SACRAMENTO CITY UNIFIED SCHOOL DISTRICT
BOARD OF EDUCATION

Agenda Item 12.1g

Meeting Date: September 2, 2021

Subject: Approve request to add a new Council on Occupational Education program Manufacturing Technician to CTE Programs at Charles A. Jones Career and Education Center

- ☐ Information Item Only
- ☒ Approval on Consent Agenda
- ☐ Conference (for discussion only)
- ☐ Conference/First Reading (Action Anticipated: _____)
- ☐ Conference/Action
- ☐ Action
- ☐ Public Hearing

Division: Academic Office

Recommendation: Approve adding new program

Background/Rationale: CAJ has been successfully operating a Manufacturing Pre-Apprenticeship program launched in October 2020 in partnership with Sacramento Valley Manufacturing Alliance (SVMA), providing 90 hours of introductory training in manufacturing processes. After consulting with our SVMA industry advisory partners, CAJ has designed a new expanded Manufacturing Technician program that will allow students to take a deeper dive into manufacturing processes. The expanded program will include pre-apprenticeship training, plus an additional 990 hours of training in a variety of processes, leading to numerous industry certifications (for a total of 1080 hours of program training). Students completing the Manufacturing Technician program will enter the workforce as an entry-level manufacturing technician, earn industry-recognized certifications, and qualify to enter an employer-sponsored apprenticeship program. Successful students will earn a 10-hr Cal/OSHA General Industry training card, Certified Forklift Operator Card, and pass the SME Certified Manufacturing Associate (CMfgA) exam in the program's first units. Students will learn a wide breadth of skills that prepare them for certification through the National Institute of Metalworking Standards (NIMS) and the American Welding Society (AWS) for appropriate processes. The students will be able to interpret manufacturing documentation to set up, operate, and troubleshoot manufacturing equipment. The students who completes the program will have the foundational skills to prepare them for entry-level manufacturing technician roles in welding, assembly, machining, quality, and material handling. Once fully implemented, this program will qualify for federal financial aid. Students who successfully complete this program will receive apprenticeship credit for multiple levels in at least two career paths. Qualifying for higher levels in apprenticeship equals a higher starting wage.

Financial Considerations: None

LCAP Goal(s): College, Career and Life Ready Graduates, Operational Excellence

Documents Attached:
1. Adult Education Course Outline – Manufacturing Technician program
2. SVMA Letter of Support
3. Signature page for approvals to add new CAJ program
4. Manufacturing Occupational Outlook Employment Statistics
5. List of CDE Courses approved for SCUSD Adult Education programs

Estimated Time of Presentation: N/A
Submitted by: Christine Baeta, Chief Academic Officer
Approved by: Jorge A. Aguilar, Superintendent

Sacramento City Unified School District

ADULT EDUCATION COURSE OUTLINE

PROGRAM AREA: Career Technical Education **COURSE NUMBER**: _____

ADULT SCHOOL: Sacramento City Unified School District **UPDATED**: January 28, 2021

SCHOOL SITE: Charles A. Jones Career and Education Center **TOTAL HOURS**: 1080

COURSE TITLE: Manufacturing Technician

COURSE DESCRIPTION:

This program prepares the student with the principles and technical skills for the manufacture of products. The core competencies related to industrial processes covered in this program are rooted in Cal/OSHA, SME, NIMS, and AWS standards. The training contains fundamental manufacturing process knowledge and skills, including troubleshooting manufacturing problems through hands-on experiential learning. After completing the training, students will have the knowledge and technical competency for entry-level employment in the manufacturing industry, trade apprenticeships, and industry-standard certifications.

