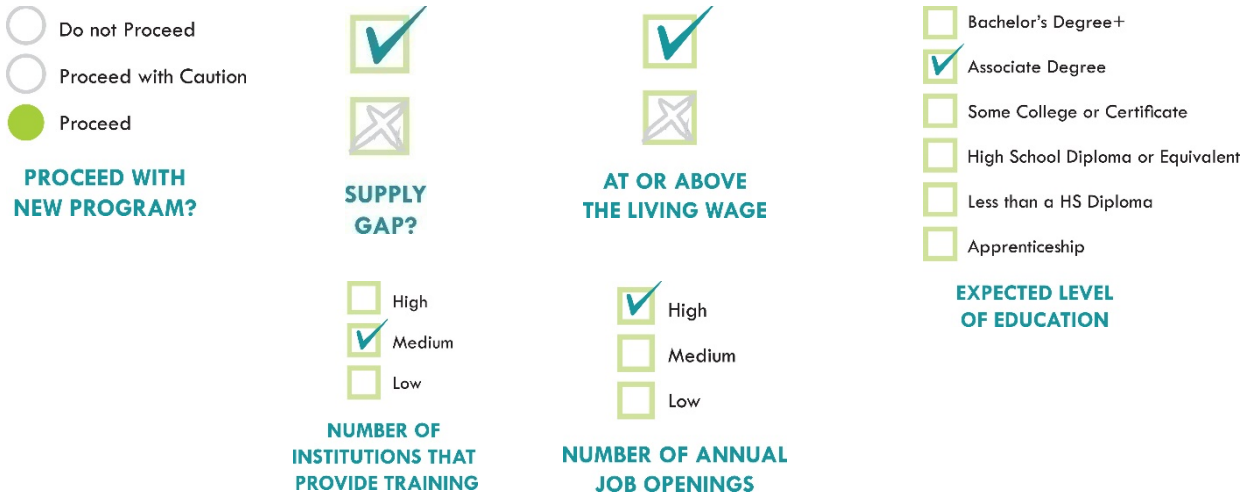
C·O·E CENTERS OF EXCELLENCE FOR LABOR MARKET RESEARCH

Industrial Automation Occupations

Labor Market Analysis: San Diego County

April 2020

Summary



The brief provides labor market information about *Industrial Automation Occupations* to assist the San Diego and Imperial Counties Community Colleges with program development and strategic planning. *Industrial Automation Occupations* include occupations associated with *automation, robotics, and mechatronics*. According to available labor market information, *Industrial Automation Occupations* in San Diego County have a labor market demand of 2,719 annual job openings, and seven educational institutions in San Diego County supply 258 awards for these occupations, suggesting that there is a supply gap in the labor market. These occupations' entry-level and median wages are above the living wage. According to the California Community Colleges' outcomes data, the percentage of students who completed programs related to *Industrial Automation Occupations* and earned a living wage is above the state average for students who complete Career Education programs in general. This brief recommends proceeding with developing a program because 1) these occupations' entry-level and median earnings are above the living wage; 2) an associate degree is the highest education needed for the occupations; and 3) a supply gap exists for these positions.

Introduction

To better understand the labor market in San Diego County for *Industrial Automation Occupations*, the San Diego-Imperial Center of Excellence for Labor Market Research (COE) completed this brief using three approaches. First, the COE analyzed traditional[1] labor market information in San Diego County for the following occupational codes in the Standard Occupational Classification (SOC)[2] system. Collectively, these occupations are referred to as *Industrial Automation Occupations* for the purpose of this brief:

