



COLLEGE OF
MARIN

Machine Metals (MMT) Program

Revised Fall 2020

Presentation By Ron Palmer & Derek Wilson

Thank you to everyone that contributed to the revised Machine Metals Technology Program.

College of Marin Administrators, Faculty and Staff:

Alina Varona, Career Education Department Dean

Ron Palmer, Career Education Department Chair

Derek Wilson, Department Curriculum Representative

Heather Rahman, Career Education Resource Support

Arthur Lutz, Retired MMT Faculty Member

Advice, Guidance & Support from the following MMT Industry Advisory Committee Members:

Jim Dour, Owner Megacycle Cams

Joe Osborn, Founder OMW Corporation

Ricky Baeza, Recruiter Tesla

Becky Rivera, Recruiter Tesla

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I. Historical Preface

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Initially there were two separate programs, a Machine Metals Technology (MACH) and a Welding (WELD) program. In 2000, the full-time faculty member, Jim Owens, retired. In 2001, Arthur Lutz was hired as a full-time faculty member to fill Jim Owen's position. During the transition, the WELD courses were moved into Machine Metals Technology with the MACH courses to unite metalworking as a single program. The combined MMT Program consisted of approximately 12 MACH courses and 3 WELD courses.

In 2015, three additional WELD courses were added to provide students with the opportunity to become proficient in their welding skills for regional employment opportunities. This brought the total up to 6 WELD courses.

In 2020, Arthur Lutz retired. Professor Lutz was a highly skilled Machinist, Tool & Die Maker, and inventor with extensive knowledge of the Machinist Tool Maker trades. It became a necessity to update the program in preparation of another full-time hire to fill the void left by Arthur Lutz's retirement. To seize the opportunity to update the MMT program, the Career Education and Workforce Dean sought faculty members to update the curriculum to provide MACH students with training for current and emerging employment opportunities.

Strong Workforce Machine Metals Curriculum and Pathway Development funds were used to provide two CE faculty members with 115 stipend hours to revise and update the Machine Metals Technology courses and program. Based on the discussion with the MMT Advisory Committee members, the determination was that the two programs required very different skilled individuals—one with machining skills, and the other with welding skills. The two different employment opportunity paths required focus and specific training, in a three to four semester duration in a Career Education program at a community college for successful outcomes within the new revised Machine Metals Technology program.

II. Advisory Committee Meeting

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The MMT Program and all of the courses are being revised to contain content, course objectives, CSLOs for the purpose of meeting industry standards. More importantly to re-tool the sequence of the MACH courses to effectively prepare students for entry level positions in the machine tool industry. The MMT Advisory Committee meeting was convened on Tuesday, October 13th, 2020. The following industry members were in attendance:

Jim Dour, *Owner Megacycle Cams*

Megacycle Cams has been in business for 51 years. His business works with machining and CNC to modify and create high performance cams for motorcycles and automobile engines. Megacycle has approximately 5-8 employees. Megacycle has hired COM students and graduates in the past.

Joe Osborn, *Founder OMW Corporation*

OMW makes aerospace, rocket launch, and space vehicles parts. This company has approximately 40 employees and 20 CNC machines. They consider themselves as a contract manufacturing company. The manufacturing work pertains to programming and quality control. OMW has hire COM students and graduates in the past.

Ricky Baeza, *Recruiter Tesla*

Supporting efforts for general assembly, powertrain, and the manufacturing group including CNC castings.

Becky Rivera, *Recruiter Tesla*

Currently hiring for general assembly and powertrain

In addition, *two members* of MCOE were present along with *five representatives* from College of Marin.

III. Advisory Discussion

To enlist a relevant discussion, the Advisory committee members were presented with a slide that contained a list of the current MACH courses and a proposed list of new or revised courses and potential MACH skill/local certificates, Certificate of Achievement, and a COM AS Degree.