I. ADMISSION REQUIREMENTS

- High school diploma
- Right to Work documentation
- Assessment test with a passing score of 239 for reading and 236 for math
- Cal Jobs registration
- SETA Job Center intake and required workshops
- Attend the one-time Orientation Session on the Charles A. Jones Career and Education Center campus

II. PROGRAM CONTENT THAT IS CONSISTENT WITH DESIRED STUDENT LEARNING OUTCOMES:

To provide students with the basic manufacturing skill and knowledge to enter the workforce as an entry-level manufacturing technician, enter an employer-sponsored apprenticeship program, and earning industry-recognized certifications. Successful students will earn a 10-hr Cal/OSHA General Industry training card, Certified Forklift Operator Card, and pass the SME Certified Manufacturing Associate (CMfgA) exam in the program's first units. Students will learn a wide breadth of skills that prepare them for certification through the National Institute of Metalworking Standards (NIMS) and the American Welding Society (AWS) for appropriate processes. The students will be able to interpret manufacturing documentation to set up, operate, and troubleshoot manufacturing equipment. The students who complete the program will have the foundational skills to prepare them for entry-level manufacturing technician roles in welding, assembly, machining, quality, and material handling.

III. PROGRAM LENGTH:

Manufacturing Technician course is 1080 hours in length, approximately 9 months, 36 instructional weeks.

PROGRAM OBJECTIVES:

Upon successful completion of this course, the student will gain the skills and knowledge necessary to perform the following manufacturing tasks:

A. Acquire and accurately use manufacturing sector terminology and protocols at the career readiness level for communicating effectively in verbal and written formats.
B. Use existing and emerging technology to produce products and services required in the manufacturing workplace environment.
C. Create alternative solutions to solve a problem unique to the manufacturing sector using critical and creative thinking, logical reasoning, and problem-solving techniques.
D. Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the manufacturing workplace environment.
E. Apply essential technical knowledge and skills common in the manufacturing sector, following procedures when performing technical tasks.

F. Demonstrate and apply the knowledge and skills contained in industry standards in the classroom, laboratory, and workplace settings.
G. Validate that a provided part meets specifications from its engineering drawing by comparing specifications by demonstrating proper technique using appropriate precision measuring tools.
H. Describe and layout a project according to specifications or engineering drawings.
I. Demonstrate proper technique with layout tools and work-holding devices such as three- and four-jaw chucks, collet chucks, angle plates, sine bars, parallels, and v-blocks to machine a real part.
J. Research and compare the properties of two metals using two different material specifications and a process specification.
K. Demonstrate a saw operation(s) to produce a length of bar stock to specification.
L. Demonstrate bending, shaping, other metal forming, and fabrication techniques, including processes such as basic hand filing, knurling on a lathe, forging metal shapes or objects, green sand casting, sheet metal machines, spot welding equipment or rivets, cold form bending with cold forming machinery or homemade devices, and shapes to achieve a specific design specification.
M. Identify and select the right grinding wheel, perform wheel dressing, and grind the provided part/material to the size and surface finish specifications provided.
N. Perform a series of routine boring operations from a set of specifications or a drawing and explain the selection of proper tools for each step of the process.
O. Describe and demonstrate the machining of an external and internal taper, knurled part, and threaded and bored part on an engine lathe to plan specification or drawing to produce a part and measure each end diameter within tolerance.
P. Produce parts to specification using a boring head or angular cutting with a sine bar, a keyway, and pockets with a typical vertical mill.
Q. Produce parts to specifications or drawings provided on computer numerical controlled (CNC) machines.
R. Demonstrate common functions or controls through manual input and through programmed input.
S. Demonstrate an understanding of basic G and M Code Programming and the use of the Cartesian coordinate system and machine axis.
T. Demonstrate how materials can be processed through the use of welding tools and equipment.
U. Differentiate and apply various types of welding assembly processes.
V. Understand finishing processes and the differences between various types of finishing materials used in the manufacture of products.
W. Understand and defend the purposes and processes of inspection and quality control in manufacturing processes.
X. Explore and understand various welding systems that require standard hand and machine tools.

Y. Understand various automated welding systems, welding design for manufacturing, flexible manufacturing systems, and materials resource planning.
Z. Understand various joining or combining processes, including welding processes used in manufacturing, maintenance, and repair.

