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

# Computerized Numerical Control (CNC) Machine Programming Occupations

## Labor Market Analysis: San Diego County

## April 2023

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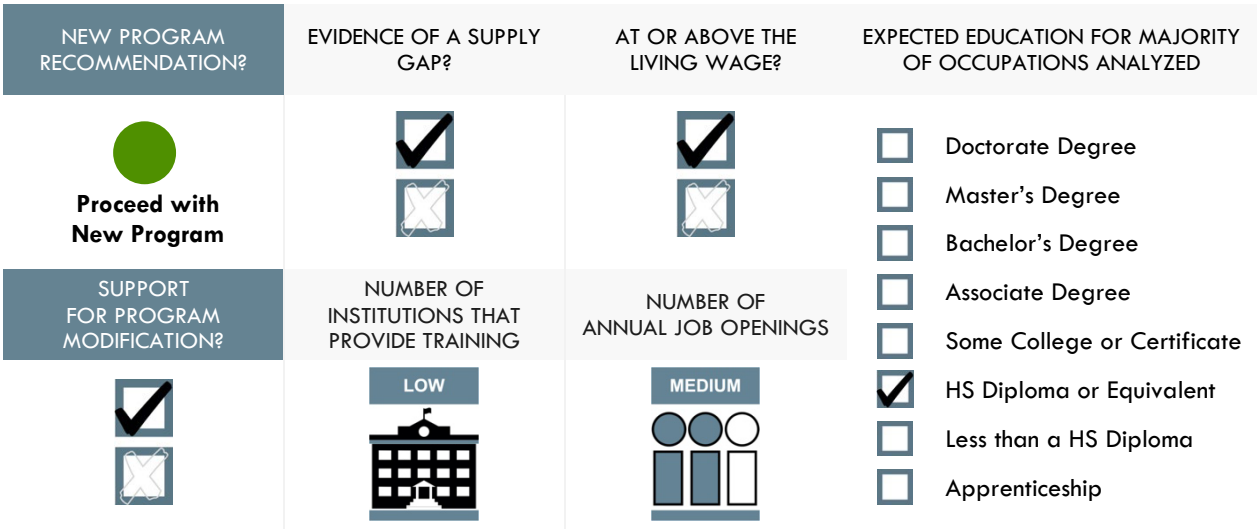
## Summary




This brief provides labor market information about *Computerized Numerical Control (CNC) Machine Programming Occupations* to assist the San Diego and Imperial Counties Community Colleges with program development and strategic planning. *CNC Machine Programming Occupations* include "Computer Numerically Controlled Tool Programmers," "Computer Numerically Controlled Tool Operators," "Machinists," and "Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic." According to available labor market information, *CNC Machine Programming Occupations* in San Diego County have a labor market demand of 573 annual job openings (while average demand for a single occupation in San Diego County is 289 annual job openings), and two institutions supply 29 awards for these occupations, suggesting that there is a supply gap in the labor market. On average, entry-level and median wages are above the living wage. This brief recommends that the colleges proceed with developing a new program and supports a program modification because 1) there is a supply gap in San Diego County; 2) these occupations' entry-level and median earnings are above the living wage; and 3) there is a medium number of annual job openings. Colleges should note that **employers typically require a high school diploma or equivalent as the minimum educational requirement for these occupations.**

## Introduction

This report provides labor market information in San Diego County for the following occupational codes in the Standard Occupational Classification (SOC)[1] system:

- **Computer Numerically Controlled Tool Operators** (SOC 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.
- **Computer Numerically Controlled Tool Programmers** (SOC 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.
- **Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic** (SOC 51-4034): Set up, operate, or tend lathe and turning machines to turn, bore, thread, form, or face metal or plastic materials, such as wire, rod, or bar stock.
- **Machinists** (SOC 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.

For the purpose of this report, these occupations are referred to as *Computerized Numerical Control (CNC) Machine Programming Occupations*.

[1] 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.

