 57 -- CNC Program Writing -- 12/13/2022

MAN 60 -- Hydraulic and Pneumatic Systems -- 12/13/2022

MAN 61 -- Robotics for Manufacturing -- 6/21/2022

MAN 64 -- Programmable Logic Controllers -- 12/13/2022

MAN 66 -- Pneumatic Fluid Power Systems -- Not approved yet

MAN 67 -- Programmable logic controllers using Siemens -- 6/7/2020

MAN 72 -- Commercial and Industrial Electrical wiring -- 1/19/2016

MAN 73 -- Electric Motors and Transformers -- 1/19/2016

MAN 74 -- Industrial Wiring and Controls -- 1/19/2016

MAN 77 -- Electrical Theory for Electricians -- 10/16/2018

MAN 78 -- Hydraulic Fluid Power Systems -- Not approved yet

Create the following courses and certificates within 5 years based on the SACA.org certificates if we can get the equipment to teach each of these courses:

Certified Industry 4.0 Robotics Specialist:

C-101 Associate-Basic Operations -- MAN 10 -- Units: 4

C-102 Industry 4.0 Advanced Operations -- MAN 11 -- Units: 4

C-103 Robot System Operations -- MAN 12 -- Units: 4

C-215 Robot System Operations 1 -- MAN 13 -- Units: 3

C-216 Robot Systems Integration 1 -- MAN 14 -- Units: 3

C-211 Industry 4.0 Total Productive Maintenance -- MAN 15 -- Units: 3

Certified Industry 4.0 Electro-Fluid Power Systems Specialist:

C-101 Associate-Basic Operations -- MAN 10 -- Units: 4

C-255 Hydraulic Systems 1 -- MAN 20 -- Units: 3

C-209 Pneumatic Systems 1 -- MAN 21 -- Units: 4

C-256 Hydraulic Maintenance -- MAN 22 -- Units: 2

C-304 Pneumatic Troubleshooting 1 -- MAN 23 -- Units: 3

C-355 Hydraulics Troubleshooting 1 -- MAN 24 -- Units: 3

Certified Industry 4.0 Control Systems Specialist

C-101 Associate-Basic Operations -- MAN 10 -- Units: 4

C-201 Electrical Systems 1 -- MAN 25 -- Units: 3

C-202 Electric Motor Control Systems 1 -- MAN 26 -- Units: 3

C-203 Variable Frequency Drive Systems 1 -- MAN 27 -- Units: 3

C-204 Motor Control Troubleshooting 1 -- MAN 28 -- Units: 3

C-205 Sensor Logic Systems 1 -- MAN 29 -- Units: 3

C-207 Programmable Controller Systems 1 -- MAN 32 -- Units: 3

C-208 Programmable Controller Troubleshooting 1 -- MAN 33 -- Units: 4

C-211 Industry 4.0 Total Productive Maintenance -- MAN 15 -- Units: 3

Certified Industry 4.0 Mechanical Systems Specialist

C-101 Associate-Basic Operations -- MAN 10 -- Units: 4

C-210 Mechanical Power Systems I -- MAN 16 -- Units: 3

C-301 Mechanical Power Systems 2 -- MAN 17 -- Units: 3

C-302 Laser Shaft Alignment 1 -- MAN 18 -- Units: 2

C-211 Industry 4.0 Total Productive Maintenance -- MAN 15 -- Units: 3

Certified Industry 4.0 Operations Specialist

C-101 Associate-Basic Operations -- MAN 10 -- Units: 4

C-102 Associate-Advanced Operations -- MAN 11 -- Units: 4

C-103 Robot System Operations -- MAN 12 -- Units: 4

C-211 Industry 4.0 Total Productive Maintenance -- MAN 15 -- Units: 3

Do you have proposals in progress for all the DE courses you intend to file?

No

Do you require help to get your courses up to date?

Yes

Please add any relevant documents here.

23FALL-MAN-56-38033

Date
03/07/2024

Observation
What did you notice?
Each student that took the quiz got at least 80% for each assessment.

Suggestions: for the class:

Assessments for the project completed during the class should be assessed.

The project that was completed during the class was too hard for the students to complete during the allotted time frame of the class. I changed the project for the class during the Spring 2024 semester which should make it easier for the students to complete

Course(s)
23FALL-MAN-56-38033

SLO(s)

CO 1	1. Analyze engineering drawings for content necessary for the set-up and operation of CNC machine tools.
CO 2	2. Select, set, and install tooling as indicated by the engineering drawings and the CNC program.
CO 3	3. Recognize CNC machine codes and terminology for computerized machining and manufacturing.
CO 4	4. Demonstrate appropriate precision measurement instrument use.
CO 5	5. Convert to and from Metric and U.S. customary; fractional and decimal fractional units.

Student Learning Outcomes:
Upon successful completion of the course, students should be able to demonstrate the following skills:

SLO 1	1. Use computer numerical control machines to create a compressed air engine.

Discussion/Analysis

Type of assessment:

Each of these assessments were quiz questions from the LMS that is assigned to each student.

Results:

Each student that took the quiz got at least 80% for each assessment.

Suggestions: for the class:

Assessments for the project completed during the class should be assessed.

The project that was completed during the class was too hard for the students to complete during the allotted time frame of the class. I changed the project for the class during the Spring 2024 semester which should make it easier for the students to complete

Please paste any relevant screenshots here.
Please add any relevant documents here.
2024-03-06T0743_Grades-23FAL-MAN-56-38033.xlsx

23FAL-MAN-57-38034

Date
03/07/2024
Observation
What did you notice?
Type of assessment:

Each of these projects were either exams, in class projects, or textbook assignments

Results:

Each student that completed the assignments for each course outline and SLO did extermly well as shown in each column.

Suggestions: for the class:

Subroutines need to be presented better and students need more instruction on subroutines.
More needs to be done to present trionometry.

Course(s)
23FAL-MAN-57-38034

SLO(s)

CO 1 1. Perform calculations necessary to develop coordinate charts for part geometry with an emphasis on trigonometry and using trigonometry to find point positions on two-dimensional parts that are more complex then squares and rectangles.
CO 2 2. Use canned cycles correctly in programs for CNC machine tools.
CO 3 3. Use subroutine techniques correctly in programs for CNC machine tools.
CO 4 4. Analyze CNC programs written by others to determine machining sequences.

Student Learning Outcomes:
Upon successful completion of the course, students should be able to demonstrate the following skills:

SLO 1 1. Create computer numerical control programs for cutting simple parts.
SLO 2 2. Ability to read and write CNC machine code so students are able to review programs machine to avoid crashing the machine.

Discussion/Analysis

Results:

Each student that completed the assignments for each course outline and SLO did extermly well as shown in each column.

Suggestions: for the class:

Subroutines need to be presented better and students need more instruction on subroutines.
More needs to be done to present trionometry.

Please paste any relevant screenshots here.
Please add any relevant documents here.
2024-03-06T0804_Grades-23FAL-MAN-57-38034.xlsx

24WIN-MAN-64-31422

Date

03/07/2024

Observation

What did you notice?

We should continue to use industry certification in this class

Course(s)

24WIN-MAN-64-31422

SLO(s)

Course Objectives:
Upon successful completion of the course, students should be able to demonstrate the following activities:

CO 1	1. List and discuss advantages and disadvantages of PLCs.
CO 2	2. Describe the functions of the major parts of a PLC system.
CO 3	3. Describe and demonstrate how the parts of the PLC system are connected electrically.
CO 4	4. Analyze problems representative of control system environments using PLC.
CO 5	5. Create ladder logic programs using Allen Bradley or Siemens software and test for correct operation.
CO 6	6. Describe the installation maintenance and troubleshooting of PLCs and PLC modules.

Student Learning Outcomes:
Upon successful completion of the course, students should be able to demonstrate the following skills:

SLO 1	1. Demonstrate programming and wiring of a programmable logic control system that is typically used in industry.

Discussion/Analysis

Each of the students in the class except one were able to gain SACA.org silver certification. SACA silver certification for each of these students is something we should really be proud of.

Results:

Each student that took the quiz got at least 90% for each assessment.

Suggestions: for the class:

Continue to use Amatrol and SACA training and assessment and to use logix pro to pratice programming

As can be seen from the list below we have had 11 students pass the SACA 207 test on PLCs

ELE-64-34757	Spring 2023	Aguilar, Noe (naguilar16@student.rccd.edu)	C-207 Programmable Controller Systems 1
		Barragan, Alejandro (abarragan16@student.rccd.edu)	C-207 Programmable Controller Systems 1
ELE-864-35489	Spring 2023	Beyers, Jim (jbeyers909@gmail.com)	C-207 Programmable Controller Systems 1
MAN-64-35014	Spring 2023	Lopez, Julian (jlopez511@student.rccd.edu)	C-207 Programmable Controller Systems 1
MAN-64-31422	Winter 2024	Meservy, Tanner (tanner.meservy@outlook.com)	C-207 Programmable Controller Systems 1
MAN-64-31422	Winter 2024	Meservy, Daniel (daniel.meservy@yahoo.com)	C-207 Programmable Controller Systems 1
MAN-64-31422	Winter 2024	Meservy, Brock (meservyamerica@outlook.com)	C-207 Programmable Controller Systems 1
MAN-64-31422	Winter 2024	Ornelas, Richard (rornelas12@student.rccd.edu)	C-207 Programmable Controller Systems 1
MAN-64-31422	Winter 2024	Soriano, Lorenzo (mrlorenzosoriano@gmail.com)	C-207 Programmable Controller Systems 1
MAN-64-31422	Winter 2024	WAYNE, THOMAS (thomasawayne08@gmail.com)	C-207 Programmable Controller Systems 1
MAN-64-35014	Spring 2023	Widdison, James (marcw2003@sbcglobal.net)	C-207 Programmable Controller Systems 1

SACA certifications are industry-driven, developed for industry by industry. They are developed through a rigorous process that begins with the creation of truly international skill standards, endorsed by leading experts in Industry 4.0 technologies throughout the world. Certification examinations are created based on these standards, pilot tested, and statistically analyzed to ensure quality. Each certification includes a proctored hands-on evaluation and an online test to ensure that candidates for certification can "do" as well as "know." SACA uses an annual review

process for all certifications to ensure that standards and examinations remain current and relevant in the fast-changing world of Industry 4.0.

https://www.saca.org/smart-automation-certifications/#:~:text=SACA%20certifications%20are%20industry%2Ddriven,4.0%20technologies%20throughout%20the%20world.

Experts from well-known industry leaders, such as Rockwell Automation, FANUC, Ashley Furniture, Kohler, Foxconn, Boeing, and Hershey, were instrumental in making sure SACA's Industry 4.0 certifications reflect the competencies that industry needs. A list of companies that SACA and Amatrol worked with to develop the certification is included on this website: https://www.saca.org/about-us-smart-automation-certification-alliance/acknowledgments/

SACA sits at the forefront of the effort to certify students and workers who demonstrate the required knowledge and hands-on smart automation skills employers so desperately need. SACA's certifications were developed in conjunction with industry partners who could speak from experience about their needs when it comes to workers able to work alongside a variety of advanced automation technologies.

SACA offers a wide variety of certifications in popular industrial skill areas, including certifications at the Associate, Specialist, and Professional level. For those wishing to focus on building a strong foundation of skills employers need, SACA also offers many micro-credentials that allow students and workers to add certifications as they master new areas.
For workers, SACA certifications can help market their smart automation skills to potential employers. For those employers, SACA certifications represent confirmation that a worker has the skills to hit the ground running in the workplace. To learn more about Industry 4.0 certifications and how SACA can help both future workers and industrial employers begin the task of bridging the Industry 4.0 skills gap, contact SACA for more information.

https://www.saca.org/2024/02/08/saca-endresshauser-seek-experts-for-technical-work-group/

Please paste any relevant screenshots here.
Please add any relevant documents here.
2024-03-06T0807_Grades-24WIN-MAN-64-31422.xlsx

23SPR-MAN-36-35522

Date
03/07/2024
Observation
What did you notice?

For MAN 36 we need to grade more of the hands on lab projects.

The assignments above represent immerse 2 learn assignments grades. Most of the quizzes are completed by the students after compling a LMS type assignments

Type of assessment:

Each of these assessments were quiz questions from the LMS that is assigned to each student.

Results:

Each student that took the quiz got at least 80% for each assessment.

Suggestions: for the class:

Assessments for the projects completed during the class should be assessed.

Course(s)
23SPR-MAN-36-35522
SLO(s)

Course Objectives:
Upon successful completion of the course, students should be able to demonstrate the following activities:

CO 1 1. Demonstrate aptitude in safely setting up and operating the lathe, mill, drill press, saw and grinder.
CO 2 2. Select and utilize various metrology tools necessary to compare engineering drawing requirements to machined dimensions.
CO 3 3. Calculate speeds and feeds related to machining applications.
CO 4 4. Set up and perform fundamental operational procedures on the lathe and mill to tolerances ranging .010-.030
CO 5 5. Demonstrate the fundamentals of bench and layout work required to create a part.

Student Learning Outcomes:
Upon successful completion of the course, students should be able to demonstrate the following skills:

SLO 1 1. Create parts using conventional mills and turning machines. For example, students usually create a hammer head and handle using the lathe. During mill lessons, students create a micrometer stand.

Discussion/Analysis

For MAN 36 we need to grade more of the hands on lab projects.

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Please paste any relevant screenshots here.
Please add any relevant documents here.
2024-03-06T0814_Grades-23SPR-MAN-36-35522.xlsx

23FAL-MAN-60-37628

Date
03/07/2024

Observation
What did you notice?

Suggestions:
Continue to use SACA industry certifications.

During the Fall 2023 semester 5 students got SACA silver certifications

MAN-60-37628 (jazouakalj@student.rccd.edu)	Fall 2023 C-209	azouak aljazaerly, jihad Pneumatic Systems 1	
MAN-60-37628	Fall 2023 Pneumatic Systems 1	Flores, George (georgefloresedu@gmail.com)	C-209
MAN-60-37628	Fall 2023 Pneumatic Systems 1	Mora, Angel (moraangel1203@gmail.com)	C-209
MAN-60-37628	Fall 2023 C-209	Rodriguez, Daniel (drodriguez60@student.rccd.edu) Pneumatic Systems 1	
MAN-60-37628	Fall 2023 Pneumatic Systems 1	stewart, aaron (dragon_as2008@yahoo.com)	C-209

For this class I would suggest that more of the laps used in the class are put on canvas to help develop a better grading system.

Course(s)
23FAL-MAN-60-37628

SLO(s)

Course Objectives:
Upon successful completion of the course, students should be able to demonstrate the following activities:

CO 1	1. Demonstrate basic safety procedures when designing, assembling and trouble shooting high pressure hydraulic and pneumatic systems used in automated and robotic processes.
CO 2	2. Set-up and operate fluid powered valves, cylinders, controls, filters, and actuators.
CO 3	3. Calculate functions and load requirements then design, select components and test complex fluid powered systems in a robotic or industrial environment using schematic symbols and blueprints typically found in the fluid power.
CO 4	4. Construct typical components using a print, and test run the system.

Student Learning Outcomes:
Upon successful completion of the course, students should be able to demonstrate the following skills:

SLO 1	1. Safely setup and operate fluid power components and systems for the manufacturing industry.

Discussion/Analysis

Suggestions:
Continue to use SACA industry certifications.

During the Fall 2023 semester 5 students got SACA silver certifications

MAN-60-37628	Fall 2023	azouak aljazaerly, jihad (jazouakalj@student.rccd.edu)	C-209 Pneumatic Systems 1
MAN-60-37628	Fall 2023	Flores, George (georgefloresedu@gmail.com)	C-209 Pneumatic Systems 1
MAN-60-37628	Fall 2023	Mora, Angel (moraangel1203@gmail.com)	C-209 Pneumatic Systems 1
MAN-60-37628	Fall 2023	Rodriguez, Daniel (drodriguez60@student.rccd.edu)	C-209 Pneumatic Systems 1
MAN-60-37628	Fall 2023	stewart, aaron (dragon_as2008@yahoo.com)	C-209 Pneumatic Systems 1

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https://www.saca.org/2024/02/08/saca-endresshauser-seek-experts-for-technical-work-group/

Please paste any relevant screenshots here.
Please add any relevant documents here.
2024-03-06T0817_Grades-23FAL-MAN-60-37628.xlsx

23FAL-MAN-35-38032

Date
03/07/2024
Observation
What did you notice?
This course's COR needs to be updated.

The scores for each assignement are at least above 90%

Instructor uses videos to help the students complete many of these assignments.

I would suggest that the instructor incurage the students that got 0 on some of these assignments

Course(s)
23FAL-MAN-35-38032
SLO(s)

Student Learning Outcomes:
Upon successful completion of the course, students should be able to demonstrate the following skills:

SLO 1 — 1. Program turning centers using MasterCam Computer Aided Machining software.
SLO 2 — 2. Program milling machine operations at a beginning and advanced level using MasterCam Computer Aided Machining (CAM) software.
SLO 3 — 3. Create simple two-dimensional and advanced three-dimensional parts using Mastercam software.

Discussion/Analysis
This course's COR needs to be updated.

The scores for each assignement are at least above 90%

Instructor uses videos to help the students complete many of these assignments.

I would suggest that the instructor encourage the students that got 0 on some of these assignments

Please paste any relevant screenshots here.
Please add any relevant documents here.
2024-03-06T0819_Grades-23FAL-MAN-35-38032.xlsx

Certified Industry 4.0 Control Systems specialist; Amatrol PLC trainer and software for teaching Industry 4.0 total productive maintenance management credential

Resource Year
2024 - 2027

What resources do we already have?
Siemens and Allen Bradley PLCs (we do need more Allen Bradley PLCs since we only have 12)

What resources do you need?

Amatrol PLC trainer 990-PABCL1F for teaching SACA 207 and 208, PLCs and PLC troubleshooting. We are suggesting two of these trainer at about $16,000 each

We will be developing the following certificate within our program and it will be called the Certified Industry 4.0 Control Systems Specialist

C-101 Associate-Basic Operations -- MAN 10 -- Units: 4 -- We have been certified through SACA to be able to give Gold certifications in C-101
C-201 Electrical Systems 1 -- MAN 25 -- Units: 3 -- We have been certified through SACA to be able to give Gold certifications in C-201
C-202 Electric Motor Control Systems 1 -- MAN 26 -- Units: 3 -- We have been certified through SACA to be able to give Gold certifications in C-202
C-203 Variable Frequency Drive Systems 1 -- MAN 27 -- Units: 3 -- We have been certified through SACA to be able to give Gold certifications in C-203
C-204 Motor Control Troubleshooting 1 -- MAN 28 -- Units: 3 -- We have been certified through SACA to be able to give Gold certifications in C-204
C-205 Sensor Logic Systems 1 -- MAN 29 -- Units: 3 -- We have been certified through SACA to be able to give Gold certifications in C-205
C-207 Programmable Controller Systems 1 -- MAN 32 -- Units: 3 -- We have been certified through SACA to be able to give Gold certifications in C-207
C-208 Programmable Controller Troubleshooting 1 -- MAN 33 -- Units: 4 -- We are lacking the equipment to be able to give Gold certifications in C-208 and we are not able to provide students with this Certification.

C-211 Industry 4.0 Total Productive Maintenance -- MAN 15 -- Units: 3 -- We are lacking the software be able to give Gold certifications in C-211 and we are not able to provide students with this Certification.

Equipment Required
For SACA C-211 Industry 4.0 Total Productive Maintenance Management Credential
Note: This equipment is required to support the C-211 standards and the associated Gold certification assessment
Functional Capabilities
A cloud-based maintenance management software should be provided to candidates, which enables demonstration of skills in setting up and using software to manage maintenance information flow and notification in an Industry 4.0 plant environment.
The software should have the following features:
• Ability to send manual or automatic push notifications to between individuals with a phone app
• Ability to configure the system to notify groups of individuals
• Ability to review the history of maintenance notifications from a PC with a web browser by displaying a list of notifications sent and explaining the structure of the data
• Ability to escalate messages to supervisor if not claimed by intended individual
Components
(1) Cloud-Based Maintenance Management Software
(1) Downloadable Smart Phone App for interaction with maintenance management software
(1) PC with access to Internet

Equipment Required
For SACA C-208 Programmable Controller Troubleshooting 1 Credential
Note: This equipment is required to support the C-208 standards and the associated Gold certification assessment
Functional Capabilities
This credential requires a programmable controller system with the same capabilities as the equipment specified in credential C-207. In addition, each system should have the capabilities to insert faults into the system to provide students with realistic troubleshooting.
The programmable controller system faults should include: field input devices, field output devices, PLC input module points, PLC output module points, PLC power supply, MCR relay coil and contacts, MCR

start pushbutton, Stop pushbutton, power supply, and AC power in.
The PLC system shall provide accessible test points to enable candidates to take electrical measurements to troubleshoot PLC faults.
Components (same as those specified in C-207)
(1) Industrial PLC model: Rockwell Rockwell CompactLogix, ControlLogix, or equivalent with discrete inputs/ outputs (can be DC or AC) and Ethernet communications port
(1) Human Machine Interface (HMI), Rockwell or Equivalent with Ethernet communication port
(1) PC-Based PLC programming Software, Rockwell Studio 5000 with RSLinx or equivalent
(1) Master Control Relay Circuit for power distribution system
(4) Output Indicator Lamps
(2) Pushbutton Switches, Normally Open
(1) Pushbutton Switches, Normally Closed
(4) Selector Switches, 2-position
(1) Electric Motor, AC or DC with contactor
(2) Solenoid-Operated Pneumatic Valve/Cylinders or electric actuator
(3) Limit Switches or Electronic Sensors, Normally Open (used for end of travel sensors for actuators)
Instrumentation
(1) Multimeter

During our industry advisory the advisory approved this certificate so we have industry approval for this certificate and the items shown above.

I have included a quote for the 990-PABCL1F PLC troubleshooting learning systems trainer in the document repository.

The best document to look at in the document repository for the occupation served by the above resource request is the COE for industrial automation technology document and the COE for industrial maintenance and automation documents that are located in the folder 3-19-2024. These documents show an annual job opening of 71 and 434 annual job openings for these careers. The median hourly earning between $29.05 to 29.86 which is much above the $21.82 hourly living wage standard. It should be noted that both of these documents show employees working on robotics and PLCs. Within this request there are elements of preventive maintenance which is also part of the training of the control systems specialist.

According to Chat GPT after searching for how is preventative maintenance used in industrial automation. According to this search having the content of the C-211 course is critical for preventative maintenance: Norco College_KES11686 (2)_AMA Portable Learning Systems_091523_jr_(copy).pdf"

Preventative maintenance is crucial in industrial automation to ensure the smooth operation of automated systems and minimize the risk of costly downtime. Here's how it is used:

1. **Scheduled Inspections:** Regular inspections of automated machinery and equipment are conducted to identify any signs of wear, damage, or potential issues before they escalate into major problems. These inspections may include checking components such as sensors, actuators, motors, and controllers for signs of wear or malfunction.

2. **Routine Maintenance Tasks:** Preventative maintenance involves performing routine tasks such as lubrication, cleaning, and calibration to keep automated systems operating at optimal performance. This helps prevent premature component failure and ensures that equipment operates within specified tolerances.

3. **Monitoring Performance Metrics:** Industrial automation systems often include monitoring systems that track key performance metrics such as temperature, pressure, vibration, and cycle time. By analyzing these metrics over time, maintenance personnel can identify trends and patterns that may indicate potential issues and take proactive measures to address them.

4. **Predictive Maintenance:** Advances in sensor technology and data analytics enable predictive maintenance, which involves using real-time data to predict when equipment is likely to fail and scheduling maintenance activities accordingly. This approach minimizes downtime and reduces the likelihood of unexpected failures.

5. **Spare Parts Inventory:** Maintaining an inventory of spare parts for critical components ensures that replacements are readily available when needed, minimizing downtime in the event of a failure. Preventative maintenance programs often include regular audits of spare parts inventory to ensure that it is adequately stocked and up to date.

6. **Training and Documentation:** Proper training of maintenance personnel and documentation of maintenance procedures are essential components of a preventative maintenance program. This ensures that maintenance tasks are performed correctly and consistently, maximizing the effectiveness of the program.

Overall, preventative maintenance plays a vital role in industrial automation by ensuring the reliability, efficiency, and longevity of automated systems, ultimately helping organizations achieve their production goals and minimize costly disruptions.

Referring to the success and retention rates for MAN and SCA in the document repository (power bi data 3-19-2024) we need to grow this program. We need to fucus on retaining students, helping them specify their educational plan and encouraging them to finish the program. We believe and have already seen that students are addicted to gain more industry certifications. They state that it looks good on their resume and they want to continue with completing more industry certifications.

According to ChatGPt, industry certification can greatly benefit students completing training in several ways:

1. **Validation of Skills:** Industry certifications provide external validation of students' skills and knowledge in a particular field or technology. Achieving a certification demonstrates to employers that students have mastered the necessary competencies to perform specific job roles effectively.

2. **Enhanced Employability:** Holding industry certifications can significantly enhance students' employability and competitiveness in the job market. Many employers value certifications as evidence of a candidate's expertise and may prioritize candidates who hold relevant certifications during the hiring process.

3. **Career Advancement:** Industry certifications can open doors to new career opportunities and advancement within a chosen field. They may qualify students for higher-level positions, promotions, or salary increases, as they demonstrate a commitment to professional development and ongoing learning.

4. **Standardized Training:** Certification programs often follow standardized curricula and assessments developed by industry experts. This ensures that students receive high-quality training that aligns with industry standards and best practices, preparing them for real-world challenges and scenarios.

5. **Access to Resources and Networking:** Certification programs often provide access to resources such as study materials, practice exams, and networking opportunities with other professionals in the field. This support can help students prepare for certification exams more effectively and stay connected with industry peers and mentors.

6. **Confidence and Recognition:** Achieving an industry certification can boost students' confidence in their abilities and provide a sense of accomplishment. It also earns them recognition within their industry or profession, enhancing their reputation and credibility among colleagues and peers.

Overall, industry certification serves as a valuable credential that validates students' skills, enhances their employability, and opens doors to career advancement opportunities. By completing training programs that lead to industry certifications, students can position themselves for success in their chosen fields and achieve their professional goals.

$ Amount Requested
32,000
Resource Type

ITEM: Equipment, Services, Software, Furniture

Please summarize how this request supports one or more EMP Goals, Equity goals, your program plans or goals, and/or is supported by outcomes assessment data.

As can be read above we are proposing a new program based on the certificate above.

This request for my area is Priority #:

2

Is this request

New

Certified Industry 4.0 Robotics Specialists, WinCC software or Squeaks software, a managed Switch from either Allen Bradley or Siemens, and the components to be able to teach robot systems integration 1

Resource Year

2024 - 2027

What resources do we already have?

C-101 Associate-Basic Operations -- MAN 10 -- Units: 4 -- We have been certified through SACA to be able to give Gold certifications in C-101
C-102 Industry 4.0 Advanced Operations -- MAN 11 -- Units: 4 -- We almost have all of the equipment to be able to teach this and we should try to submit the equipment list for this. We may need to get the equipment for C-212, Ethernet networking system
C-103 Robot System Operations -- MAN 12 -- Units: 4 -- We have equipment to be able to teach this but still need to get Gold certification in robotics (C-103)
C-215 Robot System Operations 1 -- MAN 13 -- Units: 3 -- We have equipment to be able to teach this but still need to get Gold certification in robotics (C-215)

What resources do you need?

C-216 Robot Systems Integration 1 -- MAN 14 -- Units: 3 -- We are lacking equipment (as shown below). We may be able to make these items ourselves
C-211 Industry 4.0 Total Productive Maintenance -- MAN 15 -- Units: 3 -- We are lacking the software be able to give Gold certifications in C-211 and we are not able to provide students with this Certification.