IV. COMPETENCY TESTS:

Students will complete online unit module exams for online lessons in SME ToolingU. Students also complete separate written exams and hands-on competency evaluations for certifications to OSHA, SME, and NIMS standards for related topics. Final exams are conducted at the end of each program block. The instructor also observes student performance and learning through informal formative assessment.

LEARNING ACTIVITIES:

(NOTE: These are ESTIMATED times and can fluctuate based on student performance and industry (advisory committee) input)

Units of Instruction and total hours of instruction

1. Introduction To Manufacturing Processes and Safety (90 hrs.)

1.1. Introduction to the five major types of manufacturing processes
  1.1.1. Additive
  1.1.2. Subtractive
  1.1.3. Forming
  1.1.4. Joining
  1.1.5. Surface finishing
1.2. Demonstrate safe operation and use of general hand and power tools
1.3. Terminology & common components
1.4. Overview of quality
1.5. Overview of manufacturing operations
1.6. General Industry Safety & Health (10-hr Cal/OSHA card)
1.7. Industrial Lift Truck (Forklift) operation & safety (Certified operator card)
1.8. Prepare for the SME Certified Manufacturing Associate (CMfgA) exam

2. Manufacturing Operations, Planning and Logistics (90 hrs.)

2.1. Overview of manufacturing operations flow
  2.1.1. Estimating and Quoting

2.1.2. Order entry
2.1.3. Purchasing, Purchase orders (PO)
2.1.4. Project planning, Work orders (WO) & traveler packages
2.1.5. Packing Slips (PS)
2.1.6. Bills of Lading (BL)
2.1.7. Basic functions of Material/Enterprise Resouce Planning (MRP/ERP) systems

2.2. Logistics

2.2.1. MRP/ERP system transactions

2.2.1.1. Receiving
2.2.1.2. Work In Progress (WIP) transactions
2.2.1.3. Finished goods inventory
2.2.1.4. Shipping

2.2.2. Material handling

2.2.2.1. Forklift activities
2.2.2.2. Packaging
2.2.2.3. Lifting (hoists, cranes, and slings)
2.2.2.4. Physical inventory
2.2.2.5. Tool crib (room) management

3. Quality Control and Metrology (90 hrs.)

3.1. Overview of Quality Systems

3.1.1. AS9100
3.1.2. ISO900x
3.1.3. 5S
3.1.4. Six Sigma

3.2. Manufacturing Documentation

3.2.1. Blueprint reading
3.2.2. Basics of tolerance
3.2.3. Quality Inspection Reports (QIR)
3.2.4. Discrepancy tags and Discrepancy Material Reports (DMR)
3.2.5. Material Review Board (MRB)

3.3. Metrology

3.3.1. Basics of measurement
3.3.2. Reading dials and vernier scales
3.3.3. Layout dye and scribing
3.3.4. Use of calipers
3.3.5. Use of micrometers
3.3.6. Use of height gages
3.3.7. Use of gage blocks
3.3.8. Use of gage pins
3.3.9. Use of Go-Nogo gages, including thread gages
3.3.10. Inspection of threads

3.3.11. Inspection of surface roughness
3.3.12. Inspection of material hardness
3.3.13. Surface plate set-up and care including:
3.3.13.1. Sine bar and gage block stack calculation
3.3.13.2. Angle plates
3.3.13.3. Vee-blocks
3.4. Coordinate Measurement Machine (CMM)
3.4.1. Cartesian coordinate system and six degrees of freedom
3.4.2. Importation of Computer-Aided Design solid model data
3.4.3. Conceptual programming flow
3.4.4. Machine set-up
3.4.5. Operating CMM and output of QIR data
3.5. Inspection of projects by interpreting drawings and manufacturing specifications
3.6. Prepare for applicable NIMS certification exam(s)

