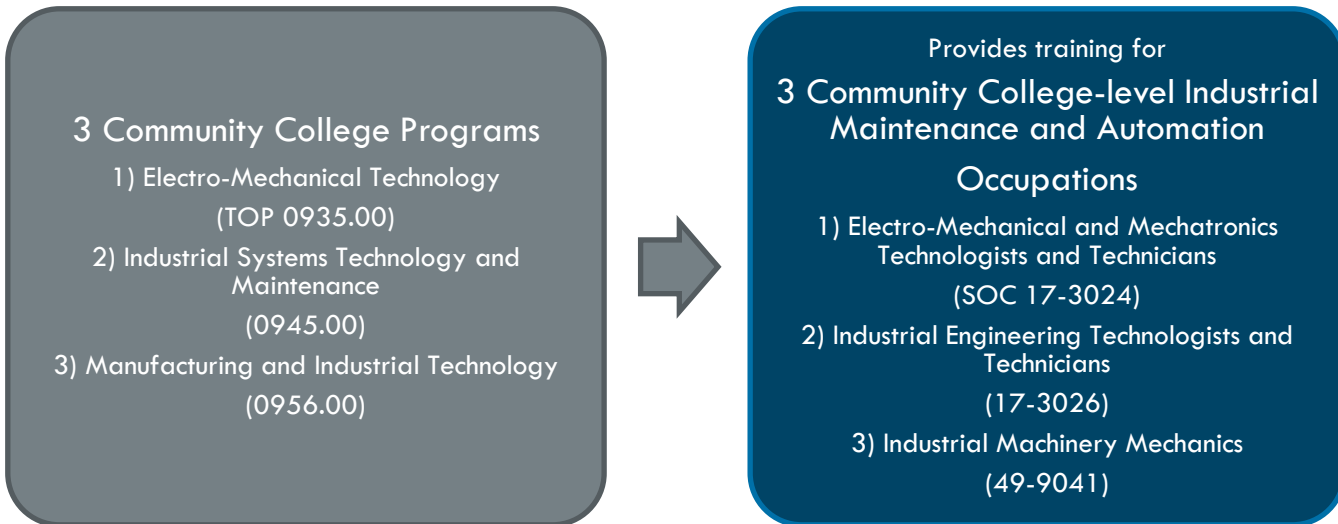


Industrial Maintenance and Automation

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

Summary



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	0
Program Awards from Community College Programs	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