## Projected Occupational Demand

Between 2022 and 2027, *CNC Machine Programming Occupations* are projected to increase by 164 net jobs or three percent (Exhibit 1a). Employers in San Diego County will need to hire 573 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 *CNC Machine Programming Occupations* (2012-2027)[2]**

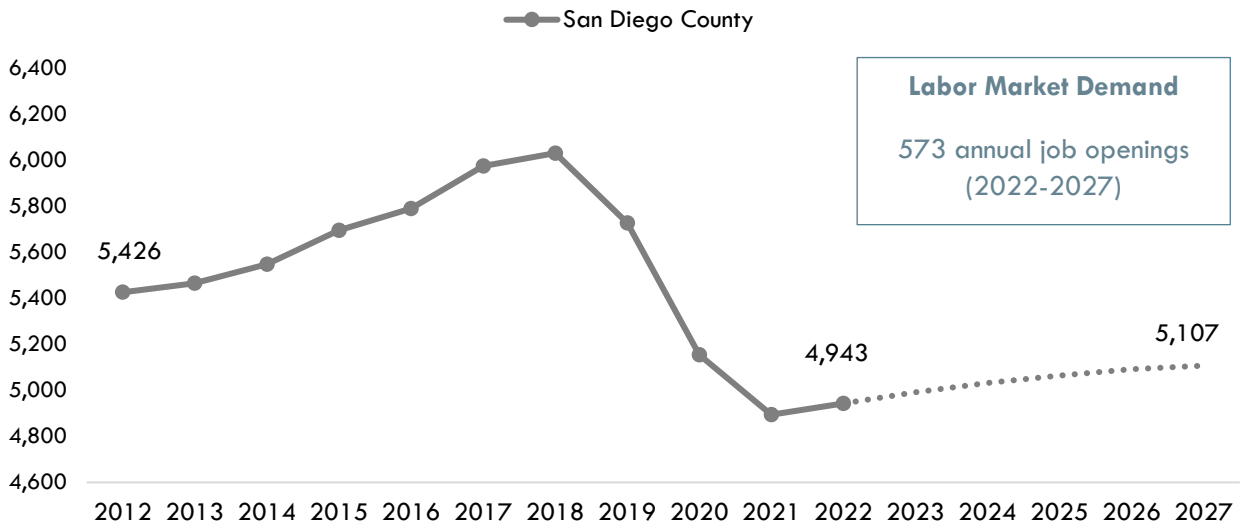



Exhibit 1b disaggregates the projected number of jobs change by occupation. "Machinists" are projected to have the most labor market demand between 2022 and 2027, with 353 annual job openings.

**Exhibit 1b: Number of Jobs for *CNC Machine Programming Occupations* in San Diego County (2022-2027)[3]**

| Occupational Title | 2022 Jobs | 2027 Jobs | 2022 - 2027 Net Jobs Change | 2022-2027 % Net Jobs Change | Annual Job Openings (Demand) |
|---|---|---|---|---|---|
| Machinists | 2,996 | 3,139 | 143 | 5% | 353 |
| Computer Numerically Controlled Tool Operators | 1,426 | 1,418 | -8 | -1% | 149 |
| Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic | 270 | 264 | -6 | -2% | 36 |
| Computer Numerically Controlled Tool Programmers | 251 | 286 | 35 | 14% | 35 |
| Total | 4,943 | 5,107 | 164 | 3% | 573 |

[2] Lightcast 2023.01; QCEW, Non-QCEW, Self-Employed.
[3] Lightcast 2023.01; QCEW, Non-QCEW, Self-Employed.