MMT Slide V1:

CURRENT	Machine Metals Technology
MACH120	—Machine Technology I (4.0)
MACH121	—Machine Technology II (4.0)
MACH140	—Intermediate Machine Tool Processes (4.0)
MACH145	—Computer Numerical Control Machining/Mill (3.0)
MACH155	—Computer Numerical Control Machining/Lathe (3.0)
MACH240	—Advanced Machine Tool Processes (4.0)
MACH250	—Applications of Machine Tool Technology (2.0)

PROPOSED	Machine Technology
MACH 100	—Career Math & Measurement (4.0)
MACH101	—Introduction to Machine Technology (4.0)
MACH102	—Intermediate Machine Technology (4.0)
MACH103	—Machine Tool Processes (2.0)
MACH104	—Advanced Machine Tool Processes (2.0)
MACH105	—Machine Production Manufacturing (2.0)
MACH106	—Introduction to CNC Machining (2.0)
MACH107	—Advanced CNC Machining (2.0)

AS COM Degree in Machine Metals Technology (24.0)

Certificate of Achievement Machine Metals Technology (24.0)

AS COM Degree in Machine Technology (22.0)

Certificate of Achievement Machine Technology (22.0)

FUTURE

Skill Certificate in Machine Technology I (12.0)	
MACH100	—Career Math & Measurement (4.0)
MACH101	—Introduction to Machine Technology (4.0)
MACH102	—Intermediate Machine Technology (4.0)

Skill Certificate in Machine Technology II (6.0)	
MACH103	—Machine Tool Processes (2.0)
MACH104	—Advanced Machine Tool Processes (2.0)
MACH105	—Machine Production Manufacturing (2.0)

Skill Certificate in Machine Technology III (4.0)	
MACH106	—Introduction to CNC Machining (2.0)
MACH107	—Advanced CNC Machining (2.0)

Slide V1 was presented to the Advisory Members for discussion at the October 13th, 2020 meeting.

MMT Slide V2:

COLLEGE OF MARIN

**Career Education Department
Machine Metals Technology Program**

CURRENT	
MACH120	—Machine Technology I (4.0)
MACH121	—Machine Technology II (4.0)
MACH140	—Intermediate Machine Tool Processes (4.0)
MACH145	—Computer Numerical Control Machining/Mill (3.0)
MACH155	—Computer Numerical Control Machining/Lathe (3.0)
MACH240	—Advanced Machine Tool Processes (4.0)
MACH250	—Applications of Machine Tool Technology (2.0)

PROPOSED	
MACH 100	—Career Math & Measurement (4.0)
MACH101	—Introduction to Machine Technology (4.0)
MACH102	—Intermediate Machine Technology (4.0)
MACH103	—Machine Tool Processes (2.0)
MACH104	—CAD 3D Modeling and Drafting (100% online) (3.0)
MACH105	—CAD-CAM Production (Hybrid lecture/lab) (3.0)
MACH106	—Introduction to CNC Machining (2.0)
MACH107	—CNC Programming for Mills and Lathes (2.0)

AS COM Degree in Machine Metals Technology (24.0)

Certificate of Achievement Machine Metals Technology (24.0)

AS COM Degree in Machine Technology (24.0)

Certificate of Achievement Machine Technology (24.0)

Prepared by D. Wilson
October 12, 2020

Revised by D. Wilson
October 22, 2020

Slide V2 is the revision from the Advisory Members' feedback during the October 13th, 2020 meeting.

IV. Advisory Recommendations I

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Key recommendations from the MMT Industry Advisory Committee members:

1. Separate the MACH and WELD courses into two programs
2. Skill certificates do not provide enough experience and practice for hiring opportunities
3. Working persons cannot attend the courses that are 5-6 hours per week
4. Many employees work rotating four 10-hour days, eliminating afternoon and evening classes
5. CNC classes, including basic programming skills for machine operators
6. CAD/CAM courses—both software skills and machine operation knowledge
7. Online or Hybrid classes would accommodate current employee schedules
8. An Autodesk workflow using Fusion 360 for CAD/CAM is highly recommended
9. Avoid proprietary systems, which are limited and becoming outdated

As a Career Education (CE) program at College of Marin, the recommendations were crucial to the decision making for updating and properly revising courses, including the addition of four new courses:

- MACH 100 Career Math and Measurement
- MACH 104 CAD 3D Modeling and Drafting (100% online)
- MACH 105 CAD-CAM Production (Hybrid: lecture online, Lab)
- MACH 107 CNC Programming for Mills and Lathes

V. Advisory Recommendations II

In addition to removing the WELD courses from the MMT program, the following MACH courses were deactivated:

- MACH 165 Blueprint Reading for the Machine Trades (blueprints are covered in MACH 100)
- MACH 240 Advanced Machine Tool Processes
- MACH 250 Applications of Machine Tool Technology

Annual Industry Advisory Committee meetings must be conducted at least once a year to gather Industry member recommendations for improving student training and skills relevant for current and emerging job opportunities in preparation of adding or revising courses. The MMT program has updated all MACH courses for student outcomes that lead to potential job opportunities in the machining industry.

Each of the MACH courses has been rewritten to meet industry standards as set forth by the MMT Industry Advisors. The intent is to prepare students for entry level positions in the machine tool industry with approved starting dates of Fall 2021. The Machine Metals Technology (MMT) Program at College of Marin has thoroughly revised and updated eight courses. All eight courses were submitted to the College of Marin Curriculum Committee and approved on October 22nd, 2020.

The following section contains each MACH course that was updated to align with the MMT Advisory Committee's recommendations. The intent of the MACH course numbers was to reflect the sequence of courses offered at a community college. The following is a list of the new and revised MACH courses for the MMT Program with the course description, delivery, course objectives, and critical thinking expectations for each course.

VI. Revised MACH Courses Summary

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MACH 100 Career Math & Measurement (4.0 units)

(No prerequisite.) This course reviews addition, subtraction, multiplication and division of whole numbers, fractions, decimals, percentages in imperial and metric units. Also included are ratio and proportion, graphs and applications specific to automotive, collision repair, machining and welding careers. The course covers worker/employer relationships in the industry, which includes communication, customer service, meeting deadlines, and time tracking skills. MACH 100 is a Hybrid Distance Education Course, with 3.5 lecture hrs/wk online and 1.5 lab hrs/wk in the Machine Shop at the College of Marin IVC campus.

Course Objectives

1. Identify, and demonstrate the correct measurement tool and units to evaluate the final workpiece for accuracy and quality.
2. Utilize charts, workbooks, and personal notes to calculate angles, percentages, ratios, and formulas.
3. Demonstrate qualities and attributes of a model employee and professional.

Critical Thinking Expectations

- Ability to use and memorize fractional/decimal charts.
- Identify, and demonstrate the correct measurement tool and units to evaluate the final workpiece for accuracy and quality.
- Utilize charts, workbooks, and personal notes to calculate angles, percentages, ratios, and formulas.
- Demonstrated comprehension of specifications as required.

MACH 101 Introduction to Machine Technology (4.0 units)

(No prerequisite. MACH 100 advised.) An introductory course in the principles of general machine shop processes utilizing lathes, milling machines, surface grinders and drilling machines; practice in general bench operations and the use of precision measuring and machining instruments. MACH 101 is a Hybrid Distance Education Course, with 3.5 lecture hrs/wk online and 1.5 lab hrs/wk in the Machine Shop at the College of Marin IVC campus.

Course Objectives

1. Practice the proper use of industry terms and measurements.
2. Follow industrial blueprint and plans for course exercises and projects
3. Machined projects that are accurately and properly machined.

Critical Thinking Expectations

- Differentiate machine tool processes to choose appropriate method
- Analyze cutting process for correct and incorrect cutting technique, material removal
- Apply principles of machining metals
- Anticipate problems and limitations of tools and different machining techniques
- Solve unfamiliar problems to fabrication techniques

VI. Revised MACH Courses Summary

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MACH 102 Intermediate Machine Technology (4.0 units)

(No prerequisite. MACH 101 advised.) This course builds upon the fundamentals established in MACH 101. This course will help students develop intermediate machining techniques utilizing lathes, milling machines, grinders, and drilling machines. This course is designed to build manipulative skill, competency, and emphasizes machine tool theory. MACH 102 is a Hybrid Distance Education Course with 3.5 lecture hrs/wk online and 1.5 lab hrs/wk in the Machine Shop at the College of Marin IVC campus.