Equipment Required
For SACA C-211 Industry 4.0 Total Productive Maintenance Management Credential

Note: This equipment is required to support the C-211 standards and the associated Gold certification

assessment
Functional Capabilities
A cloud-based maintenance management software should be provided to candidates, which enables

demonstration of skills in setting up and using software to manage maintenance information flow and

notification in an Industry 4.0 plant environment.
The software should have the following features:
• Ability to send manual or automatic push notifications to between individuals with a phone app

• Ability to configure the system to notify groups of individuals
• Ability to review the history of maintenance notifications from a PC with a web browser by

displaying a list of notifications sent and explaining the structure of the data
• Ability to escalate messages to supervisor if not claimed by intended individual

Components
(1) Cloud-Based Maintenance Management Software
(1) Downloadable Smart Phone App for interaction with maintenance management software

(1) PC with access to Internet

Unlock the future of visualization with SIMATIC WinCC Unified: your solution to overcoming modern challenges in machine and plant operation visualization in the digital age. Experience cutting-edge hardware, software, and web technologies, all seamlessly integrated in the TIA Portal. Achieve the performance and flexibility to realize your visualization solutions as you envision them.
WinCC software would meet the requirements for C-211

WinCC software on two computer in the classroom
$10,000

OR:

Igears' Squeaks software probably about the same price. We prefer the Igears' squeaks because the Amatrol curriculum is written around it.
$7,267
Please see the attached quote in the depository "Norco College_KES16427_AMA 33999_032024_jr.pdf"

C-216 Robot systems integration 1 credential need to make or buy the following:

Workcell Components

(3) Parts Bins, for placement of cylindrical and rectangular parts
(1) Set of Cylindrical Parts, for pickup by the robot. Parts should be capable of being fed by one of the

two gravity feeders.
Version 2
Date 1-19-2022
(1) Set of rectangular parts, for pickup by the robot. Parts should all be same size with several parts

having a hole drilled halfway through and several having a hole drilled completely through. These parts

should be able be fed to robot by one of the two gravity feeders.
(2) Gravity Feeders with limit switches, to feed rectangular and cylindrical parts to robot with limit

switch to sense when feeder is empty.
(1) Push button and indicator light, to enable an input and an output to be wired to robot's digital

inputs.
(1) Pallet Fixture, at least a 4x4 matrix that have recessed locations to locate rectangular parts

(1) Inspection Station with Limit Switch, a fixture with a recessed location for holding rectangular parts

placed by the robot. The station should have a limit switch to sense presence and fixtures to hold an

inductive sensor.
(1) Assembly Fixture, must have a Powered Pneumatic Clamp that can hold a cylindrical or rectangular

part placed in fixture by robot. The fixture must have a 24 VDC solenoid valve that can be connected to

be wired to a robot digital output to operate the clamp.
(1) Inductive Sensor, with mounting for inspection station, 24 VDC signal output compatible with digital

inputs of robot.

SACA C-102 Certified Industry 4.0 Associate-Advanced Operations Credential
Note: This equipment is required to support the C-101 standards and the associated Gold certification

assessment. Some of the equipment required for this credential is common to certain SACA Specialist

credentials. The component details for this equipment can be found in the Required Equipment document

for each specialist credential listed in parentheses. The components for equipment which is not in

common to any specialist credentials are detailed in this document.
Equipment Required Common to Specialist Credentials

(1) Ethernet Network System (same as C-212 requirement)

To be able to teach and give Gold certification in C-102 and C-212 we will need a managed switch. A managed switch is about $900.00 from Siemens

6GK52080BA002AC2 | 6GK52080BA002AC2
SCALANCE XC208 manageable Layer 2 IE switch; IEC 62443-4-2 certified; 8x 10/100 Mbit/s RJ45 ports; 1x console port; diagnostics LED; redundant power supply; temperature range -40 °C to +70 °C; assembly: DIN rail/S7 mounting rail/wall Office redundancy functions features (RSTP, VLAN,...); PROFINET IO device Ethernet/IP-compliant C-plug slot;

OR:

Allen Bradley's 1783-BMS10CGP switch Stratix 5700
PLC - Ethernet Switch; Managed Switch; 6-Port; RJ45 Copper; 12-48 VDC
Mfr: ALLEN-BRADLEY/ROCKWELL AUTOMATION UPC: 88673997339 Catalog #: 1783-BMS06SL Item #: AB 1783-BMS06SL
$1,163.00
We prefer the Allen Bradley since the curriculum from Amatrol is written around it.
https://royalriv.portalced.com/Product/AB/1783-BMS06SA/

During our industry advisory the advisory approved this certificate so we have industry approval for this certificate and the items shown above.

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According to Chat GPT after searching for how is preventative maintenance used in industrial automation. According to this search having the content of the C-211 course is critical for preventative maintenance:

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costly disruptions.

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Overall, industry certification serves as a valuable credential that validates students' skills, enhances their employability, and opens doors to career advancement opportunities. By completing training programs that lead to industry certifications, students can position themselves for success in their chosen fields and achieve their professional goals.

$ Amount Requested
12,500
Resource Type
ITEM: Equipment, Services, Software, Furniture
Please summarize how this request supports one or more EMP Goals, Equity goals, your program plans or goals, and/or is supported by outcomes assessment data.

This helps the college with the following goals along with the reasons why:

Goal 2:
2025 Objective 2.2 Increase number of certificates completely by 15% annually
We don't have a certificate at the college, we have most of the equipment for teaching this certificate already, and we and the industry advisory believe that this would be an excellent certificate.
The SACA concepts have been well vetted in other states and a student with this certificate will be able to find a job anywhere. Every single topic and test question within the SACA curriculum has been tested and evaluated by industry.

2030 Goal 3: (equity) close all student equity gaps
According to ChatGDT: Training in industrial robotics can help close equity gaps in several ways:
1. **Job Opportunities:** Providing training in industrial robotics creates opportunities for individuals from diverse backgrounds to enter high-demand fields. By equipping marginalized communities with the skills needed for these roles, it helps address unemployment and underemployment disparities.
2. **Skill Development:** Access to training in industrial robotics enhances the skill set of individuals, enabling them to compete for well-paying jobs in the technology sector. This, in turn, can uplift communities that have historically faced economic challenges.
3. **Income Equality:** Closing the skills gap by providing training in industrial robotics can lead to higher wages for individuals from underserved communities. Increasing income equality is essential for reducing socioeconomic disparities.
4. **Innovation and Entrepreneurship:** Training in industrial robotics can inspire innovation and entrepreneurship within underserved communities. Individuals who receive this training may develop new ideas, products, or services, contributing to economic growth and empowerment.
5. **Diversity in the Workforce:** Encouraging diversity in the field of industrial robotics through targeted training programs can foster a more inclusive workforce. Diverse perspectives often lead to more creative solutions and better decision-making, benefiting both companies and society as a whole.
Overall, investing in training for industrial robotics can play a significant role in promoting equity by providing access to lucrative career opportunities and fostering economic empowerment within marginalized communities.

2025 Objective 7.2 Develop Career & Technical Education programs and industry credentials related to regional needs
As stated during our industry advisory many industries in our area are using robotics to help move product and create need parts.

This request for my area is Priority #:
1
Is this request
New

CMM machine for MAN 35, MAN 36, MAN 56, and ENE 52

Resource Year
2024 - 2027
What resources do we already have?
The current CMM machine is very old and needs service and repair and is no longer usable

What resources do you need?

Manufacturers require more reporting, traceability, and continuity of data than ever before. Intelligent 3D CAD models are now the standard design authority in manufacturing and continue the digital thread throughout the manufacturing.
Verisurf metrology software lets you see the difference between the
nominal CAD design and finished machine part in real-time. Perfect for fast, in-process first article or automated production inspection that improves your manufacturing enterprise.
Quickly learned by new users thanks to intuitive user interface with rich visual experience.
Automate quality processes with repeatable measurement plans for any portable, manual or programable CMM.

Teach programs or create them from CAD for measurable reduction in programming time and process execution.

Integrating a Coordinate Measuring Machine (CMM) into your classroom can offer several benefits for students studying machining and related disciplines:

1. Hands-on Learning: A CMM provides students with hands-on experience in dimensional metrology and quality control. Students can learn how to use advanced measurement techniques and equipment to inspect machined parts and components accurately.
2. Real-world Application: Many industries, including aerospace, automotive, medical devices, and manufacturing, use CMMs for quality assurance and inspection purposes. By incorporating a CMM into your classroom, students gain practical skills and knowledge that are directly applicable to industry settings.
3. Enhance Problem-Solving Skills: Working with a CMM requires students to analyze measurement data, interpret geometric tolerances, and troubleshoot measurement discrepancies. This process helps students develop critical thinking and problem-solving skills essential for success in machining and engineering careers.
4. Quality Assurance Training: Understanding quality assurance principles and practices is crucial in machining and manufacturing. With a CMM in the classroom, students can learn how to perform accurate measurements, assess part conformity to specifications, and identify defects or deviations from design tolerances.
5. Exposure to Advanced Technology: CMMs utilize advanced technology, such as precision sensors, software algorithms, and computer-aided design (CAD) integration. Exposing students to this cutting-edge technology prepares them for the use of sophisticated equipment and tools in modern manufacturing environments.
6. Career Readiness: Proficiency in operating a CMM enhances students' employability and career prospects in the machining and manufacturing industries. Employers value candidates with hands-on experience in metrology and quality control, making students more competitive in the job market.
7. Interdisciplinary Learning: Integrating a CMM into the classroom encourages interdisciplinary learning by combining principles of machining, engineering, mathematics, and computer science. Students can explore the intersection of these disciplines while gaining practical skills in measurement and inspection.
8. Research and Innovation: Students can use the CMM for research projects, experiments, and innovation challenges. They can explore topics such as metrology optimization, measurement uncertainty analysis, and advanced inspection techniques, fostering creativity and innovation in machining and engineering fields.

Overall, incorporating a CMM into your classroom enriches the learning experience, equips students with valuable skills, and prepares them for successful careers in machining, manufacturing, and related industries.

During our industry advisory the advisory approved this certificate so we have industry approval for the items shown above.

$ Amount Requested
32,000
Resource Type
ITEM: Equipment, Services, Software, Furniture
Please summarize how this request supports one or more EMP Goals, Equity goals, your program plans or goals, and/or is supported by outcomes assessment data.

2025 Objective 7.2 Develop Career & Technical Education programs and industry credentials related to regional needs

Training students in Coordinate Measuring Machine (CMM) operations can benefit local industries in several ways:

1. Skilled Workforce: By providing training in CMM, local industries can develop a pool of skilled workers proficient in using this advanced measurement technology. These trained individuals can then fill critical roles within manufacturing and engineering sectors, ensuring a steady supply of qualified talent.

2. Quality Assurance: CMM is crucial for quality assurance in manufacturing processes. Training students in CMM operations equips them with the skills to accurately measure and inspect machined components, ensuring products meet precise specifications and standards. This ultimately leads to improved product quality and customer satisfaction for local industries.

3. Efficiency and Productivity: Utilizing CMM technology enables industries to streamline inspection processes, leading to increased efficiency and productivity. Trained students can contribute to reducing inspection times, minimizing errors, and optimizing production workflows, ultimately resulting in cost savings for local industries.

4. Competitiveness: Local industries that invest in CMM training for students gain a competitive advantage in the marketplace. By maintaining high-quality standards and efficiency levels, they can compete effectively with both domestic and international competitors, attracting more business and driving economic growth in the region.

5. Innovation: Training students in CMM operations fosters innovation within local industries. As they become proficient in using this advanced measurement technology, they may discover new ways to improve manufacturing processes, develop innovative products, or optimize quality control methods, contributing to the industry's overall growth and advancement.

In summary, training students in CMM helps local industries by supplying a skilled workforce, enhancing quality assurance practices, improving efficiency and productivity, increasing competitiveness, and fostering innovation. These benefits contribute to the industry's sustainability and growth, ultimately benefiting the local economy.

Please refer to the COE employment projections for machining in the document repository under the folder that I created "3-19-2024". Please note that the machining industry has an annual job opening rating of 829/year which is an increase of 2%. It should also be noted that the median hourly earnings for students is $17.50-29.48. Having a CMM helps students better prepare for work in the machining industry. It helps them reverse engineer and measure parts. Currently, we are having problems with measuring whether or not our parts are flat. A CMM machine would better help our students prepare for industry. It is important to have a CMM machine in our classes including the ENE 52 -- Geometric dimensioning and tolerancing class for the following reasons:

Having a Coordinate Measuring Machine (CMM) can greatly enhance students' learning experience in a geometric dimensioning class in several ways:

1. Practical Application: CMMs provide students with hands-on experience in measuring and inspecting geometric features on real-world parts. This practical application reinforces theoretical concepts learned in the classroom, making them more tangible and easier to understand.

2. Precision Measurement: CMMs are highly accurate and precise measuring instruments, allowing students to explore the importance of precise measurements in geometric dimensioning. They can see firsthand how small variations in measurements can impact the functionality and quality of a part.

3. Visualization of Geometric Tolerances: CMM software often includes visualization tools that display geometric tolerances and deviations graphically. This helps students visualize how geometric tolerances are applied to parts and understand the relationship between design specifications and actual measurements.

4. Problem-solving Skills: Using a CMM to measure and inspect parts requires critical thinking and problem-solving skills. Students must analyze measurement data, identify deviations from design specifications, and determine

appropriate corrective actions. This process helps develop students' analytical skills and prepares them for real-world engineering challenges.

5. Industry-Relevant Skills: Many industries, such as manufacturing, automotive, aerospace, and healthcare, rely on CMMs for quality control and inspection. By learning how to use a CMM in a geometric dimensioning class, students gain valuable skills that are directly applicable to careers in these industries.

Overall, incorporating a CMM into a geometric dimensioning class enriches the learning experience, enhances students' understanding of geometric tolerancing principles, and prepares them for success in the workforce.

This request for my area is Priority #:
4

Is this request
New

Fix the Haas simulators and have the battery's replaced.

Resource Year
2024 - 2027

What resources do we already have?
About 12 simulators about 6 of them need to have their battery's replaced

What resources do you need?
The total cost for repairing all six simulators is $3408.00, excluding taxes

$ Amount Requested
3,408

Resource Type
ITEM: Equipment, Services, Software, Furniture

Please summarize how this request supports one or more EMP Goals, Equity goals, your program plans or goals, and/or is supported by outcomes assessment data.

Since the batteries are deed in many of these simulators they are basically boat anchors in other words they are just taking up space.

Please refer to the COE employment projections for machining in the document repository under the folder that I created "3-19-2024". Please note that the machining industry has an annual job opening rating of 829/year which is an increase of 2%. It should also be noted that the median hourly earnings for students is $17.50-29.48. Having a working simulators for the MAN 57 course helps students better prepare for work in the machining industry. It helps them reverse engineer and measure parts. Currently, we are having problems with measuring whether or not our parts are flat. A CMM machine would better help our students prepare for industry. It is important to have a CMM machine in our classes including the ENE 52 -- Geometric dimensioning and tolerancing class for the following reasons:

According to ChatGPT simulating CNC (Computer Numerical Control) operations is essential for CNC training for several reasons:

1. **Safety:** Simulating CNC operations allows students to learn and practice programming and machining techniques in a safe virtual environment without the risk of damaging machinery or causing accidents. It provides a risk-free way for students to experiment and learn without real-world consequences.

2. **Cost-effectiveness:** CNC machines are expensive to operate and maintain. By simulating CNC operations, students can gain proficiency in programming and machining without consuming costly materials or machine time. This reduces training expenses and maximizes the efficient use of resources.

3. **Skill Development:** Simulating CNC operations allows students to develop a deep understanding of CNC programming, tool paths, and machining processes. They can experiment with different parameters, tooling strategies, and machining sequences to optimize performance and achieve desired outcomes.

4. **Feedback and Analysis:** Simulated CNC software often provides real-time feedback and analysis of machining operations. Students can visualize tool paths, check for collisions, and identify potential errors before executing the program on an actual CNC machine. This feedback loop helps students refine their programming skills and troubleshoot issues effectively.

5. **Accessibility:** CNC simulation software is often more accessible than actual CNC machines, allowing students to practice programming and machining techniques outside of the traditional classroom or workshop setting. They can access simulation tools remotely, enabling flexible learning opportunities and self-paced skill development.

6. **Versatility:** CNC simulation software can simulate a wide range of machining processes and machine types, allowing students to gain experience with various CNC applications, such as milling, turning, drilling, and multi-axis machining. This versatility prepares students for diverse manufacturing environments and career pathways.

In summary, simulating CNC operations is integral to CNC training as it provides a safe, cost-effective, and versatile learning environment for students to develop programming skills, experiment with machining techniques, receive feedback and analysis, and ultimately, become proficient CNC machinists or programmers.

This request for my area is Priority #:
1

Is this request
New

Skill boss trainer

Resource Year
2024 - 2027

What resources do we already have?
We already have one Skill boss trainer.

What resources do you need?
We are having problems with students completing the SCA/MSSC (Manufacturing Skill Standards Council) certificates because we only have one skill boss trainer. MSSC is the leading certifying body for the nation's front-line manufacturing production and supply chain logistics technicians.

Please see the quote in the document repository: "Norco College_KES16419_AMA Skill Boss SF_031924_jr.pdf"

$ Amount Requested
30,268

Resource Type
ITEM: Equipment, Services, Software, Furniture

Please summarize how this request supports one or more EMP Goals, Equity goals, your program plans or goals, and/or is supported by outcomes assessment data.
Having enough access for the amount of students in the classroom.

This helps the college with the following goals along with the reasons why:

Goal 2:
2025 Objective 2.2 Increase number of certificates completely by 15% annually
We don't have a certificate at the college, we have most of the equipment for teaching this certificate already, and we and the industry advisory believe that this would be an excellent certificate.
The SACA concepts have been well vetted in other states and a student with this certificate will be able to find a job anywhere. Every single topic and test question within the SACA curriculum has been tested and evaluated by industry.

2030 Goal 3: (equity) close all student equity gaps
According to ChatGDT: Training in industrial robotics can help close equity gaps in several ways:
1. **Job Opportunities:** Providing training in industrial robotics creates opportunities for individuals from diverse backgrounds to enter high-demand fields. By equipping marginalized communities with the skills needed for these roles, it helps address unemployment and underemployment disparities.
2. **Skill Development:** Access to training in industrial robotics enhances the skill set of individuals, enabling them to compete for well-paying jobs in the technology sector. This, in turn, can uplift communities that have historically faced economic challenges.
3. **Income Equality:** Closing the skills gap by providing training in industrial robotics can lead to higher wages for individuals from underserved communities. Increasing income equality is essential for reducing socioeconomic disparities.
4. **Innovation and Entrepreneurship:** Training in industrial robotics can inspire innovation and entrepreneurship within underserved communities. Individuals who receive this training may develop new ideas, products, or services, contributing to economic growth and empowerment.
5. **Diversity in the Workforce:** Encouraging diversity in the field of industrial robotics through targeted training programs can foster a more inclusive workforce. Diverse perspectives often lead to more creative solutions and better decision-making, benefiting both companies and society as a whole.
Overall, investing in training for industrial robotics can play a significant role in promoting equity by providing access to lucrative career opportunities and fostering economic empowerment within marginalized communities.

2025 Objective 7.2 Develop Career & Technical Education programs and industry credentials related to regional needs
As stated during our industry advisory many industries in our area are using robotics to help move product and create need parts.

This request for my area is Priority #:

5

Is this request
New

Purchase more Allen Bradley L16 PLC

Resource Year
2024 - 2027

What resources do we already have?
We currently have 12 of the Allen Bradley L16 PLCs

What resources do you need?
We need 12 more Allen Bradley L16 PLCs. Currently, we are trying to teach the MAN 64 class and it is confusing for the students to have multiple different types of PLCs in the classroom. Allen Bradley is used more in our local industry then the Siemens PLCs. We need to be able to give the students one type of PLC so they can all work on the same PLCs

PLC - Logic Controller; Standard Controller; 0.375 MB; 24 VDC; 24 VDC
Mfr: ALLEN-BRADLEY/ROCKWELL AUTOMATION UPC: 61259896864 Catalog #: 1769-L16ER-BB1B Item #: AB 1769-L16ER-BB1B

$ Amount Requested
31,000

Resource Type
ITEM: Equipment, Services, Software, Furniture

Please summarize how this request supports one or more EMP Goals, Equity goals, your program plans or goals, and/or is supported by outcomes assessment data.

Goal 2:
2025 Objective 2.2 Increase number of certificates completely by 15% annually
We don't have a certificate at the college, we have most of the equipment for teaching this certificate already, and we and the industry advisory believe that this would be an excellent certificate.
The SACA concepts have been well vetted in other states and a student with this certificate will be able to find a job anywhere. Every single topic and test question within the SACA curriculum has been tested and evaluated by industry.

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Overall, investing in training for industrial robotics can play a significant role in promoting equity by providing access to lucrative career opportunities and fostering economic empowerment within marginalized communities.

2025 Objective 7.2 Develop Career & Technical Education programs and industry credentials related to regional needs
As stated during our industry advisory many industries in our area are using robotics to help move product and create need parts.

This request for my area is Priority #:
6

Is this request
New

Personal Development EMS and LVSIM EMS/Data Acquisition to PLC Interface Training Pat Uetz

Resource Year
2024 - 2027

What resources do we already have?
We have all the Festo/Labvolt equipment for this training in IT-124 which includes the software, computers, the interface and Trainers.

What resources do you need?
The Personal Development training by Festo through Advanced Technologies. This training is part of PLC interfacing to Labvolt Data Acquisition Modules for Motor Controllers. This is a two day training for Paul VanHulle and Jesus Vela and should be opened up to part time faculty who also teach these courses. They can participate in all or part of this training. Current estimate on file.

$ Amount Requested
6,000

Resource Type

Please summarize how this request supports one or more EMP Goals, Equity goals, your program plans or goals, and/or is supported by outcomes assessment data.
Resource Request Lab Volt Training 2 days by Festo on Campus

2030 Goal 3 (Equity) Close all student equity gaps.
In order to close student equity gaps in earning wages as a technician requires a curriculum that zero's in on job skills that will give them a competitive edge while pursuing employment in a highly competitive environment.
2030 Goal 5 (Workforce and Economic Development) REduce working poverty and the skills gap. This is the bulls eye of what our technical programs teach. Our faculty must have the tools (training) to give state of the art skills using today's technology. Data Acquisition and PLC interfacing is one of the many important skills that students must learn and so they will not be left behind in the skills arena.
2030 Goal 7 (Programs) Become the regional college of choice by offering a comprehensive range of programs that prepare students for the future and meet employer workforce needs. The current increasing trend of Norco College technical programs will continue as we provide the best technical education in the Inland Empire. The Data Acquisition and PLC interfacing is on the cutting edge.

This request for my area is Priority #:
1

Is this request
New

Resource Request

What resources do we already have?

So far, Gil, Claude and I (Paul Van Hulle) have gained the following certifications through SACA. It should be noted that Gold certifications in SACA requires the hands-on workshops that I am hoping to attend in December. I am also working hard to gain the written certifications so that I can gain gold certifications. We have also been working hard with a few high school teachers to help them gain certifications.

Paul Van Hulle has completed the following certifications:

Certified Industry 4.0 Operations Specialist Micro-Credentials

Certified Industry 4.0 Robotics Specialist Micro-Credentials

Gold certification: C-101 - Certified Industry 4.0 Associate - Basic Operations

Gold certification: C-102 - Certified Industry 4.0 Associate - Advanced Operations

Gold certification: C-103 - Certified Industry 4.0 Associate - Robot System Operations

Gold certification: C-201 - Electrical Systems 1

Gold certification: C-202 - Electric Motor Control Systems 1

Silver certification: C-203 - Variable Frequency Drive Systems 1

Gold certification: C-205 - Sensor Logic Systems 1

Gold certification: C-207 - Programmable Controller Systems 1

Silver certification: C-208 - Programmable Controller Troubleshooting 1

Gold certification: C-209 - Pneumatic Systems 1

Silver certification: C-211 - Industry 4.0 Total Productive Maintenance Management

Gold certification: C-212 - Ethernet Communications 1

Gold certification: C-215 - Robotic Operations 1

Gold certification: C-216 - Robotic Systems 1

Silver certification: C-255 - Hydraulic Systems 1

Faculty Professional Development Requests

Gil Vela has completed the following certifications:

Certified Industry 4.0 Electrical Systems Specialist Micro-Credentials

Gold certification: C-101 - Certified Industry 4.0 Associate - Basic Operations

Gold certification: C-201 - Electrical Systems 1

Gold certification: C-202 - Electric Motor Control Systems 1

Gold certification: C-203 - Variable Frequency Drive Systems 1

Gold certification: C-204 - Motor Control Troubleshooting 1

Gold certification: C-205 - Sensor Logic Systems 1

Gold certification: C-206 - Electrical System Installation 1

Gold certification: C-208 - Programmable Controller Troubleshooting 1

Silver certification: C-211 - Industry 4.0 Total Productive Maintenance Management

Claude has completed the following certifications:

Gold certification: C-201 - Electrical Systems 1

Silver certification: C-202 - Electric Motor Control Systems 1

Silver certification: C-203 - Variable Frequency Drive Systems 1

Silver certification: C-204 - Motor Control Troubleshooting 1

Silver certification: C-205 - Sensor Logic Systems 1

Silver certification: C-206 - Electrical System Installation 1

Potential Funding Source(s)

CTE: Perkins (VTEA)

What resources do you need?

We are pushing forward three new programs that will be known as automation technician 1-3. These programs have significant industry certification developed by saca.org and amatrol.com. Amatrol helped developed the equipment for teaching the certification and Saca developed the test questions and assessments for the certification. The certifications for both the instructors and the students involve two steps. One is the silver certification and the other is the gold certification. Last summer Gil and I went to the

Faculty Professional Development Requests

Amatrol plant to get certification in many different subjects including robotics, programmable logic controllers, wiring, motor starters, electronics, and much more. We really hit it out of the park for our students and can give great certifications that students and industry are proud of but more needs to be done. The college will be proud of this too because of how the certifications look on resumes and the value industry and our students get out of the certifications. These industry certifications are not easy for the students to complete but once completed the students know that they have learned a lot and can get earn great preparation for their careers.

We need to gain certification in maintenance techniques, hydraulics, and mechanical drive systems. We are proposing that we spend another one to two weeks at the Amatrol plant. December 15-21, 2024. They have a class on mechanical drive systems class that I would like to attend. We need to gain more certifications and training on equipment to be able to teach the automation technician programs required by our industry.
The certifications I hope to gain include:

- C-203 AC variable frequency drives course
- C-210 Mechanical power systems
- C-211 Industry 4.0 Total Productive Maintenance Management
- C-255 Hydraulic Systems 1
- C-256 Hydraulic Maintenance 1

The actual dates of the workshop is December 16-20 and I hope to be able to bookend the trip with travel to the event since it takes a day of flying to get there

2025 Objective 9.1 Plan and advocate for the funding augmentations needed to meet staff requirements to achieve the vision for a more comprehensive college.

Referring to the success and retention rates for MAN and SCA in the document repository (power bi data 3-19-2024) we need to grow this program. We need to fucus on retaining students, helping them specify their educational plan and encouraging them to finish the program. We believe and have already seen that students are addicted to gain more industry certifications. They state that it looks good on their resume and they want to continue with completing more industry certifications.

According to ChatGPt, industry certification can greatly benefit students completing training in several ways:

1. **Validation of Skills:** Industry certifications provide external validation of students' skills and knowledge in a particular field or technology. Achieving a certification demonstrates to employers that students have mastered the necessary competencies to perform specific job roles effectively.

2. **Enhanced Employability:** Holding industry certifications can significantly enhance students' employability and competitiveness in the job market. Many employers value certifications as evidence of a candidate's expertise and may prioritize candidates who hold relevant certifications during the hiring process.

3. **Career Advancement:** Industry certifications can open doors to new career opportunities and advancement within a chosen field. They may qualify students for higher-level positions, promotions, or salary increases, as they demonstrate a commitment to professional development and ongoing learning.

4. **Standardized Training:** Certification programs often follow standardized curricula and assessments developed by industry experts. This ensures that students receive high-quality training that aligns with industry standards and best practices, preparing them for real-world challenges and scenarios.

5. **Access to Resources and Networking:** Certification programs often provide access to resources such as study materials, practice exams, and networking opportunities with other professionals in the field. This support can help students prepare for certification exams more effectively and stay connected with industry peers and mentors.

6. **Confidence and Recognition:** Achieving an industry certification can boost students' confidence in their abilities and provide a sense of accomplishment. It also earns them recognition within their industry or

profession, enhancing their reputation and credibility among colleagues and peers.