- **Electrical and Electronics Engineering Technicians** (SOC 17-3023): Apply electrical and electronic theory and related knowledge, usually under the direction of engineering staff, to design, build, repair, calibrate, and modify electrical components, circuitry, controls, and machinery for subsequent evaluation and use by engineering staff in making engineering design decisions.
- **Electro-Mechanical Technicians** (SOC 17-3024): Operate, test, maintain, or calibrate unmanned, automated, servo-mechanical, or electromechanical equipment. May operate unmanned submarines, aircraft, or other equipment at worksites, such as oil rigs, deep ocean exploration, or hazardous waste removal. May assist engineers in testing and designing robotics equipment.
- **Industrial Engineering Technicians** (SOC 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.
- **Mechanical Engineering Technicians** (SOC 17-3027): Apply theory and principles of mechanical engineering to modify, develop, test, or calibrate machinery and equipment under direction of engineering staff or physical scientists.
- **Electrical and Electronics Installers and Repairers, Transportation Equipment** (SOC 49-2093): Install, adjust, or maintain mobile electronics communication equipment, including sound, sonar, security, navigation, and surveillance systems on trains, watercraft, or other mobile equipment.
- **Electrical and Electronics Repairers, Commercial and Industrial Equipment** (SOC 49-2094): Repair, test, adjust, or install electronic equipment, such as industrial controls, transmitters, and antennas.
- **Electrical and Electronics Repairers, Powerhouse, Substation, and Relay** (SOC 49-2095): Inspect, test, repair, or maintain electrical equipment in generating stations, substations, and in-service relays.

[1] Traditional labor market research consists of a longitudinal analysis of historical and projected occupational data
[2] The Standard Occupational Classification (SOC) system is used by federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating or disseminating data. bls.gov/soc.

- **Industrial Machinery Mechanics** (SOC 49-9041): Repair, install, adjust, or maintain industrial production and processing machinery or refinery and pipeline distribution systems. May also be referred to as "Industrial Maintenance Technicians."
- **Maintenance and Repair Workers, General** (SOC 49-9071): Perform work involving the skills of two or more maintenance or craft occupations to keep machines, mechanical equipment, or the structure of an establishment in repair. Duties may involve pipe fitting; boiler making; insulating; welding; machining; carpentry; repairing electrical or mechanical equipment; installing, aligning, and balancing new equipment; and repairing buildings, floors, or stairs.
- **Installation, Maintenance, and Repair Workers, All Other** (SOC 49-9099): All, installation, maintenance, and repair workers not listed separately.

Second, the COE analyzed real-time data from online job postings for occupations that are not commonly found in traditional labor market information.[3] These specialized occupations are also known as "eight-digit O*NET occupational codes." For this brief, the following O*NET codes were analyzed:

- **Robotics Technicians** (17-3024.01): Build, install, test, or maintain robotic equipment or related automated production systems.
- **Industrial Engineering Technologists** (17-3029.05): Assist industrial engineers in such activities as quality control, inventory control, or material flow methods. May conduct statistical studies or analyze production costs.
- **Manufacturing Engineering Technologists** (17-3029.06): Develop tools, implement designs, or integrate machinery, equipment, or computer technologies to ensure effective manufacturing processes.

Third, the COE analyzed online job postings for key terms that did not fit the two approaches above, specifically "mechatronics" and "automation technicians." Results from the second and third approaches are provided below in the "Online Job Postings" section. The rest of the brief provides labor market information for *Industrial Automation Occupations*, which has the most available data to analyze.

[3] The Centers of Excellence for Labor Market Research (COE) and other labor market researchers typically analyze six-digit occupational codes from the SOC-O*NET system (onetonline.org/help/online/search#code). Six-digit codes are more common and have more data, whereas eight-digit codes are less common and typically have insufficient data to analyze. However, data for eight-digit codes exist in online job postings and were included in this brief.

Projected Occupational Demand

Between 2019 and 2024, *Industrial Automation Occupations* are projected to increase by 992 net jobs or four percent (Exhibit 1a). Employers in San Diego County will need to hire 2,719 workers annually to fill new jobs and backfill jobs due to attrition caused by turnover and retirement, for example.

