

Machining and Machine Tools

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

- Community college machining and machine tools programs provide the knowledge, skills, and abilities that prepare students for employment in three community college-level occupations.
- These occupations are projected to have 438 annual job openings through 2025, increasing employment by 3%.
- The median hourly earnings for these occupations are between \$17.97 and \$34.30 per hour. The median hourly earnings for computer numerically controlled tool programmers are above the regional \$24.36 per hour self-sustainable wage standard for a single adult with one child.
- Regional community colleges have issued an annual average of 19 awards in machining and machine tools programs over the last three academic years.
- The COE recommends expanding machining and machine tools programs. See the [recommendation section](#) for further detail.

Introduction

California Community College machining and machine tools (TOP 0956.30) programs prepare students for employment through the instruction of the fabrication, assembly, and repair of parts and components or systems on machines, such as lathes, grinders, drill presses, milling machines, and shaping machines. These programs include computer numerical control and tool design (Taxonomy of Programs, 2012). The knowledge, skills, and abilities trained by machining and machine tools programs lead to three distinct occupations, collectively referred to as the machining occupational group in this report.

- Computer Numerically Controlled Tool Operators (SOC 51-9161)
- Computer Numerically Controlled Tool Programmers (51-9162)
- Machinists (51-4041)

Job Counts and Projections

In 2020, there were 4,385 machining jobs in the Inland Empire/Desert Region. Employment for the machining occupational group is projected to increase by 3% through 2025, with 438 job openings available annually. 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 machining 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+
Machinists	3,211	3,334	4%	1,634	327	33%
Computer Numerically Controlled Tool Operators	938	931	(1%)	419	84	22%
Computer Numerically Controlled Tool Programmers	237	264	12%	135	27	19%
Total	4,385	4,530	3%	2,188	438	30%

Source: Emsi 2021.3

Exhibit 2 shows the number of job ads posted during the last 12 months in the region and the regional and statewide average time filling each occupation. The job advertisement search for computer numerically controlled tool programmers was expanded to the state-level to ensure there were sufficient advertisements to obtain reliable job advertisement information.

On average, regional employers fill online job advertisements for machining workers in 30 days, one day shorter than the statewide average time to fill. Time to fill information indicates that regional employers likely face similar challenges filling open positions as 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)
Computer Numerically Controlled Tool Operators	293	31	31
Machinists	140	29	31
Computer Numerically Controlled Tool Programmers*	590	-	30
Total	1,023	30	31