Overall, industry certification serves as a valuable credential that validates students' skills, enhances their employability, and opens doors to career advancement opportunities. By completing training programs that lead to industry certifications, students can position themselves for success in their chosen fields and achieve their professional goals.

Request related to EMP goal or Assessment?

EMP Goal 4

$ Amount Requested

4,785

Resource Type

FACULTY: Professional Development

The evidence to support this request can be found in:

Program Review: Curriculum,Program/Unit Goals

This request for my area is Priority #:

1

Professional Development Activity Funding Request Application

Attendee and Activity Information

Has this professional development request been discussed and approved by your department chair?

Yes

Date of Request

12/15/2024

Activity Date(s)

12/15/2024 -- 12/20/2024

Attendee Name

Paul Van Hulle

Position

Full-time Faculty

Discipline

AT&A

Name of Activity and Organization/Sponsor

Amatrol and SACA.org

Link to Activity Website

https://www.saca.org/certified-instructor-training/

Instructors attending one of these week-long workshops can earn one or multiple SACA gold credentials, which in turn grants them the ability to proctor other SACA credential candidates – including other instructors – for Gold credentials at their organization.

Faculty Professional Development Requests

These initial workshops will be held at the national authorized SACA Training and Assessment Center, but will soon be available at SACA-authorized Regional Teacher Training Centers.

Please Note: These workshops are not for training, but for assessments to certify instructors on 20 different SACA Gold credentials, so attendees must be prepared for assessment prior to attending these workshops (see requirements below).

Prerequisites:

- **SACA Silver Certified**: Instructors attending a SACA Gold Certification Workshop must possess SACA Silver Certifications in the credentials for which they plan to be assessed at the workshop. Silver Certifications can be taken online.
- **Hands-On Skills**: Instructors attending a SACA Gold Certification Workshop must possess the ability to complete hands-on skills in the credential areas for which they wish to be certified.
- The workshop requires a fee of **$2,485.00** for each attendee.

Register Now!

- SACA Gold Certification Workshop -Level 2 December 26–29, 2023
- SACA Gold Certification Workshop February 5-9, 2024
- SACA Gold Certification Workshop April 8-12, 2024
- SACA Gold Certification Workshop September 9-13, 2024
- SACA Gold Certification Workshop December 16-20, 2024

Location

Out-of-state

City, State

Jeffersonville, IN

Have you sought any other co-sponsorship (other internal and/or external funding)?

No

If yes, list source and total dollar amount.

Estimated Costs ($)

Registration

2,485

What is included with Registration?

Lunches during the conference, the hotel will take care of transportation

Air Travel or Mileage (65.5 cents/mile)

900

Hotel (tax included)

1,512

Airport Parking

100

Faculty Professional Development Requests

Ground Transportation

Meals ($75/day maximum)

420

Hotel Parking

0

Incidentals

Total Costs

5,425

Justification for Funding Request

Select the categories of professional development that best support your request. (Check all that apply)

Maintenance of current academic/technical knowledge & skills

Briefly describe the objective of the activity and how it will benefit you and the work you do for the college. If this activity aligns with the objectives of any special programs, grants, or plans (e.g., Equity, AB 705, Guided Pathways, STEM, etc.) please explain.

We are pushing forward three new programs that will be known as automation technician 1-3. These programs have significant industry certification developed by saca.org and amatrol.com. Amatrol helped developed the equipment for teaching the certification and Saca developed the test questions and assessments for the certification. The certifications for both the instructors and the students involve two steps. One is the silver certification and the other is the gold certification. Last summer Gil and I went to the Amatrol plant to get certification in many different subjects including robotics, programmable logic controllers, wiring, motor starters, electronics, and much more. We really hit it out of the park for our students and can give great certifications that students and industry are proud of but more needs to be done. The college will be proud of this too because of how the certifications look on resumes and the value industry and our students get out of the certifications. These industry certifications are not easy for the students to complete but once completed the students know that they have learned a lot and can get earn great preparation for their careers.

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- C-255 Hydraulic Systems 1
- C-256 Hydraulic Maintenance 1

The actual dates of the workshop is December 16-20 and I hope to be able to bookend the trip with travel to the event since it takes a day of flying to get there

How do you plan to share the information gained from the activity to your department/division? See "Dissemination Plan Ideas" document for ways to disseminate information and check all that apply.

Provide adjunct training,Change something in your classroom

Faculty Professional Development Requests

Briefly explain your selection above.

Since our previous SACA training we are working hard to provide all of our faculty and students training and certification through SACA certifications. SACA has motived students and faculty alike to improve their understanding of automation and to gain certifications.

Is there anything else you would like to add?

With this training and the equipment request we plan on creating the following college certificates:

Create the following courses and certificates within 5 years based on the SACA.org certificates if we can get the equipment to teach each of these courses:

Certified Industry 4.0 Robotics Specialist:

C-101 Associate-Basic Operations -- MAN 10 -- Units: 4

C-102 Industry 4.0 Advanced Operations -- MAN 11 -- Units: 4

C-103 Robot System Operations -- MAN 12 -- Units: 4

C-215 Robot System Operations 1 -- MAN 13 -- Units: 3

C-216 Robot Systems Integration 1 -- MAN 14 -- Units: 3

C-211 Industry 4.0 Total Productive Maintenance -- MAN 15 -- Units: 3

Certified Industry 4.0 Electro-Fluid Power Systems Specialist:

C-101 Associate-Basic Operations -- MAN 10 -- Units: 4

C-255 Hydraulic Systems 1 -- MAN 20 -- Units: 3

C-209 Pneumatic Systems 1 -- MAN 21 -- Units: 4

C-256 Hydraulic Maintenance -- MAN 22 -- Units: 2

C-304 Pneumatic Troubleshooting 1 -- MAN 23 -- Units: 3

C-355 Hydraulics Troubleshooting 1 -- MAN 24 -- Units: 3

Certified Industry 4.0 Control Systems Specialist

C-101 Associate-Basic Operations -- MAN 10 -- Units: 4

C-201 Electrical Systems 1 -- MAN 25 -- Units: 3

C-202 Electric Motor Control Systems 1 -- MAN 26 -- Units: 3

C-203 Variable Frequency Drive Systems 1 -- MAN 27 -- Units: 3

C-204 Motor Control Troubleshooting 1 -- MAN 28 -- Units: 3

C-205 Sensor Logic Systems 1 -- MAN 29 -- Units: 3

Faculty Professional Development Requests

C-207 Programmable Controller Systems 1 -- MAN 32 -- Units: 3

C-208 Programmable Controller Troubleshooting 1 -- MAN 33 -- Units: 4

C-211 Industry 4.0 Total Productive Maintenance -- MAN 15 -- Units: 3

Certified Industry 4.0 Mechanical Systems Specialist

C-101 Associate-Basic Operations -- MAN 10 -- Units: 4

C-210 Mechanical Power Systems I -- MAN 16 -- Units: 3

C-301 Mechanical Power Systems 2 -- MAN 17 -- Units: 3

C-302 Laser Shaft Alignment 1 -- MAN 18 -- Units: 2

C-211 Industry 4.0 Total Productive Maintenance -- MAN 15 -- Units: 3

Certified Industry 4.0 Operations Specialist

C-101 Associate-Basic Operations -- MAN 10 -- Units: 4

C-102 Associate-Advanced Operations -- MAN 11 -- Units: 4

C-103 Robot System Operations -- MAN 12 -- Units: 4

C-211 Industry 4.0 Total Productive Maintenance -- MAN 15 -- Units: 3

Approve and Submit

Proof of approval is uploaded, ready to submit?

Please upload proof of approval for travel from your department chair or Dean.

For Administrative Use Only

Funding Status

Notes

Faculty Hiring Resource Requests

2024 - 2027

Program Review Reflections

What would make program review meaningful and relevant for your unit?

None

What questions do we need to ask to understand your program plans, goals, needs?

None

What types of data do you need to support your program plans, goals, needs?

None

If there are any supporting documents you would like to attach, please attach them here.

Submission

All parts of my Program Review have been completed and it is ready for review.

Yes

Discipline - Level: MAN, SCA

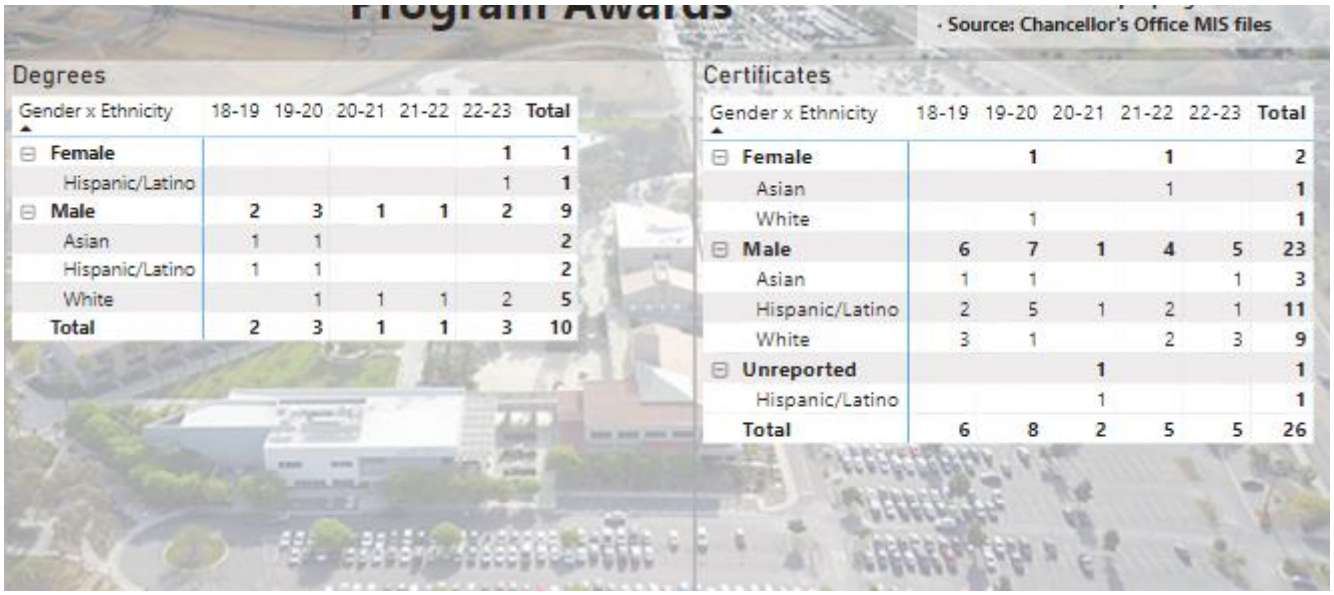
Gender	Enrolled	Retained	Retention Rate	DI	Close Gap
Female	**148**	**118**	**79.7%**	**1**	**10**
African American	16	9	56.3%	1	5
Asian	13	12	92.3%	0	0
Hispanic	78	66	84.6%	0	1
Pacific Islander	Masked Data			0	
White	35	25	71.4%	0	6
Two or More	Masked Data			0	
Unknown	Masked Data			0	
Male	**1,072**	**926**	**86.4%**	**0**	**0**
African American	56	46	82.1%	0	2
Asian	72	67	93.1%	0	0
Hispanic	668	572	85.6%	0	0
Native American	Masked Data			0	
Pacific Islander	Masked Data			0	
White	252	221	87.7%	0	0
Two or More	17	15	88.2%	0	0
Unknown	Masked Data			0	
Unknown	**Masked Data**			**0**	
Hispanic	Masked Data			0	
White	Masked Data			0	
Total	**1,224**	**1,047**	**85.5%**	**0**	**0**

er teaches the course(s) or there were < 10 enrollments in a student group based on
ot show in screenshots but are included in table if you scroll down

Program of study and Student Educational Plan
Industrial automation
Manufacturing Technology: Industrial Automation
Manufacturing: Computer Aided production …

Gender by Ethnicity	2019-20	2020-21	2021-22	2022-23
Female	**4**	**3**	**1**	**2**
Asian				2
Hispanic	4	3	1	
Male	**47**	**23**	**24**	**37**
African-American	2		1	
Asian	2	2	2	1
Hispanic	29	17	20	29
Pacific Islander	1			
Two or More		1		
Unreported	1			
White	12	3	1	7
Unreported	**1**			
White	1			
Total	**52**	**26**	**25**	**39**

Program Awards
Industrial automation
Computer Numerical Control



Degrees

Gender x Ethnicity	18-19	19-20	20-21	21-22	22-23	Total
Female					1	1
Hispanic/Latino					1	1
Male	2	3	1	1	2	9
Asian	1	1				2
Hispanic/Latino	1	1				2
White		1	1	1	2	5
Total	2	3	1	1	3	10

Certificates

Gender x Ethnicity	18-19	19-20	20-21	21-22	22-23	Total
Female		1		1		2
Asian				1		1
White		1				1
Male	6	7	1	4	5	23
Asian	1	1			1	3
Hispanic/Latino	2	5	1	2	1	11
White	3	1		2	3	9
Unreported			1			1
Hispanic/Latino			1			1
Total	6	8	2	5	5	26

KLEIN
Educational Systems

2851 Spafford Street
Davis, CA 95618
1-800-698-3249

QUOTE

Quote# KES16427

Quotation for:
Norco College
Paul Van Hulle
Norco, CA 92860

Date Quoted : 03/20/2024
Expiry Date : 04/22/2024
Sales Manager : Joe Ray

Item & Description	Qty	Unit Cost	Total Cost
33999 Visual Communications Kit for 95-MSB2AB Required for 95-MSB2AB to operate optional Smart Factory skill. Not required if customer has already purchased software in 87-TVC or 87-VC. Includes: (1) 21002 IGEAR Squeaks Software; (1) 87-CLD1 Cloud Hosting; (1) Unmanaged Ethernet Switch; (1) S34101 Supplemental Disk.	1	6,651.00	6,651.00

Sub Total	6,651.00
City of Norco Sales Tax (8.75%)	581.96
Estimated Freight	35.00
Delivered Total	**$7,267.96**

Klein Educational Systems, Inc.
Email Purchase Orders to **orders@kleineducational.com** or fax to **888-503-3108**
2851 Spafford Street Davis, CA 95618 Toll Free: 800-698-3249
Prices Valid for 30 Days Terms Net 30 Days Estimated Delivery TBD

KLEIN
Educational Systems

2851 Spafford Street
Davis, CA 95618
1-800-698-3249

QUOTE

Quote# KES16419

Quotation for:
Norco College
Paul Van Hulle
Norco, CA 92860

Date Quoted : 03/19/2024
Expiry Date : 04/19/2024
Sales Manager : Joe Ray

Amatrol Skill Boss Smart Factory

Item & Description	Qty	Unit Cost	Total Cost
95-MSB2AB Skill Boss Smart Factory - Allen-Bradley Either 95-MSB1 or 95-MSB2AB is required for MSSC's CPT+ Certification to assess manufacturing skills in the fields of Safety, Quality, Production Processes, and Maintenance Awareness. Requires 120V /60Hz/1ph electrical, 33934 Hand Tool Package, and compressed air. Recommended 82-610 Mobile Technology Workstation or equivalent. If not used in conjunction with I4F program, recommended 33999 Visual Communications Kit to perform optional Smart Factory Skill. Includes: (1) Operator Station, (1) Parts Feeder, (1) Aluminum Work Surface with Handles, (1) Pick and Place Robotic System, (1) D34101 Maintenance and Operation Manual, (1) K34101 Instructor's Resource PCD.	1	25,020.00	25,020.00
33934 Hand Tool Package - Skill Boss Manufacturing Required for 95-MSB1 and 95-MSB2AB. Includes: Mini Grease Gun, Assorted Wrenches, Hose Cutter, Shim Kit, Screwdrivers, Dial Indicator, Tension Tester, Level, Rule, Extension Bar, Ruler, Micrometer, Tape Measure, Feeler Gauge, Dial Calipers, and Multimeter.	1	1,825.00	1,825.00

Sub Total	26,845.00
City of Norco Sales Tax (8.75%)	2,348.94
Estimated Freight	1,074.00
Delivered Total	**$30,267.94**

KLEIN
Educational Systems
2851 Spafford Street
Davis, CA 95618
1-800-698-3249

QUOTE

Quote# KES11686

Quotation for:
Norco College
Jesus (Gil) Vela
Norco, CA 92860

Date Quoted : 09/15/2023
Expiry Date : 10/15/2023
Sales Manager : Joe Ray

Quotation for Amatrol Portable Learning Systems

Item & Description	Qty	Unit Cost	Total Cost
990-PABCL1F Portable PLC Troubleshooting Learning System - AB CompactLogix Requires 82-8RSM Studio 5000 Mini for education or 82-8RSMI for all other organizations, PC, 100-240V/50-60Hz/1ph electrical, and compressed air. Recommended 82-610 Mobile Technology Workstation. For PC requirements, see amatrol.com/support. Also requires a router if using more than one 990-PABCL1F on the same network. Includes: (1) Allen-Bradley L16 Processor; (1) Fault Insertion System and Software; (16) 24 VDC Digital Inputs; Digital Outputs; (1) HMI Panel; (1) 24VDC Power Supply; (1) Built-in Power Supply; (1) I/O Simulator Console; (1) Application Panel; (1) Mobile Carrying Case with Workstation Mounting Panel; (1) USB Cable; (1) N40087 Student Curriculum - Interactive PC-Based Multimedia; (1) C40087 Instructor's Guide; (1) K40087 Instructor's Resource Print CD; (1) S40087 Supplemental Disk; (1) D40087 Installation Guide; (1) H40087 Student Reference.	1	14,936.00	14,936.00
Customer to provide compressed air			
82-8RSM Studio 5000 Mini PLC Programming Software - 1 Seat License, EDUCATION ONLY Available exclusively to secondary and post-secondary educational organizations. Studio 5000 Logix Designer software for A-B CompactLogix PLC's to allow off-line/on-line programming of ladder diagrams. For PC requirements, see amatrol.com/support. Includes: (1) Seat License.	1	820.00	820.00
990-PAB53AF Portable PLC Troubleshooting Learning System - AB CompactLogix L16 Requires 82-8RSM Studio 5000 Mini and 82-711 FactoryTalk View Studio ME for education or 82-8RSMI and 82-711I for all other organizations, PC, and 100-240V/50-60Hz/1ph electrical. Recommended 82-610 Mobile Technology Workstation. For PC requirements, see amatrol.com/support. Also requires a router if using more than one 990-PAB53AF on the same network. Includes: (1) Allen-Bradley AB5300 L16 Processor; (1) Fault Insertion	1	19,793.00	19,793.00

Item & Description	Qty	Unit Cost	Total Cost
System and Software; (16) 24VDC Digital Inputs; (16) Digital Outputs; (4) 10V Analog Inputs; (2) 10V Analog Outputs; (1) PanelView Plus Compact HMI Panel; (1) 5-Port Ethernet Connection; (1) 24VDC Power Supply; (1) Built-in Power Supply; (1) I/O Simulator Console; (1) Temperature Control Application; (1) Variable Speed Drive Application; (1) Reversing Contactor Application; (1) Stepper Motor Control Application; (1) Portable Console; (1) 40079 USB Cable; (1) M40085 & M40086 Student Curriculum - Interactive PC-Based Multimedia; (1) C40085 & C40086 Instructor's Guide; (1) K40085 & K40086 Instructor's Resource Print CD; (1) S40085 & S40086 Supplemental Disks; (1) D40085 & D40086 Installation Guide; (1) D40261 RSLinx Installation Guide; (1) H19732, H19734, & H40086 Student Reference.			
82-8RSM Studio 5000 Mini PLC Programming Software - 1 Seat License, EDUCATION ONLY Available exclusively to secondary and post-secondary educational organizations. Studio 5000 Logix Designer software for A-B CompactLogix PLC's to allow off-line/on-line programming of ladder diagrams. For PC requirements, see amatrol.com/support. Includes: (1) Seat License.	1	820.00	820.00
82-711 FactoryTalk View ME Programming Software - 1 Seat License, EDUCATION Available exclusively to secondary and post-secondary educational organizations. Used to develop application programs for the PanelView Plus 1000 terminal. For PC requirements, see amatrol.com/support. Includes: (1) Seat License FactoryTalk View Studio for Machine Edition.	1	1,311.00	1,311.00
990-DRV1F Portable AC Variable Frequency Drives Troubleshooting Learning System Requires 120V/60Hz/1ph and PC. For PC requirements, see amatrol.com/support. Recommended table 82-610 Mobile Technology Workstation or equivalent. Includes: (1) Portable Console; (1) Allen-Bradley PowerFlex 4 Drive, Interface, and Test Panel; (1) 3-Phase Motor, Flywheel, and Test Panel; (1) Speed Command Input Voltmeter; (1) Speed Command Potentiometer; (1) PLC Discrete I/O Interface; (1) Standard Banana Lead Set; (1) Fault Insertion System and Software; (1) M11135 and M11153 Student Curriculum - Interactive PC-Based Multimedia; (1) C11135 and C11153 Instructor's Guides; (1) K11135 and K11153 Instructor's Resource Print CDs; (1) D11135 and D11153 Installation Guides; (1) H11135 and H11153 Student Reference Guides.	1	13,887.00	13,887.00
990-MC1FSL Portable Electric Motor Control Troubleshooting Learning System (Sheathed Banana Leads) Requires 208V/60Hz/3ph electrical and PC. (Optional 16880 cable for 240V/60Hz/3ph Delta configuration available.) For PC requirements, see amatrol.com/support. Recommended table 82-610 Mobile Technology Workstation or equivalent. Includes: (1) Portable Console; (1) AC 3-Phase Motor; (2) Control Relays; (1) Timer Relay; (1) Reversing Motor Starter; (1) Manual Motor	1	16,342.00	16,342.00

Item & Description	Qty	Unit Cost	Total Cost
Starter; (1) Overload Relay Section; (1) Drum Switch; (1) Operator Inputs Station; (1) Liquid Level Switch; (1) Pressure Switch; (1) Limit Switch; (1) Regular Banana Lead Set; (3) Indicator Lamps; (1) Multimeter; (1) Lockout/Tagout Kit; (1) Fault Insertion System and Software; (1) M11134 and M11152 Student Curriculum - Interactive PC-Based Multimedia; (1) C11134 and C11152 Instructor's Guide; (1) K11134 and K11152 Instructor's Resource Print CD; (1) D11134 and D11152 Installation Guide; (1) H11134 and H11152 Student Reference Guides.			
990-ACDC1 Portable AC / DC Electrical Learning System Requires 100-240V/50-60Hz/1ph electrical and PC. For PC requirements, see amatrol.com/support. Recommended table 82-610 Mobile Technology Workstation or equivalent. Optional 23150 Spare Parts kit available. Includes: (1) Portable Console; (1) Power Cord; (1) Output Component Set; (1) Input Component Set; (1) Transformer Module; (1) Capacitor /Inductor Set; (1) Digital Multimeter; (1) Fuse Puller and Fuses; (1) Neon Circuit Tester; (1) M11133 Student Curriculum - Interactive PC-Based Multimedia; (1) C11133 Instructor's Guide; (1) K11133 Instructor's Resource Print CD; (1) D11133 Installation Guide; (1) H11133 Student Reference Guide.	1	9,557.00	9,557.00
990-PN1 Portable Pneumatic Learning System Requires compressed air supply, 41221 Hand Tool Package, and PC. Recommended table 82-610 Mobile Technology Workstation or equivalent. For PC requirements, see amatrol.com/support. Includes: (1) Portable Console; (1) Rotameter, (2) Double-Acting Cylinders, (1) Single-Acting Cylinder; (5) DCVs; (1) Loose Components Kit; (1) Hose Kit; (1) M11139 Student Curriculum - Interactive PC-Based Multimedia; (1) C11139 Instructor's Guide; (1) K11139 Instructor's Resource Print CD; (1) D11139 Installation Guide; (1) H11139 Student Reference Guide.	1	11,116.00	11,116.00
41221 Hand Tool Package - Pneumatic Systems Required for 85-IP, 950-PT1, 990-PN1 and 96-PNE2. Includes: (1) 16" Hand Box, (1) Strap Wrench; (1) Combination Wrench; (1) Screwdriver Set, (1) Feeler Gauge; (1) Grease; (1) Magnifier; (1) Oil; (1) Pick Set; (1) Can; (1) Spanner Wrench; (1) Tweezers, (1) Adjustable Wrench; (1) Syringe.	1	865.00	865.00
990-MC1FSL Portable Electric Motor Control Troubleshooting Learning System (Sheathed Banana Leads) Requires 208V/60Hz/3ph electrical and PC. (Optional 16880 cable for 240V/60Hz/3ph Delta configuration available.) For PC requirements, see amatrol.com/support. Recommended table 82-610 Mobile Technology Workstation or equivalent. Includes: (1) Portable Console; (1) AC 3-Phase Motor; (2) Control Relays; (1) Timer Relay; (1) Reversing Motor Starter; (1) Manual Motor Starter; (1) Overload Relay Section; (1) Drum Switch; (1) Operator Inputs Station; (1) Liquid Level Switch; (1) Pressure Switch; (1) Limit Switch; (1)	1	16,342.00	16,342.00

Item & Description	Qty	Unit Cost	Total Cost
Regular Banana Lead Set; (3) Indicator Lamps; (1) Multimeter; (1) Lockout/Tagout Kit; (1) Fault Insertion System and Software; (1) M11134 and M11152 Student Curriculum - Interactive PC-Based Multimedia; (1) C11134 and C11152 Instructor's Guide; (1) K11134 and K11152 Instructor's Resource Print CD; (1) D11134 and D11152 Installation Guide; (1) H11134 and H11152 Student Reference Guides.			
INST1 On Site Installation & Product Orientation 1 Day On Site KES requires written site readiness confirmation prior to installation. The technician shall assemble, connect and ready the system for use. The customer shall be expected to supply all utilities and connections to the machines; truck unloading, uncrating and location of all shipments to room where system is to be set up; and assistance to the KES technician, when necessary, for lifting of equipment. IF needed, the customer shall be required to provide local network access, passcodes, etc or to have the school IT manager present. Does not include installation or configuration of non KES supplied equipment, electrical work, removal or relocation of existing Non-KES equipment/ furniture, or removal of packaging debris.	1	1,800.00	1,800.00

Sub Total	107,589.00
City of Norco Sales Tax (8.75%)	9,256.54
Estimated Freight	3,702.62
Delivered Total	**$120,548.16**

Klein Educational Systems, Inc.
Email Purchase Orders to **debra@kleineducational.com** or fax to **888-503-3108**
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Industrial Maintenance and Automation

Inland Empire/Desert Region (Riverside and San Bernardino counties)

Summary

3 Community College Programs

1) Electro-Mechanical Technology (TOP 0935.00)
2) Industrial Systems Technology and Maintenance (0945.00)
3) Manufacturing and Industrial Technology (0956.00)

Provides training for

3 Community College-level Industrial Maintenance and Automation Occupations

1) Electro-Mechanical and Mechatronics Technologists and Technicians (SOC 17-3024)
2) Industrial Engineering Technologists and Technicians (17-3026)
3) Industrial Machinery Mechanics (49-9041)

Over the next five years (2022-2027), employment for community college-level industrial automation and maintenance occupations is projected to

Increase Employment by 13%

434 Annual Job Openings

Median Hourly Earnings Between **$29.05 to $29.86** Above the $21.82 Hourly Living Wage Standard

34 Total Annual Average Awards
In Industrial Maintenance and Automation Programs

34 Program Awards from Community College Programs

0 Program Awards from Other Postsecondary Education Providers

The Inland Empire/Desert Centers of Excellence

Recommends

Industrial Maintenance and Automation Program Expansion to meet the need for more workers in the region

Introduction

This labor market assessment provides occupational demand, earnings, and postsecondary program outcomes related to industrial maintenance and automation programs and occupations. The California Community College programs closely aligned to industrial maintenance and automation training are:

1. Electro-Mechanical Technology (TOP 0935.00)
2. Industrial Systems Technology and Maintenance (0945.00)
3. Manufacturing and Industrial Technology (0956.00)

The knowledge, skills, and abilities trained by these industrial maintenance and automation programs lead to employment in the following occupations, further referred to as the industrial maintenance and automation occupational group:

1. Electro-Mechanical and Mechatronics Technologists and Technicians (SOC 17-3024)
2. Industrial Engineering Technologists and Technicians (17-3026)
3. Industrial Machinery Mechanics (49-9041)

Definitions for this report's industrial maintenance and automation community college programs and occupations are available in the Appendix section.