Course Objectives

1. Identify and use practices and equipment to complete machining processes as required for MACH102 assignments.
2. Communicate appropriate terms for tools and methods of machining processes.
3. Calculate cutting speeds and feeds for mill and lathe machining processes.

Critical Thinking Expectations

- Differentiate machine tool processes to choose appropriate method for machining angles, radii, and other geometry.
- Written and sketched plans for machining project assignments.
- Analyze cutting process for correct and incorrect cutting techniques to properly and safely remove material
- Anticipate problems and limitations of tools for different machining techniques (e.g. speed and cutting depths)

MACH 103 Machine Tool Processes (2.0 units)

(No prerequisite. Advisory MACH 102). This course emphasizes the use of machining with metal lathes and milling machines. Developing the ability to layout and plan each project using cutting tool theory, feeds and speeds, tooling, and heat treatment. With a brief introduction to numerical control. MACH 103 is a Hybrid Distance Education Course, with 1.0 lecture hrs/wk online and 1.5 lab hrs/wk in the Machine Shop at the College of Marin.

Course Objectives

1. Utilize industrial blueprint plans for set-up and machining of projects.
2. Utilize charts, workbooks, and personal notes to calculate angles, percentages, ratios, and formulas.
3. Machined projects that are accurately and properly machined, as reviewed by the instructor and class peers.

Critical Thinking Expectations

- Differentiate complex machining methods to choose appropriate tools and processes
- Analyze cutting tools and process to ensure an accurate and correct cutting technique
- Anticipate problems from beginning to end of a project, then frequently check set-ups and work
- Review and assess finished quality and accuracy of machined parts

VI. Revised MACH Courses Summary

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MACH 104 CAD 3D Modeling and Drafting (3.0 units)

(No prerequisite.) An introductory course using CAD software to develop 3D models and drafting plans. This course will develop understanding of technical drawings, blueprints and plan using 3D tools for metal technology trades, engineering and industrial design projects. MACH 104 is a 100% online Distance Education Course with 2.5 lecture hrs/wk and 1.5 lab hrs/wk online to complete lessons, quizzes, preliminary assignments, final projects, research and class discussions.

Course Objectives

1. Develop a working understanding of a CAD 3D Modeling application (e.g. Fusion 360)
2. Design and develop original 2D sketches and 3D models
3. Review and assess finished models for rendering and/or printing quality

Critical Thinking Expectations

- Research each assignment, inquire & question key criteria for necessary comprehension and a successful project.
- Apply their research to compare and contrast potential successful project outcomes for the assignment's objective(s).
- Analyze provided project examples to arrange and organize their 2D and/or 3D parts in preparation of the finished assignment or project.
- Refine their drawings and models to develop a finished, deliverable project—that is correct, accurate, and on time.
- Clearly describe in writing a presentation of each finished project's concept and the techniques used.
- Review/Critique their peers' work to evaluate in writing the success of each project's objectives, criteria and specifications.

MACH 105 CAD-CAM Production (2.0 units)

(No prerequisite. MACH104 advised.) An intermediate course that builds upon the knowledge of using CAD software to develop 3D models and drafting plans. This course will develop the understanding and skills to use CAD files to generate CAM for metal technology trades, engineering and industrial design projects. MACH 105 is a Hybrid Distance Education Course, with 1.0 lecture hrs/wk online and 3.0 lab hrs/wk in the Machine Shop at the College of Marin IVC campus.

Course Objectives

1. Develop a working understanding of a CAD-CAM machining
2. Develop production-level CAD-CAM programming skills
3. Review and assess finished CAD models and finished CAM parts for quality and accuracy

Critical Thinking Expectations

- Research each assignment, inquire & question key criteria for necessary comprehension and a successful project.
- Apply their research to compare and contrast potential successful project outcomes for the assignment's objective(s).
- Analyze provided project examples to arrange and organize their 2D and/or 3D parts in preparation of the finished assignment or project.
- Refine their drawings and models to develop a finished, deliverable project—that is correct, accurate, and on time.
- Clearly describe in writing a presentation of each finished project's concept and the techniques used.
- Review/Critique their peers' work to evaluate in writing the success of each project's objectives, criteria and specifications for quality assurance.