Exhibit 1a: Number of Jobs for *Industrial Automation Occupations* (2009-2024)[4]

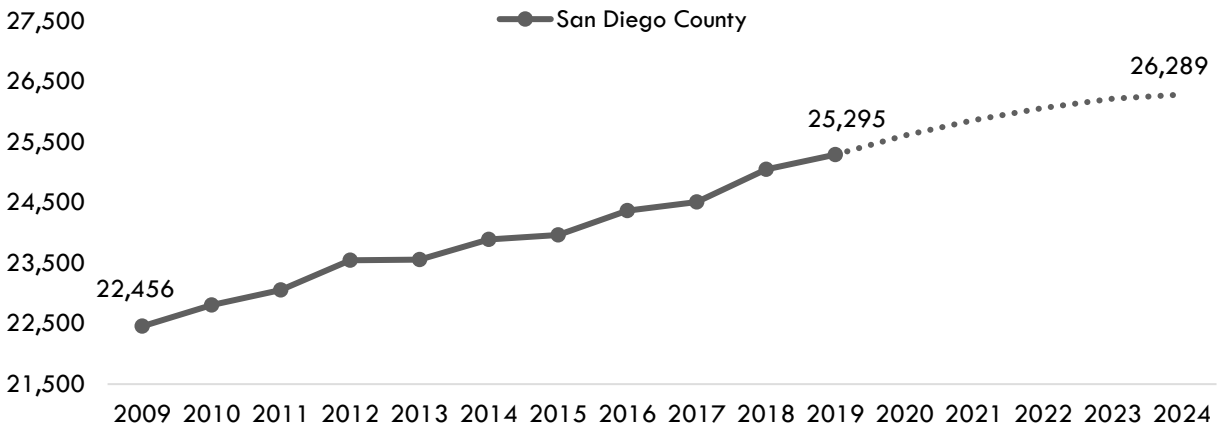


Exhibit 1b breaks down the projected number of jobs change by occupation more specifically. As Exhibit 1b shows, labor market demand *for Maintenance and Repair Workers, General* is projected to increase the most by 684 total jobs between 2019 and 2024.

Exhibit 1b: Number of Jobs for *Industrial Automation Occupations* in San Diego County (2019-2024)

Occupational Title	2019 Jobs	2024 Jobs	2019 - 2024 Net Jobs Change	2019-2024 % Net Jobs Change	Annual Openings (Demand)
Maintenance and Repair Workers, General	13,796	14,480	684	5%	1,508
Installation, Maintenance, and Repair Workers, All Other	3,290	3,358	68	2%	371
Electrical and Electronics Engineering Technicians	3,256	3,296	40	1%	329
Industrial Machinery Mechanics	2,343	2,450	107	5%	243
Electrical and Electronics Repairers, Commercial and Industrial Equipment	943	959	16	2%	88
Industrial Engineering Technicians	629	664	35	6%	70
Mechanical Engineering Technicians	530	562	32	6%	60

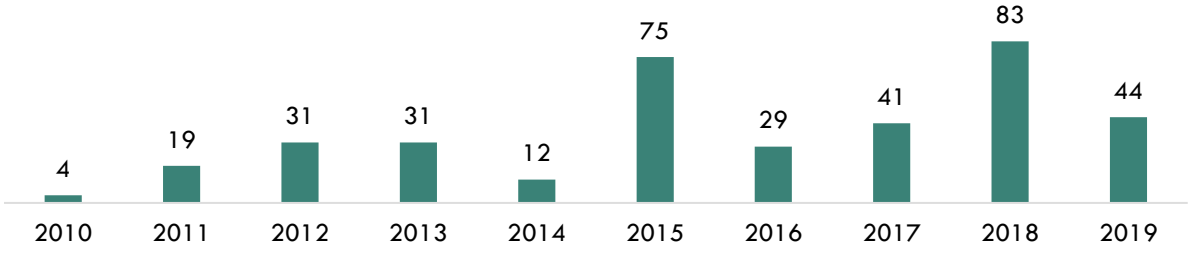
[4] Emsi 2020.01; QCEW, Non-QCEW, Self-Employed.

Occupational Title	2019 Jobs	2024 Jobs	2019 - 2024 Net Jobs Change	2019-2024 % Net Jobs Change	Annual Openings (Demand)
Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	222	227	5	2%	21
Electro-Mechanical Technicians	141	149	8	6%	16
Electrical and Electronics Installers and Repairers, Transportation Equipment	144	143	-1	-1%	13
Total	25,294	26,288	994	4%	2,719

Online Job Postings

This report analyzes not only historical and projected data (traditional labor market information or LMI), but also recent data from online job postings (real-time LMI). Online job postings may provide additional insight about recent changes in the labor market demand that are not captured by historical data. Between 2010 and 2019, there was an average of 37 online job postings per year in San Diego County for *Robotics Technicians, Industrial Engineering Technologists,* and *Manufacturing Engineering Technologists* (Exhibit 2a).

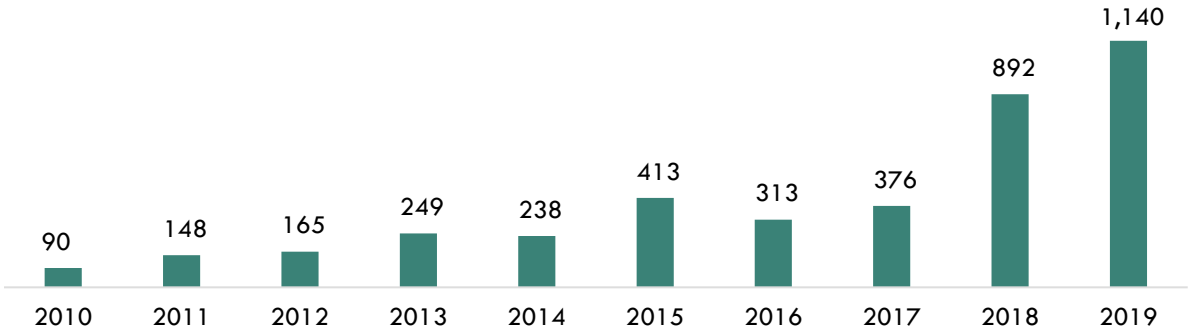
Exhibit 2a: Number of Online Job Postings for *Robotics Technicians, Industrial Engineering Technologists, and Manufacturing Engineering Technologists* in San Diego County (2010-2019)[5]



Similarly, during the period 2010 and 2019, there was an increase of 1,050 online job postings for the key terms, "mechatronics" and "automation technicians" (Exhibit 2b).

[5] Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2010-2019.

Exhibit 2b: Number of Online Job Postings for Key Terms "Mechatronics" and "Automation Technicians" in San Diego County (2010-2019)



Earnings

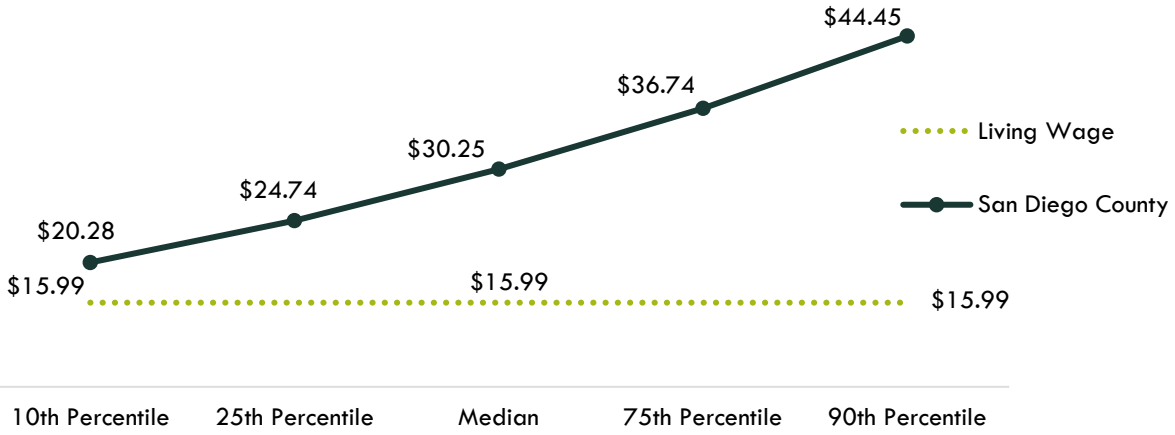
The median hourly earnings of *Industrial Automation Occupations* range from $19.78 to $53.03 (Exhibit 3a). On average, the median hourly earnings for *Industrial Automation Occupations* is $30.25; this is more than the living wage for a single adult in San Diego County, which is $15.99 per hour (Exhibit 3b).[6]