Job Counts and Projections

In 2022, the region had 3,654 combined industrial maintenance and automation occupational jobs. Over the next five years, regional employment for this group is projected to have 434 annual job openings, increasing employment by 13% through 2027. Most jobs and job openings in this group are for industrial machinery mechanics occupations. Exhibit 1 displays the job counts, five-year projected job growth, job openings, and the share of incumbent workers aged 55 years and older in the region.

Exhibit 1. Five-year projections for the industrial maintenance and automation occupational group, Inland Empire/Desert Region, 2022-2027

Industrial Maintenance and Automation Occupational Group	2022 Jobs	2027 Jobs	5-Yr Job Change	5-Yr % Job Growth	Annual Openings (New + Replacement Jobs)	% of workers age 55+
Industrial Machinery Mechanics	3,429	3,862	433	13%	403	32%
Industrial Engineering Technologists and Technicians	155	181	26	17%	22	30%
Electro-Mechanical and Mechatronics Technologists and Technicians	70	77	7	10%	9	36%
Total	**3,654**	**4,120**	**466**	**13%**	**434**	**32%**

Source: Lightcast 2023.3

A search of regional online job advertisements (ads) for industrial maintenance and automation jobs was

conducted to reveal local employer demand for this classification of workers, including job ad duration, earnings information, employer names, and in-demand skills. Over the last twelve months, from September 2022 through August 2023, 1,013 regional job ads were posted for jobs in this occupational group. Too few job ads (7) for electrical and electronics repairers, commercial and industrial equipment were found to provide generalizable job ad data. However, this does not necessarily indicate a lack of demand for these workers since employers may fill these jobs through other methods or hire multiple workers from a single job ad.

On average, employers kept online job ads for industrial maintenance and automation jobs open for 31 days. The average regional online job ad is open for 29 days. This may indicate that employers spend slightly more time filling industrial maintenance and automation jobs than all other jobs in the region. Exhibit 2 shows the number of job ads posted and the median posting duration over the last twelve months.

Exhibit 2. Industrial maintenance and automation occupational group online job ads and time to fill, Inland Empire/Desert Region, September 2022 through August 2023

Industrial Maintenance and Automation Occupational Group	Unique Job Ads	Median Posting Duration (Days)
Industrial Engineering Technologists and Technicians	821	31
Industrial Machinery Mechanics	185	31
Electrical and Electronics Repairers, Commercial and Industrial Equipment	7	N/A
Total	**1,013**	**31**

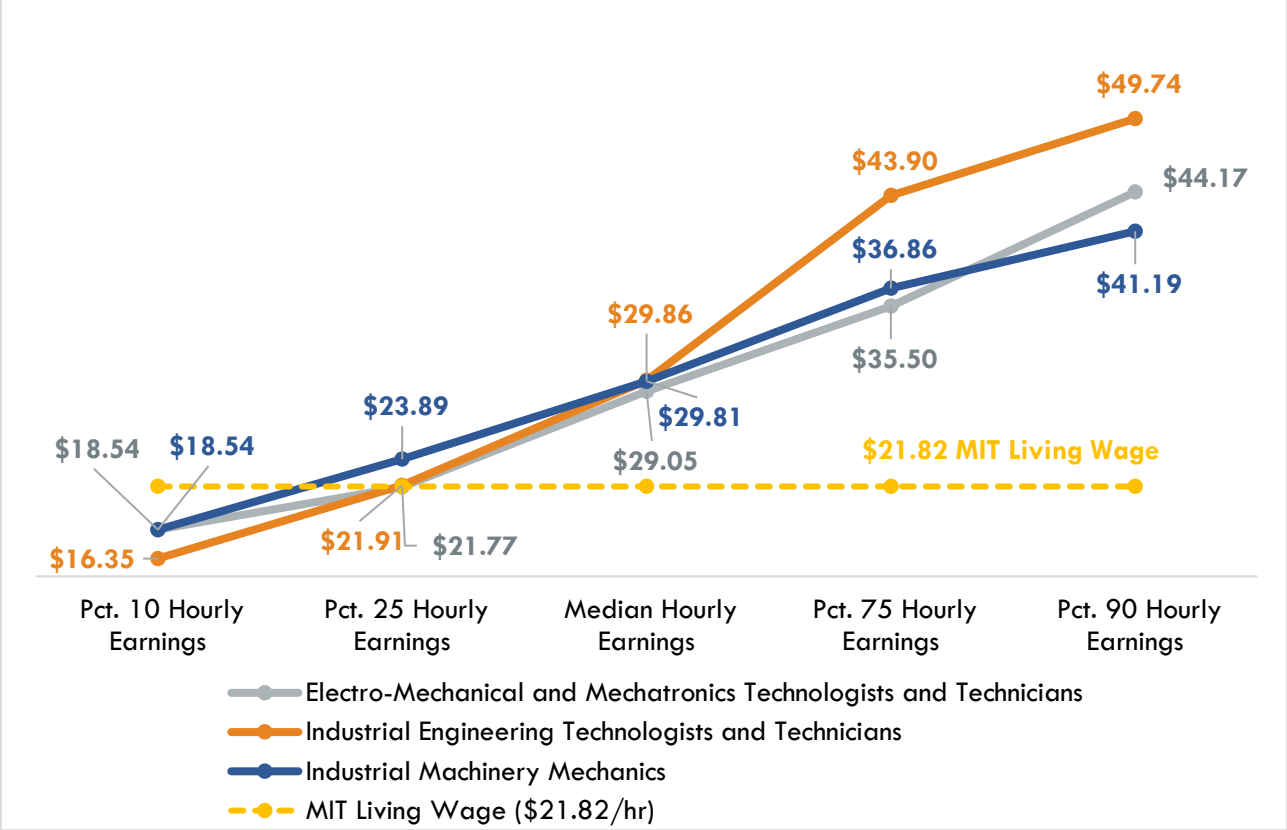
Source: Lightcast 2023.3

Earnings

Community colleges should ensure their training programs lead to employment opportunities that provide a living wage. The MIT living wage calculator estimates that an individual must earn $21.82 per hour or $45,386 annually to be self-sufficient in California (Glasmeier, 2022).

Exhibit 3 displays the hourly earnings for the industrial automation occupational group. The 25th percentile hourly earnings for two of the three industrial automation group jobs exceed the living wage standard, with one job, electro-mechanical and mechatronics technologist and technicians falling just short of the standard. The median earnings for all occupations in this group exceed the living wage standard.

Exhibit 3. Hourly earnings by percentile for the industrial automation and maintenance occupational group, Inland Empire/Desert Region, 2022

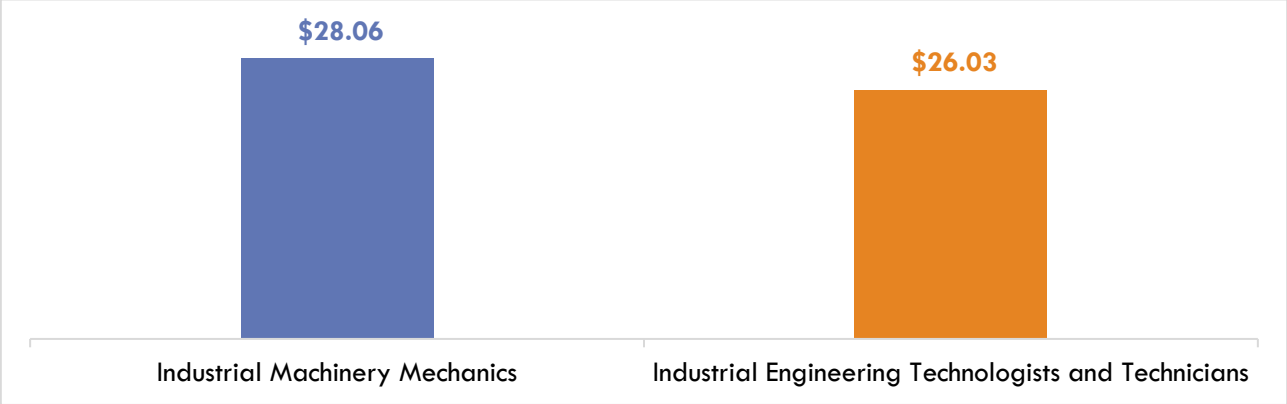


Source: Lightcast 2023.3

Advertised Salary from Online Job Ads

Exhibit 4 displays the regional median advertised salaries for industrial automation and maintenance workers over the last 12 months. Online job ad salary information reveals that employers are willing to pay jobs in this occupational group a median hourly rate between $26.03 and $28.06, above the $21.82 hourly living wage standard. Median hourly online job ad data was unavailable for the electrical and electronics repairers, commercial and industrial equipment occupation.

Exhibit 4. Online advertised hourly salary for the industrial maintenance and automation occupational group, Inland Empire/Desert Region, September 2022 through August 2023



Source: Lightcast 2023.3

Online Job Advertisement: Job Titles, Employers, Skills, Education, and Work Experience

Exhibit 5 displays the job titles most frequently used in job ads for the industrial maintenance and automation occupational group over the last 12 months. Displaying advertised job titles may provide insight into the types of positions sought by employers posting ads. The most frequently requested job title for the industrial machinery mechanics occupation was "maintenance mechanics." "Maintenance technicians" was the most frequently requested job title for the industrial engineering technologists and technicians industrial engineering technologists and technicians occupation.

Exhibit 5. Job titles most frequently used in industrial maintenance and automation job ads, Inland Empire/Desert Region, September 2022 through August 2023

Industrial Maintenance and Automation Occupational Group	
Industrial Machinery Mechanics Job Titles	**Unique Job Ads**
Maintenance Mechanics	84
Mechanics	26
Industrial Maintenance Mechanics	7
OTHER Industrial Machinery Mechanics Job Titles	68
Industrial Engineering Technologists and Technicians Job Titles	**Unique Job Ads**
Maintenance Technicians	349
Maintenance Workers	49
Industrial Maintenance Technicians	36
Manufacturing Technicians	27
Lead Maintenance Technicians	21
General Maintenance Technicians	13
Facility Maintenance Helpers	13

Industrial Maintenance and Automation Occupational Group	
Industrial Machinery Mechanics Job Titles	**Unique Job Ads**
OTHER Industrial Engineering Technologists and Technicians Job Titles	313
Electrical and Electronics Repairers, Commercial and Industrial Equipment Job Titles	**Unique Job Ads**
N/A	

Source: Lightcast 2023.3

Exhibit 6 displays the employers posting the most job ads for the industrial automation occupational group during the last 12 months. Showing employer names provides insight into where students may find employment after completing a program. Anheuser-Busch posted the most job ads for the industrial machinery mechanics occupation. Cushman & Wakefield, and FedEx posted the most job ads seeking industrial engineering technologists and technicians industrial engineering technologists and technicians workers.

Exhibit 6. Employers posting the most job ads for the industrial maintenance and automation occupational group, Inland Empire/Desert Region, September 2022 through August 2023

Industrial Machinery Mechanics Employers	**Unique Job Ads**
Anheuser-Busch	22
BlueTriton Brands	8
Niagara Bottling	7
Industrial Engineering Technologists and Technicians Employers	**Unique Job Ads**
Cushman & Wakefield	21
FedEx	21
Flag Solutions	16
Burrtec	16
CalPortland	13
Harbor Freight Tools	11
Electrical and Electronics Repairers, Commercial and Industrial Equipment Employers	**Unique Job Ads**
N/A	

Source: Lightcast 2023.3

Exhibit 7 lists a sample of specialized and employability skills employers seek when seeking workers to fill industrial automation positions. Specialized skills are occupation-specific skills that employers request for industry or job competency. Common skills are foundational skills that transcend industries and occupations; this category is often referred to as "soft skills." The skills requested in job ads may be utilized to guide curriculum development.

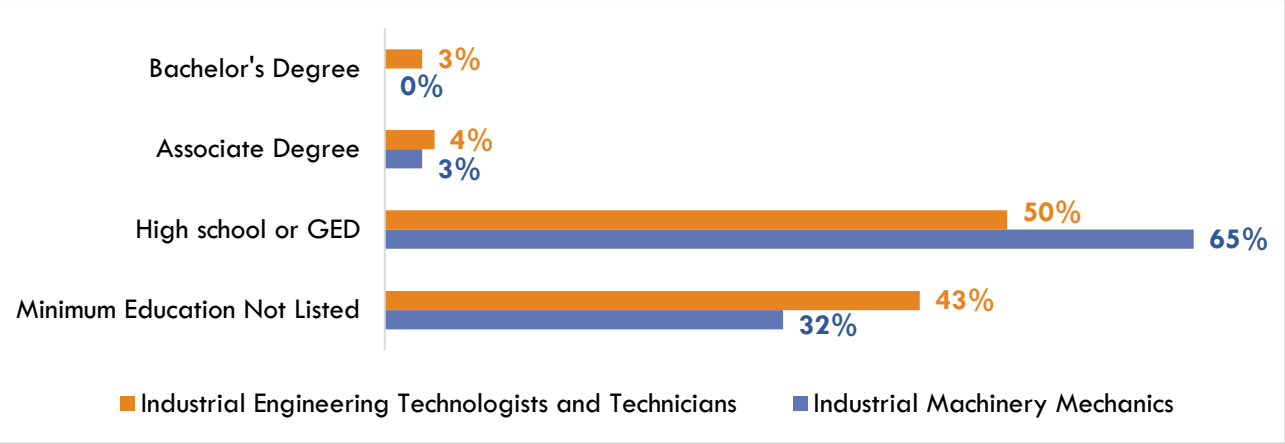
Exhibit 7. Sample of in-demand skills from online job ads for the industrial maintenance and automation occupational group, Inland Empire/Desert Region, September 2022 through August 2023

Occupation	Specialized skills	Common skills
Industrial Machinery Mechanics	• Machinery • Preventive Maintenance • Hydraulics • Lock Out/Tag Out • Welding • Equipment Repair	• Troubleshooting (Problem-Solving) • Communications • Lifting Ability • Packaging and Labeling • Operations • Microsoft Excel • Detail Oriented
Industrial Engineering Technologists and Technicians	• Machinery • Preventive Maintenance • Blueprinting • Programmable Logistics Controllers • Material Handling Equipment • Power Tool Operation • Industrial Repair and Maintenance	• Troubleshooting (Problem-Solving) • Communications • Management • Operations • Lifting Ability
Electrical and Electronics Repairers, Commercial and Industrial Equipment	• N/A	• N/A

Source: Lightcast 2023.3

Exhibit 8 displays the minimum advertised education requirements for the industrial maintenance and automation occupational group. More than half of employers sought workers with at least a high school diploma or GED. A notable share of employers did not list a minimum education requirement.

Exhibit 8. Minimum advertised education requirements from online job ads for the industrial maintenance and automation occupational group, Inland Empire/Desert Region, September 2022 through August 2023

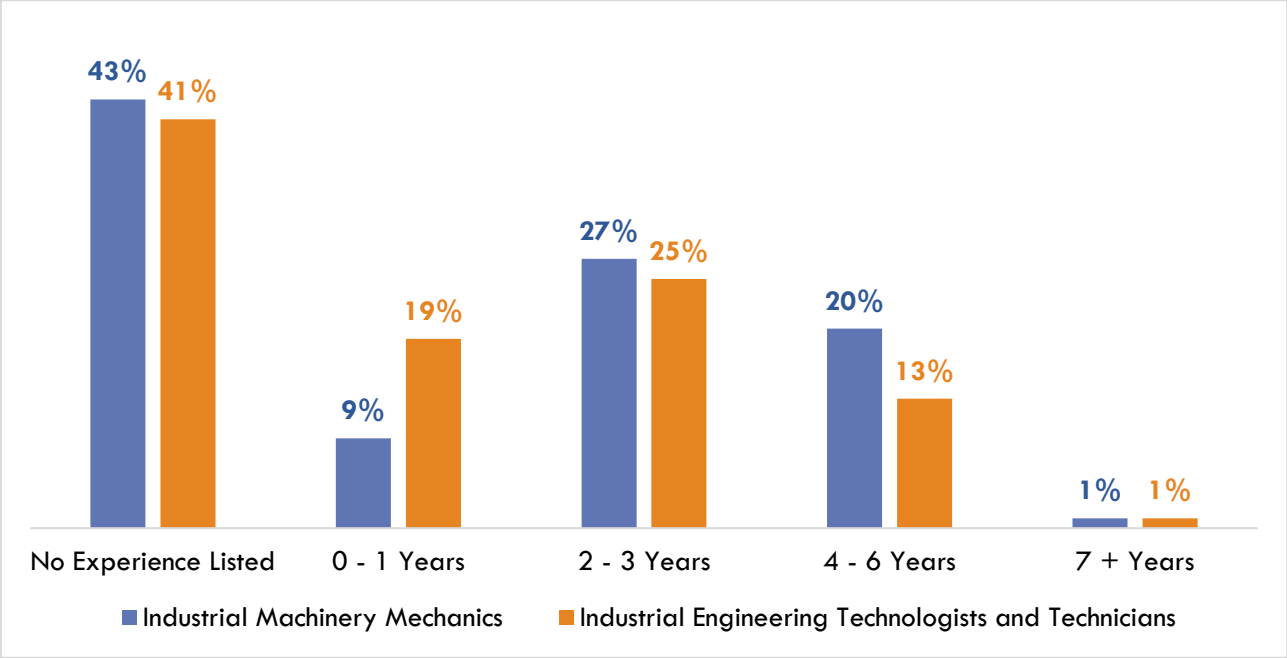


Source: Lightcast 2023.3

Exhibit 9 displays the work experience typically required for the industrial maintenance and automation occupational group. More than 40% of employers did not list previous work experience requirements for this

classification of worker. Of employers that did require work experience, many were seeking workers with three or fewer years.

Exhibit 9. Online job ad work experience requirements for the industrial maintenance and automation occupational group, Inland Empire/Desert Region, September 2022 through August 2023



Source: Lightcast 2023.3

Student Completions and Programs Outcomes

Four regional community colleges offer three TOP program codes related to industrial maintenance and automation program training. Exhibit 10 displays the programs offered at each college, their local program title, and the award type offered by these programs.

Exhibit 10: Industrial maintenance and automation programs, Inland Empire/Desert Region, 2022-23 academic year

TOP Program (TOP Code)	College	Local Program Title	Award
Electro-Mechanical Technology (0935.00)	Chaffey	Mechatronics	A.S. Degree
		Mechatronics Level I	Certificate
		Mechatronics Level II	Certificate
		Electromechanical Technology	Certificate
Industrial System Technology and Maintenance (0945.00)	Barstow	Industrial Maintenance Electrical and Instrumentation	Associate Degree
		Industrial Maintenance Mechanic	Associate Degree/Certificate
		Industrial Maintenance Mechanic, Level 2	Certificate
		Industrial Maintenance Mechanic Technology, Level 3	Certificate
		Trade Technician	Noncredit
	San Bernardino Valley	Industrial Automation	Certificate
		Industrial Maintenance	Certificate
		Mechanical Hydraulics/Pneumatics	Certificate
Manufacturing and Industrial Technology (0956.00)	Norco	Industrial Automation	Associate Degree/Certificate
		Industrial Automation Non-Credit	Noncredit
		Supply Chain Automation	Associate Degree/Certificate
		Supply Chain Technology	Associate Degree/Certificate
		Manufacturing Tech-Automated Systems	Associate Degree/Certificate
	San Bernardino Valley	Computer Numerical Control - CAD & CAM	Associate Degree/Certificate

Source: COCI, 2022-23 Community College Catalogs

Exhibits 11 – 13 display student completions for electro-mechanical technology (TOP 0935.00), industrial systems technology and maintenance (0945.00), and manufacturing and industrial technology (0956.00) programs related to industrial maintenance and automation programs over the last three academic years, 2019-2022. Over the last three academic years, these programs issued an annual average of 34 awards; 11 awards were associate degrees, and 23 were certificates of achievement. Program completion and student outcome methodologies can be found in the appendix.

Exhibit 11: Annual average community college awards for Electro-Mechanical Technology programs related to industrial automation technology, Inland Empire/Desert Region, Academic Years 2019-2022

TOP 0935.00 - Electro-Mechanical Technology	Academic Year 2019-20	Academic Year 2020-21	Academic Year 2021-22	Total CC Annual Average Awards, Academic Years 2019-22
Chaffey				
Associate Degree	-	-	3	1
Certificate 16 < 30-semester units	-	2	1	1
Certificate 8 < 16-semester units	-	2	2	1
Total	**-**	**4**	**6**	**3**

Source: COE Supply Resource, May 2023

Exhibit 12: Annual average community college awards for industrial systems technology and maintenance programs related to industrial automation technology, Inland Empire/Desert Region, Academic Years 2019-2022

TOP 0945.00 – Industrial Systems Technology and Maintenance	Academic Year 2019-20	Academic Year 2020-21	Academic Year 2021-22	Total CC Annual Average Awards, Academic Years 2019-22
Barstow				
Associate Degree	10	9	3	7
Certificate 30 < 60-semester units	9	4	-	4
Certificate 16 < 30-semester units	-	5	4	3
Certificate 8 < 16-semester units	-	2	5	2
Certificate 6 < 18-semester units	-	-	4	1
Noncredit award 144 < 192 hours	-	-	2	1
San Bernardino Valley				
Certificate 30 < 60-semester units	-	1	1	1
Total	**19**	**21**	**19**	**20**

Source: COE Supply Resource, May 2023

Exhibit 13: Annual average community college awards for manufacturing and industrial technology programs related to industrial automation technology, Inland Empire/Desert Region, Academic Years 2019-2022

TOP 0956.00 – Manufacturing and Industrial Technology	Academic Year 2019-20	Academic Year 2020-21	Academic Year 2021-22	Total CC Annual Average Awards, Academic Years 2019-22
Norco				
Associate Degree	2	3	-	2
Certificate 16 < 30-semester units	10	4	2	5
Certificate 6 < 18-semester units	3	1	2	2
San Bernardino				
Associate Degree	1	-	2	1
Certificate 30 < 60-semester units	1	-	1	1

TOP 0956.00 – Manufacturing and Industrial Technology	Academic Year 2019-20	Academic Year 2020-21	Academic Year 2021-22	Total CC Annual Average Awards, Academic Years 2019-22
Total	**17**	**8**	**7**	**11**

Source: COE Supply Resource, May 2023

Other postsecondary institutions may utilize a variety of program codes for programs that prepare students for industrial automation technology employment. Industrial automation technology CIP codes include electromechanical/ electromechanical engineering technology/technician (15.0403), robotics technology/technician (15.0405), and industrial electronics technology/technician (47.0105). Other regional postsecondary institutions did not issue awards in programs related to industrial automation technology over the last three academic years.

Summary of Findings & Recommendation

The knowledge, skills, and abilities trained by three industrial maintenance and automation-related community college programs leads to three middle-skill occupations. These three occupations are projected to have 434 annual job openings, increasing employment by 13% over the next five years. The median hourly earnings for these occupations are between $29.05 and $29.86, above the regional living wage standard of $21.82 per hour.

Four regional community colleges offer three TOP program codes related to industrial maintenance and automation program training: electro-mechanical technology (0935.00), industrial systems technology and maintenance (0945.00), and manufacturing and industrial technology (0956.00). Over the last three academic years (2019-2022), these programs issued an annual average of 34 awards: 11 associate degrees and 23 certificates of achievement. Other regional postsecondary education institutions have not issued any known awards in related programs over the previous three academic years.

The Centers of Excellence recommends expanding industrial maintenance and automation programs to meet the regional demand for more workers in this field. Colleges considering this program should partner with relevant employers and confirm their demand for workers and the skills students need to secure work and self-sustainable earings in this field shortly after exiting the program.

Contact
Michael Goss
Paul Vaccher
Centers of Excellence, Inland Empire/Desert Region
michael.goss@chaffey.edu
September 2023

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Appendix: Community College Program and Occupational Definitions

Taxonomy of Program (TOP) and description

Electro-Mechanical Technology (TOP 0935.00): Design, development, testing, and maintenance of electro-mechanical and servo-mechanical devices and systems (Taxonomy of Programs, 2023).

Industrial System Technology and Maintenance (0945.00): Design, construction, maintenance, and operation of mechanical, hydraulic, pneumatic, and electrical equipment and related systems, such as production machinery. Includes building and plant maintenance (Taxonomy of Programs, 2023).

Manufacturing and Industrial Technology (0956.00): Engineering principles and technical skills for the manufacture of products and related industrial processes. Includes shaping and forming operations, materials handling, instrumentation and controls, and quality control. Includes Computer Aided Manufacturing and robotics. Also has optimization theory, industrial and manufacturing planning, and related management skills (Taxonomy of Programs, 2023).

Occupation Definitions* (SOC code), *Education and Training Requirements, Community College Education Attainment

Electro-Mechanical and Mechatronics Technologists and Technicians (SOC 17-3024)

Operate, test, maintain, or adjust unmanned, automated, servomechanical, or electromechanical equipment. May operate unmanned submarines, aircraft, or other equipment to observe or record visual information at sites such as oil rigs, crop fields, buildings, or for similar infrastructure, deep ocean exploration, or hazardous waste removal. May assist engineers in testing and designing robotics equipment.

Sample job titles: Automation Technician (Automation Tech), Electro-Mechanic, Electromechanical Assembler (EM Assembler), Electromechanical Technician (EM Technician), Electronics Technician (Electronics Tech), Mechanical Technician (Mechanical Tech), Process Control Tech, Product Test Specialist, Test Engineering Technician (Test Engineering Tech), Test Technician (Test Tech)

Entry-Level Educational Requirement: Associate degree
Training Requirement: None
Work Experience: None
Percentage of incumbent workers with a Community College Award or Some Postsecondary Coursework: 51%

Industrial Engineering Technologists and Technicians (17-3026)
Apply engineering theory and principles to problems of industrial layout or manufacturing production, usually under the direction of engineering staff. May perform time and motion studies on worker operations in a variety of industries for purposes such as establishing standard production rates or improving efficiency.

Sample of reported job titles: Business Process Analyst, Engineering Technician, Industrial Engineering Analyst, Industrial Engineering Technician, Manufacturing Coordinator, Manufacturing Technology Analyst, Quality Control Engineering Technician (QC Engineering Technician), Quality Management Coordinator, Quality Technician, Service Technician

Entry-Level Educational Requirement: Associate degree
Training Requirement: None
Work Experience: None
Percentage of incumbent workers with a Community College Award or Some Postsecondary Coursework: 51%

Industrial Machinery Mechanics (49-9041)
Repair, install, adjust, or maintain industrial production and processing machinery or refinery and pipeline distribution systems. May also install, dismantle, or move machinery and heavy equipment according to plans.

Sample of reported job titles: Industrial Machinery Mechanic, Industrial Mechanic, Loom Fixer, Loom Technician, Machine Adjuster, Machine Mechanic, Maintenance Technician, Mechanic, Overhauler, Sewing Machine Mechanic

Entry-Level Educational Requirement: High School Diploma
Training Requirement: Long-term
Work Experience: None
Percentage of incumbent workers with a Community College Award or Some Postsecondary Coursework: 41%

Appendix: Methodology

Exhibits 11 - 14 display the average annual California Community College (CCC) awards conferred during the three academic years between 2019 and 2022 from the California Community Colleges Chancellor's Office Management Information Systems (MIS) Data Mart. Awards are the combined total of associate degrees and certificates issued during the timeframe, divided by three in this case to calculate an annual average. This is done to minimize the effect of atypical variations that might be present in a single year.

Community college student outcome information is from LaunchBoard and based on the selected TOP code and region. These metrics are based on records submitted to the California Community Colleges Chancellor's Office Management Information Systems (MIS) by community colleges, which come from self-reported student information from CCC Apply and the National Student Clearinghouse. Employment and earnings metrics are sourced from California's Employment Development Department's Unemployment Insurance database. When available, outcomes for completers are reported to demonstrate the impact that earning a degree or certificate can have on employment and earnings. For more information on the types of students included for each metric, please see the web link for LaunchBoard's Strong Workforce Program Metrics Data Element Dictionary in the References section (LaunchBoard, 2023a). Finally, employment in a job closely related to the field of study comes from self-reported student responses on the CTE Employment Outcomes Survey (CTEOS) administered by Santa Rosa Junior College (LaunchBoard, 2023a).