Source: Burning Glass – Labor Insights

*California job advertisement information

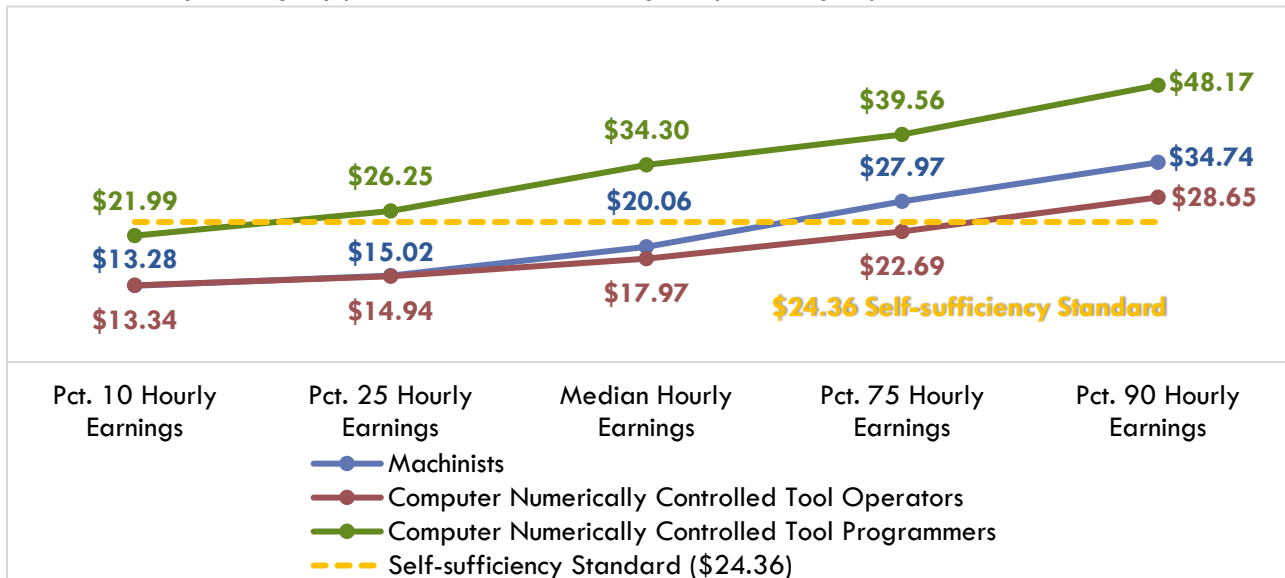
Earnings and Benefits

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 machining occupational group. The median hourly earnings for this occupational group are between \$17.97 and \$34.30. The hourly earnings for computer numerically controlled tool programmers surpass the regional self-sufficiency standard at the 25th percentile, indicating that most workers will earn a thriving wage shortly after entering the workforce. The hourly earnings for machinists exceed the self-sufficiency standard at the 75th percentile, indicating that most workers will likely need years of work experience to achieve a thriving wage. Earnings for computer numerically controlled tool operators do not surpass the self-sufficiency standard until the 90th percentile; only the top 10% of workers earn a self-sustainable wage.

Exhibit 3: Hourly earnings by percentile for the machining occupational group



Source: Emsi 2021.3

Benefits information, provided by the California Labor Market Information Division's occupational guides, reveals that workers in the machining occupational group generally receive health, dental, and life insurance, vacation, and sick leave, when employed full-time (Detailed Occupational Guides, 2021).

Advertised Salary from Online Job Ads

Exhibit 4 displays online job ad salary data for the machining occupational group over the last 12 months. Online job ad salary information reveals that employers are willing to pay the machining occupational group between \$41,000 and \$67,000 annually. The advertised wages for computer numerically controlled tool programmers are above the region's \$51,452 annual (\$24.36 hourly) self-sufficiency standard. Consider the

salary information with caution since only 61% (622 out of 1,023) of online job ads for these occupations provided salary information. The salary figures are prorated to reflect full-time, annual wage status.

Exhibit 4: Advertised salary information

Occupations	Real-Time Salary Information					Average Annual Salary
	Number of job postings	Less than \$35,000	\$35,000 to \$49,999	\$50,000 to \$74,999	More than \$75,000	
Computer Numerically Controlled Tool Operators	227	24%	63%	12%	1%	\$41,000
Machinists	76	13%	56%	30%	1%	\$46,000
Computer Numerically Controlled Tool Programmers*	319	1%	19%	50%	30%	\$67,000

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

Employers, Skills, Education, and Work Experience

Exhibit 5 displays the employers that posted the most job ads during the last 12 months. Displaying employer names provides some insight into where students may find employment after completing a program. Arms Precision posted the most job advertisements for the machining occupational group in the region.

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

Occupation	Top Employers	
Computer Numerically Controlled Tool Operators (n=293)	<ul style="list-style-type: none"> Arms Precision Tamshell Corporation X Machine Inc. BBK Performance, Inc. 	<ul style="list-style-type: none"> SR Machining, Inc. Kelly Machine Manufacturing Inc. Hoosier Precision Machining Edelbrock Foundry
Machinists (n=140)	<ul style="list-style-type: none"> General Atomics Precision Castparts Corp. 	<ul style="list-style-type: none"> California Machine Specialties BBK Performance
Computer Numerically Controlled Tool Programmers* (n=590)	<ul style="list-style-type: none"> Northrop Grumman Sanmina Corporation Kennametal Incorporated Carlisle Interconnect Technologies SMP Engineering 	<ul style="list-style-type: none"> Pacon Manufacturing Corporation ARCH Global Precision Stolle Machinery SpaceX Ankra International LLC

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

Exhibit 6 lists a sample of specialized and employability skills employers seek when looking for workers to fill machining 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 postings may be utilized to guide curriculum development.