Exhibit 3a: Hourly Earnings for *Industrial Automation Occupations* in San Diego County

Occupational Title	Entry-Level Hourly Earnings (25th Percentile)	Median Hourly Earnings	Experienced Hourly Earnings (75th Percentile)
Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	$43.36	$53.03	$60.16
Industrial Engineering Technicians	$28.30	$34.27	$38.93
Electrical and Electronics Repairers, Commercial and Industrial Equipment	$26.80	$30.90	$37.17
Electrical and Electronics Engineering Technicians	$26.34	$33.14	$41.61
Electrical and Electronics Installers and Repairers, Transportation Equipment	$24.68	$27.50	$30.69
Industrial Machinery Mechanics	$23.25	$27.82	$31.82
Electro-Mechanical Technicians	$21.96	$28.52	$36.77
Mechanical Engineering Technicians	$20.40	$26.96	$35.88
Installation, Maintenance, and Repair Workers, All Other	$16.47	$20.59	$29.34
Maintenance and Repair Workers, General	$15.86	$19.78	$25.01

[6] "California Family Needs Calculator (formerly the Self-Sufficiency Standard)," Insight: Center for Community Economic Development, last updated 2018. insightcced.org/2018-self-sufficiency-standard.

Exhibit 3b: Hourly Earnings[7] for *Industrial Automation Occupations* in San Diego County[8]



Educational Supply

Educational supply for an occupation can be estimated by analyzing the number of awards in related Taxonomy of Programs (TOP) or Classification of Instructional Programs (CIP) codes.[9] There are nine TOP codes and 23 CIP codes related to *Industrial Automation Occupations* (Exhibit 4).

Exhibit 4: Related TOP and CIP Codes for *Industrial Automation Occupations*

Industrial Automation Occupations
TOP 093400: Electronics and Electric Technology
TOP 093410: Computer Electronics
TOP 093420: Industrial Electronics
TOP 093440: Electrical Systems and Power Transmission
TOP 093500: Electro-Mechanical Technology
TOP 094300: Instrumentation Technology
TOP 094500: Industrial Systems Technology and Maintenance
TOP 095600: Manufacturing and Industrial Technology
TOP 099900: Other Engineering and Related Industrial Technologies
CIP 15.0303: Electrical, Electronic and Communications Engineering Technology/Technician
CIP 15.0306: Integrated Circuit Design

[7] 10th and 25th percentiles could be considered entry-level wages, and 75th and 90th percentiles could be considered experienced wages for individuals who may have been in the occupation longer, received more training than others, etc.
[8] Emsi 2020.01; QCEW, Non-QCEW, Self-Employed.
[9] TOP data comes from the California Community Colleges Chancellor's Office MIS Data Mart (datamart.cccco.edu) and CIP data comes from the Integrated Postsecondary Education Data System (nces.ed.gov/ipeds/use-the-data).

Industrial Automation Occupations
CIP 15.0399: Electrical and Electronic Engineering Technologies/Technicians, Other
CIP 15.0403: Electromechanical Technology/Electromechanical Engineering Technology
CIP 15.0404: Instrumentation Technology/Technician
CIP 15.0405: Robotics Technology/Technician
CIP 15.0406: Automation Engineer Technology/Technician
CIP 15.0611: Metallurgical Technology/Technician
CIP 15.0612: Industrial Technology/Technician
CIP 15.0613: Manufacturing Engineering Technology/Technician
CIP 15.0699: Industrial Production Technologies/Technicians, Other
CIP 15.0803: Automotive Engineering Technology/Technician
CIP 15.0805: Mechanical Engineering/Mechanical Technology/Technician
CIP 15.1201: Computer Engineering Technology/Technician
CIP 15.1203: Computer Hardware Technology/Technician
CIP 15.9999: Engineering Technologies and Engineering-Related Fields, Other
CIP 46.0301: Electrical and Power Transmission Installation/Installer, General
CIP 47.0101: Electrical/Electronics Equipment Installation and Repair, General
CIP 47.0104: Computer Installation and Repair Technology/Technician
CIP 47.0105: Industrial Electronics Technology/Technician
CIP 47.0199: Electrical/Electronics Maintenance and Repair Technology, Other
CIP 47.0303: Industrial Mechanics and Maintenance Technology
CIP 50.0404: Industrial and Product Design

According to TOP data, three community colleges supply the region with awards for these occupations: Cuyamaca College, San Diego City, and San Diego Continuing Education. According to CIP data, four non-community colleges supply the region with awards, California Institute of Arts & Technology, United Education Institute-Chula Vista, United Education Institute-UEI College San Marcos, and NewSchool of Architecture and Design (Exhibit 5).

Exhibit 5: Number of Awards (Certificates and Degrees) Conferred by Postsecondary Institutions (Program Year 2014-15 through PY2017-18 Average)

TOP6 or CIP	TOP6 or CIP Title	3-Yr Annual Average CC Awards (PY15-16 to PY17-18)	Other Educational Institutions 3-Yr Annual Average Awards (PY14-15 to PY16-17)	3-Yr Total Average Supply (PY14-15 to PY17-18)
093400	Electronics and Electric Technology	**125**	**0**	**125**
	• San Diego City	4	0	
	• San Diego Cont. Ed.	121	0	
093410	Computer Electronics	**2**	**0**	**2**
	• San Diego City	0	0	
	• San Diego Cont. Ed.	2	0	
093440	Electrical Systems and Power Transmission	**45**	**0**	**45**
	• San Diego City	45	0	
093500	Electro-Mechanical Technology	**1**	**0**	**1**
	• Cuyamaca	1	0	
095600	Manufacturing and Industrial Technology	**16**	**0**	**16**
	• San Diego City	16	0	
	• San Diego Cont. Ed.	0	0	
099900	Other Engineering and Related Industrial Technologies	**4**	**0**	**4**
	• San Diego City	4	0	
47.0104	Computer Installation and Repair Technology/Technician	**0**	**64**	**64**
	• California Institute of Arts & Technology	0	4	
	• United Education Institute-Chula Vista	0	31	
	• United Education Institute-UEI College San Marcos	0	29	
50.0404	Industrial and Product Design	**0**	**1**	**1**
	• NewSchool of Architecture and Design	0	1	
			Total	**258**

Demand vs. Supply

Comparing labor demand (annual openings) with labor supply[10] suggests that there is a supply gap for these occupations in San Diego County, with 2,719 annual openings and 258 awards. Comparatively, there are 27,830 annual openings in California and 3,604 awards, demonstrating that there is a supply gap across the state[11] (Exhibit 6).

Exhibit 6: Labor Demand (Annual Openings) Compared with Labor Supply (Average Annual Awards)

Community Colleges and Other Postsecondary Educational Institutions	**Demand** (Annual Openings)	**Supply** (Total Annual Average Supply)	**Supply Gap or Oversupply**
San Diego	2,719	258	**2,461**
California	27,830	3,604	**24,226**

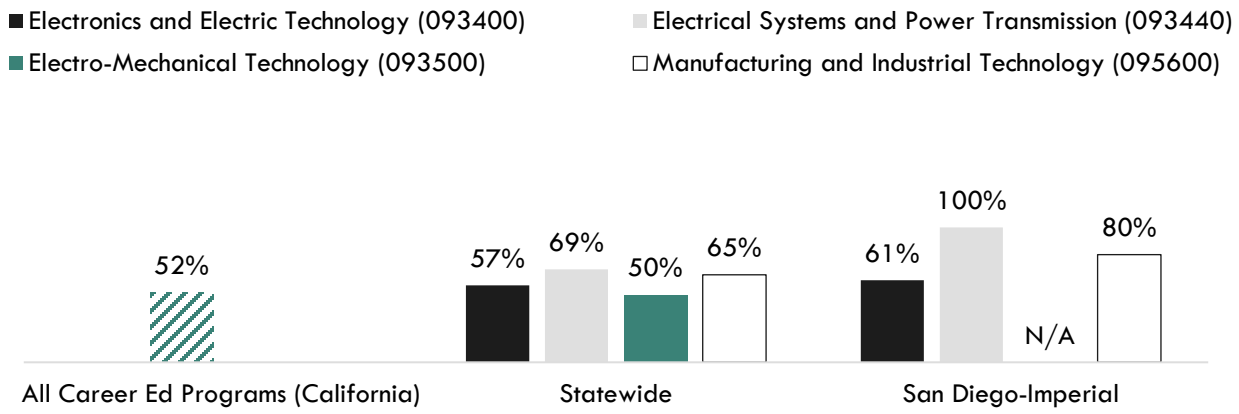
Please note: This is a basic analysis of supply and demand of labor. The data does not include workers currently in the labor force who could fill these positions or workers who are not captured by publicly available data. This data should be used to discuss the potential gaps or oversupply of workers; however, it should not be the only basis for determining whether or not a program should be developed.

Student Outcomes and Regional Comparisons

According to the California Community Colleges LaunchBoard, between 61 and 100 percent of students in the San Diego-Imperial region earned a living wage after completing a program related to *Industrial Automation Occupations*, compared to 50 to 69 percent statewide and 52 percent of students in Career Education programs in general across the state (Exhibit 7a).[12]

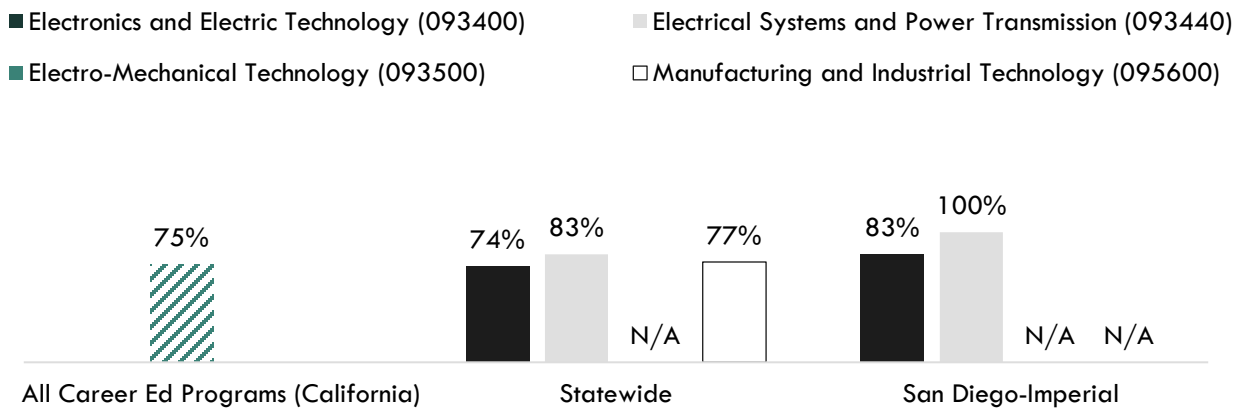
[10] Labor supply can be found from two different sources: EMSI or the California Community Colleges Chancellor's Office MIS Data Mart. EMSI uses CIP codes while MIS uses TOP codes. Different coding systems result in differences in the supply numbers.
[11] "Supply and Demand," Centers of Excellence Student Outcomes, coeccc.net/Supply-and-Demand.aspx.
[12] calpassplus.org/LaunchBoard/SWP.aspx

Exhibit 7a: Proportion of Students Who Earned a Living Wage, PY2016-17[13]



According to the California Community Colleges LaunchBoard, between 83 and 100 percent of students in the San Diego-Imperial region obtained a job closely related to their field of study after completing a related program, compared to 74 to 83 percent statewide and 75 percent of students in Career Education programs in general across the state (Exhibit 7b).[14]

Exhibit 7b: Percentage of Students in a Job Closely Related to Field of Study, PY2015-16[15]



[13] Among completers and skills builders who exited, the proportion of students who attained a living wage.
[14] calpassplus.org/LaunchBoard/SWP.aspx
[15] Most recent year with available data is Program Year 2014-15. Percentage of Students in a Job Closely Related to Field of Study: Among students who responded to the CTEOS, the percentage reporting employment in the same or similar field as their program of study.