Job ad data is limited to the information provided by employers and the ability of artificial intelligence search engines to identify this information. Additionally, preliminary calculations by Georgetown Center on Education and the Workforce found that "just 30 to 40 percent of openings for candidates with some college or an associate degree, and only 40 to 60 percent of openings for high school diploma holders appear online" (Carnevale et al., 2014). Online job ads often do not reveal employers' hiring intentions; it is unknown if employers plan to hire one or multiple workers from a single online job ad or collect resumes for future hiring needs. A closed job ad may not be the result of a hired worker.

Table 1. 2022 to 2027 job growth, wages, entry-level education, training, and work experience required for the industrial maintenance and automation occupational group in the Inland Empire/Desert Region (Riverside and San Bernardino Counties combined)

Industrial Maintenance and Automation Occupational Group	2022 Jobs	2027 Jobs	5-Yr Job Change	5-Yr % Job Growth	Annual Openings (New + Replacement Jobs)	Entry-Experienced Hourly Wage (10th to 90th percentile)	Median Hourly Wage (50th percentile)	Median Annual Earnings
Industrial Machinery Mechanics	3,429	3,862	433	13%	403	$18.54 to $41.19	$29.81	$62,000
Industrial Engineering Technologists and Technicians	155	181	26	17%	22	$16.35 to $49.74	$29.86	$62,100
Electro-Mechanical and Mechatronics Technologists and Technicians	70	77	7	10%	9	$18.54 to $44.17	$29.05	$60,400
Total	**3,654**	**4,120**	**466**	**13%**	**434**	**-**	**-**	**-**

Source: Lightcast 2023.3

Industrial Automation Technology

Inland Empire/Desert Region (Riverside and San Bernardino counties)

Summary

Electro-Mechanical Technology
Community College Program
(TOP 0935.00)

Provides training for
2 Community College-level Industrial Automation Technology
Occupations

Over the next five years (2021-2026), employment for community college-level industrial automation occupations is projected to

Increase Employment by
4%

71
Annual Job Openings

10th Percentile Hourly Earnings Between
$22.84 to $25.11
Above the $21.82 Hourly Living Wage Standard

57 Total Annual Awards
In Industrial Automation Technology Programs

57
Program Awards from Community College Programs

0
Program Awards from Other Postsecondary Education Providers

The Inland Empire/Desert Centers of Excellence
Recommends
Industrial Automation Program Expansion to meet the need for more workers in the region

Introduction

This report provides labor market occupational demand and wage research and postsecondary program outcomes related to industrial automation technology. The California Community College program most likely to prepare students for industrial automation technology employment is the electro-mechanical technology (TOP0935.00) program. Electro-mechanical technology programs prepare students for employment through instruction related to the design, development, testing, and maintenance of electro-mechanical and servo-mechanical devices and systems (Taxonomy of Programs, 2012). The knowledge, skills, and abilities trained by electro-mechanical technology programs lead to employment in the following occupations, further referred to as the industrial automation occupational group.

- Electro-Mechanical and Mechatronics Technologists and Technicians (SOC 17-3024)
- Electrical and Electronics Repairers, Commercial and Industrial Equipment (49-2094)

Job Counts and Projections

In 2021, there were 776 jobs in the industrial automation occupational group in the region. Regional employment for the industrial automation occupational group is projected to increase by 4% through 2026; 71 job openings are projected annually. Exhibit 1 displays the job counts, five-year projected job growth, job openings, and the share of incumbent workers aged 55 years and greater in the region.

Exhibit 1. Five-year projections for the industrial automation occupational group, Inland Empire/Desert Region, 2021-2026

Occupation	2021 Jobs	2026 Jobs	5-Yr % Change	5-Yr Openings (New + Replacement Jobs)	Annual Openings (New + Replacement Jobs)	% of workers age 55+
Electrical and Electronics Repairers, Commercial and Industrial Equipment	648	683	5%	294	59	17%
Electro-Mechanical and Mechatronics Technologists and Technicians	127	126	(1%)	59	12	29%
Total	**776**	**810**	**4%**	**354**	**71**	**19%**

Source: Lightcast 2022.4

An online job ad search for jobs in the industrial automation occupational group was conducted to reveal the employers seeking these workers, including the median job advertisement duration, earnings information, and in-demand skills. Over the last twelve months, from February 2022 through January 2023, only 34 job ads were posted for the industrial automation occupational group in the region. The job ad search was expanded to include all industrial automation jobs posted throughout California to ensure that the advertisement information included in this report is reliable and generalizable. Exhibit 2 shows the number of job ads posted over the last twelve months in California and the median posting duration.

On average, employers kept online job ads for electro-mechanical and mechatronics technologists and technicians open for 29 days. The average statewide online job is open for 27 days, indicating that it is slightly more challenging for employers to fill industrial automation positions than other jobs.

Exhibit 2. Job ads and time to fill, California, February 2022 through January 2023

Occupation	Job Ads	Median Posting Duration (Days)
Electro-Mechanical and Mechatronics Technologists and Technicians	265	29
Electrical and Electronics Repairers, Commercial and Industrial Equipment	1	N/A
Total	**266**	**29**

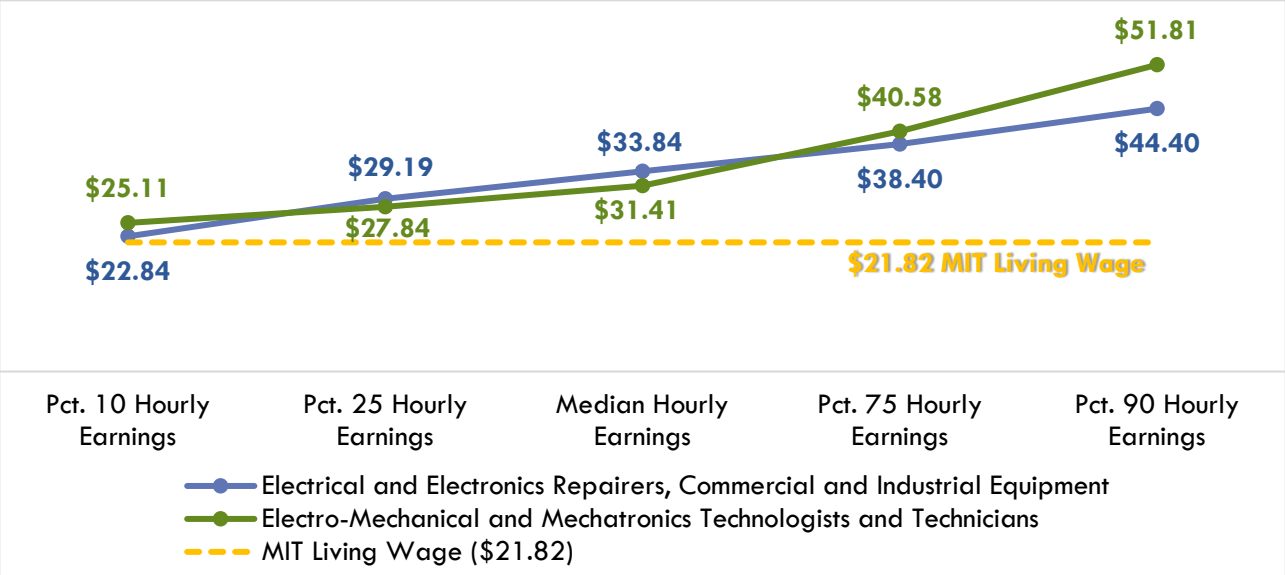
Source: Lightcast 2022.4

Earnings and Benefits

Community colleges should ensure their training programs lead to employment opportunities that provide a living wage. The MIT living wage calculator estimates that an individual must earn $21.82 per hour or $45,386 annually to be self-sufficient in California (Glasmeier, 2022).

Exhibit 3 displays the hourly earnings for the industrial automation occupational group. The 10th percentile hourly earnings for the industrial automation occupational group are above the living wage standard, indicating that at least 90% of workers earn a living wage.

Exhibit 3. Hourly earnings by percentile for the industrial automation occupational group, Inland Empire/Desert Region, 2021

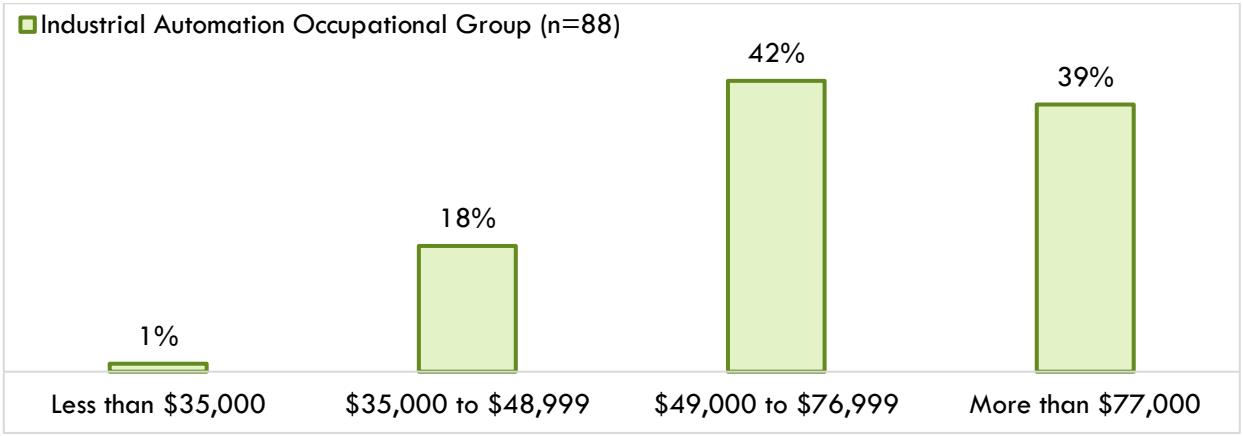


Source: Lightcast 2022.4

Advertised Salary from Online Job Ads

Exhibit 4 displays the statewide online advertised salaries for industrial automation workers over the last 12 months. Online job ad salary information reveals that employers are willing to pay this occupational group a median rate of $68,480 annually or $32.92 per hour, above the $21.82 hourly living wage standard. Consider the salary information with caution since only 33% (88 out of 266) of online job ads for this occupational group provided salary information.

Exhibit 4. Online Advertised Salaries for the industrial automation occupational group, California, February 2022 through January 2023



Source: Lightcast 2022.4

Job Titles, Employers, Skills, Education, and Work Experience

Exhibit 5 displays the job titles most frequently used in job ads for the industrial automation occupational group over the last 12 months. Displaying advertised job titles may provide insight into the types of positions sought by employers posting ads. The most frequently requested job title in the state was calibration technician.

Exhibit 5. Job titles most frequently used in industrial automation job ads, California, February 2022 through January 2023

Job Titles	Unique Job Ads
Calibration Technician	71
Robotics Technician	26
Instrument Technician	22
Electromechanical Technician	19
Electronics Technician	17
Instrumentation Technician	16
Mechatronics Technician	8
Maintenance Technician	6
Electronic Repair Technician	4
Automation Technician	4

Source: Lightcast 2022.4

Exhibit 6 displays the employers posting the most job ads for the industrial automation occupational group during the last 12 months. Showing employer names provides insight into where students may find employment after completing a program. Takeda Pharmaceutical Company posted the most job ads for the industrial

automation occupational group, seeking workers to maintain, repair, and calibrate automated control systems used in manufacturing pharmaceutical products.

Exhibit 6. Employers posting the most job ads for the industrial automation occupational, California, February 2022 through January 2023

Top Employer	Unique Job Ads
Takeda Pharmaceutical Company	12
Applied Industrial Technologies	11
Jervis B. Webb Company	9
Keurig Dr Pepper	9
GXO Logistics	8
Johnson & Johnson	6
Northrop Grumman Corporation	5
Thermo Fisher Scientific	5

Source: Lightcast 2022.4

Exhibit 7 lists a sample of specialized and employability skills employers seek when seeking workers to fill industrial automation positions. Specialized skills are occupation-specific skills that employers request for industry or job competency. Common skills are foundational skills that transcend industries and occupations; this category is often referred to as "soft skills." The skills requested in job ads may be utilized to guide curriculum development.

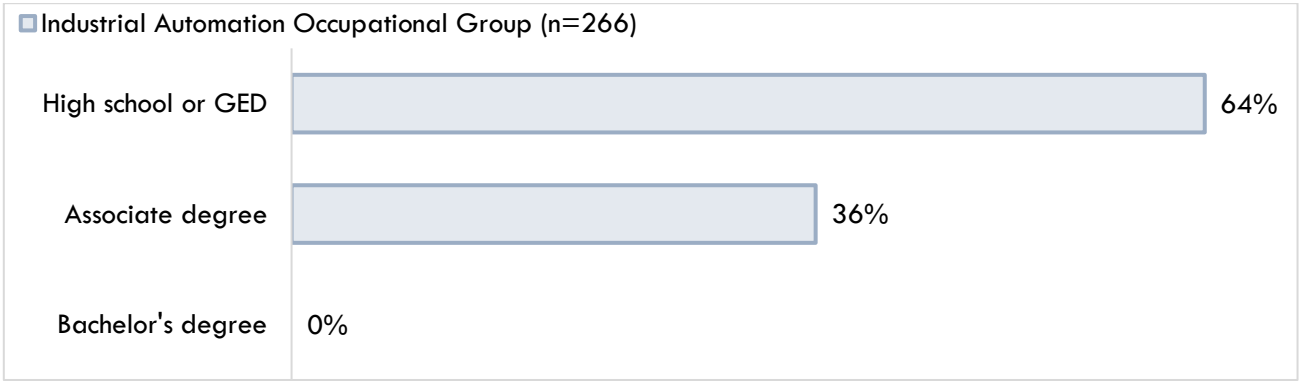
Exhibit 7. Sample of in-demand skills from employer job ads, California, February 2022 through January 2023

Specialized skills *(n=266)*	Common skills
• Automation	• Troubleshooting (Problem-Solving)
• Electronics	• Communications
• Calibration	• Operations
• Instrumentation	• Management
• Programmable Logic Controllers	• Lifting Ability
• Preventive Maintenance	• Customer Service
• Test Equipment	• Detail Oriented
• Electromechanics	• Writing
• Control Systems	• Organization Skills
• Robotics	• Planning

Source: Lightcast 2022.4

Exhibit 8 displays the minimum advertised education requirements for the industrial automation occupational group. According to the Bureau of Labor Statistics, between 48% and 51% of incumbent workers in this field hold a community college-level of educational attainment, "some college, no degree," and an "associate degree." Most employers listing a minimum education level requested a high school diploma or GED followed by an associate degree.

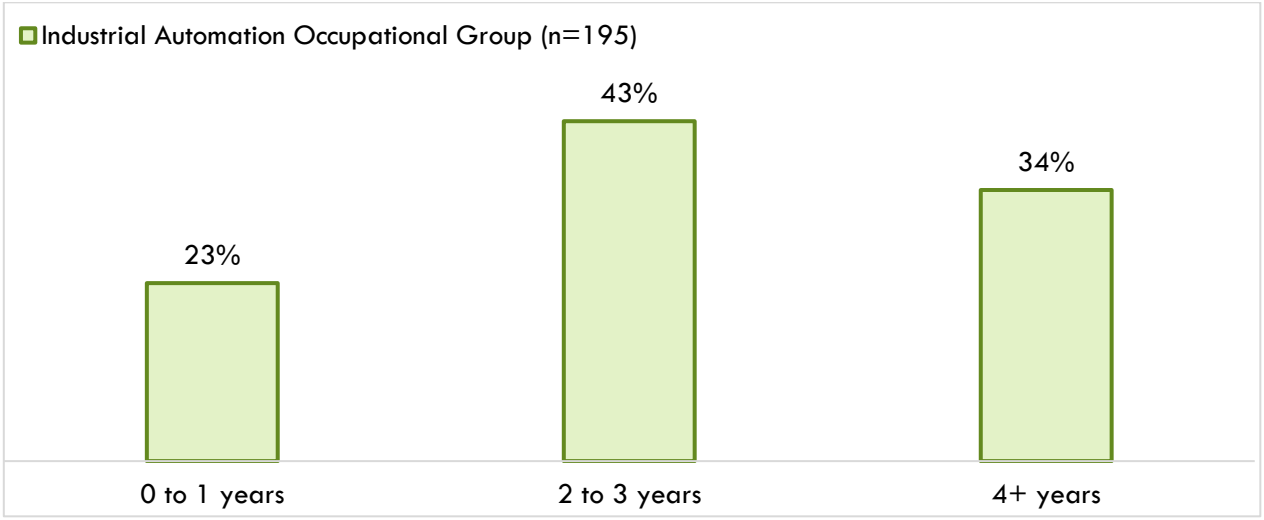
Exhibit 8. Minimum advertised education requirements, California, February 2022 through January 2023



Source: Lightcast 2022.4

Exhibit 9 displays the work experience typically required for the industrial automation occupational group. The occupations in the industrial automation occupational group do not typically require workers to have previous work experience. More than three-quarters of employers sought candidates with two years or more of prior work experience.

Exhibit 9. Real-time work experience requirements, California, February 2022 through January 2023



Source: Lightcast 2022.4

Student Completions and Programs Outcomes

Three regional community colleges currently use four program codes in their programs related to industrial automation technology. Combined, regional community college industrial automation technology programs have issued 57 awards annually over the last three academic years, 2019-2022. Exhibit 10 displays each regional industrial automation technology programs and award types students earn upon program completion.

Exhibit 10: Industrial automation-related programs, Inland Empire/Desert Region, 2022-23 academic year

College	TOP Program (TOP Code)	Local Program Title	Award
Chaffey	Electrical Systems and Power Transmission (0934.40)	Industrial Electrical Technology	Associate Degree
		Industrial Electrical Technology Level I	Certificate
		Industrial Electrical Technology Level II	Certificate
		Industrial Electrical Technology Level III	Certificate
	Electro-Mechanical Technology (0935.00)	Mechatronics	A.S. Degree
		Mechatronics Level I	Certificate
		Mechatronics Level II	Certificate
		Electromechanical Technology	Certificate
Norco	Manufacturing and Industrial Technology (0956.00)	Industrial Automation	Associate Degree/Certificate
		Supply Chain Automation	Associate Degree/Certificate
San Bernardino Valley	Industrial System Technology and Maintenance (0945.00)	Industrial Automation	Certificate

Source: COCI, 2022-23 Community College Catalogs

Electrical Systems and Power Transmission (0934.40): Installation, operation, maintenance, and repair of electrical systems and the power lines that transmit electricity. Includes assembly, installation, maintenance, and repair of motors, generators, transformers, and related equipment (Taxonomy of Programs, 2012).

Electro-Mechanical Technology (0935.00): Design, development, testing, and maintenance of electro-mechanical and servo-mechanical devices and systems (Taxonomy of Programs, 2012).

Industrial System Technology and Maintenance (0945.00): Design, construction, maintenance, and operation of mechanical, hydraulic, pneumatic, and electrical equipment and related systems, such as production machinery. Includes building and plant maintenance (Taxonomy of Programs, 2012).

Manufacturing and Industrial Technology (0956.00): Engineering principles and technical skills for the manufacture of products and related industrial processes. Includes shaping and forming operations, materials

handling, instrumentation and controls, and quality control. Includes Computer Aided Manufacturing and robotics. Also has optimization theory, industrial and manufacturing planning, and related management skills (Taxonomy of Programs, 2012).

Exhibits 11 – 14 display student completions for electrical systems and power transmission (TOP 0934.40), electro-mechanical technology (0935.00), industrial systems technology and maintenance (0945.00), and manufacturing and industrial technology (0956.00) programs related to industrial automation technology over the last three academic years, 2019-2022. In the previous three academic years, Chaffey College issued three awards annually in electro-mechanical technology programs and 44 awards in electrical systems and power transmission programs. San Bernardino Valley College issued one award annually in its industrial systems technology and maintenance program. Norco College issued an annual average of nine awards over the last three academic years in manufacturing and industrial technology programs related to industrial automation. Program completion and student outcome methodologies can be found in the appendix.

Exhibit 11: Annual average community college awards for electrical systems and power transmission programs related to industrial automation technology, Inland Empire/Desert Region, Academic Years 2019-2022

TOP 0934.40 – Electrical Systems and Power Transmission (Local Program Title)	**Academic Year 2019-20**	**Academic Year 2020-21**	**Academic Year 2021-22**	**Total CC Annual Average Awards, Academic Years 2019-22**
Chaffey (Industrial Electrical Technology/Industrial Electrical Technology Level I/II/III)				**44**
Associate Degree	8	6	16	10
Certificate 16 < 30-semester units	35	12	14	20
Certificate 30 < 60-semester units	10	10	19	13
Certificate 6 < 18-semester units	2	1	0	1
Total	**55**	**29**	**49**	**44**

Source: MIS Data Mart, COCI

Exhibit 12: Annual average community college awards for electro-mechanical technology programs related to industrial automation technology, Inland Empire/Desert Region, Academic Years 2019-2022

TOP 0935.00 – Electro-Mechanical Technology (Local Program Title)	**Academic Year 2019-20**	**Academic Year 2020-21**	**Academic Year 2021-22**	**Total CC Annual Average Awards, Academic Years 2019-22**
Chaffey (Electromechanical Technology/Mechatronics/ Mechatronics Level I & II)				**3**
Associate Degree	0	0	3	1
Certificate 16 < 30-semester units	0	2	1	1
Certificate 8 < 16-semester units	0	2	2	1
Total	**0**	**4**	**6**	**3**

Source: MIS Data Mart, COCI

Exhibit 13: Annual average community college awards for industrial systems technology and maintenance programs related to industrial automation technology, Inland Empire/Desert Region, Academic Years 2019-2022

TOP 0945.00 – Industrial Systems Technology and Maintenance (Local Program Title)	**Academic Year 2019-20**	**Academic Year 2020-21**	**Academic Year 2021-22**	**Total CC Annual Average Awards, Academic Years 2019-22**
San Bernardino Valley (Industrial Automation)				**1**
Certificate 30 < 60-semester units	0	1	1	1
Total	**0**	**1**	**1**	**1**

Source: MIS Data Mart, COCI

Exhibit 14: Annual average community college awards for manufacturing and industrial technology programs related to industrial automation technology, Inland Empire/Desert Region, Academic Years 2019-2022

TOP 0956.00 – Manufacturing and Industrial Technology (Local Program Title)	**Academic Year 2019-20**	**Academic Year 2020-21**	**Academic Year 2021-22**	**Total CC Annual Average Awards, Academic Years 2019-22**
Norco (Industrial Automation/Supply Chain Automation)				**9**
Associate Degree	2	3	0	2
Certificate 16 < 30-semester units	10	4	2	5
Certificate 6 < 18-semester units	3	1	2	2
Total	**15**	**8**	**4**	**9**

Source: MIS Data Mart, COCI

California program outcome data may provide useful insight into the likelihood of success for the proposed program. Community college student outcome information based on the selected TOP code and region is provided in Exhibits 15 – 18.

Exhibit 15: 0934.40 – Electrical systems and power transmission strong workforce program outcomes, Inland Empire/Desert Region, Academic Year 2019-2020 (Unless Noted)

Strong Workforce Program Metrics: 0934.40 – Electrical Systems and Power Transmission	Inland Empire/Desert Region	California
Unduplicated count of enrolled students (2020-21)	258	1,427
Completed 9+ career education units in one year (2020-21)	40%	31%
Students who completed a noncredit CTE or workforce preparation course (2020-21)	-	39%
Students who earned a degree, certificate, or attained apprenticeship (2020-21)	29	114
Job closely related to the field of study (2018-19)	73%	84%
Median annual earnings (all exiters)	$51,904	$61,152
Median change in earnings (all exiters)	23%	54%
Attained a living wage (completers and skills-builders)	73%	71%

Sources: LaunchBoard Community College Pipeline and Strong Workforce Program Metrics

Exhibit 16: 0935.00 – Electro-mechanical technology strong workforce program outcomes, Inland Empire/Desert Region, Academic Year 2019-2020 (Unless Noted)

Strong Workforce Program Metrics: 0935.00 – Electro-Mechanical Technology	Inland Empire/Desert Region	California
Unduplicated count of enrolled students (2020-21)	110	379
Completed 9+ career education units in one year (2020-21)	59%	47%
Students who earned a degree, certificate, or attained apprenticeship (2020-21)	-	44
Transferred to a four-year institution (transfers)	-	33
Job closely related to the field of study (2018-19)	89%	94%
Median annual earnings (all exiters)	$55,288	$50,070
Median change in earnings (all exiters)	62%	28%
Attained a living wage (completers and skills-builders)	80%	62%

Sources: LaunchBoard Community College Pipeline and Strong Workforce Program Metrics

Exhibit 17: 0945.00 – Industrial systems technology maintenance strong workforce program outcomes, Inland Empire/Desert Region, Academic Year 2019-2020 (Unless Noted)

Strong Workforce Program Metrics: 0945.00 – Industrial Systems Technology Maintenance	Inland Empire/Desert Region	California
Unduplicated count of enrolled students (2020-21)	34	854
Completed 9+ career education units in one year (2020-21)	35%	45%
Students who completed a noncredit CTE or workforce preparation course (2020-21)	-	93%
Students who earned a degree, certificate, or attained apprenticeship (2020-21)	10	132
Job closely related to the field of study (2018-19)	100%	80%
Median annual earnings (all exiters)	$49,958	$47,238
Median change in earnings (all exiters)	41%	30%
Attained a living wage (completers and skills-builders)	85%	64%

Sources: LaunchBoard Community College Pipeline and Strong Workforce Program Metrics

Exhibit 18: 0956.00 – Manufacturing and industrial technology strong workforce program outcomes, Inland Empire/Desert Region, Academic Year 2019-2020 (Unless Noted)

Strong Workforce Program Metrics: 0956.00 – Manufacturing Industrial Technology	Inland Empire/Desert Region	California
Unduplicated count of enrolled students (2020-21)	59	2,934
Completed 9+ career education units in one year (2020-21)	39%	34%
Students who completed a noncredit CTE or workforce preparation course (2020-21)	-	24%
Students who earned a degree, certificate, or attained apprenticeship (2020-21)	-	316
Transferred to a four-year institution (transfers)	-	87
Job closely related to the field of study (2018-19)	78%	75%
Median annual earnings (all exiters)	$47,752	$50,216
Median change in earnings (all exiters)	68%	48%
Attained a living wage (completers and skills-builders)	83%	66%

Sources: LaunchBoard Community College Pipeline and Strong Workforce Program Metrics

Other postsecondary institutions may utilize a variety of program codes for programs that prepare students for industrial automation technology employment. Industrial automation technology CIP codes include electromechanical/ electromechanical engineering technology/technician (15.0403), robotics technology/technician (15.0405), and industrial electronics technology/technician (47.0105). Other regional postsecondary institutions did not issue awards in programs related to industrial automation technology over the last three academic years.

Summary of Findings

The knowledge, skills, and abilities trained by electro-mechanical technology programs (TOP 0935.00) prepare students for employment in two community college-level occupations. These occupations are projected to have 71 annual job openings and increase employment by 4% over the next five years in the Inland Empire/Desert Region. The 10th percentile earnings for these occupations are between $22.84 and $25.11 per hour, above the living wage standard, indicating that at least 90% of workers in this field earn a living wage. Online job ad salary information confirms that employers are willing to pay this occupational group a median annual rate of $68,480 annually or $32.92 per hour.

Regional community college industrial automation programs currently utilize four program codes, electrical systems and power transmission (TOP 0934.40), electro-mechanical technology (0935.00), industrial systems technology and maintenance (0945.00), and manufacturing and industrial technology (0956.00). Combined, regional community colleges have issued 57 awards annually in programs related to industrial automation technology over the last three academic years, 2019-2022. Other postsecondary education institutions in the region have not issued awards related to industrial automation technology over the previous three academic years.

The Centers of Excellence recommends expanding programs related to industrial automation to meet the regional demand for more workers. Colleges considering this program should partner with relevant employers and confirm their demand for industrial automation workers and the skills needed for students to secure work in this field shortly after exiting the program.