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

Occupation	Specialized skills	Employability skills
Computer Numerically Controlled Tool Operators (n=285)	<ul style="list-style-type: none"> Machining Calipers Cleaning Micrometers Lathes 	<ul style="list-style-type: none"> Detail-Oriented Physical Abilities Communication Skills Work Area Maintenance Troubleshooting
Machinists (n=128)	<ul style="list-style-type: none"> Computer Numerical Control (CNC) Lathes Grinders Machine Tools Repair 	<ul style="list-style-type: none"> Physical Abilities Troubleshooting Detail-Oriented Communication Skills Organizational Skills
Computer Numerically Controlled Tool Programmers* (n=571)	<ul style="list-style-type: none"> Machining Mastercam Lathes Cleaning Geometry 	<ul style="list-style-type: none"> Communication Skills Detail-Oriented Problem Solving Troubleshooting Teamwork/Collaboration

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

Exhibit 7 displays the typical entry-level education, educational attainment, and minimum advertised education requirements for the machining occupational group. According to the Bureau of Labor Statistics, between 41%-44% of incumbent workers in this field hold a community college-level of educational attainment; "some college, no degree" and an "associate degree."

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

Occupation	Typical Entry-Level Education Requirement	CC-Level Educational Attainment*	Number of Job Ads	Real-Time Minimum Advertised Education Requirement		
				High school or vocational training	Associate degree	Bachelor's degree or higher
Computer Numerically Controlled Tool Operators	High school diploma or equivalent	44%	176	94%	4%	2%

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
Machinists	High school diploma or equivalent	41%	75	91%	7%	2%
Computer Numerically Controlled Tool Programmers**	Postsecondary nondegree award	44%	335	85%	5%	10%

Source: Emsi 2021.3, Burning Glass – Labor Insights

*Percentage of incumbent workers with a Community College Award or Some Postsecondary Coursework

**California 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.

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

Occupation	Work Experience Typically Required	Real-Time Work Experience			
		Number of job postings	0 – 2 years	3 – 5 years	6+ years
Computer Numerically Controlled Tool Operators	None	157	51%	39%	10%
Machinists	None	90	22%	59%	19%
Computer Numerically Controlled Tool Programmers*	None	398	14%	54%	32%

Source: Emsi 2021.3, Burning Glass – Labor Insights

*California job advertisement information

Programs Completions and Student Outcomes

Exhibit 9 displays student completions from machining and machine tools (0956.30) programs over the last three academic years. Regional community colleges have issued 19 awards annually in machining and machine tool programs over the last three academic years in the region. Program completion and student outcome methodologies can be found in the appendix.

Exhibit 9: 2017-20, Annual average community college awards for machining and machine tools programs in the region

TOP 0956.30 – Machining and Machine Tools	Associate Degree	Certificate requiring 30 to < 60-semester units	Certificate requiring 18 to < 30-semester units	Certificate requiring 16 to < 30-semester units	Certificate requiring 6 to < 18-semester units	Total CC Annual Average Awards, Academic Years 2017-20
Norco	2	-	3	3	3	10
San Bernardino	1	0	2	-	5	9
Total	3	0	5	3	8	19

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. Among the students exiting machining and machine tools programs in the region, 46% of students reported working in a job closely related to their field of study. The median annual earnings were \$34,944, and 74% attained a living wage. The outcome methodology is available in the appendix section of this report.

Exhibit 10: 0956.30 – Machining and machine tools strong workforce program outcomes

Strong Workforce Program Metrics: 0956.30 – Machining and Machine Tools Academic Year 2018-19, unless noted otherwise	Inland Empire/Desert Region	California
Unduplicated count of enrolled students (2019-20)	162	3,465
Completed 9+ career education units in one year (2019-20)	37%	30%
Perkins Economically disadvantaged students	77%	74%
Students who attained a noncredit workforce milestone in a year (2019-20)	-	79%
Students who earned a degree, certificate, or attained apprenticeship (2019-20)	-	249
Transferred to a four-year institution (transfers)	-	66
Job closely related to the field of study (2017-18)	46%	78%
Median annual earnings (all exiters)	\$34,944	\$43,290
Median change in earnings (all exiters)	5%	20%
Attained a living wage (completers and skills-builders)	74%	64%

Sources: LaunchBoard Community College Pipeline and Strong Workforce Program Metrics

Recommendation

Community college machining and machine tool programs provide the knowledge, skills, and abilities that prepare students for employment in three community college-level occupations. The machining occupational group is expected to have 438 annual job openings through 2025, increasing employment by 3% over this period.

The median hourly earnings for these occupations are between \$17.97 and \$34.30 per hour. The median hourly earnings for computer numerically controlled tool programmers are above the regional \$24.36 per hour self-sustainable wage standard for a single adult with one child.

Regional community college machining and machine tools (TOP 0956.30) programs have issued 19 awards annually over the last three academic years. Among the students exiting machining and machine tools programs in the region, 46% of students reported working in a job closely related to their field of study. The median annual earnings were \$34,944, and 74% attained a living wage.

The COE recommends expanding machining programs to meet the demand for more machining workers in the region. Colleges considering this program should provide knowledge and skills training leading to the computer numerically controlled tool programmers and machinist occupations, ensuring students will have access to jobs that offer self-sustainable earnings after exiting the program.

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

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

Machinists (51-4041)

Set up and operate a variety of machine tools to produce precision parts and instruments out of metal. Includes precision instrument makers who fabricate, modify, or repair mechanical instruments. May also fabricate and modify parts to make or repair machine tools or maintain industrial machines, applying knowledge of mechanics, mathematics, metal properties, layout, and machining procedures.

Sample job titles: CNC Machinist (Computer Numeric Controlled Machinist), CNC Machinist (Computer Numerically Controlled Machinist), Gear Machinist, Machine Repair Person, Machinist, Maintenance Machinist, Manual Lathe Machinist, Production Machinist, Tool Room Machinist

Entry-Level Educational Requirement: High school diploma or equivalent

Training Requirement: More than 12 months on-the-job training

Work Experience: None

Percentage of incumbent workers with a Community College Award or Some Postsecondary Coursework: 41%

Computer Numerically Controlled Tool Operators (51-9161)

Operate computer-controlled tools, machines, or robots to machine or process parts, tools, or other work pieces made of metal, plastic, wood, stone, or other materials. May also set up and maintain equipment.

Sample job titles: Brake Press Operator, Computer Numerical Control Lathe Operator (CNC Lathe Operator), Computer Numerical Control Machine Operator (CNC Machine Operator), Computer Numerical Control Machinist (CNC Machinist), Computer Numerical Control Mill Operator (CNC Mill Operator), Computer Numerical Control Operator (CNC Operator), Computer Numerical Control Set-Up and Operator (CNC Set-Up and Operator), Machine Operator, Machine Set-Up Operator, Machinist

Entry-Level Educational Requirement: High school diploma or equivalent

Training Requirement: Between one and twelve months on-the-job training

Work Experience: None

Percentage of incumbent workers with a Community College Award or Some Postsecondary Coursework: 44%

Computer Numerically Controlled Tool Programmers (51-9162)

Develop programs to control machining or processing of materials by automatic machine tools, equipment, or systems. May also set up, operate, or maintain equipment.

Sample job titles: CAD CAM Programmer (Computer-Aided Design Computer-Aided Manufacturing Programmer), Computer Numerical Control Machinist (CNC Machinist), Computer Numerical Control Programmer (CNC Programmer), Programmer

Entry-Level Educational Requirement: Postsecondary nondegree award

Training Requirement: Between one and twelve months on-the-job training

Work Experience: None

Percentage of incumbent workers with a Community College Award or Some Postsecondary Coursework: 44%

Appendix: Methodology

Exhibit 9 displays the average annual California Community College (CCC) awards conferred during the three academic years between 2017 and 2020 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 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 in each metric, please see the web link for LaunchBoard's Strong Workforce Program Metrics Data Element Dictionary in the References section (LaunchBoard, 2021 a). 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, 2021 a).

Job postings 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 postings often do not reveal the hiring intentions of employers; it is unknown if employers plan to hire one or multiple workers from a single online job posting or if they are collecting resumes for future hiring needs. A closed job posting 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 machining occupational group

Occupation (SOC)	2020 Jobs	5-Year Change (New Jobs)	5-Year % Change (New Jobs)	Annual Openings (New + Replacement Jobs)	Entry-Experienced Hourly Wage (10 th to 90 th percentile)	Median Hourly Wage (50 th percentile)	Average Annual Earnings	Entry-Level Education & On-The-Job-Training	Work Experience Required
Machinists (51-4041)	3,211	123	4%	327	\$13.28 to \$34.74	\$20.06	\$45,900	High school diploma or equivalent & More than 12 months	None
Computer Numerically Controlled Tool Operators (51-9161)	938	(6)	(1%)	84	\$13.34 to \$28.65	\$17.97	\$40,400	High school diploma or equivalent & 1-12 months	None
Computer Numerically Controlled Tool Programmers (51-9162)	237	27	12%	27	\$21.99 to \$48.17	\$34.30	\$70,600	Postsecondary nondegree award & 1-12 months	None
Total	4,385	144	3%	438	-	-	-	-	-

Source: Emsi 2021.3