Top Employers and Work Locations

Between January 1, 2017 and December 31, 2019, the top five employers in San Diego County for these occupations were Marriott International Incorporated, Sysco Corporation, General Dynamics, The Home Depot Incorporated, and General Atomics (Exhibit 8).

Exhibit 8: Top Employers in San Diego County for *Industrial Automation Occupations*[16]

Top Employers	
• Marriott International Incorporated	• U.S. Navy
• Sysco Corporation	• McDonald's
• General Dynamics	• U.S. Government
• The Home Depot Incorporated	• BAE Systems
• General Atomics	• Northrop Grumman

Skills, Education, and Certifications

Industrial Automation Occupations have a national educational requirement ranging from high school diploma or equivalent to an associate degree (Exhibit 9a).

Exhibit 9a: National Educational Attainment for *Industrial Automation Occupations* [17]

Occupational Title	Typical Entry-Level Education
Industrial Engineering Technicians	Associate degree
Electrical and Electronics Engineering Technicians	Associate degree
Mechanical Engineering Technicians	Associate degree
Electro-Mechanical Technicians	Associate degree
Electrical and Electronics Repairers, Commercial and Industrial Equipment	Postsecondary non-degree award
Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	Postsecondary non-degree award
Electrical and Electronics Installers and Repairers, Transportation Equipment	Postsecondary non-degree award
Maintenance and Repair Workers, General	High school diploma or equivalent
Installation, Maintenance, and Repair Workers, All Other	High school diploma or equivalent
Industrial Machinery Mechanics	High school diploma or equivalent

[16] Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2017-2019.
[17] Emsi 2020.01; QCEW, Non-QCEW, Self-Employed.

Based on online job postings between January 1, 2017 and December 31, 2019 in San Diego County, the top listed educational requirement for *Industrial Automation Occupations* is a high school or vocational training (Exhibit 9b).[18]

Exhibit 9b: Educational Requirements for *Industrial Automation Occupations* in San Diego County[19]

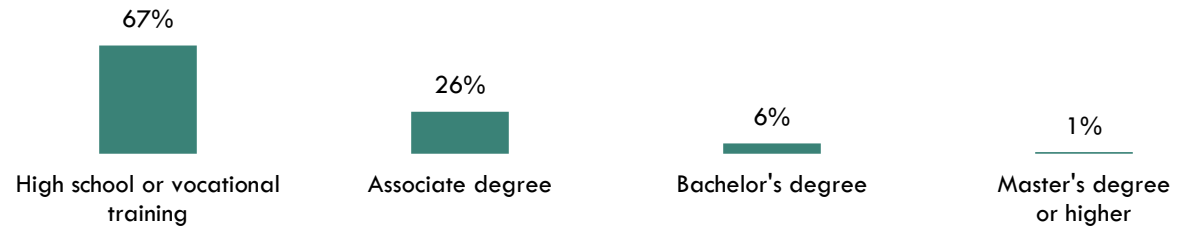


Exhibit 10 lists the top specialized, soft, and software skills that appeared in online job postings between January 1, 2017 and December 31, 2019.

Exhibit 10: Top Skills for *Industrial Automation Occupations* in San Diego County[20]

Specialized Skills	Soft Skills	Software Skills
• Repair • Plumbing • HVAC • Painting • Predictive / Preventative Maintenance	• Troubleshooting • Communication Skills • Physical Abilities • Computer Literacy • Organizational Skills	• Microsoft Excel • Microsoft Word • SAP • Microsoft PowerPoint • Microsoft Outlook

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[18] Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2017-2019.
[19] "Educational Attainment for Workers 25 Years and Older by Detailed Occupation," Bureau of Labor Statistics, last modified September 4, 2019. bls.gov/emp/tables/educational-attainment.htm.
[20] Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2017-2019.

Important Disclaimers

All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. This study examines the most recent data available at the time of the analysis; however, data sets are updated regularly and may not be consistent with previous reports. Efforts have been made to qualify and validate the accuracy of the data and the report findings; however, neither the Centers of Excellence for Labor Market Research (COE), COE host district, nor California Community Colleges Chancellor's Office are responsible for the applications or decisions made by individuals and/or organizations based on this study or its recommendations.

This workforce demand report uses state and federal job projection data that was 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.