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February 2023

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Appendix: Occupation definitions, sample job titles, five-year projections, and earnings for industrial automation occupations

Occupation Definitions* (SOC code), *Education and Training Requirements, Community College Education Attainment

Electro-Mechanical and Mechatronics Technologists and Technicians (17-3024)

Operate, test, maintain, or adjust unmanned, automated, servomechanical, or electromechanical equipment. May operate unmanned submarines, aircraft, or other equipment to observe or record visual information at sites such as oil rigs, crop fields, buildings, or for similar infrastructure, deep ocean exploration, or hazardous waste removal. May assist engineers in testing and designing robotics equipment.

Sample job titles: Automation Technician (Automation Tech), Electro-Mechanic, Electromechanical Assembler (EM Assembler), Electromechanical Technician (EM Technician), Electronics Technician (Electronics Tech), Mechanical Technician (Mechanical Tech), Process Control Tech, Product Test Specialist, Test Engineering Technician (Test Engineering Tech), Test Technician (Test Tech)

Entry-Level Educational Requirement: Associate's degree
Training Requirement: None
Work Experience: None
Percentage of incumbent workers with a Community College Award or Some Postsecondary Coursework: 51%

Electrical and Electronics Repairers, Commercial and Industrial Equipment (49-2094)

Repair, test, adjust, or install electronic equipment, such as industrial controls, transmitters, and antennas.

Sample job titles: Control Technician, E and I Mechanic (Electrical and Instrument Mechanic), E and I Mechanic (Electrical and Instrumentation Mechanic), Electrical and Instrument Technician (E and I Tech), Electrical Maintenance Technician, Electronic Technician, I and C Tech (Instrument and Control Technician), Instrument and Electrical Technician (I and E Tech), Repair Technician, Scale Technician

Entry-Level Educational Requirement: Postsecondary nondegree award
Training Requirement: More than twelve months of on-the-job training
Work Experience: None
Percentage of incumbent workers with a Community College Award or Some Postsecondary Coursework: 48%

Appendix: Methodology

Exhibits 11 - 14 display the average annual California Community College (CCC) awards conferred during the three academic years between 2019 and 2022 from the California Community Colleges Chancellor's Office Management Information Systems (MIS) Data Mart. Awards are the combined total of associate degrees and certificates issued during the timeframe, divided by three in this case to calculate an annual average. This is done to minimize the effect of atypical variations that might be present in a single year.

Community college student outcome information is from LaunchBoard and based on the selected TOP code and region. These metrics are based on records submitted to the California Community Colleges Chancellor's Office Management Information Systems (MIS) by community colleges, which come from self-reported student information from CCC Apply and the National Student Clearinghouse. Employment and earnings metrics are sourced from California's Employment Development Department's Unemployment Insurance database. When available, outcomes for completers are reported to demonstrate the impact that earning a degree or certificate can have on employment and earnings. For more information on the types of students included for each metric, please see the web link for LaunchBoard's Strong Workforce Program Metrics Data Element Dictionary in the References section (LaunchBoard, 2023a). Finally, employment in a job closely related to the field of study comes from self-reported student responses on the CTE Employment Outcomes Survey (CTEOS) administered by Santa Rosa Junior College (LaunchBoard, 2023a).

Job ad data is limited to the information provided by employers and the ability of artificial intelligence search engines to identify this information. Additionally, preliminary calculations by Georgetown Center on Education and the Workforce found that "just 30 to 40 percent of openings for candidates with some college or an associate degree, and only 40 to 60 percent of openings for high school diploma holders appear online" (Carnevale et al., 2014). Online job ads often do not reveal employers' hiring intentions; it is unknown if employers plan to hire one or multiple workers from a single online job ad or collect resumes for future hiring needs. A closed job ad may not be the result of a hired worker.

Table 1. 2021 to 2026 job growth, wages, entry-level education, training, and work experience required for the industrial automation technology occupational group in the Inland Empire/Desert Region (Riverside and San Bernardino Counties combined)

Occupation	2021 Jobs	5-Year Change	5-Year % Change	Annual Openings (New + Replacement Jobs)	Entry-Experienced Hourly Wage (10th to 90th percentile)	Median Hourly Wage (50th percentile)	Average Annual Earnings	Entry-Level Education & On-The-Job-Training	Work Experience Required
Electrical and Electronics Repairers, Commercial and Industrial Equipment (49-2094)	648	35	5%	59	$22.84 to $44.40	$33.84	$69,700	Postsecondary nondegree award & More than 12 months	None
Electro-Mechanical and Mechatronics Technologists and Technicians (17-3024)	127	(1)	(1%)	12	$25.11 to $51.81	$31.41	$73,600	Associate's degree & None	None
Total	**776**	**34**	**4%**	**71**	**-**	**-**	**-**	**-**	**-**

Source: Lightcast 2022.4

	Student	[illegible] 209 Pneumatic Systems 1 Course (SACA) -- 1 Pneumatic Power Systems - Skill PDF (2118220)	[illegible] 209 Pneumatic Systems 1 Course (SACA) -- 2 Basic Pneumatic Circuits -- Skill PDF (2118656)	VB831-XC04UEN-E1 - Hydraulic Speed Control (2063362)	VB831-XC05UEN-E1 - Pressure Control Circuits (2063368)	V57209-5 Pneumatic DCV Applications (2193017)	VB831-XC03UEN-E1 - Principles of Hydraulic Pressure and Flow (2063358)	V57209-3 Principles of Pneumatic Pressure and Flow (2063335)	V57209-4 Pneumatic Speed Control Circuits (2063342)	V57209-6 Air Logic (2193018)	VB831-XC04UEN-E1 - Hydraulic Speed Control (2063362)	VB831-XC05UEN-E1 - Pressure Control Circuits (2063368)	V57209-6 Air Logic (2193018)	V57209-6 Air Logic (2193018)	VB831-XC04UEN-E1 - Hydraulic Speed Control (2063362)	VB831-XC05UEN-E1 - Pressure Control Circuits (2063368)	V57209-6 Air Logic (2193018)
MAN-60-37628	Student 1	100	100	94	70	100	89	77	73	80	94	70	80	80	94	70	80
MAN-60-37628	Student 2	54	71	81	70	100	89	77	93	80	81	70	80	80	81	70	80
MAN-60-37628	Student 3	99	76	100	100	100	89	92	87	80	100	100	80	80	100	100	80
MAN-60-37628	Student 4	58				100		54	100								
MAN-60-37628	Student 5			100	100	100	100	100	100	100	100	100	100	100	100	100	100
MAN-60-37628	Student 6	94	90			83		85	80	70			70	70			70
MAN-60-37628	Student 7	100	100			67	78	62	80	60			60	60			60
MAN-60-37628	Student 8	58	55	100	100	100	89	77	73	80	100	100	80	80	100	100	80
MAN-60-37628	Student 9	100	82	100	100	100	100	100	100	100	100	100	100	100	100	100	100
MAN-60-37628	Student 10	100	100				33	54	33								
MAN-60-37628	Student 11	98	88	88		100	89	100	100	100	88		100	100	88		100
		CO 1	CO 1	CO 2	CO 2	CO 2	CO 3	CO 3	CO 3	CO 4	CO 4	CO 4	CO 4	SLO 1	SLO 1	SLO 1	SLO 1
		86.1	84.66666667	94.71428571	90	95	84	79.81818182	83.54545455	83.33333333	94.71428571	90	83.33333333	83.33333333	94.71428571	90	83.33333333
		85.38333333		93.23809524			82.45454545			87.8452381				87.8452381			

Course Objectives:
Upon successful completion of the course, students should be able to demonstrate the following activities:

CO 1 1. Demonstrate basic safety procedures when designing, assembling and trouble shooting high pressure hydraulic and pneumatic systems used in automated and robotic processes.
CO 2 2. Set-up and operate fluid powered valves, cylinders, controls, filters, and actuators.
CO 3 3. Calculate functions and load requirements then design, select components and test complex fluid powered systems in a robotic or industrial environment using schematic symbols and blueprints typically found in the fluid power.
CO 4 4. Construct typical components using a print, and test run the system.

Student Learning Outcomes:
Upon successful completion of the course, students should be able to demonstrate the following skills:

SLO 1 1. Safely setup and operate fluid power components and systems for the manufacturing industry.

Suggestions:
Continue to use SACA industry certifications.
For this class I would suggest that more of the laps used in the class are put on canvas to help develop a better grading system.

During the Fall 2023 semester 5 students got SACA silver certifications

MAN-60-37628	Fall 2023	azouak aljazaer	C-209	Pneumatic Systems 1
MAN-60-37628	Fall 2023	Flores, George	C-209	Pneumatic Systems 1
MAN-60-37628	Fall 2023	Mora, Angel (m	C-209	Pneumatic Systems 1
MAN-60-37628	Fall 2023	Rodriguez, Dan	C-209	Pneumatic Systems 1
MAN-60-37628	Fall 2023	stewart, aaron	C-209	Pneumatic Systems 1

SACA certifications are industry-driven, developed for industry by industry. They are developed through a rigorous process that begins with the creation of truly international skill standards, endorsed by leading experts in Industry 4.0 technologies throughout the world. Certification examinations are created based on these standards, pilot tested, and statistically analyzed to ensure quality. Each certification includes a proctored hands-on evaluation and an online test to ensure that candidates for certification can "do" as well as "know." SACA uses an annual review process for all certifications to ensure that standards and examinations remain current and relevant in the fast-changing world of Industry 4.0.

https://www.saca.org/smart-automation-certifications/#:~:text=SACA%20certifications%20are%20industry%2Ddriven,4.0%20technologies%20throughout%20the%20world.

Experts from well-known industry leaders, such as Rockwell Automation, FANUC, Ashley Furniture, Kohler, Foxconn, Boeing, and Hershey, were instrumental in making sure SACA's Industry 4.0 certifications reflect the competencies that industry needs. A list of companies that SACA and Amatrol worked with to develop the certification is included on this website: https://www.saca.org/about-us-smart-automation-certification-alliance/acknowledgments/

SACA sits at the forefront of the effort to certify students and workers who demonstrate the required knowledge and hands-on smart automation skills employers so desperately SACA offers a wide variety of certifications in popular industrial skill areas, including certifications at the Associate, Specialist, and Professional level. For those wishing to focus For workers, SACA certifications can help market their smart automation skills to potential employers. For those employers, SACA certifications represent confirmation that a

https://www.saca.org/2024/02/08/saca-endresshauser-seek-experts-for-technical-work-group/

	Student	Do the Drill Press class on immerse2learn (1918282)	Do the Manual Mill class on immerse2learn (1918286)	Do the Manual Lathe class on immerse2learn (1918285)	Do the Precision Grinding class on immerse2learn (1918288)	Do the Safety for Machining class on immerse2learn (1918291)	General shop and milling machine safety test (1918248)	Do the Reading Manufacturing Blueprints class on immerse2learn	Do the Precision Measurement class on immerse2learn (1918289)	Do the Speeds and Feeds class on immerse2learn (1918294)	Do the Shop Mathematics Level II class on immerse2learn (1918293)	Tapping block (1918252)	Do the Layout class on immerse2learn (1918284)	Do the Benchwork (e) class on immerse2learn (1918281)	Tapping block (1918252)
23Spring 23-MAN 36-35522	Student 1					96			41	96		1	60	100	1
23Spring 23-MAN 36-35522	Student 2	75	94.3	100	62.9	100	50	100	100	100	100	1	92	100	1
23Spring 23-MAN 36-35522	Student 3	75	85.7	75	71.4	92	43	85	84.6	96.4	70	1	76	71	1
23Spring 23-MAN 36-35522	Student 4					100	45.67	85	94.4		87.5	1	72.5	80.6	1
23Spring 23-MAN 36-35522	Student 5	92.5	100	100	97.1	100	49	97.5	100	100	95	1	100	100	1
		CO 1	CO 1	CO 1	CO 1	CO 1	CO 1	CO 2	CO 2	CO 3	CO 3	CO 4	CO 5	CO 5	SLO 1
		80.8333	93.3333	91.6667	77.1333	97.6	46.9175	91.875	84	98.1	88.125	1	80.1	90.32	1
		81.24736111						87.9375		93.1125		100	85.21		100

Course Objectives:
Upon successful completion of the course, students should be able to demonstrate the following activities:

CO 1 1. Demonstrate aptitude in safely setting up and operating the lathe, mill, drill press, saw and grinder.
CO 2 2. Select and utilize various metrology tools necessary to compare engineering drawing requirements to machined dimensions.
CO 3 3. Calculate speeds and feeds related to machining applications.
CO 4 4. Set up and perform fundamental operational procedures on the lathe and mill to tolerances ranging .010-.030
CO 5 5. Demonstrate the fundamentals of bench and layout work required to create a part.

Student Learning Outcomes:
Upon successful completion of the course, students should be able to demonstrate the following skills:

SLO 1 1. Create parts using conventional mills and turning machines. For example, students usually create a hammer head and handle using the lathe. During mill lessons, students create a micrometer stand.

For MAN 36 we need to grade more of the hands on lab projects.
The assignments above represent immerse 2 learn assignments grades. Most of the quizzes are completed by the students after compling a LMS type assignments

Type of assessment:

Each of these assessments were quiz questions from the LMS that is assigned to each student.

Results:

Each student that took the quiz got at least 80% for each assessment.

Suggestions: for the class:

Assessments for the projects completed during the class should be assessed.

	Student	Lessons - 20701 Introduction to Programmable Controllers (2314577)		Lessons - 20703 PLC Operation (2334539)	Lessons - 20704 PanelView Plus Terminal-PLC Connections (2314580)		Lessons - 20702 PC-PLC Connections (2334538)	Lessons - 20702 PC-PLC Connections (2334538)	Please take pictures of your PLC wired up (2314809)		Lessons - 20709 PLC Program Questions (2334541)	Lessons - 20709 PLC Memory Organization (2334542)	Lessons - 20709 PLC Motor Control (2334545)	Lessons - 20711 PLC Timers (2334547)	Lessons - 20712 PLC Counters (2334548)	LogixPro Relay Logic Introductory Lab (2314806)	Door simulation Student Programming Exercise #4 (2314799)	LogixPro introduction to RSLogix timers (2314808)	Logix pro traffic control exercises utilizing TON timers (2314802)	Logix Pro Traffic control Lab Utilizing Word comparison (2314801)	Please take pictures of your PLC wired up (2314809)		LogixPro Relay Logic Introductory Lab (2314806)	Door simulation Student Programming Exercise #4 (2314799)	LogixPro introduction to RSLogix timers (2314808)	Logix pro traffic control exercises utilizing TON timers (2314802)	Logix Pro Traffic control Lab Utilizing Word comparison (2314801)		Lessons - 20702 PC-PLC Connections (2334538)	Lessons - 20702 PC-PLC Connections (2334538)		LogixPro Relay Logic Introductory Lab (2314806)	Door simulation Student Programming Exercise #4 (2314799)	LogixPro introduction to RSLogix timers (2314808)	Logix pro traffic control exercises utilizing TON timers (2314802)	Logix Pro Traffic control Lab Utilizing Word comparison (2314801)	Please take pictures of your PLC wired up (2314809)	
ELE-864-31353	Student 1	100		100	100		100	100	100		100	100	100	100	100	100					100		100				100						100
ELE-864-31353	Student 2	100		100	100		100	100			100	100	100	100		100							100										
ELE-864-31353	Student 3	100		100	100		100	100			100	100	100	100	100	100	100						100	100									
ELE-864-31353	Student 4	100		100	100		100	100	100		100	100	100	100	100	100	100	100	100	100	100		100	100	100	100	100		100	100	100	100	100	
ELE-864-31353	Student 5	57		100	89		40	40	100		100	80	100	100	100	100	100	100	100	80	100		100	100	100	80	100		40	40		100	100	100
MAN-64-31422	Student 6	100		100	100		100	100	100		100	100	100	100	100	100	100	100	100		100		100	100	100		100		100	100		100	100	100
ELE-864-31353	Student 7	100		100	100		100	100	100		100	100	100	88	100	100	95	100	100	100	100		100	95	100	100	100		100	100		100	95	100
		CO 1		CO 2	CO 2		CO 3	CO 3	CO 3		CO 4	CO 4	CO 4	CO 4	CO 4	CO 4	CO 4	CO 4	CO 4	CO 4	CO 4		CO 5	CO 5	CO 5	CO 5	CO 5		CO 6	CO 6		SLO 1	SLO 1	SLO 1
		93.9		100.0	98.4		100.0	91.4	100.0		100.0	97.1	100.0	98.3	100.0	100.0	99.0	100.0	93.3	100.0	100.0		100.0	99.0	100.0	93.3	100.0		91.4	91.4		100.0	99.0	100.0
				99.2			94.3				98.9												98.5						91.4			98.7		

Course Objectives:
Upon successful completion of the course, students should be able to demonstrate the following activities:

CO 1 1. List and discuss advantages and disadvantages of PLCs.
CO 2 2. Describe the functions of the major parts of a PLC system.
CO 3 3. Describe and demonstrate how the parts of the PLC system are connected electrically.
CO 4 4. Analyze problems representative of control system environments using PLC.
CO 5 5. Create ladder logic programs using Allen Bradley or Siemens software and test for correct operation.
CO 6 6. Describe the installation maintenance and troubleshooting of PLCs and PLC modules.

Student Learning Outcomes:
Upon successful completion of the course, students should be able to demonstrate the following skills:

SLO 1 1. Demonstrate programming and wiring of a programmable logic control system that is typically used in industry.

Each of the students in the class except one were able to gain SACA.org silver certification. SACA silver certification for each of these students is something we should really be proud of.

Results:

Each student that took the quiz got at least 90% for each assessment.

Suggestions: for the class:

Continue to use Amatrol and SACA training and assessment and to use logix pro to pratice programming

As can be seen from the list below we have had 11 students pass the SACA 207 test on PLCs

1	ELE-64-34757	Spring 2023	Aguilar, Noe (naguilar16@student.rccd.edu)	C-207	Programma	No	The user has passed this assessment.
2			Barragan, Alejandro (abarragan16@student.rccd.edu)	C-207	Programma	No	The user has passed this assessment.
3	ELE-864-3548	Spring 2023	Beyers, Jim (jbeyers909@gmail.com)	C-207	Programma	No	The user has passed this assessment.
4	MAN-64-3501	Spring 2023	Lopez, Julian (jlopez511@student.rccd.edu)	C-207	Programma	No	
5	MAN-64-31422	Winter 2024	Meservy, Tanner (tanner.meservy@outlook.com)	C-207	Programma	No	The user has passed this assessment.
6	MAN-64-31422	Winter 2024	Meservy, Daniel (daniel.meservy@yahoo.com)	C-207	Programma	No	The user has passed this assessment.
7	MAN-64-31422	Winter 2024	Meservy, Brock (meservyamerica@outlook.com)	C-207	Programma	No	The user has passed this assessment.
8	MAN-64-31422	Winter 2024	Omelas, Richard (rornelas12@student.rccd.edu)	C-207	Programma	No	The user has passed this assessment.
9	MAN-64-31422	Winter 2024	Soriano, Lorenzo (mrlorenzosoriano@gmail.com)	C-207	Programma	No	The user has passed this assessment.
10	MAN-64-31422	Winter 2024	WAYNE, THOMAS (thomasawayne08@gmail.com)	C-207	Programma	No	
11	MAN-64-3501	Spring 2023	Widdison, James (marcw2003@sbcglobal.net)	C-207	Programma	No	The user has passed this assessment.

SACA certifications are industry-driven, developed for industry by industry. They are developed through a rigorous process that begins with the creation of truly international skill standards, endorsed by leading experts in industry 4.0 technologies throughout the world. Certification examinations are created based on these standards, pilot tested, and statistically analyzed to ensure quality. Each certification includes a proctored hands-on evaluation and an online test to ensure that candidates for certification can "do" as well as "know." SACA uses an annual review process for all certifications to ensure that standards and examinations remain current and relevant in the fast-changing world of Industry 4.0.

https://www.saca.org/smart-automation-certifications/#:~:text=SACA%20certifications%20are%20industry%2Ddriven,4.0%20technologies%20throughout%20the%20world.

Experts from well-known industry leaders, such as Rockwell Automation, FANUC, Ashley Furniture, Kohler, Foxconn, Boeing, and Hershey, were instrumental in making sure SACA's Industry 4.0 certifications reflect the competencies that industry needs. A list of companies that SACA and Amatrol worked with to develop the certification is included on this website: https://www.saca.org/about-us-smart-automation-certification-alliance/acknowledgments/

SACA sits at the forefront of the effort to certify students and workers who demonstrate the required knowledge and hands-on smart automation skills employers so desperately need. SACA's certifications were developed in conjunction with industry partners who could speak from experience about their needs when it comes to workers able to work alongside a variety of advanced automation technologies.

SACA offers a wide variety of certifications in popular industrial skill areas, including certifications at the Associate, Specialist, and Professional level. For those wishing to focus on building a strong foundation of skills employers need, SACA also offers many micro-credentials that allow students and workers to add certifications as they master new areas.

For workers, SACA certifications can help market their smart automation skills to potential employers. For those employers, SACA certifications represent confirmation that a worker has the skills to hit the ground running in the workplace. To learn more about Industry 4.0 certifications and how SACA can help both future workers and industrial employers begin the task of bridging the Industry 4.0 skills gap, contact SACA for more information.

https://www.saca.org/2024/02/08/saca-endresshauser-seek-experts-for-technical-work-group/

C·O·E CENTERS OF EXCELLENCE FOR LABOR MARKET RESEARCH

Mechatronics

Inland Empire/Desert Region (Riverside and San Bernardino counties)

This workforce demand report uses state and federal job projection data developed before the economic impact of COVID-19. The COE is monitoring the situation and will provide more information as it becomes available. Please consult with local employers to understand their current employment needs.

Summary

The Community College
Electro-Mechanical Technology
(TOP 0935.00)
Program

Provides training for the following Community College-level Occupations:
- Electro-Mechanical and Mechatronics Technologists and Technicians
(SOC 17-3024)
- Electrical and Electronics Repairers, Commercial and Industrial Equipment
(25-2011)

Over the next five years (2020-2025), community college-level mechatronics employment is projected to

Increase Employment
6%

58
combined
Annual Job Openings

Median Hourly Wage
$28.57 - $34.29
above the $24.36 hourly Self-sustainability Standard

45 Total Annual Awards
In Programs Related to Electro-Mechancial Technology

4
Program Awards in Electro-Mechanical Technology Programs

41
Program Awards in Programs Related to Mechatronics

The Inland Empire/Desert Centers of Excellence
Cautiously Recommends
Electro-Mechanical Technology Program Expansion due to low annual job openings for related occupations

Introduction

This report provides regional occupational demand and wage research, and postsecondary program outcomes related to mechatronics training. The California Community College electro-mechanical technology (TOP 0935.00) program provides training for mechatronics jobs. This program prepares students for

employment through instruction related to the design, development, testing, and maintenance of electro-mechanical and servo-mechanical devices and systems (Taxonomy of Programs, 2012). The result of the interdisciplinary nature of this field is that mechatronics-related programs are assigned to various TOP codes. For this reason, the supply section in this report includes completions for all programs that train mechatronics workers in the region. According to the footnotes in the most recent Taxonomy of Programs manual, "All Mechatronics training programs should be aligned to TOP 0935.00" (Taxonomy of Programs, 2012, pg. 113).

The knowledge, skills, and abilities trained by electro-mechanical programs lead to three distinct occupations and one emerging occupation, collectively referred to as the mechatronics occupational group in this report. The mechatronics occupational group is separated into community college-level and bachelor's degree-level occupations to illuminate job opportunities for individuals with varying education levels.

The **community college-level occupations** in this report represent the entry-level employment opportunities in the mechatronics field and typically require an associate degree or a postsecondary nondegree award before entering employment. Between 48% and 51% of incumbent workers in these occupations have a community college-level education, some college or an associate degree, as their highest level of educational attainment. The community college-level occupations included in the mechatronics occupational group are:

- Electro-Mechanical and Mechatronics Technologists and Technicians (SOC 17-3024)
- Electrical and Electronics Repairers, Commercial and Industrial Equipment (49-2094)

The **bachelor's degree-level occupations** in this report typically require workers to obtain a four-year degree before entering employment. Approximately 14% of workers in this occupation have a community college-level education, some college or an associate degree, as their highest level of educational attainment. The bachelor's degree-level occupation included in the mechatronics occupational group is:

- Engineers, All Other (SOC 17-2199)
    - Mechatronics Engineers (17-2199.05)*

*The Federal Standard Occupation Classification (SOC) system classifies mechatronic engineers (SOC 17-2199.05) as an emerging occupation within the broader occupational code, engineers, all other (17-2199). Precise jobs counts and wages are not available for emerging occupation. A list of common job titles within Engineers, All Other is available at the end of this report. Demand for mechatronics engineers is approximated through an online job ad search for this emerging occupation.

This report's educational supply and employment demand portions focus solely on the community college-level jobs students are likely to obtain after completing a community college electro-mechanical technology program in the Inland Empire/Desert Region.

Job Counts and Projections

In 2020, there were 1,762 total mechatronics jobs in the region. Employment for the community college-level mechatronics occupational group is projected to increase by 6% through 2025, with 58 combined annual job openings expected annually. Engineers, all other are expected 86 annual job openings, increasing employment by 6% over the next five years. Exhibit 1 displays the job counts, five-year projected job growth, job openings, and the share of incumbent workers age 55 years and greater in the region.

Exhibit 1: Five-year projections for the mechatronics occupational group, 2020-2025

Occupation	2020 Jobs	2025 Jobs	5-Yr % Change (New Jobs)	5-Yr Openings (New + Replacement Jobs)	Annual Openings (New + Replacement Jobs)	% of workers age 55+
Electrical and Electronics Repairers, Commercial and Industrial Equipment	576	608	6%	263	53	17%
Electro-Mechanical and Mechatronics Technologists and Technicians	46	50	7%	26	5	23%
Community College-level Total	**622**	**657**	**6%**	**289**	**58**	**18%**
Occupation	**2020 Jobs**	**2025 Jobs**	**5-Yr % Change (New Jobs)**	**5-Yr Openings (New + Replacement Jobs)**	**Annual Openings (New + Replacement Jobs)**	**% of workers age 55+**
Engineers, All Other*	1,139	1,204	6%	430	86	34%
Bachelor's Degree-level Total	**1,139**	**1,204**	**6%**	**430**	**86**	**34%**

Source: Emsi 2022.1

*Engineers, All Other includes the emerging, mechatronics engineers occupation among other engineering roles that cannot be quantified alone at this time. Demand for mechatronics engineers alone is likely overstated.

An online job advertisement search for mechatronics jobs was conducted to reveal the details about the employers seeking these workers, including the time it takes to fill positions, earnings information, and in-demand skills. To determine the demand for bachelor's degree-level mechatronics opportunities, the job search focuses on the emerging occupation, mechatronics engineers (17-2199.05), because this occupation is specialized to mechatronics, unlike the broader occupation engineers all other (17-2199).

Over the previous 12 months, there were no jobs ads for electrical and electronics repairers, commercial and industrial equipment, and only two advertisements posted for mechatronics engineers in the region. To ensure there were sufficient advertisements to obtain reliable advertisement information, the job search for these occupations was expanded to include all advertisements posted in California. Despite the increased search area, the statewide job advertisement search for electrical and electronics repairers, commercial and industrial equipment yielded zero results.

Exhibit 2 shows the number of job ads posted during the last 12 months and the regional and statewide average time to fill this job. On average, regional employers spent 30 days filling online job advertisements for electro-mechanical and mechatronics technologists and technicians, six days shorter than employers throughout the state. Time to fill information reveals that regional employers likely face fewer challenges filling open positions than other employers in California.