VI. Revised MACH Courses Summary

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MACH 106 Introduction to CNC Machining (2.0 units)

(No prerequisite. MACH101 advised.) A course in the principles and practical applications of computer numerical control (CNC) machining applications for milling machines and metal lathes. MACH 106 is a Hybrid Distance Education Course, with 1.0 lecture hrs/wk online and 3.0 lab hrs/wk in the Machine Shop at the College of Marin IVC campus.

Course Objectives

1. Develop a working understanding of a CAD-CAM machining
2. Develop production-level CAD-CAM programming skills
3. Review and assess finished CAD models and finished CAM parts for quality and accuracy

Critical Thinking Expectations

- Differentiate CNC mill and lathe machine tool processes
- Analyze cutting process axis for cutting technique & material removal
- Apply principles of CNC machining of different metals
- Anticipate problems and limitations of tools and different CNC machining techniques
- Solve problems using standard CNC processes and techniques

MACH 107 CNC Programming for Mills and Lathes (2.0 units)

(No prerequisite. MACH106 advised.) A course in the principles and applications of computer numerical control (CNC) programming for milling machines and metal lathes. MACH 107 is a Hybrid Distance Education Course, with 1.0 lecture hrs/wk online and 3.0 lab hrs/wk in the Machine Shop at the College of Marin IVC campus.

Course Objectives

1. Demonstrate and utilize the proper CNC programming terms and code.
2. Develop CNC programming for CNC machining on mills and lathes.
3. CNC machined projects that are programmed for accuracy and quality.

Critical Thinking Expectations

- Differentiate CNC mill and lathe machine programming
- Analyze cutting process and axis for different cycles
- Apply principles of CNC programming machining on mills and lathes
- Solve problems using CNC programming techniques

The Machine Metals Technology (MMT) Program at College of Marin has revised and updated all the MACH courses. The eight courses were entered into eLumen and submitted for approval to the Curriculum Committee, UDWC, and the College of Marin Board of Trustees by the fall 2020 deadline to ensure scheduling of MMT classes beginning in the Fall 2021 semester.

VII. Centers of Excellence

Occupational Title	Entry Level Education	Base Year Employment Estimate 2018	Projected Year Employment Estimate 2023	Numeric Change 2018-2023	Percentage Change 2018-2023	Average Annual Job Openings	2018 Q1 Median Hourly	2018 Q1 Median Annual
Computer-Controlled Machine Tool Operators, Metal and	High school diploma	1,638	1,708	70	4.1%	179	\$ 17.47	\$ 36,334
Computer Numerically Controlled Machine Tool Program	Postsecondary non-d	538	583	45	9.6%	65	\$ 36.69	\$ 76,306
Lathe and Turning Machine Tool Setters, Operators, and T	High school diploma	722	677	(45)	(6.8%)	60	\$ 17.24	\$ 35,855
Machinists	High school diploma	7,148	7,368	220	6.5%	768	\$ 26.37	\$ 54,851
Tool and Die Makers	Postsecondary non-d	294	304	10	0.6%	31	\$ 25.94	\$ 53,956
Machine Feeders and Offbearers	No formal education	592	547	(45)	(6.5%)	66	\$ 13.73	\$ 28,558
		10,932	11,187	255	2.7%	1,169	\$ 22.69	\$ 47,199

Region ☰ ✕

- Bay Area
- California
- Central
- Greater Sacramento
- Inland Empire
- LA/Orange County
- North Far North
- San Diego and Imperial
- South Central

SubRegion ☰ ✕

- East Bay
- Mid-Peninsula
- North Bay
- Santa Cruz-Monterey
- Silicon Valley
- All Regions
- Central
- Greater Sacramento
- Inland Empire

Occupation ☰ ✕

- Tellers
- Therapists, All Other
- Tile and Marble Setters
- Tire Repairers and Changers
- Title Examiners, Abstractors, and Searchers
- Tool and Die Makers
- Tour Guides and Escorts
- Training and Development Managers

Centers of Excellence projections show an increase in **High Wage Careers** and **High Volume Employment** opportunities for MMT occupations in the Bay Area Region:

	Increase	New Jobs	Total	Annual	Hourly	Annual
CNC Machine Operators	4.1%	+70	1,708	179	\$ 17.47	\$ 36,334
CNC Machine Programmers	9.6%	+45	583	65	\$ 36.69	\$ 76,306
Machinists	6.5%	+220	7,368	768	\$ 26.37	\$ 54,851
Tool & Die Makers	0.6%	10	304	31	\$ 25.94	\$ 53,956

VIII. California Wages

Computer Controlled Operators (51-4011.00)

O*NET OnLine

California Wages for:
51-4011.00 - Computer-Controlled Machine Tool Operators, Metal and Plastic ✔ Green

View wages for state: California

View wages near ZIP Code:

View wages:

In California:

Wage data for Computer Numerically Controlled Tool Operators.

- Workers on average earn **\$43,220**.
- 10% of workers earn **\$27,650 or less**.
- 10% of workers earn **\$66,600 or more**.

In the United States:

Wage data for Computer Numerically Controlled Tool Operators.

- Workers on average earn **\$41,200**.
- 10% of workers earn **\$27,730 or less**.
- 10% of workers earn **\$61,980 or more**.

Source: Bureau of Labor Statistics [2019 wage data](#)

Full Details [Save Table \(XLSX/CSV\)](#)

Location	Annual Low (10%)	Annual Q ₁ (25%)	Annual Median (50%)	Annual Q ₃ (75%)	Annual High (90%)
United States	\$27,730	\$33,540	\$41,200	\$50,940	\$61,980
California	\$27,650	\$33,970	\$43,220	\$55,310	\$66,600
Bakersfield, CA	\$26,310	\$28,480	\$35,570	\$50,560	\$60,940
Chico, CA	\$28,880	\$34,350	\$43,170	\$47,910	\$50,860
Fresno, CA	\$28,250	\$34,090	\$42,570	\$54,710	\$65,340

CNC Machine Tool Programmers (51-4012.00)

O*NET OnLine

California Wages for:
51-4012.00 - Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic ★ Bright Outlook

View wages for state: California

View wages near ZIP Code:

View wages:

In California:

Wage data for Computer Numerically Controlled Tool Programmers.

- Workers on average earn **\$71,090**.
- 10% of workers earn **\$42,730 or less**.
- 10% of workers earn **\$104,840 or more**.

In the United States:

Wage data for Computer Numerically Controlled Tool Programmers.

- Workers on average earn **\$56,450**.
- 10% of workers earn **\$36,280 or less**.
- 10% of workers earn **\$89,170 or more**.


Source: Bureau of Labor Statistics [2019 wage data](#)

Full Details [Save Table \(XLSX/CSV\)](#)

Location	Annual Low (10%)	Annual Q ₁ (25%)	Annual Median (50%)	Annual Q ₃ (75%)	Annual High (90%)
United States	\$36,280	\$44,680	\$56,450	\$70,750	\$89,170
California	\$42,730	\$55,940	\$71,090	\$86,370	\$104,840
Bakersfield, CA	\$40,400	\$42,660	\$46,420	\$50,190	\$80,430
Los Angeles-Long Beach-Anaheim,	\$40,940	\$54,620	\$70,210	\$83,580	\$104,270

VIII. California Wages

Lathe & Turning Machine Operators (51-4034.00)



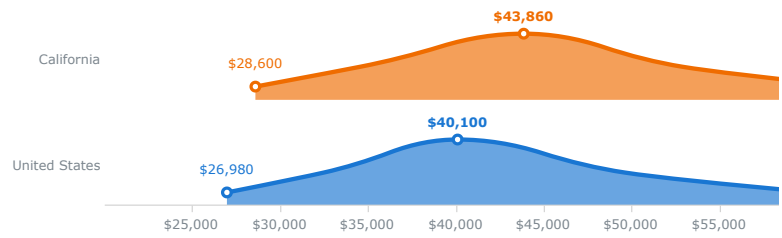
O*NET OnLine

California Wages for:
51-4034.00 - Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic

View wages for state:

View wages near ZIP Code:

View wages:



In California:

- Workers on average earn **\$43,860**.
- 10% of workers earn **\$28,600 or less**.
- 10% of workers earn **\$62,430 or more**.

In the United States:


- Workers on average earn **\$40,100**.
- 10% of workers earn **\$26,980 or less**.
- 10% of workers earn **\$60,420 or more**.

Source: Bureau of Labor Statistics [2019 wage data](#)

Full Details [Save Table \(XLSX/CSV\)](#)

Location	Annual Low (10%)	Annual Q _L (25%)	Annual Median (50%)	Annual Q _U (75%)	Annual High (90%)
United States	\$26,980	\$32,480	\$40,100	\$49,630	\$60,420
California	\$28,600	\$34,560	\$43,860	\$52,890	\$62,430
Los Angeles-Long Beach-Anaheim, CA	\$28,970	\$35,840	\$45,060	\$53,520	\$62,120
Oxnard-Thousand Oaks-Ventura, CA	\$26,480	\$31,610	\$37,650	\$46,300	\$58,640
Riverside-San Bernardino-Ontario, CA	\$26,180	\$30,360	\$38,830	\$50,490	\$64,810
Sacramento-Roseville-Arden-	\$32,670	\$36,290	\$42,940	\$49,010	\$55,260

Machinists (51-4041.00)



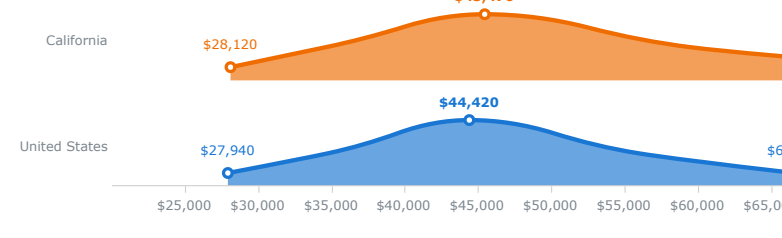
O*NET OnLine

California Wages for:
51-4041.00 - Machinists Green

View wages for state:

View wages near ZIP Code:

View wages:



In California:

- Workers on average earn **\$45,470**.
- 10% of workers earn **\$28,120 or less**.
- 10% of workers earn **\$74,990 or more**.

In the United States:

- Workers on average earn **\$44,420**.
- 10% of workers earn **\$27,940 or less**.
- 10% of workers earn **\$66,610 or more**.


Source: Bureau of Labor Statistics [2019 wage data](#)

Full Details [Save Table \(XLSX/CSV\)](#)

Location	Annual Low (10%)	Annual Q _L (25%)	Annual Median (50%)	Annual Q _U (75%)	Annual High (90%)
United States	\$27,940	\$34,820	\$44,420	\$55,910	\$66,610
California	\$28,120	\$34,580	\$45,470	\$59,580	\$74,990
Bakersfield, CA	\$25,170	\$34,510	\$43,410	\$55,080	\$63,880
Chico, CA	\$23,800	\$27,140	\$34,690	\$41,030	\$63,090
Eastern Sierra-Mother Lode Region of California nonmetropolitan area	\$31,990	\$34,890	\$39,880	\$53,000	\$60,530
Fresno, CA	\$26,440	\$28,720	\$33,380	\$43,270	\$55,760

VIII. California Wages

Multiple Machine Operators (51-4081.00)



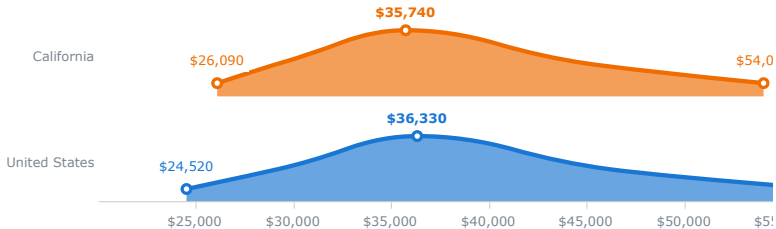
O*NET OnLine

California Wages for:
 51-4081.00 - [Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic](#)

View wages for state:

View wages near ZIP Code:

View wages:



In California:

- Workers on average earn **\$35,740**.
- 10% of workers earn **\$26,090 or less**.
- 10% of workers earn **\$54,060 or more**.

In the United States:


- Workers on average earn **\$36,330**.
- 10% of workers earn **\$24,520 or less**.
- 10% of workers earn **\$57,080 or more**.

Source: Bureau of Labor Statistics [2019 wage data](#)

Full Details [Save Table \(XLSX/CSV\)](#)

Location	Annual Low (10%)	Annual Q _L (25%)	Annual Median (50%)	Annual Q _U (75%)	Annual High (90%)
United States	\$24,520	\$29,200	\$36,330	\$46,150	\$57,080
California	\$26,090	\$29,280	\$35,740	\$44,960	\$54,060
Los Angeles-Long Beach-Anaheim, CA	\$25,940	\$29,190	\$35,870	\$46,110	\$56,560
Oxnard-Thousand Oaks-Ventura, CA	\$26,340	\$29,320	\$35,230	\$42,820	\$48,920
Riverside-San Bernardino-Ontario, CA	\$25,240	\$27,470	\$32,340	\$41,400	\$52,400
Sacramento-Roseville-Arden-Arcade, CA	\$23,760	\$32,140	\$44,220	\$50,920	\$60,740

Tool and Die Makers (51-4111.00)



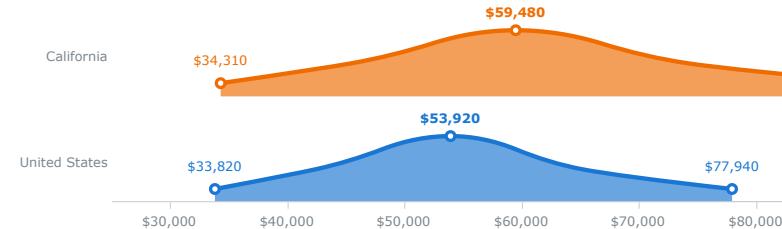
O*NET OnLine

California Wages for:
 51-4111.00 - [Tool and Die Makers](#)

View wages for state:

View wages near ZIP Code:

View wages:



In California:

- Workers on average earn **\$59,480**.
- 10% of workers earn **\$34,310 or less**.
- 10% of workers earn **\$90,730 or more**.

In the United States:

- Workers on average earn **\$53,920**.
- 10% of workers earn **\$33,820 or less**.
- 10% of workers earn **\$77,940 or more**.

Source: Bureau of Labor Statistics [2019 wage data](#)

Full Details [Save Table \(XLSX/CSV\)](#)

Location	Annual Low (10%)	Annual Q _L (25%)	Annual Median (50%)	Annual Q _U (75%)	Annual High (90%)
United States	\$33,820	\$42,460	\$53,920	\$65,110	\$77,940
California	\$34,310	\$45,450	\$59,480	\$74,190	\$90,730
Fresno, CA	\$29,510	\$39,820	\$53,210	\$61,710	\$71,740
Los Angeles-Long Beach-Anaheim, CA	\$34,380	\$47,790	\$60,560	\$74,550	\$90,530
Modesto, CA	\$32,180	\$35,790	\$42,960	\$51,140	\$59,930
Oxnard-Thousand Oaks-Ventura, CA	\$30,450	\$37,930	\$61,540	\$74,810	\$89,550

IX. BACCC Region 13

- College of Marin, Novato & Kentfield (Machine and Metals Technology)
- Chabot College, Hayward (Machine Tool Technology)
- De Anza Community College, Cupertino (CNC Machinist)
- Laney College, Oakland (Machine Technology)
- Napa Valley College (Machine Tool Technology)
- San Jose City College (Machine Technology)
- Santa Rosa Junior College, Santa Rosa (Machine Tool Technology)

Outside of BACCC

- College of the Redwoods (Manufacturing Technology)
- Modesto (Machine Tool Technology)
- San Joaquin Delta (Machining Technology)