4. Manual/CNC Cutting & Separation (90 hrs.)

4.1. Overview of cutting and separation processes
4.2. Identify and apply basic hand tools and deburring techniques associated with cutting and separation processes
4.3. Demonstrate safe operation of basic pneumatic and power tools
4.3.1. Pedestal grinders, including wheel selection
4.4. Demonstrate safe operation manual machines:
4.4.1. Bandsaws (horizontal and vertical configurations)
4.4.2. Sheers (mechanical, hydraulic, and power)
4.4.3. Abrasive wheel saws
4.4.4. Ironworker cutting operations
4.5. Overview of XY table CNC cutting machine types and configurations
4.6. Review of cartesian coordinate systems as related to XY table CNC cutting machines
4.7. Demonstrate safe operation XY table CNC cutting machines
4.7.1. CNC plasma jet cutter
4.7.2. CNC water jet cutter
4.7.3. CNC laser engraving/cutter
4.8. Perform in-process and final inspection techniques for cutting and separation processes
4.9. Construct projects by interpreting drawings and manufacturing specifications
4.10. Prepare for applicable NIMS certification exam(s)

5. Sheet Metal Fabrication (90 hrs.)

5.1. Overview of sheet metal processes
5.2. Identify and apply hand tools and deburring techniques associated with sheet metal fabrication processes
5.3. Demonstrate safe operation manual machines:

5.3.1. Brakes (pan & press)
5.3.2. Sheers (mechanical, hydraulic, and power)
5.3.3. Notchers
5.3.4. Rolls
5.3.5. Tube Benders
5.3.6. Flanging machines
5.3.7. Punches

5.4. Demonstrate safe operation of CNC cutting machines
5.4.1. CNC punch

5.5. Sheet metal hardware and safe fabrication techniques
5.5.1. Basics of threaded and non-threaded sheet metal fasteners
5.5.2. Riveting
5.5.3. Swaging

5.6. Perform in-process and final inspection techniques for sheet metal fabrication processes
5.7. Construction of projects by interpreting drawings and manufacturing specifications
5.8. Prepare for applicable NIMS certification exam(s)

6. Finishing Processes (40 hrs.)

6.1. Overview of the part finishing processes
6.1.1. Mechanical
6.1.2. Chemical
6.1.2.1. Plating
6.1.2.2. Anodizing
6.1.2.3. Passivation
6.1.2.4. Alodine
6.1.2.5. Heat treatment
6.1.3. Coatings
6.1.3.1. Spray painting (liquid, dry powder)
6.1.3.2. Dip coatings
6.1.3.3. Disposition coatings

6.2. Identify and apply basic hand tools and deburring techniques associated with finishing processes
6.3. Identify and apply the basics of hand finishing and handling of manufactured parts
6.4. Demonstrate safe operation manual machines:
6.4.1. Media blasters (sand, bead, etc.)
6.4.2. Grinders
6.4.3. Buffers
6.4.4. Tumblers
6.4.5. Spray coating equipment

6.5. Perform in-process and final inspection techniques for finishing processes
6.6. Construct projects by interpreting drawings and manufacturing specifications
6.7. Prepare for applicable NIMS certification exam(s)

7. Electromechanical Assembly (40 hrs.)

7.1. Overview of electromechanical processes
7.2. Identify and apply basic hand tools associated with mechanical assembly
7.3. Demonstrate safe operation manual machines:
    7.3.1. Presses (arbor, hydraulic)
    7.3.2. PEM inserting machine
    7.3.3. Ultrasonic inserting, welding, staking machines
7.4. Demonstrate safe operation of CNC cutting machines
    7.4.1. CNC dot peening
    7.4.2. CNC laser engraving
7.5. Perform in-process and final inspection techniques for mechanical assembly processes
7.6. Identify and apply mechanical assembly hardware and fabrication techniques
    7.6.1. Advanced threaded and non-threaded fasteners
    7.6.2. Mechanical components
    7.6.3. Pressing interference fit hardware
    7.6.4. Solvent welding
    7.6.5. Ultrasonic welding
    7.6.6. Basic thread taps and dies
    7.6.7. Basics of lubricants, adhesives, sealants, and thread locking compounds
7.7. Identify and apply basic hand tools associated with electromechanical assembly
7.8. