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

Summary

Program LMI Endorsement	Endorsed: All LMI Criteria Met	☐	Endorsed: Some LMI Criteria Met	☒	Not LMI Endorsed	☐

Program LMI Endorsement Criteria		
	Yes ☑	No ☐
Supply Gap:	*Comments:* There are projected to be **2,243 middle-skill annual job openings** throughout Los Angeles and Orange counties for these manufacturing and industrial technology occupations, which **is more than the 904 awards conferred by educational institutions.**	
	Yes ☐	No ☑
Living Wage: (Entry-Level, 25th)	*Comments:* **Nearly 83% of annual job openings** for these manufacturing and industrial technology occupations **have entry-level hourly wages below the OC living wage of $20.63**.	
	Yes ☑	No ☐
Education:	*Comments:* Though the majority (84%) of annual openings for these occupations typically require a high school diploma or equivalent, **more than one-third of workers in the field have completed some college or an associate degree as their highest level of education.**	

Emerging Occupation(s)	
Yes ☐	*No* ☑
Comments: N/A	

The Orange County Center of Excellence for Labor Market Research (OC COE) prepared this report to determine whether there is a supply gap in the Los Angeles/Orange County regional labor market related to five middle-skill occupations:

- *Industrial Engineering Technologists and Technicians* (17-3026)
- *Mechanical Engineering Technologists and Technicians* (17-3027)
- *Machinists* (51-4041)
- *Computer Numerically Controlled Tool Operators* (51-9161)
- *Computer Numerically Controlled Tool Programmers* (51-9162)

Based on the available data, there appears to be a supply gap for these electrical engineering occupations and typical education requirements for these occupations align with a community college education. However, the majority of annual openings have entry-level wages below the living wage. **Therefore, due to some of the regional labor market criteria being met, the COE endorses this proposed program.**

Exhibit 1 lists the occupational demand, supply, typical entry-level education, and educational attainment for the occupations included in this report.

Exhibit 1: Labor Market Endorsement Summary

Occupation (SOC)	Demand (Annual Openings)	Supply (CC and Non-CC)	Entry-Level Hourly Earnings (25th Percentile)	Typical Entry-Level Education	Community College Educational Attainment
Industrial Engineering Technologists and Technicians (17-3026)	LA: 65	LA: 91	OC: $28.72	Associate degree	51%
	OC: 44	OC: 31			
	TTL: 109	TTL: 122			
Mechanical Engineering Technologists and Technicians (17-3027)	LA: 83	LA: 365	OC: $27.79	Associate degree	51%
	OC: 48	OC: 3			
	TTL: 130	TTL: 367			
Machinists (51-4041)	LA: 809	LA: 199	OC: $18.70	High school diploma or equivalent	41%
	OC: 466	OC: 134			
	TTL: 1,275	TTL: 332			
Computer Numerically Controlled Tool Operators (51-9161)	LA: 394	LA: 35	OC: $17.89	High school diploma or equivalent	44%
	OC: 211	OC: 48			
	TTL: 605	TTL: 83			
Computer Numerically Controlled Tool Programmers (51-9162)	LA: 78	*Accounted for Above*	OC: $28.38	Postsecondary nondegree award	44%
	OC: 44				
	TTL: 123				
Total	**2,243**	**904**	**N/A**	**N/A**	**N/A**

Demand:

- The number of jobs related to these manufacturing and industrial technology occupations are projected to increase 0.7% through 2027, equating to 2,243 annual job openings.
- Hourly entry-level wages for these manufacturing and industrial technology occupations range from $17.89 to $28.72 in Orange County; nearly 83% of annual job openings have entry-level wages below the living wage.
- There were 9,282 online job postings for these manufacturing and industrial technology occupations over the past 12 months. The highest number of postings were for maintenance technicians, CNC machinists, and manufacturing technicians.
- The typical entry-level education for these manufacturing and industrial technology occupations ranges from a high school diploma or equivalent to an associate degree.
- Between 41% and 51% of workers in the field have completed some college or an associate degree as their highest level of educational attainment.

Supply:

- There was an average of 606 awards conferred by 19 community colleges in Los Angeles and Orange Counties from 2019 to 2022.
- Non-community college institutions conferred an average of 299 awards from 2019 to 2021.
- Orange County community college students that exited manufacturing and industrial technology programs in the 2020-21 academic year had a median annual wage of $44,864 ($21.57 per hour) after exiting the program and 52% attained the regional living wage.
- Throughout Orange County, 76% of manufacturing and industrial technology students that exited their program in 2019-20 reported that they are working in a job closely related to their field of study.

Demand

Occupational Projections:

Exhibit 2 shows the annual percent change in jobs for these manufacturing and industrial technology occupations from 2017 through 2027. Employment in these manufacturing and industrial technology occupations decreased 11% from 2019 to 2020, which is more than the 7% decline across all occupations in Los Angeles and Orange counties due to the COVID-19 pandemic. Employment for these manufacturing and industrial technology occupations continued to decrease through 2022.

In the years, preceding the pandemic, employment for these manufacturing and industrial technology occupations fluctuated, with declines in 2017 and increases in 2018, followed by subsequent declines in 2019. However, employment for these occupations is projected to remain flat, albeit below all occupations, through 2027 in Orange County.

Exhibit 2: Annual Percent Change in Jobs for Manufacturing and Industrial Technology Occupations, 2017-2027
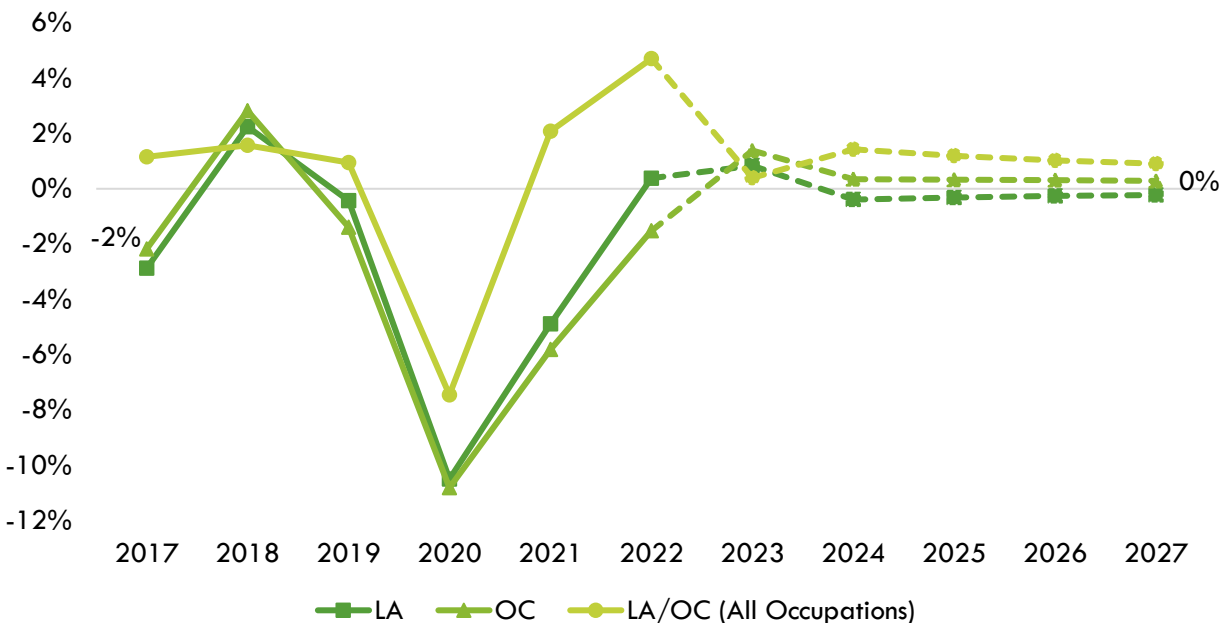

Exhibit 3 shows the five-year occupational demand projections for these manufacturing and industrial technology occupations. In Los Angeles/Orange County, the number of jobs related to these occupations is projected to increase by 0.7% through 2027. There is projected to be 2,243 jobs available annually.

## Exhibit 3: Occupational Demand in Los Angeles and Orange Counties[1]

Geography	2022 Jobs	2027 Jobs	2022-2027 Change	2022-2027 % Change	Annual Openings
Los Angeles	14,811	14,757	(54)	(0.4%)	1,429
Orange	7,973	8,187	214	2.7%	813
Total	**22,784**	**22,943**	**160**	**0.7%**	**2,243**

Wages:

The labor market endorsement in this report considers the entry-level hourly wages for these manufacturing and industrial technology occupations in Orange County as they relate to the county's living wage. Los Angeles County wages are included below to provide a complete analysis of the LA/OC region.

Nearly 83% of annual openings for these manufacturing and industrial technology occupations have entry-level wages below the living wage for one adult ($20.63 in Orange County). Typical entry-level hourly wages range between $17.89 and $28.72. Orange County's average wages of $26.81 are below the average statewide wage of $27.66 for these occupations. Exhibit 4 shows the wage range for each of these manufacturing and industrial technology occupations in Orange County and how they compare to the regional living wage, sorted from lowest to highest entry-level wage.

Exhibit 4: Wages by Occupation in Orange County
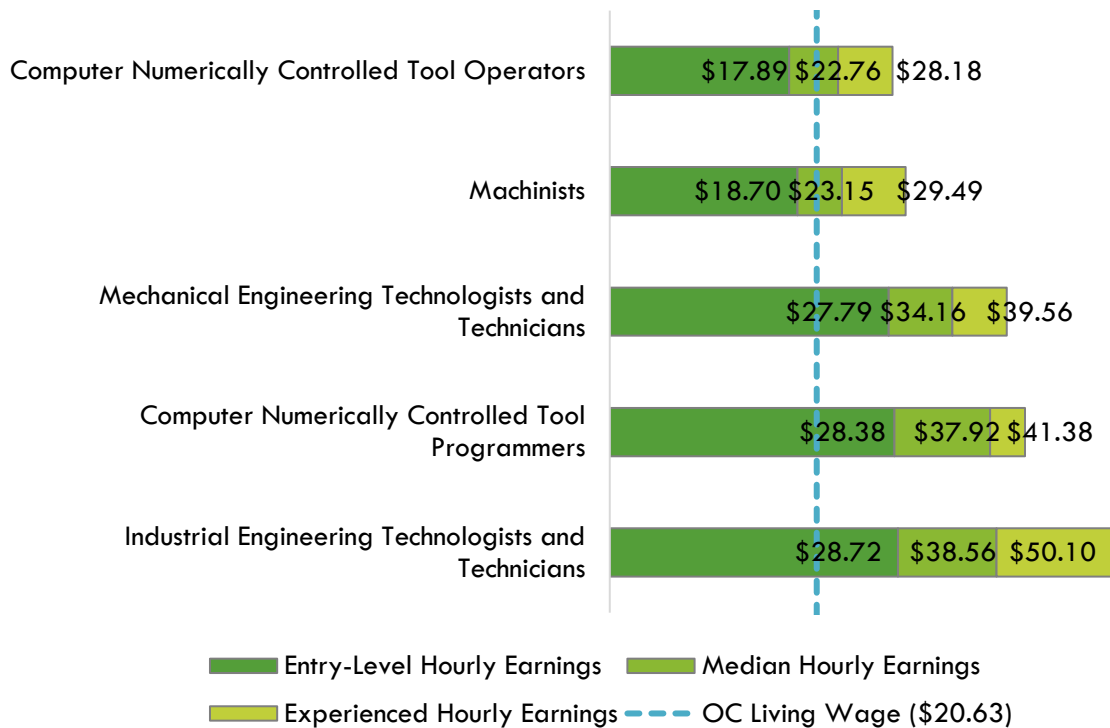
Approximately 72% of annual openings for these manufacturing and industrial technology occupations have entry-level wages above the living wage for one adult ($18.10 in Los Angeles County). Typical entry-level hourly wages are in a range between $17.67 to $27.98. Los Angeles County's average wages of $26.39 are below the average statewide wage of $27.66 for these occupations. Exhibit 5 shows the

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[1] Five-year change represents new job additions to the workforce. Annual openings include new jobs and replacement jobs that result from retirements and separations.

wage range for each of these manufacturing and industrial technology occupations in Los Angeles County and how they compare to the regional living wage, sorted from lowest to highest entry-level wage.
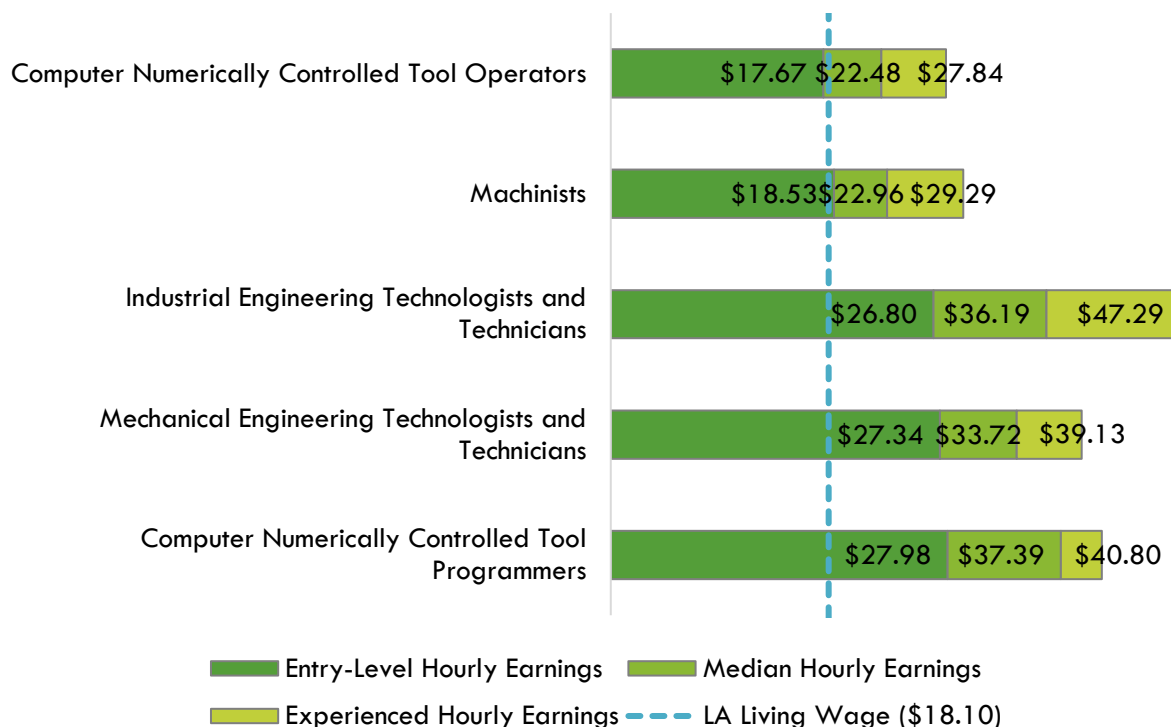
Exhibit 5: Wages by Occupation in Los Angeles County

Computer Numerically Controlled Tool Operators: $17.67 $22.48 $27.84
Machinists: $18.53 $22.96 $29.29
Industrial Engineering Technologists and Technicians: $26.80 $36.19 $47.29
Mechanical Engineering Technologists and Technicians: $27.34 $33.72 $39.13
Computer Numerically Controlled Tool Programmers: $27.98 $37.39 $40.80

Entry-Level Hourly Earnings   Median Hourly Earnings
Experienced Hourly Earnings   LA Living Wage ($18.10)

Job Postings:

Important Online Job Postings Data Note: Online job postings data is sourced from Lightcast, a labor market analytics firm that scrapes, collects, and organizes data from online job boards such as LinkedIn, Indeed, Glassdoor, Monster, GovernmentJobs.com, and thousands more. Lightcast uses natural language processing (NLP) to determine the related company, industry, occupation, and other information for each job posting. However, NLP has limitations that include understanding contextual words of phrases; determining differences in words that can be used as nouns, verbs, and/or adjectives; and misspellings or grammatical errors.[2] For these reasons, job postings could be assigned to the wrong employer, industry, or occupation within Lightcast's database.

Additionally, there are several limitations when analyzing job postings. A single job posting may not represent a single job opening, as employers may be creating a pool of candidates for future openings or hiring for multiple positions with a single posting. Additionally, not all jobs are posted online, and jobs may be filled through other methods such as internal promotion, word-of-mouth advertising, physical job boards, or a variety of other channels.

There were 9,282 online job postings related to these manufacturing and industrial technology occupations listed in the past 12 months. Exhibit 6 shows the number of job postings by occupation. Nearly 52% of job postings were for *industrial engineering technologists and technicians* and 21% were for *machinists*.

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[2] K. R. Chowdhary, Fundamentals of Artificial Intelligence (Basingstoke: Springer Nature, 2020), https://link.springer.com/book/10.1007/978-81-322-3972-7.

Exhibit 6: Number of Job Postings by Occupation (n=9,282)

Occupation	Job Postings	Percentage of Job Postings
Industrial Engineering Technologists and Technicians	4,783	52%
Machinists	1,987	21%
Computer Numerically Controlled Tool Operators	1,411	15%
Computer Numerically Controlled Tool Programmers	567	6%
Mechanical Engineering Technologists and Technicians	534	6%
Total Postings	**9,282**	**100%**

The top employers in the region, by number of job postings, are shown in Exhibit 7.

Exhibit 7: Top Employers by Number of Job Postings (n=9,282)

Employer	Job Postings	Percentage of Job Postings
Aerotek	843	9%
Flag Solutions	135	1%
Volt	124	1%
Precision Castparts	123	1%
Kelly Services	110	1%
Randstad	94	1%
Disney	87	1%
Flowserve	80	1%
Applied Medical Resources Corporation	79	1%
Express Employment Professionals	75	1%

The top specialized, soft, and computer skills listed by those most frequently mentioned in job postings (denoted in parentheses) are shown in Exhibit 8.

Exhibit 8: Top Skills by Number of Job Postings (n=9,282)

Top Specialized Skills	Top Soft Skills	Top Computer Skills
Machining (2,588)	Operations (2,356)	Mastercam (CAD/CAM Software) (409)
Lathes (1,855)	Troubleshooting (Problem Solving) (2,169)	Microsoft Office (404)
Computer Numerical Control (CNC) (1,643)	Communication (1,821)	Microsoft Excel (351)
Tooling (1,434)	Mathematics (1,324)	G-Codes (227)
Blueprinting (1,347)	Lifting Ability (1,059)	SolidWorks (CAD) (219)
Machinery (1,306)	Detail Oriented (1,046)	Microsoft Word (218)
Mills (1,290)	Management (1,020)	Microsoft Outlook (204)
Micrometer (1,213)	English Language (971)	Microsoft PowerPoint (126)

Top Specialized Skills	Top Soft Skills	Top Computer Skills
Calipers (1,106)	Problem Solving (906)	Computer Aided Three-Dimensional Interactive Application (CATIA) (91)
CNC Machining (1,041)	Computer Literacy (696)	AutoCAD (80)

Educational Attainment:

The Bureau of Labor Statistics (BLS) lists a high school diploma or equivalent as the typical entry-level education for *computer numerically controlled tool operators* and *machinists*, a postsecondary nondegree award for *computer numerically controlled tool programmers*, and an associate degree for *industrial engineering technologists and technicians* and *mechanical engineering technologists and technicians*. The national-level educational attainment data indicates between 41% and 51% of workers in the field have completed some college or an associate degree as their highest level of education. Exhibit 9 shows the educational attainment for each occupation, sorted by highest community college educational attainment to lowest.

Exhibit 9: National-level Educational Attainment for Occupations

Industrial Engineering Technologists and Technicians: 28% | 51% | 17% | 4%
Mechanical Engineering Technologists and Technicians: 28% | 51% | 17% | 4%
Computer Numerically Controlled Tool Operators: 47% | 44% | 8% | 1%
Computer Numerically Controlled Tool Programmers: 47% | 44% | 8% | 1%
Machinists: 54% | 41% | 4% | 1%

- High School Diploma or Less
- Some College or Associate Degree
- Bachelor's Degree
- Graduate or Professional Degree

Of the 49% of the cumulative job postings for these manufacturing and industrial technology occupations that listed a minimum education requirement in Los Angeles/Orange County, 92% (4,226) requested a high school diploma or an associate degree and 7% (327) requested a bachelor's degree.

Educational Supply

Community College Supply:

Exhibit 10 shows the three-year average number of awards conferred by community colleges in the related TOP codes:

- Engineering Technology, General (requires Trigonometry) (0924.00)
- Industrial Electronics (0934.20)
- Manufacturing and Industrial Technology (0956.00)

- Machining and Machine Tools (0956.30)
- Industrial and Occupational Safety and Health (0956.70)
- Other Engineering and Related Industrial Technologies (0999.00)

The colleges with the most completions in the region are Pasadena, Santa Ana, and Orange Coast. Over the past 12 months, there were no other related program recommendation requests from regional community colleges.
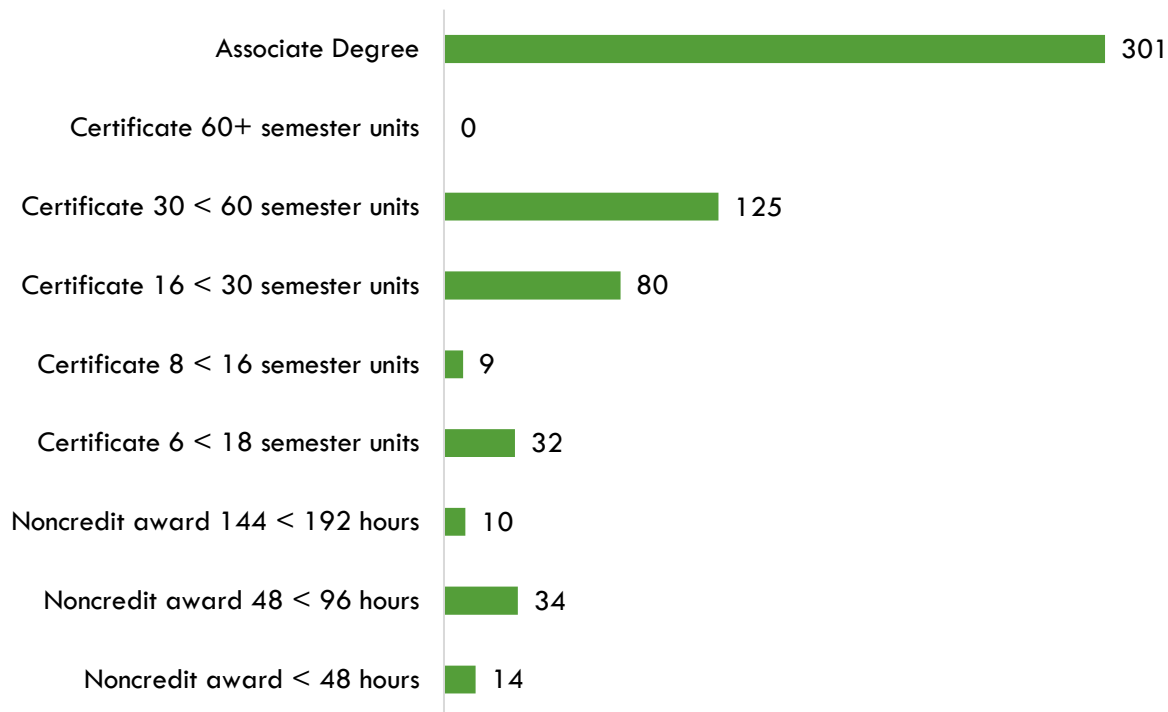
Exhibit 10: Regional Community College Awards (Certificates and Degrees), 2019-2022

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
0924.00	Engineering Technology, General (requires Trigonometry)	Cerritos	15	6	15	12
		East LA	1	1	0	1
		Glendale	7	14	3	8
		Mt San Antonio	2	0	6	3
		Pasadena	216	238	211	222
		LA Subtotal	**241**	**259**	**235**	**245**
		Santa Ana	3	5	0	3
		OC Subtotal	**3**	**5**	**0**	**3**
		Supply Subtotal/Average	**244**	**264**	**235**	**248**
0934.20	Industrial Electronics	LA Valley	0	23	0	8
		LA Subtotal	**0**	**23**	**0**	**8**
		-	-	-	-	-
		OC Subtotal	**-**	**-**	**-**	**-**
		Supply Subtotal/Average	**0**	**23**	**0**	**8**
0956.00	Manufacturing and Industrial Technology	Cerritos	0	1	1	1
		El Camino	0	0	4	1
		Glendale	2	0	1	1
		LA Trade	9	9	15	11
		LA Valley	9	7	0	5
		Mt San Antonio	14	4	13	10
		LA Subtotal	**34**	**21**	**34**	**30**
		Fullerton	38	20	18	25

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
		Irvine	0	4	2	2
		Saddleback	7	4	8	6
		Santa Ana	3	2	4	3
		Santiago Canyon	10	12	7	10
		OC Subtotal	**58**	**42**	**39**	**46**
	Supply Subtotal/Average		**92**	**63**	**73**	**76**
0956.30	Machining and Machine Tools	Cerritos	37	14	16	22
		Compton	12	0	16	9
		El Camino	22	4	26	17
		Glendale	7	1	1	3
		LA Pierce	8	2	2	4
		LA Trade	4	2	7	4
		LA Valley	3	3	6	4
		Pasadena	0	2	3	2
		LA Subtotal	**93**	**28**	**77**	**66**
		Orange Coast	74	41	27	47
		Santa Ana	102	76	81	86
		OC Subtotal	**176**	**117**	**108**	**134**
	Supply Subtotal/Average		**269**	**145**	**185**	**200**
0956.70	Industrial and Occupational Safety and Health	LA Southwest	0	0	117	39
		LA Trade	0	5	5	3
		LA Subtotal	**0**	**5**	**122**	**42**
		-	-	-	-	-
		OC Subtotal	**-**	**-**	**-**	**-**
	Supply Subtotal/Average		**0**	**5**	**122**	**42**
0999.00	Other Engineering and Related Industrial Technologies	Santa Monica	0	0	4	1
		LA Subtotal	**0**	**0**	**4**	**1**
		Coastline	30	42	21	31
		OC Subtotal	**30**	**42**	**21**	**31**
	Supply Subtotal/Average		**30**	**42**	**25**	**32**
	Supply Total/Average		**625**	**542**	**640**	**606**

Exhibit 11 shows the annual average community college awards by type from 2019-20 to 2021-22. The plurality of the awards are for associate degrees, followed by certificates between 30 and less than 60 semester units and certificates between 16 and less than 30 semester units.

Exhibit 11: Annual Average Community College Awards by Type, 2019-2022

Award Type	Value
Associate Degree	301
Certificate 60+ semester units	0
Certificate 30 < 60 semester units	125
Certificate 16 < 30 semester units	80
Certificate 8 < 16 semester units	9
Certificate 6 < 18 semester units	32
Noncredit award 144 < 192 hours	10
Noncredit award 48 < 96 hours	34
Noncredit award < 48 hours	14

Community College Student Outcomes:

Exhibit 12 shows the Strong Workforce Program (SWP) metrics for manufacturing and industrial technology programs in North Orange County Community College District (NOCCCD), the Orange County Region, and California. Of the 548 manufacturing and industrial technology students in the 2020-21 academic year, 52% (286) attended an NOCCCD college.

NOCCCD students that exited manufacturing and industrial technology programs in the 2020-21 academic year had slightly lower median annual earnings ($44,768 or $21.52 per hour) compared to all manufacturing and industrial technology students in Orange County ($44,864 or $21.57 per hour). The percentage of NOCCCD manufacturing and industrial technology students attained the living wage is identical to that of all manufacturing and industrial technology students in Orange County (52%).

Exhibit 12: Manufacturing and Industrial Technology (0956.00) Strong Workforce Program Metrics, 2020-21[3]

SWP Metric	NOCCCD	OC Region	California
SWP Students	286	548	3,716
SWP Students Who Earned 9 or More Career Education Units in the District in a Single Year	48%	42%	35%
SWP Students Who Completed a Noncredit CTE or Workforce Preparation Course	Insufficient Data	65%	21%

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[3] All SWP metrics are for 2020-21 unless otherwise noted.

SWP Metric	NOCCCD	OC Region	California
SWP Students Who Earned a Degree or Certificate or Attained Apprenticeship Journey Status	17	34	327
SWP Students Who Transferred to a Four-Year Postsecondary Institution (2019-20)	Insufficient Data	24	87
SWP Students with a Job Closely Related to Their Field of Study (2019-20)	86%	76%	79%
Median Annual Earnings for SWP Exiting Students	$44,768 ($21.52)	$44,864 ($21.57)	$47,028 ($22.61)
Median Change in Earnings for SWP Exiting Students	10%	4%	31%
SWP Exiting Students Who Attained the Living Wage	52%	52%	67%

Non-Community College Supply:

To comprehensively analyze the regional supply, it is crucial to include data from other institutions offering manufacturing and industrial technology training programs. Exhibit 13 displays the annual and two-year average awards granted by these institutions under the related Classification of Instructional Programs (CIP) Codes:

- Industrial Technology/Technician (15.0612)
- Manufacturing Engineering Technology/Technician (15.0613)
- Automotive Engineering Technology/Technician (15.0803)
- Mechanical/Mechanical Engineering Technology/Technician (15.0805)

- Machine Tool Technology/Machinist (48.0501)
- Machine Shop Technology/Assistant (48.0503)
- Computer Numerically Controlled (CNC) Machinist Technology/CNC Machinist (48.0510)

No data was available for the following CIP Codes:

- Applied Engineering Technologies/Technicians (15.0001)
- Industrial Production Technologies/Technicians, Other (15.0699)

- Industrial Safety Technology/Technician (15.0703)
- Process Safety Technology/Technician (15.0705)

The available data covers 2019 to 2021. During this period, non-community college institutions in the region conferred an average of 299 awards annually in related programs.

Exhibit 13: Regional Non-Community College Awards, 2019-2021

CIP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2-Year Award Average
15.0612	Industrial Technology / Technician	California State University-Los Angeles	48	31	40
		Supply Subtotal/Average	48	31	40

CIP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2-Year Award Average
15.0613	Manufacturing Engineering Technology / Technician	California State University-Long Beach	0	0	0
		Supply Subtotal/Average	**0**	**0**	**0**
15.0803	Automotive Engineering Technology / Technician	Art Center College of Design	43	52	48
		Hacienda La Puente Adult Education	25	31	28
		Supply Subtotal/Average	**68**	**83**	**76**
15.0805	Mechanical / Mechanical Engineering Technology / Technician	California State Polytechnic University-Pomona	34	54	44
		Supply Subtotal/Average	**34**	**54**	**44**
48.0501	Machine Tool Technology / Machinist	NTMA Training Centers of Southern California	139	124	132
		Pomona Unified School District Adult and Career Education	2	0	1
		Supply Subtotal/Average	**141**	**124**	**133**
48.0503	Machine Shop Technology / Assistant	Pomona Unified School District Adult and Career Education	8	2	5
		Supply Subtotal/Average	**8**	**2**	**5**
48.0510	Computer Numerically Controlled (CNC) Machinist Technology / CNC Machinist	California Career School	4	0	2
		NTMA Training Centers of Southern California	0	0	0
		Supply Subtotal/Average	**4**	**0**	**2**
		Supply Total/Average	**303**	**294**	**299**

Regional Demographics

This section examines demographic data for Orange County community college students in manufacturing and industrial technology programs compared to the OC population, along with occupational data, to identify potential diversity and equity issues addressable by community college programs.

It is important to note that demographic data for *industrial engineering technologists and technicians* and *mechanical engineering technologists and technicians* are identical. The demographic data for *computer numerically controlled tool operators* and *computer numerically controlled tool programmers* are identical as well.

Ethnicity:

Exhibit 14 compares the ethnicity of Orange County community college students enrolled in manufacturing and industrial technology programs, the overall Orange County population, and occupation-specific data for the five manufacturing and industrial technology occupations included in this report.

Approximately 35% of workers in the field are Asian, which is significantly higher than the county population and community college manufacturing and industrial technology students (21% each). Conversely, 42% of community college manufacturing and industrial technology students are Hispanic or Latino, which is higher than the county population workers in the field (34% each) align. Approximately 40% of the population is white, which is significantly higher than community college manufacturing and industrial technology students and workers in the field (26% each).

Examining disaggregated data for each occupation (not shown), the occupations with the highest percentages of Hispanic or Latino workers are *computer numerically controlled tool operators* (43%), which has the lowest typical entry-level wages and typical education requirements of all five occupations, and *computer numerically controlled tool programmers* (43%). Additionally, 33% of *machinists* are white, which is significantly higher than the four other occupations. Notably, the percentages of Asian workers in each occupation largely align, ranging from 33% to 36%.

Exhibit 14: Program and County Demographics by Ethnicity

- **OC Community College Students (0956.00)**
- **OC Population**
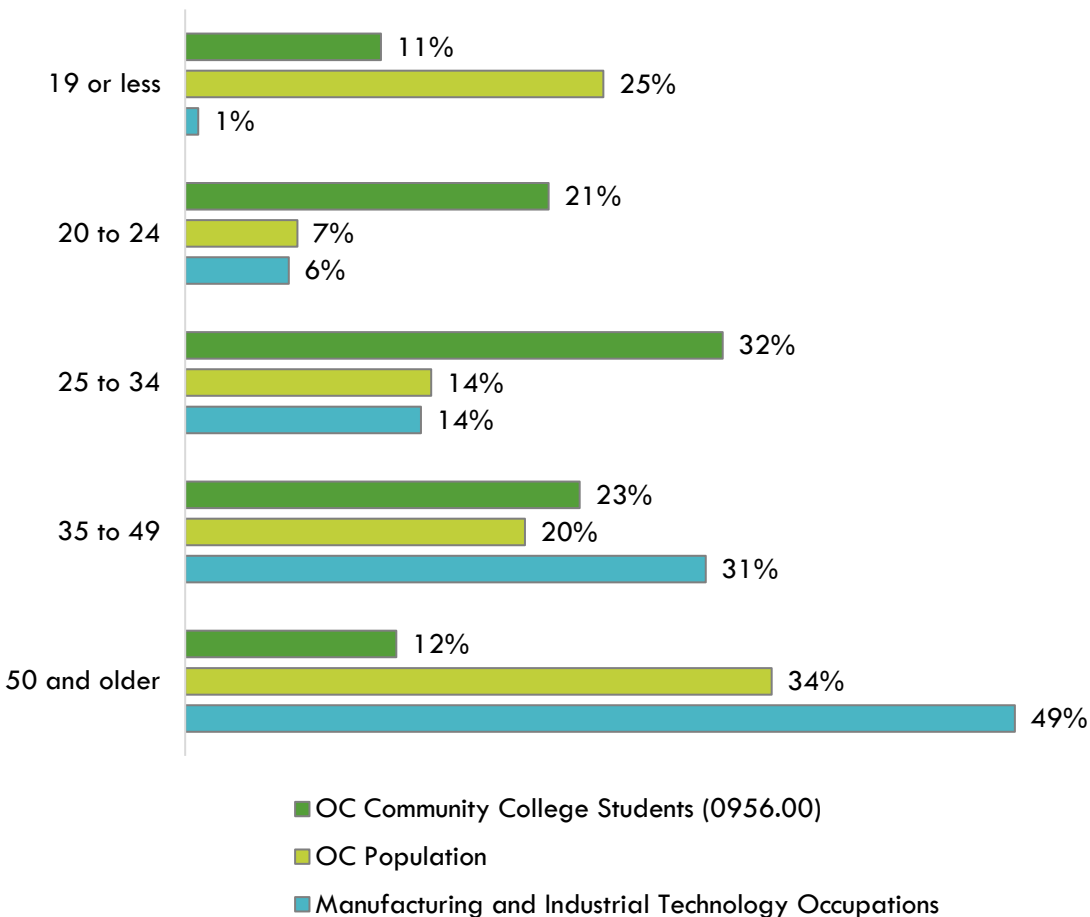- **Manufacturing and Industrial Technology Occupations**
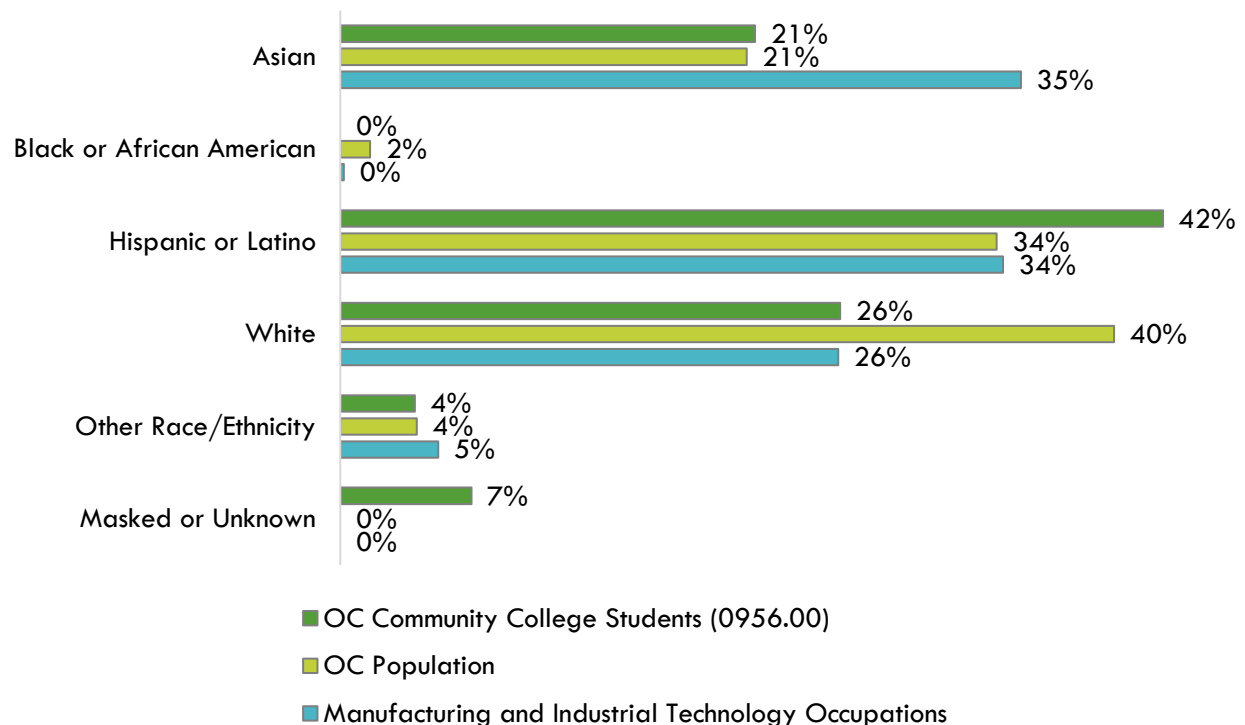
Age:

Exhibit 15 compares the age of Orange County community college students enrolled in manufacturing and industrial technology programs, the overall Orange County population, and occupation-specific data for the five manufacturing and industrial technology occupations included in this report.

Nearly 49% of all workers in these manufacturing and industrial technology occupations are age 50 and older, which is significantly higher than this age group's share of the population (34%) and more than four-times higher than their representation among community college manufacturing and industrial technology students (12%). The plurality of community college manufacturing and industrial technology students are 20 to 34 (53%), yet they only represent 20% of workers in the field and 21% of the county population.

Examining disaggregated data for each occupation (not shown), *industrial engineering technologists and technicians* and *mechanical engineering technologists and technicians* have the highest percentage of workers age 34 or younger (26% each). Conversely, 87% of *machinists* are 35 and older. This occupation has the second lowest entry-level wages and lowest typical entry-level education requirements among the five manufacturing and industrial technology occupations.

Exhibit 15: Program and County Demographics by Age

- 19 or less: 11%, 25%, 1%
- 20 to 24: 21%, 7%, 6%
- 25 to 34: 32%, 14%, 14%
- 35 to 49: 23%, 20%, 31%
- 50 and older: 12%, 34%, 49%

- ■ OC Community College Students (0956.00)
- ■ OC Population
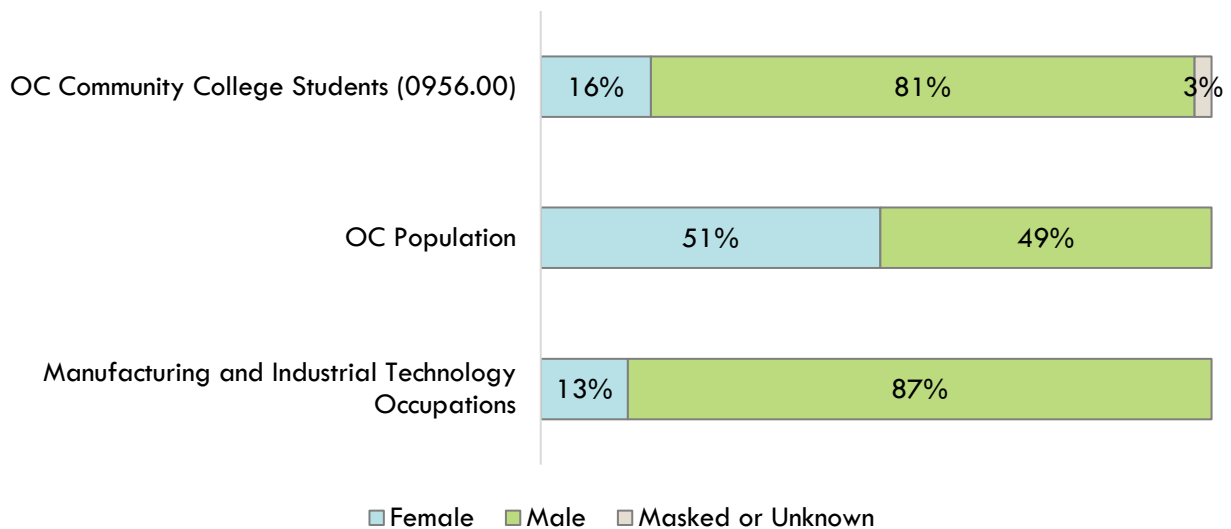- ■ Manufacturing and Industrial Technology Occupations

Sex:

Exhibit 16 compares the sex of Orange County community college students enrolled in manufacturing and industrial technology programs, the overall Orange County population, and occupation-specific data for these manufacturing and industrial technology occupations.

Though the population is split nearly evenly amongst women and men, only 16% of manufacturing and industrial technology students and 13% of workers in the field are women. Examining disaggregated data for each occupation (not shown), there are significantly larger percentages of men than women across all five occupations with men. Approximately 94% of *machinists* are men, the highest among these five manufacturing and industrial technology occupations.

The occupations with the largest percentages of women are *industrial engineering technologists and technicians* and *mechanical engineering technologists and technicians* (18% each). These two occupations typically require an associate degree as their entry-level education, and they rank first and third in entry-level wages when compared among all five manufacturing and industrial technology occupations.

Exhibit 16: Program and County Demographics by Sex

	Female	Male	Masked or Unknown
OC Community College Students (0956.00)	16%	81%	3%
OC Population	51%	49%	
Manufacturing and Industrial Technology Occupations	13%	87%	

☐ Female   ☐ Male   ☐ Masked or Unknown

Appendix A: Methodology

The OC COE prepared this report by analyzing data from occupations and education programs. Occupational data is derived from Lightcast, a labor market analytics firm that consolidates data from the California Employment Development Department (EDD), U.S. Bureau of Labor Statistics (BLS) and other government agencies. Program supply data is drawn from two systems: Taxonomy of Programs (TOP) and Classification of Instructional Programs (CIP).

Using a TOP-SOC crosswalk, the OC COE identified middle-skill jobs for which programs within these TOP codes train. Middle-skill jobs include:

- All occupations that require an educational requirement of some college, associate degree or apprenticeship;
- All occupations that require a bachelor's degree, but also have more than one-third of their existing labor force with an educational attainment of some college or associate degree; or
- All occupations that require a high school diploma or equivalent or no formal education, but also require short- to long-term on-the-job training where multiple community colleges have existing programs.

The OC COE determined labor market supply for an occupation or SOC code by analyzing the number of program completers or awards in a related TOP or CIP code. The COE developed a "supply table" with this information, which is the source of the program supply data for this report. TOP code data comes from the California Community Colleges Chancellor's Office MIS Data Mart (datamart.cccco.edu) and CIP code data comes from the Integrated Postsecondary Education Data System (nces.ed.gov/ipeds/use-the-data), also known as IPEDS. TOP is a system of numerical codes used at the state level to collect and report information on California community college programs and courses throughout the state that have similar outcomes. CIP codes are a taxonomy of academic disciplines at institutions of higher education in the United States and Canada. Institutions outside of the California Community College system do not use TOP codes in their reporting systems.

Data included in this analysis represent the labor market demand for relevant positions most closely related to the proposed program as expressed by the requesting college in consultation with the OC COE. Traditional labor market information was used to show current and projected employment based on data trends, as well as annual average awards granted by regional community colleges. Real-time labor market information captures job post advertisements for occupations relevant to the field of study which can signal demand and show what employers are looking for in potential employees, but is not a perfect measure of the quantity of open positions.

All representations have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. The most recent data available at the time of the analysis was examined; 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 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.

Appendix B: Data Sources

Data Type	Source
Occupational Projections, Wages, and Job Postings	Traditional labor market information data is sourced from Lightcast, a labor market analytics firm. Lightcast occupational employment data are based on final Lightcast industry data and final Lightcast staffing patterns. Wage estimates are based on Occupational Employment Statistics and the American Community Survey. For more information, see https://lightcast.io/
Living Wage	The living wage is derived from the Insight Center's California Family Needs Calculator, which measures the income necessary for an individual of family to afford basic expenses. The data assesses the cost of housing, food, child care, health care, transportation, and taxes. For more information, see: https://insightcced.org/family-needs-calculator/ The living wage for one adult in Orange County is $20.63 per hour ($42,910.40 annually). This figure is used by the CCCCO to calculate the percentage of students that attained the regional living wage.
Typical Education and Training Requirements, and Educational Attainment	The Bureau of Labor Statistics (BLS) provides information about education and training requirements for hundreds of occupations. BLS uses a system to assign categories for entry-level education, work experience in a related occupation, and typical on-the-job training to each occupation for which BLS publishes projections data. For more information, see https://www.bls.gov/emp/documentation/education/tech.htm
Emerging Occupation Descriptions, Additional Education Requirements, and Employer Preferences	The O*NET database includes information on skills, abilities, knowledges, work activities, and interests associated with occupations. For more information, see https://www.onetonline.org/help/online/
Educational Supply	The CCCCO Data Mart provides information about students, courses, student services, outcomes and faculty and staff. For more information, see: https://datamart.cccco.edu The National Center for Education Statistics (NCES) Integrated Postsecondary Integrated Data System (IPEDS) collects data on the number of postsecondary awards earned (completions). For more information, see https://nces.ed.gov/ipeds/use-the-data/survey-components/7/completions
Student Metrics and Demographics	LaunchBoard, a statewide data system supported by the California Community Colleges Chancellor's Office and hosted by Cal-PASS Plus, provides data on progress, success, employment, and earnings outcomes for California community college students. For more information, see: https://www.calpassplus.org/LaunchBoard/Home.aspx

Data Type	Source
Population and Occupation Demographics	The Census Bureau's American Community Survey (ACS) is the premier source for detailed population and housing information. For more information, see: https://www.census.gov/programs-surveys/acs Data is sourced from IPUMS USA, a database providing access to ACS and other Census Bureau data products. For more information, see: https://usa.ipums.org/usa/about.shtml

For more information, please contact the Orange County Center of Excellence:

Jesse Crete, Ed. D., Director
crete_jesse@rsccd.edu

Jacob Poore, Assistant Director
poore_jacob@rsccd.edu

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