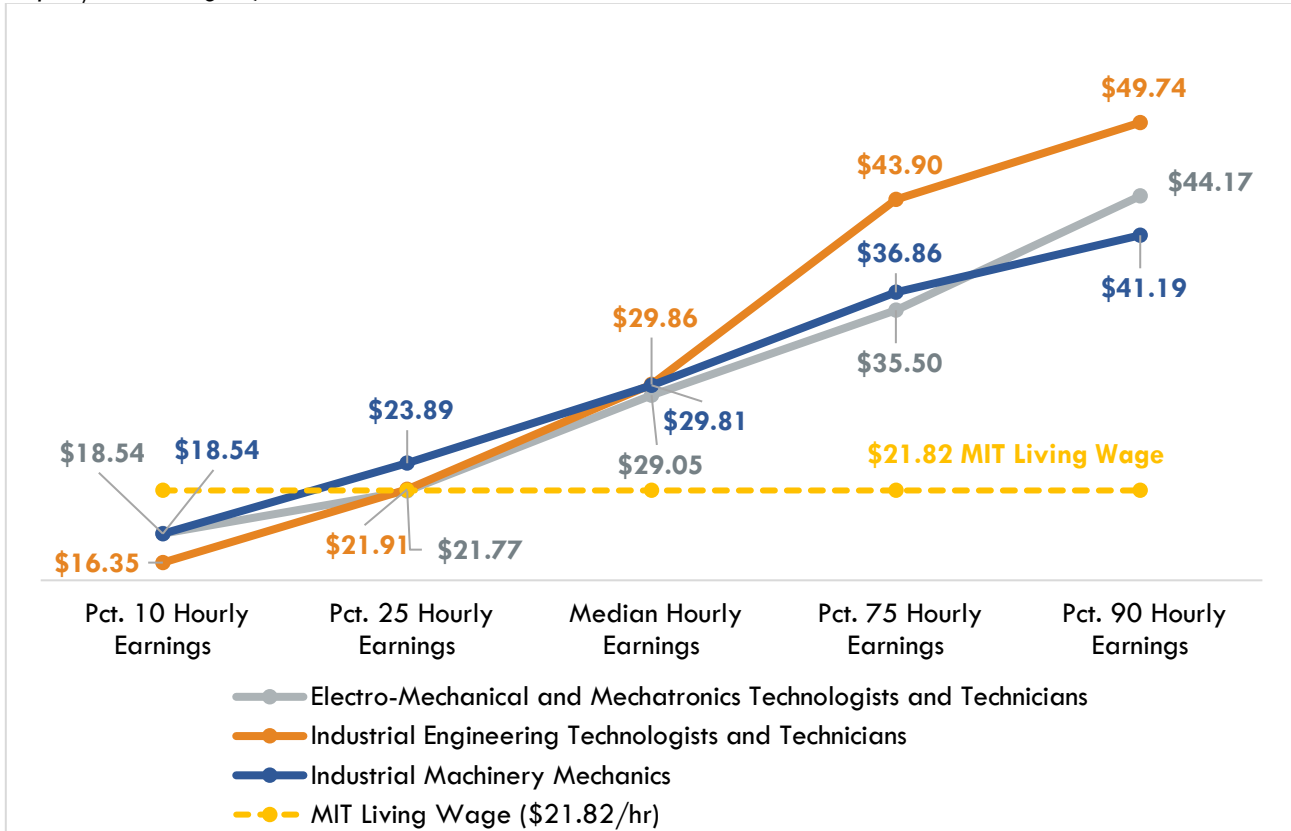
Source: Lightcast 2023.3

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

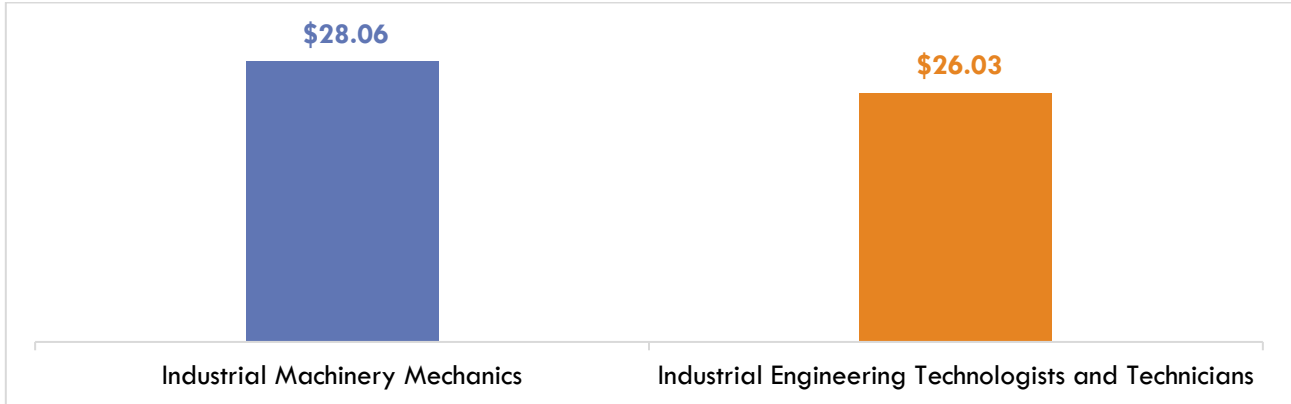


Source: Lightcast 2023.3

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.

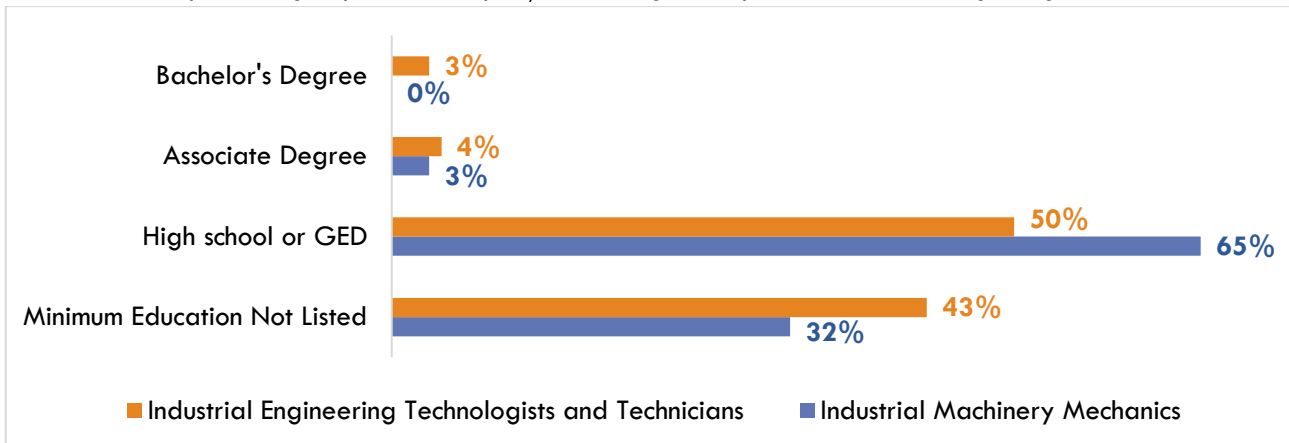
Exhibit 7. Sample of in-demand skills from online job ads for the industrial maintenance and automation occupational group, Inland Empire/Desert Region, September 2022 through August 2023

Occupation	Specialized skills	Common skills
Industrial Machinery Mechanics	<ul style="list-style-type: none"> • Machinery • Preventive Maintenance • Hydraulics • Lock Out/Tag Out • Welding • Equipment Repair 	<ul style="list-style-type: none"> • Troubleshooting (Problem-Solving) • Communications • Lifting Ability • Packaging and Labeling • Operations • Microsoft Excel • Detail Oriented
Industrial Engineering Technologists and Technicians	<ul style="list-style-type: none"> • Machinery • Preventive Maintenance • Blueprinting • Programmable Logistics Controllers • Material Handling Equipment • Power Tool Operation • Industrial Repair and Maintenance 	<ul style="list-style-type: none"> • Troubleshooting (Problem-Solving) • Communications • Management • Operations • Lifting Ability
Electrical and Electronics Repairers, Commercial and Industrial Equipment	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • 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

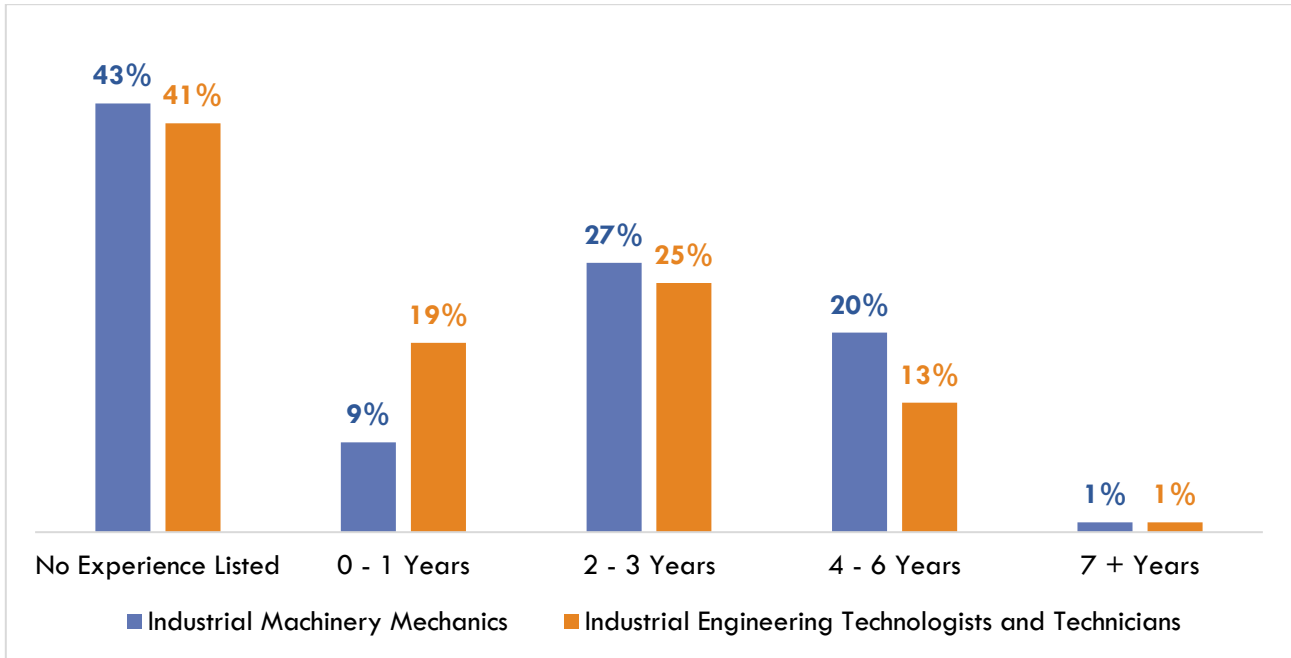


Source: Lightcast 2023.3

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
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 earnings in this field shortly after exiting the program.

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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 (10 th to 90 th percentile)	Median Hourly Wage (50 th 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