## Earnings

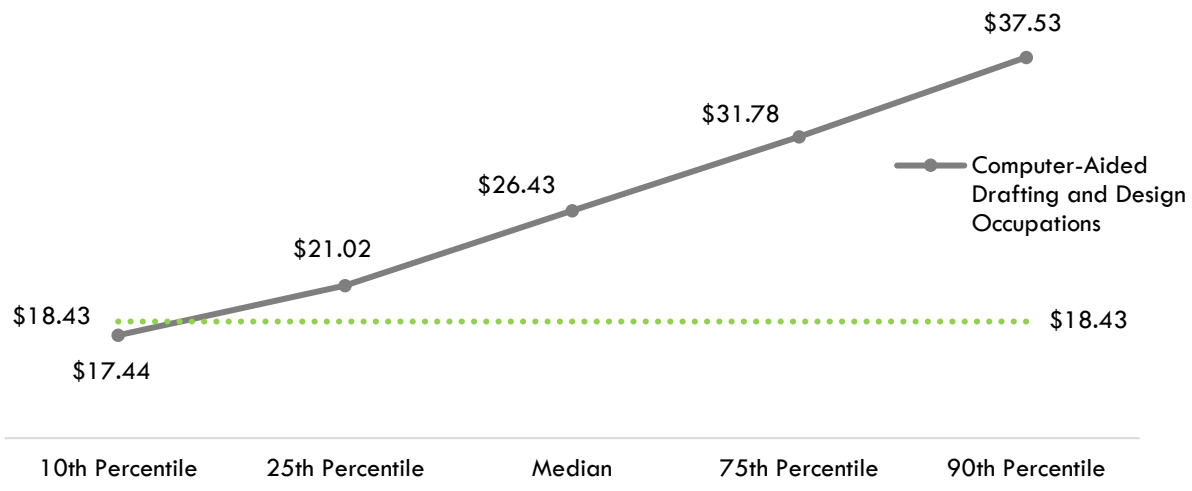
Exhibit 2a disaggregates hourly earnings by occupation. The entry-level hourly earnings for *CNC Machine Programming Occupations* range from $18.14 to $29.45.

**Exhibit 2a: Hourly Earnings for *CNC Machine Programming Occupations* in San Diego County[4]**

| Occupational Title | Entry-Level Hourly Earnings (25th Percentile) | Median Hourly Earnings | Experienced Hourly Earnings (75th Percentile) |
|---|---|---|---|
| Computer Numerically Controlled Tool Programmers | $29.45 | $36.95 | $40.27 |
| Computer Numerically Controlled Tool Operators | $18.25 | $23.04 | $28.73 |
| Machinists | $18.24 | $23.12 | $29.41 |
| Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic | $18.14 | $22.62 | $28.73 |

On average, the entry-level hourly earnings for *CNC Machine Programming Occupations* are $21.02; this is more than the living wage for a single adult in San Diego County, which is $18.43 per hour (Exhibit 2b).[5]

**Exhibit 2b: Average Hourly Earnings[6] for *CNC Machine Programming Occupations* in San Diego County[7]**




[4] Lightcast 2023.01; QCEW, Non-QCEW, Self-Employed.
[5] "Family Needs Calculator (formerly the California Family Needs Calculator)," Insight: Center for Community Economic Development, last updated 2021. insightcced.org/family-needs-calculator/.
[6] 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.
[7] Lightcast 2023.01; QCEW, Non-QCEW, Self-Employed.

## 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.[8] There are two TOP codes and nine CIP codes related to *CNC Machine Programming Occupations* (Exhibit 3).

**Exhibit 3: Related TOP and CIP Codes for *CNC Machine Programming Occupations*[9]**

| TOP or CIP Code | TOP or CIP Program Title |
|---|---|
| TOP 0956.00 | Manufacturing and Industrial Technology |
| TOP 0956.30 | Machining and Machine Tools |
| CIP 15.0405 | Robotics Technology/Technician |
| CIP 15.0406 | Automation Engineer Technology/Technician |
| CIP 15.0611 | Metallurgical Technology/Technician |
| CIP 15.0613 | Manufacturing Engineering Technology/Technician |
| CIP 15.0805 | Mechanical Engineering/Mechanical Technology/Technician |
| CIP 48.0501 | Machine Tool Technology/Machinist |
| CIP 48.0503 | Machine Shop Technology/Assistant |
| CIP 48.0510 | Computer Numerically Controlled (CNC) Machinist Technology/CNC Machinist |
| CIP 50.0404 | Industrial and Product Design |

[8] 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).
[9] This brief uses a conservative estimate of program supply and only calculates awards from the TOP codes in Exhibit 3.

According to TOP data, one community college supplies the region with awards for these occupations, San Diego City College. According to CIP data, one non-community-college institution supplies the region with awards, Newschool of Architecture and Design (Exhibit 4).

**Exhibit 4: Number of Awards (Certificates and Degrees) Conferred by Postsecondary Institutions (Program Year 2017-18 through Program Year 2020-21 Average)**

| TOP6 or CIP Code | TOP6 or CIP Program Title | 3-Yr Annual Average CC Awards (PY18-19 to PY20-21) | Other Educational Institutions 3-Yr Annual Average Awards (PY17-18 to PY19-20) | 3-Yr Total Average Supply (PY17-18 to PY20-21) |
|---|---|---|---|---|
| 0956.00 | Manufacturing and Industrial Technology | **4** | **0** | **4** |
| | • San Diego City | 4 | 0 | |
| 0956.30 | Machining and Machine Tools | **21** | **0** | **21** |
| | • San Diego City | 21 | 0 | |
| 50.0404 | Industrial and Product Design | **0** | **4** | **4** |
| | • Newschool of Architecture and Design | 0 | 4 | |
| | | | **Total** | **29** |

## 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 573 annual openings and 29 awards. Comparatively, there are 6,085 annual openings in California and 1,392 awards, suggesting that there is also a supply gap across the state[11] (Exhibit 5).

**Exhibit 5: Labor Demand (Annual Openings) Compared with Labor Supply (Average Annual Awards)**

| | **Demand** (Annual Openings) | **Supply**[12] (Total Annual Average Supply) | **Supply Gap or Oversupply** |
|---|---|---|---|
| San Diego | 573 | 29 | **544** |
| California | 6,085 | 1,392 | **4,693** |

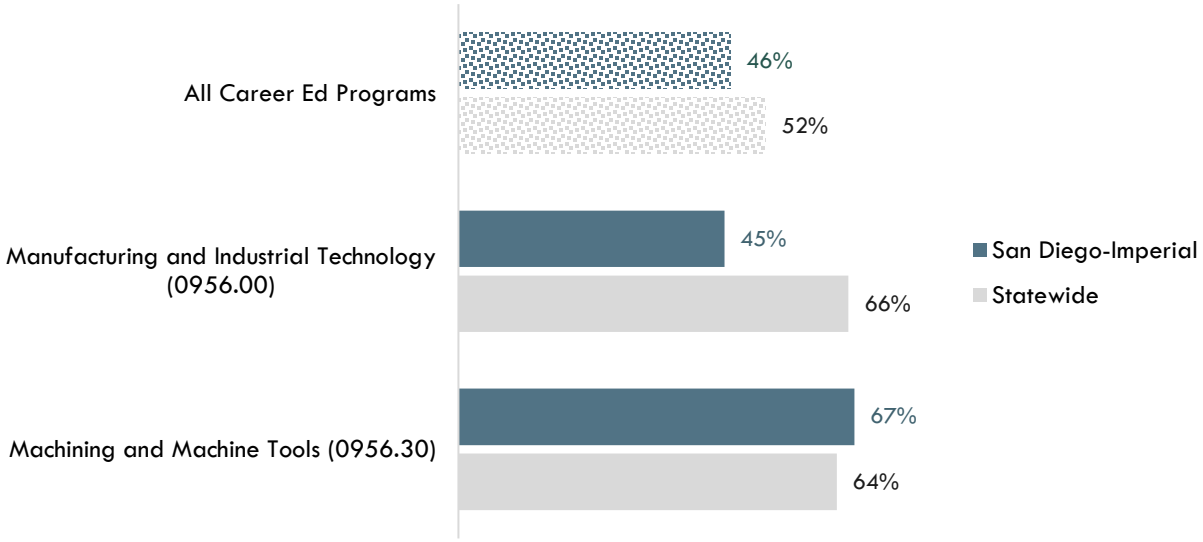
**Please note:** This is a basic analysis of supply and demand of labor. The data does not include workers currently in the labor force who could fill these positions or workers who are not captured by publicly available data. This data should be used to discuss the potential gaps or oversupply of workers;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

[10] Labor supply can be found from two different sources: Lightcast or the California Community Colleges Chancellor's Office MIS Data Mart. Lightcast 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, https://coeccc.net/our-resources/.
[12] Awards included: associate degree; award <1 year; award 1<2 years; and postsecondary awards.

## Student Outcomes and Regional Comparisons

According to the California Community Colleges LaunchBoard, 45 to 67 percent of students in the San Diego-Imperial region earned a living wage after completing a program related to *CNC Machine Programming Occupations,* compared 64 to 66 percent statewide and 52 percent of students in Career Education programs in general across the state (Exhibit 6a).[13]

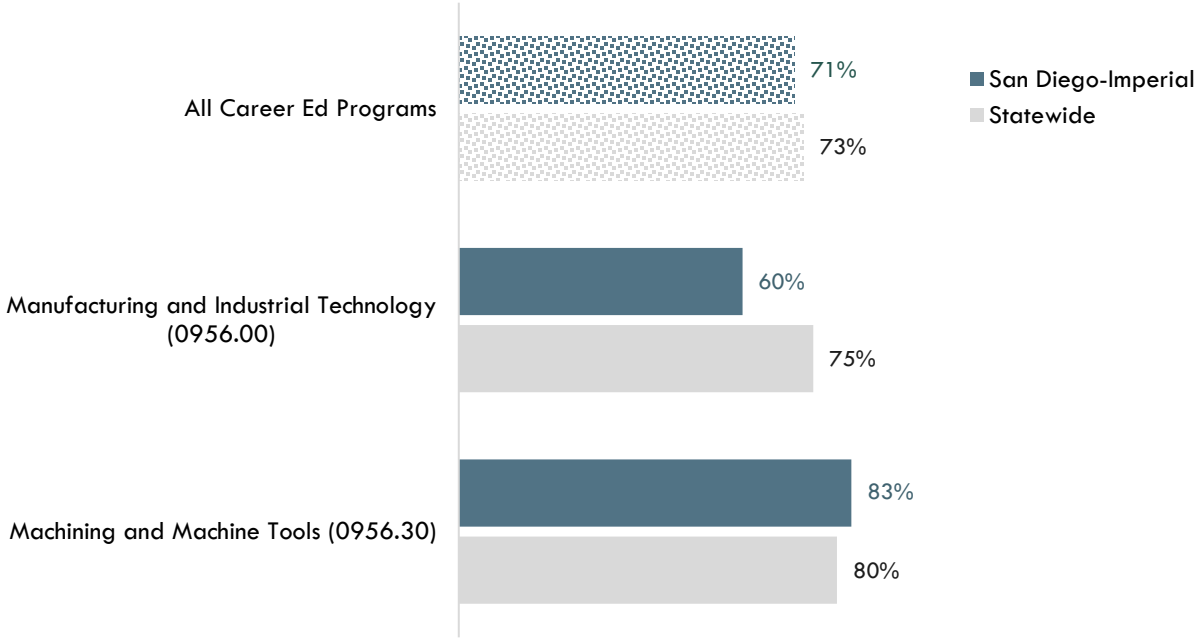
**Exhibit 6a: Percentage of Students Who Earned a Living Wage by Program, PY2019-20[14]**




[13] "California Community Colleges Strong Workforce Program," California Community Colleges, calpassplus.org/LaunchBoard/SWP.aspx.
[14] Most recent year with available data is Program Year 2019-20. Among completers and skills builders who exited, the percentage of students who attained a living wage.

According to the California Community Colleges LaunchBoard, 60 to 83 percent of students in the San Diego-Imperial region obtained a job closely related to their field of study after completing a program related to *CNC Machine Programming Occupations,* compared to 75 to 80 percent statewide and 73 percent of students in Career Education programs in general across the state (Exhibit 6b).[15]

**Exhibit 6b: Percentage of Students in a Job Closely Related to Field of Study by Program, PY2018-19[16]**

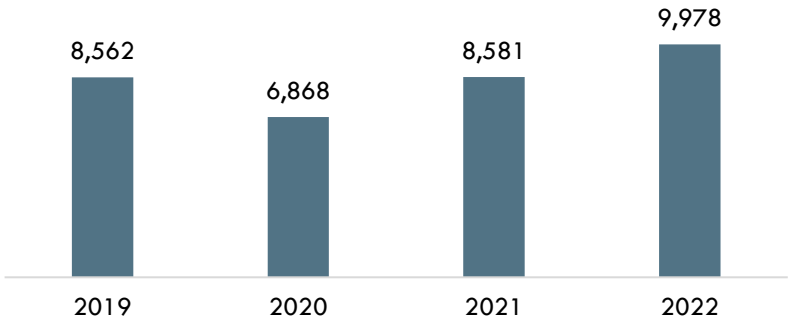



[15] "California Community Colleges Strong Workforce Program," California Community Colleges, calpassplus.org/LaunchBoard/SWP.aspx.
[16] Most recent year with available data is Program Year 2018-19. Percentage of Students in a Job Closely Related to Field of Study: Among students who responded to the CTEOS, the percentage reporting employment in the same or similar field as their program of study.

## Online Job Postings

This report analyzes not only historical and projected (traditional LMI) data, 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 that are not captured by historical data. Between 2019 and 2022, there was an average of 8,497 online job postings per year for *CNC Machine Programming Occupations* in San Diego County (Exhibit 7). Please note that online job postings do **not** equal labor market demand; demand is represented by annual job openings (see Exhibit 1b). While this brief includes online jobs postings data to help with curriculum development, the community colleges should note that this type of data is impacted by several variables: employers may post a position multiple times to increase the pool of applicants; a job posting can remain posted after a business decides not to fill a position; or an employer may use one posting to fill multiple positions, for example.

**Exhibit 7: Number of Online Job Postings for *CNC Machine Programming Occupations* in San Diego County (2018-2022)**[17]




[17] Lightcast; "Job Posting Analytics." 2018-2022.

## Top Employers

Between January 1, 2020 and December 31, 2022, the top five employers in San Diego County for *CNC Machine Programming Occupations* were Aerotek, Randstad, Volt, Orchid Orthopedic Solutions, and ResourceMFG based on online job postings (Exhibit 8).

**Exhibit 8: Top Employers for *CNC Machine Programming Occupations* in San Diego County[18]**

| Top Employers | |
|---|---|
| • Aerotek<br>• Randstad<br>• Volt<br>• Orchid Orthopedic Solutions<br>• ResourceMFG | • Flowserve<br>• Kelly Services<br>• Adecco<br>• General Atomics<br>• Jabil |

## Education, Skills, and Certifications

*CNC Machine Programming Occupations* have a national educational attainment ranging from a high school diploma or equivalent to a postsecondary non-degree award (Exhibit 9a).

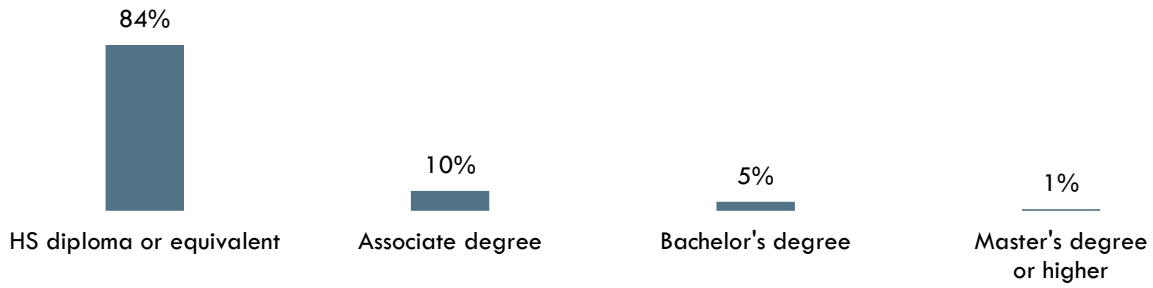
**Exhibit 9a: National Educational Attainment for *CNC Machine Programming Occupations*[19]**

| Occupational Title | Typical Entry-Level Education |
|---|---|
| Computer Numerically Controlled Tool Programmers | Postsecondary non-degree award |
| Computer Numerically Controlled Tool Operators | High school diploma or equivalent |
| Machinists | High school diploma or equivalent |
| Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic | High school diploma or equivalent |

[18] Lightcast; "Job Posting Analytics." 2020-2022.
[19] Lightcast 2023.01; QCEW, Non-QCEW, Self-Employed.

Based on online job postings between January 1, 2020 and December 31, 2022 in San Diego County, employers posted a high school diploma or equivalent as the most requested educational requirement for *CNC Machine Programming Occupations* (Exhibit 9b).[20]

**Exhibit 9b: Educational Requirements for *CNC Machine Programming Occupations* in San Diego County[21]**




*May not total 100 percent due to rounding

Exhibit 10 lists the top specialized, soft, and software skills that appeared in online job postings between January 1, 2020 and December 31, 2022.

**Exhibit 10: Top Skills for *CNC Machine Programming Occupations* in San Diego County[22]**

| Specialized Skills | Soft Skills | Software Skills |
|---|---|---|
| • Machining<br>• Lathes<br>• Computer Numerical Control (CNC)<br>• Mills<br>• Tooling<br>• CNC Machining<br>• Micrometer<br>• Calipers<br>• Machinery<br>• Blueprinting<br>• Machine Operation<br>• Metal Lathes<br>• CNC Milling<br>• Milling<br>• Machine Tools | • Operations<br>• Mathematics<br>• Communications<br>• Detail Oriented<br>• Troubleshooting (Problem Solving)<br>• Lifting Ability<br>• Problem Solving<br>• Management<br>• Arithmetic<br>• Self-Motivation<br>• Computer Literacy<br>• Mechanical Aptitude<br>• Writing<br>• Planning<br>• Teamwork | • Mastercam<br>• G-Codes<br>• SolidWorks<br>• Microsoft Excel<br>• Programming Tools<br>• Angular<br>• Microsoft Outlook<br>• AutoCAD<br>• Microsoft Word<br>• Fusion 360<br>• Computer Aided Three-Dimensional Interactive Application<br>• Microsoft PowerPoint<br>• Vericut<br>• SAP Applications<br>• Siemens NX |

[20] Lightcast; "Job Posting Analytics." 2020-2022.
[21] "Educational Attainment for Workers 25 Years and Older by Detailed Occupation," Bureau of Labor Statistics, last modified April 9, 2021. bls.gov/emp/tables/educational-attainment.htm.
[22] Lightcast; "Job Posting Analytics." 2020-2022.

Exhibit 11 lists the top certification that appeared in online job postings between January 1, 2020 and December 31, 2022.

**Exhibit 11: Top Certification for *CNC Machine Programming Occupations* in San Diego County[23]**

| Top Certification in Online Job Postings |
|---|
| 1. Security Clearance |
| 2. Forklift Certification |
| 3. National Apprenticeship Certificate |
| 4. Secret Clearance |
| 5. CNC Machining Certification |
| 6. Esthetician License |
| 7. Automotive Service Excellence (ASE) Certification |
| 8. National Institute for Metalworking Skills (NIMS) Credentials |
| 9. Lean Manufacturing Certification |
| 10. Top Secret Clearance |
| 11. Functional Skills Qualification |
| 12. Top Secret-Sensitive Compartmented Information (TS/SCI Clearance) |
| 13. American Society for Quality (ASQ) Certified |
| 14. Transportation Worker Identification Credential (TWIC) Card |
| 15. 10-Hour OSHA General Industry Card |

[23] Lightcast; "Job Posting Analytics." 2020-2022.

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