Exhibit 2: Job ads and time to fill

Occupation	Job Ads	Regional Average Time to Fill (Days)	Statewide Average Time to Fill (Days)
Mechatronics Engineers*	340	-	43
Bachelor's Degree-level Total	**340**	**-**	**43**
Electro-Mechanical and Mechatronics Technologists and Technicians	97	30	36
Electrical and Electronics Repairers, Commercial and Industrial Equipment*	0	-	-
Community College-level Total	**97**	**30**	**36**
Total	**437**	**30**	**37**

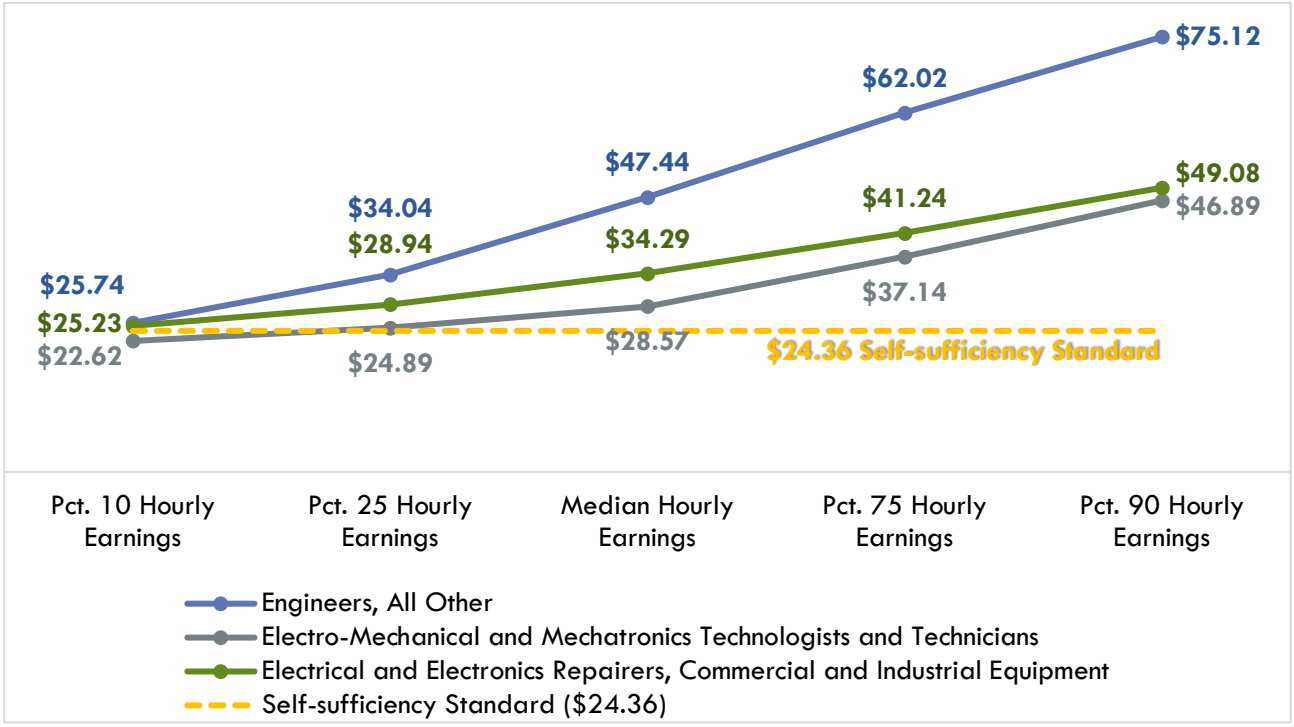
Source: Burning Glass – Labor Insights
*Statewide job advertisement information

Earnings and Benefits

Community colleges should ensure their training programs lead to employment opportunities that provide self-sustainable income. The University of Washington estimates that a self-sufficient hourly rate for a single adult with one school-age child is $24.36 per hour or $51,452 annually in Riverside County; $23.73 per hour or $50,119 annually in San Bernardino County (Pearce, 2021). For this study, the higher hourly earnings requirement in Riverside County is adopted as the self-sufficiency standard for the two-county region.

Exhibit 3 displays the hourly earnings for the mechatronics occupational group in the Inland Empire/Desert Region. The median hourly earnings for the community college-level occupational group are between $28.57 and $34.29, above the regional self-sufficiency standard. The hourly earnings for engineers, all other and electrical and electronics repairers, commercial and industrial surpass the regional self-sufficiency standard at the 10th percentile, indicating that at least the top 90% of workers earn a self-sustainable wage. The hourly earnings for electro-mechanical and mechatronics technologists and technicians exceed the self-sufficiency standard at the 25th percentile.

Exhibit 3: Hourly earnings by percentile



Source: Emsi 2022.1

Benefits information, typically provided by the occupational guides developed by the California Labor Market Information Division, is not available for the mechatronics occupational group (Detailed Occupational Guides, 2022).

Advertised Salary from Online Job Ads

Exhibit 4 displays online job ad salary data for the mechatronics occupational group over the last 12 months. Online job ad salary information reveals that employers are willing to pay the mechatronics occupational group an average annual salary between $55,000 and $106,000, above the region's $51,452 annual ($24.36 hourly) self-sufficiency standard. Consider the salary information with caution since only 12% (54 out of 437) of online job advertisements for these occupations provided salary information. The salary figures are

prorated to reflect full-time, annual earnings status. Job ad data was not available for the electrical and electronics repairers, commercial and industrial equipment occupation.

Exhibit 4: Advertised salary information

Occupation	Real-Time Salary Information					
	Number of job ads	Less than $35,000	$35,000 to $49,999	$50,000 to $74,999	More than $75,000	Average Annual Salary
Bachelor's Degree-level						
Mechatronics Engineers*	*26*	-	-	19%	81%	$106,000
Community College-level						
Electro-Mechanical and Mechatronics Technologists and Technicians	*28*	3%	54%	29%	14%	$55,000

Source: Burning Glass – Labor Insights
*Statewide job advertisement information

Employers, Skills, Education, and Work Experience

Exhibit 5 displays the employers posting the most job ads for the mechatronics occupational group over the last 12 months. Showing employer names provides some insight into where students may find employment after completing a program. XPO Logistics posted the most advertisements for the mechatronics occupational group in the Inland Empire/Desert Region, accounting for 19% of total regional advertisements. XPO Logistics sought mechatronics workers to repair and maintain the robotics used in materials transportation. Job ad data was not available for the electrical and electronics repairers, commercial and industrial equipment occupation.

Exhibit 5: Employers posting the most job ads for the mechatronics occupational group

Occupation	Top Employers	
Bachelor's Degree-level		
Mechatronics Engineers* *(n=340)*	• Tesla, Inc. • Rivian Automotive, Inc. • KLA Corporation • Johnson & Johnson	• Meta Platforms, Inc. • Actalent • SpaceX • Intuitive Surgical, Inc.
Community College-level		
Electro-Mechanical and Mechatronics Technologists and Technicians *(n=97)*	• XPO Logistics • GXO Logistics	• Applus IDIADA • WITRON Service

Source: Burning Glass – Labor Insights
*Statewide job advertisement information

Exhibit 6 lists a sample of specialized, employability, and software and programming skills employers seek when looking for workers to fill the mechatronics occupational group positions. Specialized skills are occupation-specific skills that employers request for industry or job competency. Employability skills are foundational skills that transcend industries and occupations; this category is often referred to as "soft skills." The skills requested in job ads may be utilized to guide curriculum development. Job ad data was not available for the electrical and electronics repairers, commercial and industrial equipment occupation.

Exhibit 6: Sample of in-demand skills from employer job ads

Occupation	Specialized skills	Employability skills	Software and Programming skills
Bachelor's Degree-level			
Mechatronics Engineers* *(n=338)*	• Mechanical Engineering • Robotics • Prototyping • Manufacturing Processes • Finite Element Analysis	• Communication Skills • Teamwork/ Collaboration • Troubleshooting • Problem Solving • Creativity	• SolidWorks • Python • MATLAB • C++
Community College-level			
Electro-Mechanical and Mechatronics Technologists and Technicians *(n=94)*	• Robotics • Equipment Repair • Calibration • Programmable Logic Controller (PLC) Programming	• Troubleshooting • Preventive Maintenance • Physical Abilities • Problem Solving • Communication Skills	• Microsoft Office

Source: Burning Glass – Labor Insights
*Statewide job advertisement information

Exhibit 7 displays the typical entry-level education, educational attainment, and minimum advertised education requirements for the mechatronics occupational group. According to the Bureau of Labor Statistics, between 48% and 51% of incumbent workers in this field hold a community college-level of educational attainment; "some college, no degree" and an "associate degree." Approximately 56% of employer job advertisements for electro-mechanical and mechatronics technologists and technicians sought candidates with at least a high school diploma or vocational training, and about 7% of employers preferred an associate degree. Typical entry-level education requirement and community college-level educational attainment information is not available for mechatronics engineers since this is an emerging occupation.

Exhibit 7: Typical entry-level education, educational attainment, and minimum advertised education requirements

Occupation	Typical Entry-Level Education Requirement	CC-Level Educational Attainment*	Real-Time Minimum Advertised Education Requirement			
			Number of Job Ads	High school or vocational training	Associate degree	Bachelor's degree or higher
Bachelor's Degree-level						
Mechatronics Engineers**	-	-	*313*	2%	1%	97%
Community College-level						
Electro-Mechanical and Mechatronics Technologists and Technicians	Associate degree	51%	*70*	56%	7%	37%
Electrical and Electronics Repairers, Commercial and Industrial Equipment**	Postsecondary nondegree award	48%	*0*	N/A	N/A	N/A

Source: Emsi 2021.4, Burning Glass – Labor Insights
*Percentage of incumbent workers with a Community College Award or Some Postsecondary Coursework
**Statewide job advertisement information

Exhibit 8 displays the work experience typically required to enter each occupation and the real-time work experience requirements from employer job ads. The majority of employers posting job advertisements for electro-mechanical and mechatronics technologists and technicians sought candidates with zero to two years of previous work experience, while most employers posting advertisements for mechatronics engineers sought candidates with three to five years of previous work experience.

Exhibit 8: Work experience required and real-time work experience requirements

Occupation	Work Experience Typically Required	Real-Time Work Experience			
		Number of job ads	0 – 2 years	3 – 5 years	6+ years
Bachelor's Degree-level					
Mechatronics Engineers*	-	*262*	17%	57%	26%
Community College-level					
Electro-Mechanical and Mechatronics Technologists and Technicians	None	*75*	72%	27%	1%

Source: Burning Glass – Labor Insights
*Statewide job advertisement information

Student Completions and Programs Outcomes

This section contains completion data for the California Community College mechatronics programs, which are currently coded under the following: electro-mechanical technology (TOP 0935.00), electrical, electronic, and electro-mechanical drafting (TOP 0953.30), electrical systems and power transmission (TOP 0934.40), and industrial systems technology and maintenance (TOP 0945.00), and manufacturing and industrial technology (TOP 0956.00) in the region. Combined, regional programs generated a potential supply of 45 qualified mechatronics workers annually. The Taxonomy of Programs manual states, "All Mechatronics programs should be moved to TOP 0935.00" (Taxonomy of Programs, 2012, p. 113).

Chaffey College is the only regional community college to offer an electro-mechanical technology (TOP 0935.00) program. In the 2020-21 academic year, Chaffey College issued four awards total across its mechatronics training programs. Exhibit 9 displays the awards issued in regional electro-mechanical technology programs in the 2020-2021 academic year.

Exhibit 9: Awards issued in regional electro-mechanical technology programs, 2020-21

TOP 0935.00 – Electro-Mechanical Technology	Award Type	Awards, Academic Year 2020-2021
Chaffey		**4**
Mechatronics	Associate Degree	0
Mechatronics Level I	Certificate 16 < 30 semester units	2
Mechatronics Level II	Certificate 8 < 16 semester units	2
Total		**4**

Source: MIS Data Mart

California program outcome data may provide a useful insight into the likelihood of success for the proposed program. Community college student outcome information based on the selected TOP code and region is provided in Exhibit 10. The outcome methodology is available in the appendix section of this report.

Exhibit 10: 0935.00 – Electro-mechanical technology strong workforce program outcomes

Strong Workforce Program Metrics: 0935.00 – Electro-Mechanical Technology Academic Year 2018-19, unless noted otherwise	Inland Empire/Desert Region	California
Unduplicated count of enrolled students (2019-20)	149	458
Completed 9+ career education units in one year (2019-20)	64%	51%
Perkins Economically disadvantaged students (2019-20)	85%	85%
Students who earned a degree, certificate, or attained apprenticeship (2019-20)	-	30
Transferred to a four-year institution (transfers)	-	33
Job closely related to the field of study (2017-18)	100%	100%
Median annual earnings (all exiters)	$45,306	$47,172

Strong Workforce Program Metrics: 0935.00 – Electro-Mechanical Technology Academic Year 2018-19, unless noted otherwise	Inland Empire/Desert Region	California
Median change in earnings (all exiters)	73%	76%
Attained a living wage (completers and skills-builders)	73%	70%

Sources: LaunchBoard Community College Pipeline and Strong Workforce Program Metrics

For a complete analysis of mechatronics educational supply in the region, programs similar in nature to mechatronics but assigned to different TOP codes were analyzed. The programs included in the supply analysis have been limited to those that provide training directly related to mechatronics. Exhibit 11 displays the mechatronics-related program titles and TOP codes and the types of awards offered by the colleges in the region.

Exhibit 11: Regional mechatronics and automation programs

College	Program Title	Program Code (TOP Code)	Award Offered
Chaffey	Industrial Electrical Technology	Electrical Systems and Power Transmission (0934.40)	A.S. Degree
	Industrial Electrical Technology Level I	Electrical Systems and Power Transmission (0934.40)	Certificate of Achievement requiring 16 to less than 30-semester units
	Industrial Electrical Technology Level II	Electrical Systems and Power Transmission (0934.40)	Certificate of Achievement requiring 30 to less than 60-semester units
	Industrial Electrical Technology Level III	Electrical Systems and Power Transmission (0934.40)	Certificate of Achievement requiring 30 to less than 60-semester units
	Mechatronics	Electro-Mechanical Technology (0935.00)	A.S. Degree
	Mechatronics Level I	Electro-Mechanical Technology (0935.00)	Certificate of Achievement requiring 16 to less than 30-semester units
	Mechatronics Level II	Electro-Mechanical Technology (0935.00)	Certificate of Achievement requiring 8 to less than 16-semester units
Norco	Industrial Automation	Manufacturing and Industrial Technology (0956.00)	A.S. Degree; Certificate of Achievement requiring 16 to less than 30-semester units; Noncredit Program
	Supply Chain Automation	Manufacturing and Industrial Technology (0956.00)	A.S. Degree; Certificate of Achievement: 30 to less than 60-semester units
San Bernardino Valley	Industrial Automation	Industrial Systems Technology and Maintenance (0945.00)	Certificate of Achievement requiring 30 to less than 60-semester units
	Smart Systems Automation Technology	Electrical, Electronic, and Electro-Mechanical Drafting (0953.30)	Noncredit Program

Source: COCI, Community College Catalogs 2021-22

Exhibit 12 displays the average annual credentials conferred from mechatronics training programs in the Inland Empire/Desert Region. Please note that the combination of completions from various training programs is intended to help assess the potential supply of mechatronics workers and does not provide an exact measure of trained mechatronics workers. These completion numbers do not reflect all competitions for each TOP code included, just the programs related to mechatronics within each TOP code.

Exhibit 12: Annual average community college credentials for programs related to mechatronics

Programs Related to Mechatronics	CCC Annual Average Credentials, Academic Years 2018-21
0934.40 – Electrical Systems and Power Transmission	
Chaffey	
Associate Degree	7
Certificate 30 to < 60 semester units	9
Certificate 18 to < 30 semester units	16
Electrical Systems and Power Transmission Total	**32**
0956.00 – Manufacturing and Industrial Technology	
Norco	
Associate Degree	4
Certificate 16 to < 30 semester units	5
Manufacturing and Industrial Technology Total	**9**
0945.00 – Industrial Systems Technology and Maintenance	
San Bernardino Valley	
Certificate 30 to < 60 semester units	0
Industrial Systems Technology and Maintenance Total	**0**
Mechatronics Programs Total	**41**

Source: LaunchBoard, MIS Data Mart, COCI

Recommendation

Community college electro-mechanical technology programs provide the knowledge, skills, and abilities that prepare students for employment as electrical and electronics repairers, commercial and industrial equipment and electro-mechanical and mechatronics technologists and technicians. Employment for the community college-level mechatronics occupational group is projected to increase by 6% through 2025, with 58 combined annual job openings are expected annually. The median hourly earnings for the mechatronics occupational group are between $28.57 to $34.29, above the regional self-sufficiency standard.

Five regional community college programs that provide training relevant to the mechatronics occupational group. Electro-mechanical technology programs provide the training most closely associated with mechatronics. In the 2020-21 academic year, Chaffey College issued four awards in their electro-mechanical technology programs. Over the last three academic years, there were 41 awards issued from four regional programs related to mechatronics and automation. Combined, regional programs generated 45 qualified

mechatronics workers annually. In the 2017-18 academic year, 100% of exiting students reported holding a job closely related to the field of study.

While community college-level mechatronics jobs offer self-sustainable earnings, the Centers of Excellence cautiously recommends expanding electro-mechanical programs due to low annual job openings for these workers. Well qualified exiting students may face strong competition from regional and commuting incumbent workers for relatively low job opportunities. Colleges considering this program should have a strong partnership with mechatronics employers and document their demand for workers and the skills needed for students to work in this field shortly after exiting the program.

Contact

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Appendix: Occupation definitions, sample job titles, five-year projections, and earnings for mechatronics occupations

Occupation Definitions* (SOC code), *Education and Training Requirement, Community College Education Attainment

Bachelor's Degree-level Occupations

Engineers, All Other (17-2199)

All engineers not listed separately.

Sample job titles: Energy Engineers, Except Wind and Solar, Mechatronics Engineers, Microsystems Engineers, Photonics Engineers, Robotics Engineers, Nanosystems Engineers, Wind Energy Engineers, Solar Energy Systems Engineers.

Entry-Level Educational Requirement: Bachelor's degree

Work Experience Required: None

Training Requirement: None

Incumbent workers with a Community College Award or Some Postsecondary Coursework: 14%

Mechatronic Engineers (17-2199.05)

Research, design, develop, or test automation, intelligent systems, smart devices, or industrial systems control.

Sample job titles: Automation Engineer, Automation Specialist, Controls Engineer, Design Engineer, Development Engineer, Engineer, Equipment Engineer, Project Engineer

Community College-level Occupations

Electro-Mechanical and Mechatronics Technologists and Technicians (17-3024)

Operate, test, maintain, or adjust unmanned, automated, servomechanical, or electro-mechanical equipment. May operate unmanned submarines, aircraft, or other equipment to observe or record visual information at sites such as oil rigs, crop fields, buildings, or for similar infrastructure, deep ocean exploration, or hazardous waste removal. May assist engineers in testing and designing robotics equipment.

Sample job titles: Designer, Electro-Mechanic, Electro-Mechanical Technician (E/M Technician), Electronic Technician, Engineering Specialist, Engineering Technician, Maintenance Technician, Mechanical Technician, Process Control Tech, Product Test Specialist

Entry-Level Educational Requirement: Associate degree

Work Experience Required: None

Training Requirement: None

Incumbent workers with a Community College Award or Some Postsecondary Coursework: 51%

Electrical and Electronics Repairers, Commercial and Industrial Equipment (47-2094)

Repair, test, adjust, or install electronic equipment, such as industrial controls, transmitters, and antennas.

Sample job titles: Control Technician, E and I Mechanic (Electrical and Instrument Mechanic), E and I Mechanic (Electrical and Instrumentation Mechanic), Electrical and Instrument Technician (E and I Tech), Electrical Maintenance Technician, Electronic Technician, I and C Tech (Instrument and Control Technician), Instrument and Electrical Technician (I and E Tech), Repair Technician, Scale Technician

Entry-Level Educational Requirement: Postsecondary nondegree award
Work Experience Required: None
Training Requirement: More than twelve months on-the-job training
Incumbent workers with a Community College Award or Some Postsecondary Coursework: 48%

Appendix: Methodology

Exhibits 9 and 12 display the average annual California Community College (CCC) awards conferred during the three academic years between 2018 and 2021 from the California Community Colleges Chancellor's Office Management Information Systems (MIS) Data Mart. Awards are the combined total of associate degrees and certificates issued during the timeframe, divided by three in this case to calculate an annual average. This is done to minimize the effect of atypical variation that might be present in a single year.

Community college student outcome information is from LaunchBoard and based on the selected TOP code and region. These metrics are based on records submitted to the California Community Colleges Chancellor's Office Management Information Systems (MIS) by community colleges, which come from self-reported student information from CCC Apply and the National Student Clearinghouse. Employment and earnings metrics are sourced from records provided by California's Employment Development Department's Unemployment Insurance database. When available, outcomes for completers are reported to demonstrate the impact that earning a degree or certificate can have on employment and earnings. For more information on the types of students included for each metric, please see the web link for LaunchBoard's Strong Workforce Program Metrics Data Element Dictionary in the References section (LaunchBoard, 2021a). Finally, employment in a job closely related to the field of study comes from self-reported student responses on the CTE Employment Outcomes Survey (CTEOS), administered by Santa Rosa Junior College (LaunchBoard, 2021a).

Job advertisement data is limited to the information provided by employers and the ability of artificial intelligence search engines to identify this information. Additionally, preliminary calculations by Georgetown Center on Education and the Workforce found that "just 30 to 40 percent of openings for candidates with some college or an associate degree, and only 40 to 60 percent of openings for high school diploma holders appear online" (Carnevale et al., 2014). Online job advertisements often do not reveal employers' hiring intentions; it is unknown if employers plan to hire one or multiple workers from a single online job ad or if they are collecting resumes for future hiring needs. A closed job ad may not be the result of a hired worker.

Table 1. 2020 to 2025 job growth, wages, entry-level education, training, and work experience required for the mechatronics occupational group in the Inland Empire/Desert Region (Riverside and San Bernardino counties combined)

Occupation (SOC)	2020 Jobs	5-Year Change (New Jobs)	5-Year % Change (New Jobs)	Annual Openings (New + Replacement Jobs)	Entry-Experienced Hourly Wage (10th to 90th percentile)	Median Hourly Wage (50th percentile)	Average Annual Earnings	Entry-Level Education & On-The-Job-Training	Work Experience Required
Engineers, All Other (17-2199)	1,139	65	6%	86	$25.74 to $75.12	$47.44	$109,000	Bachelor's degree & None	None
Mechatronic Engineers (17-2199.05)	-	-	-	-	-	-	-	-	-
Bachelor's Degree-level Total	**1,139**	**65**	**6%**	**86**	**-**	**-**	**-**	**-**	**-**
Electrical and Electronics Repairers, Commercial and Industrial Equipment (49-2094)	576	32	6%	53	$25.53 to $49.08	$34.29	$73,900	Postsecondary nondegree award & 12 months	None
Electro-Mechanical and Mechatronics Technologists and Technicians (17-3024)	46	3	7%	5	$22.62 to $46.89	$28.57	$67,200	Associate's degree & None	None
Community College-level Total	**622**	**35**	**6%**	**58**	**-**	**-**	**-**	**-**	**-**
Total	**1,762**	**100**	**6%**	**144**	**-**	**-**	**-**	**-**	**-**

Source: Emsi 2022.1

Student	Lathe project on page 7-8 of the lathe workbook (2063185)	Lathe project on page 9 of the lathe workbook (2063188)	Hitch ball (2063180)	Pillar (2063242)	Final exam Final Score
Student 1	100	95	95	95	100
Student 2	80	85	95		100
Student 3			95		100
Student 4					
Student 5	90	90	90		100
Student 6	100	100	100	100	100
Student 7	100	100	100	100	100
Student 8	75	80	90		100
Student 9	100	100		100	95
Student 10	100	100	90		
	SLO 1	SLO 1	SLO 1	SLO 1	SLO 1
	93.1	93.8	94.4	98.8	99.4
	95.9				

Midterm exam after the 2d lessons Current Score	Midterm exam after the 2d lessons Unposted Current Score	Midterm exam after the 2d lessons Final Score	Midterm exam after the 2d lessons Unposted Final Score
80	80	80	80
95	95	95	95
95	95	95	95
80	80	80	80
85	85	85	85
100	100	100	100
100	100	100	100
20	20	20	20
85	85	85	85
80	80	80	80
SLO 2	SLO 2	SLO 2	SLO 2
82.0	82.0	82.0	82.0
82.0			

4-5 axis, Lesson 1: Conical and cylinderical helix (2063149)	4-5 axis, Lesson 2: 4th axis part 1, wrap text and points around a cylinder (2063154)	4-5 axis, Lesson 4 dodecahedron (2063157)	4-5th axis: Dodecahedron with drill holes (2063162)	Mastercam 2020 - 5 axis Current Score	Mastercam 2020 - 5 axis Unposted Current Score	Mastercam 2020 - 5 axis Final Score	Mastercam 2020 - 5 axis Unposted Final Score
	95	100		56.43	56.43	56.43	56.43
90	95	100	100	96.14	96.14	96.14	96.14
95	85	100	100	81.43	81.43	81.43	81.43
100	100	100		70.71	70.71	70.71	70.71
100	100	100	100	98.57	98.57	98.57	98.57
100	100	100	100	100	100	100	100
85		100	100	82.86	82.86	82.86	82.86
100	100	95	100	99.29	99.29	99.29	99.29
SLO 3	SLO 3	SLO 3	SLO 3	SLO 3	SLO 3	SLO 3	SLO 3
95.7	96.4	99.4	100.0	85.7	85.7	85.7	85.7
91.8							

Student Learning Outcomes:
Upon successful completion of the course, students should be able to demonstrate the following skills:

SLO 1 1. Program turning centers using MasterCam Computer Aided Machining software.
SLO 2 2. Program milling machine operations at a beginning and advanced level using MasterCam Computer Aided Machining (CAM) software.
SLO 3 3. Create simple two-dimensional and advanced three-dimensional parts using Mastercam software.

This course's COR needs to be updated.

The scores for each assignement are at least above 90%

Instructor uses videos to help the students complete many of these assignments.

I would suggest that the instructor incurage the students that got 0 on some of these assignments

		Midterm exam (1998241)	mill page 9 positioning exercise (1998169)	lathe page 9 typical lathe part Cartesian coordinate quiz (1998181)	Absolute and incremental part a (1998194)
23Fall-MAN-57-38034	Student 1	85	100	100	100
23Fall-MAN-57-38034	Student 2	90	100	100	100
23Fall-MAN-57-38034	Student 3	85	100	100	97.5
23Fall-MAN-57-38034	Student 4	95	100	95.83	92.5
23Fall-MAN-57-38034	Student 5	85	100	100	100
23Fall-MAN-57-38034	Student 6	95	92.71	95.83	95
23Fall-MAN-57-38034	Student 7	98	100	100	100
23Fall-MAN-57-38034	Student 8	88	100	100	100
23Fall-MAN-57-38034	Student 9	85	100	100	98.75
		CO 1	CO 1	CO 1	CO 1
		90	99	99	98
		97			

		mill page 81 CANNED CYCLE EXERCISE 1 (1998153)	mill page 90 canned cycle exercise 2 (1998177)	mill page 102 canned cycle exercise 3 (1998161)
23Fall-MAN-57-38034	Student 1	99.99	100	100
23Fall-MAN-57-38034	Student 2	98.98	100	97.59
23Fall-MAN-57-38034	Student 3	93.84	100	96.37
23Fall-MAN-57-38034	Student 4			100
23Fall-MAN-57-38034	Student 5	83.67	100	93.99
23Fall-MAN-57-38034	Student 6	86.7	100	72.36
23Fall-MAN-57-38034	Student 7	99.99	100	100
23Fall-MAN-57-38034	Student 8	97.97	100	95.18
23Fall-MAN-57-38034	Student 9	91.85		91.64
		CO 2	CO 2	CO 2
		94	100	94
		96		

		Turn in your completed M97-M99 project for the small part you have run (1998160)	Incremental assignment showing G150 pocketing commands
23Fall-MAN-57-38034	Student 1	85	60
23Fall-MAN-57-38034	Student 2		
23Fall-MAN-57-38034	Student 3	80	85
23Fall-MAN-57-38034	Student 4	95	80
23Fall-MAN-57-38034	Student 5	100	90
23Fall-MAN-57-38034	Student 6	50	75
23Fall-MAN-57-38034	Student 7		95
23Fall-MAN-57-38034	Student 8		
23Fall-MAN-57-38034	Student 9		
		CO 3	CO 3
		82	81
		81	

		Midterm exam (1998241)	mill page 41 interpolation exercise (1998185)	mill page55 CIRCULAR POCKET MILLING EXERCISE (1998158)	mill page 66 CUTTER COMPENSATION EXERCISE 1 Quiz (1998157)	mill page 88 CUTTER COMPENSATION EXERCISE #2 (1998172)
23Fall-MAN-57-38034	Student 1	85	100	100	100	95
23Fall-MAN-57-38034	Student 2	90	100	100	100	100
23Fall-MAN-57-38034	Student 3	85	96.67	100	100	100
23Fall-MAN-57-38034	Student 4	95	100	100	100	90
23Fall-MAN-57-38034	Student 5	85	96.67	97.3	97.14	90
23Fall-MAN-57-38034	Student 6	95	100	94.59	94.29	90
23Fall-MAN-57-38034	Student 7	98	100	100	100	100
23Fall-MAN-57-38034	Student 8	88	100	100	100	75
23Fall-MAN-57-38034	Student 9	85	96.67	89.19	85.71	
		CO 4	CO 4	CO 4	CO 4	CO 4
		90	99	98	97	93
		95				

		Absolute programming TV screen (1998213)	Incremental programming assignment one with cutter comp (1998253)	Incremental programming assignment two (1998235)	Absolute programming with cutter comp (TV screen) assignment	Lathe page 7-8 typical lathe part tool path (1998237)	lathe page9 typical lathe part tool path (1998239)	Hammer handle (1998227)	Hammer head (1998228)
23Fall-MAN-57-38034	Student 1	95	100	75	90	100	100	85	85
23Fall-MAN-57-38034	Student 2							90	90
23Fall-MAN-57-38034	Student 3	50	80	80	80	100	100	85	85
23Fall-MAN-57-38034	Student 4	95	85		90	100	70	90	90
23Fall-MAN-57-38034	Student 5	90	75	85	75	100	100	85	85
23Fall-MAN-57-38034	Student 6	90	85	90	100	100	80	85	85
23Fall-MAN-57-38034	Student 7	100	95	95	95	100	100	85	85
23Fall-MAN-57-38034	Student 8	80		85	90	100	100	90	90
23Fall-MAN-57-38034	Student 9	100				100	100	85	85
		SLO 1	SLO 1	SLO 1	SLO 1	SLO 1	SLO 1	SLO 1	SLO 1
		88	87	85	89	100	94	87	87
		89							

		Hammer handle (1998227)	Hammer head (1998228)
23Fall-MAN-57-38034	Student 1	85	85
23Fall-MAN-57-38034	Student 2	90	90
23Fall-MAN-57-38034	Student 3	85	85
23Fall-MAN-57-38034	Student 4	90	90
23Fall-MAN-57-38034	Student 5	85	85
23Fall-MAN-57-38034	Student 6	85	85
23Fall-MAN-57-38034	Student 7	85	85
23Fall-MAN-57-38034	Student 8	90	90
23Fall-MAN-57-38034	Student 9	85	85
		CO 4	CO 4
		87	87
		87	

Course Objectives:
Upon successful completion of the course, students should be able to demonstrate the following activities:

CO 1 1. Perform calculations necessary to develop coordinate charts for part geometry with an emphasis on trigonometry and using trigonometry to find point positions on two-dimensional parts that are more complex then squares and rectangles.
CO 2 2. Use canned cycles correctly in programs for CNC machine tools.
CO 3 3. Use subroutine techniques correctly in programs for CNC machine tools.
CO 4 4. Analyze CNC programs written by others to determine machining sequences.

Student Learning Outcomes:
Upon successful completion of the course, students should be able to demonstrate the following skills:

SLO 1 1. Create computer numerical control programs for cutting simple parts.
SLO 2 2. Ability to read and write CNC machine code so students are able to review programs machine to avoid crashing the machine.

Type of assessment:

Each of these projects were either exams, in class projects, or textbook assignments

Results:

Each student that completed the assignments for each course outline and SLO did extermly well as shown in each column.

Suggestions: for the class:

Subroutines need to be presented better and students need more instruction on subroutines.
More needs to be done to present trionometry.

		I2L Reading Manufacturing Blueprints module progress	I2L 3-Axis CNC Milling Machine Setup (new control) module	I2L 3-Axis cnc milling machine setup (classic control)	I2L Haas Mill Intuitive Programming System	I2L CNC Lathe Setup (Classic Control)	I2L CNC Lathe Setup (GUI Control) (2096805)	I2L Renishaw Tool Setter and Probing (GUI Control)(e)	I2L precision measurement (2096813)	Inch to Metric -- metric to inch	I2L CNC Mill Project 1 (GUI Control) (e) (2096807)	I2L CNC Mill Project 1 (Next Generation Control)(e)	I2L CNC Lathe Project 1 (GUI Control)(e) (2096803)	I2L CNC Lathe Project 1 (Next Generation Control)(e)
	Points Possible	100	100	100	100	100	100	100	100	89	100	100	100	100
23FALL-MAN-56-38033	Student 1	90	72.1	63.9	74.3	82.5	80	73.7	61.5	100	86.2	90	66.7	76.5
23FALL-MAN-56-38033	Student 2	92.5	97.2	97.2		85	97.5		79.5	67	93.1		89	100
23FALL-MAN-56-38033	Student 3	80	75	91.7		77.5	92.5	73.7	87.2	100	93.1		94.4	100
23FALL-MAN-56-38033	Student 4	97.5	97.2	94.4	100	95	77.8	89.5	94.9	100	89.7	96.6	94.1	96.6
23FALL-MAN-56-38033	Student 5	85	97.2	100	88.6	95	97.5	84.2	92.3	91	100	100	94.4	100
23FALL-MAN-56-38033	Student 6	90	86.1	94.4	74.3	87.5	95		94.9	99	93.1	76.5	88.9	76.5
23FALL-MAN-56-38033	Student 7	95	75	94.4	97.1	92.5			92.3					
23FALL-MAN-56-38033	Student 8	95	86.1						97.4					
23FALL-MAN-56-38033	Student 9	97.5	88.9	100	94.3	97.2	97.5	81.6	100	99	100	96.9	94.4	82.5
23FALL-MAN-56-38033	Student 10	85	83.3	75	71.4	85	85	79	84.6	100	79.3	96	67	70.6
23FALL-MAN-56-38033	Student 11	100	100	100		100	100		100	86	100	100	100	100
23FALL-MAN-56-38033	Student 12	90	86.1	86.1		82.5	95	81.6	87	93	100	93.1	72.2	94.1
23FALL-MAN-56-38033	Student 13	80	75	94.4	71.4	97.5	97.5	78.9	89.7					
23FALL-MAN-56-38033	Student 14	97.5	97.2	100	100	100	100	94.7	100		100	100	94	100
23FALL-MAN-56-38033	Student 15	95	97.5	97.2	94.3	100	100	92.1	94.9		100	100	88.9	100
23FALL-MAN-56-38033	Student 16	75	88.9	77.8	88.9	90	87.5		82.1		89.7	94.1	88.9	94.1
23FALL-MAN-56-38033	Student 17	95	91.7	88.9	94.3	97.5	95	97.4	97.4		93.1	96.6	88.9	94.1
		90.6	87.9	91.0	87.4	91.5	93.2	84.2	90.3	93.5	94.1	95.0	87.3	91.8
		CO 1	CO 2	CO 2	CO 2	CO 2	CO 2	CO 2	CO 4	CO 5	SLO 1	SLO 1	SLO 1	SLO 1
Totals for each Course objective and SLO:		90.6	89.2						90.3	93.5	92.0			

Course Objectives:
Upon successful completion of the course, students should be able to demonstrate the following activities:

CO 1 1. Analyze engineering drawings for content necessary for the set-up and operation of CNC machine tools.
CO 2 2. Select, set, and install tooling as indicated by the engineering drawings and the CNC program.
CO 3 3. Recognize CNC machine codes and terminology for computerized machining and manufacturing.
CO 4 4. Demonstrate appropriate precision measurement instrument use.
CO 5 5. Convert to and from Metric and U.S. customary; fractional and decimal fractional units.

Student Learning Outcomes:
Upon successful completion of the course, students should be able to demonstrate the following skills:

SLO 1 1. Use computer numerical control machines to create a compressed air engine.

Type of assessment:

Each of these assessments were quiz questions from the LMS that is assigned to each student.

Results:

Each student that took the quiz got at least 80% for each assessment.

Suggestions: for the class:

Assessments for the project completed during the class should be assessed.

The project that was completed during the class was too hard for the students to complete during the allotted time frame of the class. I changed the project for the class during the Spring 2024 semester which should make it easier for the students to complete

Manufacturing and Machining

Inland Empire/Desert Region (Riverside and San Bernardino counties)

Summary

Manufacturing and Industrial Technology
Community College Program
(TOP 0956.00)

Provides training for
- Machinists (51-4041)
- Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic (51-4072)
- Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic (51-4081)
- Tool and Die Makers (51-4111)
- Computer Numerically Controlled Tool Operators (51-9161)
- Computer Numerically Controlled Tool Programmers (51-9162)
Occupations

Over the next five years (2022-2027), employment for the manufacturing and machining occupational group is projected to:

Increase Employment by
2%

829
Annual Job Openings

Median Hourly Earnings
$17.50 - $29.49

27 Total Annual Awards
In manufacturing and machining-related programs

27
Program Awards from Community College Programs

N/A
Program Awards from Other Postsecondary Education Providers

The Inland Empire/Desert Centers of Excellence
Recommends
manufacturing and industrial technology and/or machining and machine tools program(s)
to meet the need for more workers in the region

Introduction

California Community College manufacturing and industrial technology (TOP 0956.00) programs prepare students for employment through the instruction of engineering principles and technical skills for the manufacture of products and related industrial processes. It includes shaping and forming operations, materials handling, instrumentation and controls, quality control, Computer Aided Manufacturing, robotics, optimization theory, industrial and manufacturing planning, and related management skills (Taxonomy of Programs, 2023). The knowledge, skills, and abilities trained by manufacturing and industrial technology programs lead to employment in the manufacturing and machining occupational group.

- Machinists (51-4041)
- Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic (51-4072)
- Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic (51-4081)
- Tool and Die Makers (51-4111)
- Computer Numerically Controlled Tool Operators (51-9161)
- Computer Numerically Controlled Tool Programmers (51-9162)

Job Demand

In 2022, there were 7,416 jobs in the manufacturing and machining occupational group in the Inland Empire/Desert Region. Regional employment for this occupational group is projected to increase by 2% through 2027 – 829 job openings are projected annually. Exhibit 1 displays the job counts, five-year projected job growth, and job openings in the region. Exhibit 1 is sorted from highest to lowest number of annual openings.

Exhibit 1. Five-year projections for the manufacturing and machining occupational group, Inland Empire/Desert Region, 2022-2027

Occupation	2022 Jobs	2027 Jobs	5-Yr % Change	5-Yr Openings (New + Replacement Jobs)	Annual Openings (New + Replacement Jobs)
Machinists	3,104	3,191	3%	1,762	352
Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	2,134	2,142	0%	1,133	227
Computer Numerically Controlled Tool Operators	1,192	1,178	(1%)	623	125
Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	505	555	10%	329	66
Computer Numerically Controlled Tool Programmers	260	287	10%	168	34
Tool and Die Makers	220	226	2%	129	26
Total	**7,416**	**7,577**	**2%**	**4,144**	**829**

Source: Lightcast 2023.3

An online job ad search for the manufacturing and machining occupational group was conducted to reveal the employers seeking these workers, including the median posting duration, earnings information, and in-demand skills. Exhibit 2 displays the number of job ads posted for the manufacturing and machining occupational group over the last 12 months and the median posting duration. Over the previous 12 months, there were 922 job ads for the manufacturing and machining occupational group in the region (sorted from highest to lowest number of job ads).

Exhibit 2. Job ads and posting duration, Inland Empire/Desert Region, November 2022 through October 2023

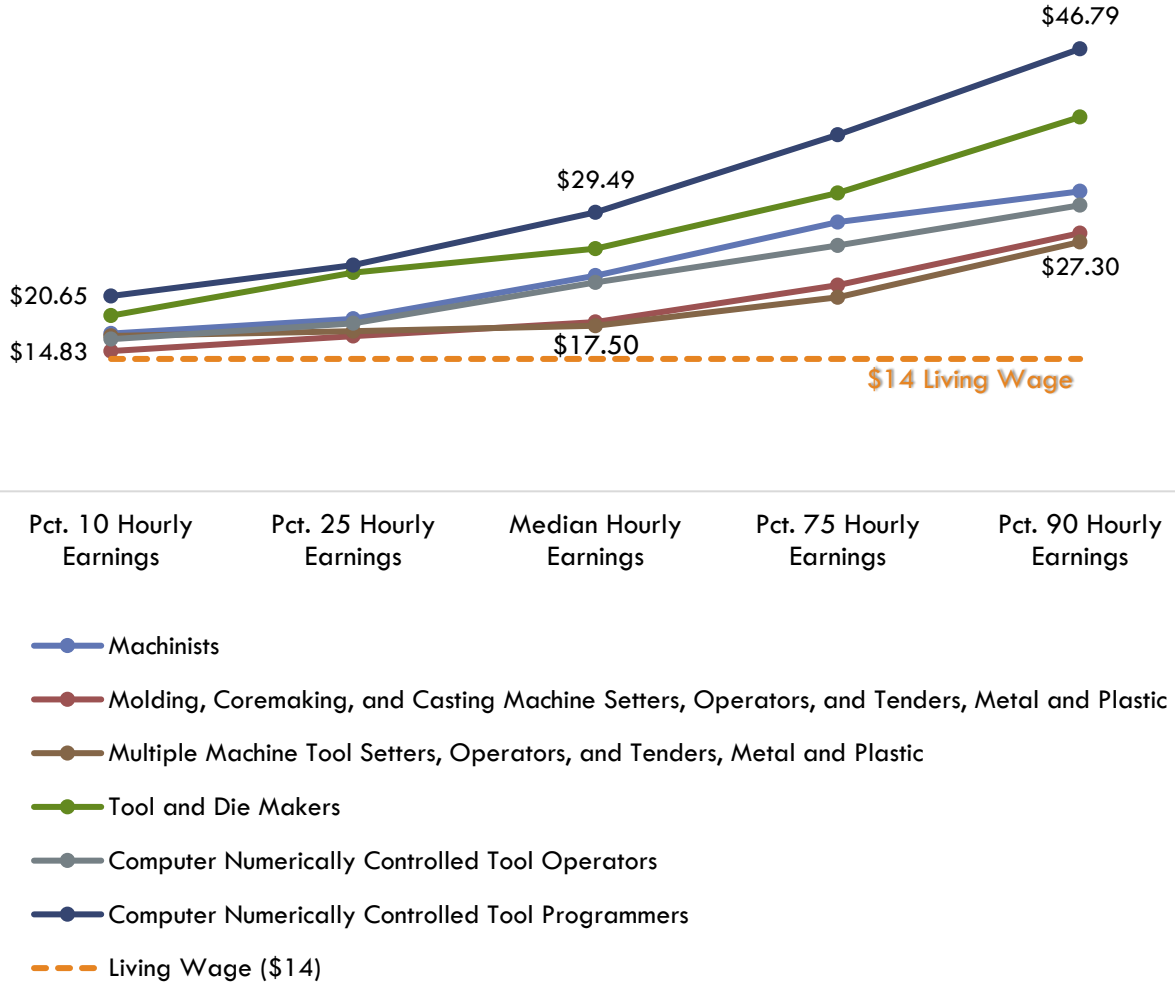
Occupation	Job Ads	Median Posting Duration (Days)
Computer Numerically Controlled Tool Operators	391	25
Machinists	337	25
Computer Numerically Controlled Tool Programmers	99	24
Tool and Die Makers	39	24
Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	38	25
Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	18	18
Total	**922**	**--**

Source: Lightcast 2023.3

Earnings

The living wage for one adult in the Inland Empire (Riverside and San Bernardino) is $14 per hour or $29,120 annually. Exhibit 3 displays the hourly earnings for the manufacturing and machining occupational group. Most notable is that all six occupations have entry-level hourly wages above the living wage estimate.

Exhibit 3. Hourly earnings by percentile for the manufacturing and machining *occupational group, Inland Empire/Desert Region, 2022*



Source: Lightcast 2023.3

Advertised Salary from Online Job Ads

Exhibit 4 displays the regional online advertised salaries for the manufacturing machining occupational group over the last 12 months. Online job ads salary information reveals that most employers (69%) advertise an annual salary between $35,000 and $54,999.

Exhibit 4. Online advertised salaries for the manufacturing and machining *occupational group, Inland Empire/Desert Region, November 2022 through October 2023*

Source: Lightcast 2023.3

Online Job Advertisements: Job Titles, Employers, Skills, Education, & Work Experience

Exhibit 5 displays the job titles most frequently used in manufacturing and machining job ads over the last 12 months. Displaying advertised job titles may provide insight into the types of positions sought by employers.

Exhibit 5. Job titles most frequently used in manufacturing and machining *job ads, Inland Empire/Desert Region, November 2022 through October 2023*

Job Titles	Unique Job Ads
Machinists	89
CNC Machinists	82
CNC Programmers	61
CNC Operators	50
CNC Machine Operators	47
CNC Lathe Operators	45
Machine Operators	40
CNC Operators/Machinists	35
CNC Set Up Operators	33
CNC Lathe Machinists	25

Source: Lightcast 2023.3

Exhibit 6 displays the employers posting the most job ads for the manufacturing and machining occupational group during the last 12 months. Showing employer names provides insight into where students may find employment after completing a program. Aerotek posted the most job ads for the manufacturing and machining occupational group over the last 12 months.

Exhibit 6. Employers posting the most job ads for the manufacturing machining occupational group, Inland Empire/Desert Region, November 2022 through October 2023

Top Employer	Unique Job Ads
Aerotek	78
Flag Solutions	31
Flowserve	29
Randstad	24
Key Skilled Personnel	20

Source: Lightcast 2023.3

Exhibit 7 lists a sample of specialized and employability skills employers list when seeking workers to fill manufacturing and machining positions. Specialized skills are occupation-specific skills that employers request for industry or job competency. Common skills are foundational skills that transcend industries and occupations; this category is often referred to as "soft skills." The skills requested in job ads may be utilized to guide curriculum development.

Exhibit 7. Sample of in-demand skills from employer job ads, Inland Empire/Desert Region, November 2022 through October 2023

Specialized skills	Common skills
• Machining	• Operations
• Lathes	• Communications
• Computer Numerical Control (CNC)	• Troubleshooting
• Mills	• Mathematics
• Tooling	• Detail Oriented
• CNC Machining	• Problem Solving
• Micrometer	• Management
• Calipers	• Lifting Ability
• Blueprinting	• Mechanical Aptitude
• Metal Lathes	• Teamwork

Source: Lightcast 2023.3

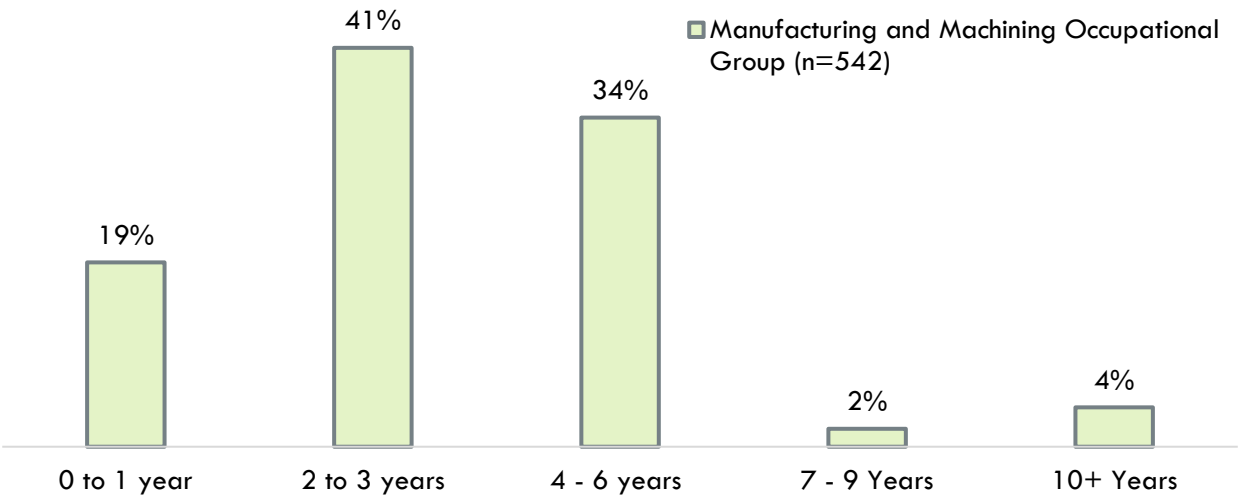
Exhibit 8 displays the minimum advertised education requirements for the manufacturing and machining occupational group. According to the Bureau of Labor Statistics, between 28% and 48% of incumbent workers in this field hold a community college-level of educational attainment; "some college, no degree," and an "associate degree." Only 38% of employer job ads included minimum education requirements. Most employer job ads (95%) sought a candidate holding a high school diploma or GED (equivalent) as a minimum education requirement.

Exhibit 8. Minimum advertised education requirements, Inland Empire/Desert Region, November 2022 through October 2023

Source: Lightcast 2023.3

Exhibit 9 displays the work experience typically required from employer job ads for the manufacturing and machining occupational group. The majority (41%) of employers listing minimum experience requirements sought candidates with two (2) to three (3) years of previous work experience.

Exhibit 9. Real-time work experience requirements, Inland Empire/Desert Region, November 2022 through October 2023



Source: Lightcast 2023.3

Certifications

Exhibit 10 displays the most frequently requested certifications by employers in job advertisements.

Job advertisements reveal that employers value the Forklift certification.

Exhibit 10: Certifications most frequently required by employers, Inland Empire/Desert Region, November 2022 through October 2023

Certification	Jobs Ads
Forklift Certification	35
CNC Machining Certification	24
Six Sigma Certification	19
Certified Associate in Project Management	8
Project Management Professional Certification	7

Source: Lightcast 2023.3

Student Completions and Programs Outcomes

Exhibit 11 displays student completions for Manufacturing and Industrial Technology (TOP 0956.00) and Machining and Machine Tools (TOP 0956.30) programs over the last three academic years (2019-2022). In the previous three academic years, two regional community colleges issued an average of 27 awards in relevant programs.

Exhibit 11. Annual average community college awards for manufacturing and industrial technology (0956.00) and machining and machine tools (0956.30) programs, Inland Empire/Desert Region, 2019-2022

TOP Code	Program	College	2019-20 Awards	2020-21 Awards	2021-22 Awards	3-Year Award Average
0956.00	Manufacturing and Industrial Technology	Norco	15	8	4	9
		San Bernardino Valley	2	-	3	2
Supply Subtotal/Average			**17**	**8**	**7**	**11**
0956.30	Machining and Machine Tools	Norco	15	7	9	10
		San Bernardino Valley	6	2	9	6
Supply Subtotal/Average			**21**	**9**	**18**	**16**
Supply Total/Average			**38**	**17**	**25**	**27**

Source: MIS Data Mart

California program outcome data may provide useful insight into the likelihood of success for the proposed program. Community college student outcome information based on the selected TOP code and region is provided in Exhibit 12.

Exhibit 12. 0956.00 – Manufacturing and Industrial Technology strong workforce program outcomes, Inland Empire/Desert Region, most recent academic year

Strong Workforce Program Metrics: 0956.00 – Manufacturing and Industrial Technology	Inland Empire/Desert Region	California
Unduplicated count of enrolled students (2021-22)	50	3,670
Completed 9+ career education units in one year (2021-22)	32%	31%
Students who attained a noncredit workforce milestone in a year (2021-22)	N/A	14%
Students who earned a degree, certificate, or attained apprenticeship	12 (2019-20)	386 (2021-22)
Job closely related to the field of study	88% (2018-19)	79% (2019-20)
Median annual earnings (all exiters) (2020-21)	$42,560 ($20.46)	$47,028 ($22.61)
Median change in earnings (all exiters) (2020-21)	18%	31%
Attained a living wage (completers and skills-builders) (2020-21)	68%	67%

Sources: LaunchBoard Community College Pipeline and Strong Workforce Program Metrics

Non-Community College Supply

No award completion data is available for Manufacturing Engineering Technology/Technician (CIP 15.0613); Machine Tool Technology/Machinist (CIP 48.0501); Industrial and Product Design (CIP 50.0404) in the Inland Empire/Desert Region.

Summary of Findings & Recommendation

Over the next five years, the manufacturing and machining occupational group is projected to have 829 annual job openings and increase employment by 2% in the Inland Empire/Desert Region. All six occupations pay hourly wages above the living wage estimate ($14).

Over the last three academic years, 2 regional community colleges have issued 27 annual average awards in manufacturing and industrial technology (TOP 0956.00) and machining and machine tools (TOP 0956.30) programs. Non-community college postsecondary education institutions did not issue any awards in manufacturing and/or machining-related programs over the past two years. In total, regional institutions issued 27 manufacturing and machining-related awards annually, on average.

The Centers of Excellence finds that there is a regional need for manufacturing and machining training programs to meet the regional demand for more workers. Colleges considering this program should partner with applicable employers to document their demand for manufacturing and machining workers and the skills/certifications required for students to earn a living wage after exiting the program.

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Appendix: Methodology

Exhibit 11 displays the average annual California Community College (CCC) awards conferred during the three academic years between 2019 and 2022 from the California Community Colleges Chancellor's Office Management Information Systems (MIS) Data Mart. Awards are the combined total during the timeframe, divided by three in this case to calculate an annual average. This is done to minimize the effect of atypical variations that might be present in a single year.

Community college student outcome information is from LaunchBoard and based on the selected TOP code and region. These metrics are based on records submitted to the California Community Colleges Chancellor's Office Management Information Systems (MIS) by community colleges, which come from self-reported student information from CCC Apply and the National Student Clearinghouse. Employment and earnings metrics are sourced from California's Employment Development Department's Unemployment Insurance database. When available, outcomes for completers are reported to demonstrate the impact that earning a degree or certificate can have on employment and earnings. For more information on the types of students included for each metric, please see the web link for LaunchBoard's Strong Workforce Program Metrics Data Element Dictionary in the References section (LaunchBoard, 2023a). Finally, employment in a job closely related to the field of study comes from self-reported student responses on the CTE Employment Outcomes Survey (CTEOS) administered by Santa Rosa Junior College (LaunchBoard, 2023a).

Table 1. 2022 to 2027 job growth, wages, entry-level education, training, and work experience required for the manufacturing and machining occupational group in the Inland Empire/Desert Region (Riverside and San Bernardino Counties combined)

Occupation (SOC)	2022 Jobs	5-Year Change	5-Year % Change	Annual Openings (New + Replacement Jobs)	Entry-Experienced Hourly Wage (10th to 90th percentile)	Median Hourly Wage (50th percentile)	Average Annual Earnings	Entry-Level Education & On-The-Job-Training	Work Experience Required
Machinists (51-4041)	3,104	87	3%	352	$16.68 to $31.72	$22.81	$50,074	High school diploma or equivalent & Long-term	None
Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic (51-4072)	2,134	7	0%	227	$14.83 to $27.30	$17.90	$40,643	High school diploma or equivalent & Moderate-term	None
Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic (51-4081)	505	50	10%	66	$16.43 to $26.37	$17.50	$40,558	High school diploma or equivalent & Moderate-term	None
Tool and Die Makers (51-4111)	220	5	2%	26	$18.57 to $39.58	$25.66	$58,271	Postsecondary nondegree award & Long-term	None
Computer Numerically Controlled Tool Operators (51-9161)	1,192	(15)	(1%)	125	$16.09 to $30.25	$22.08	$47,208	High school diploma or equivalent & Moderate-term	None
Computer Numerically Controlled Tool Programmers (51-9162)	260	27	10%	34	$20.65 to $46.79	$29.49	$65,864	Postsecondary nondegree award & Moderate-term	None
Total	**7,416**	**162**	**2%**	**829**	**-**	**-**	**-**	**-**	**-**

Source: Lightcast 2023.3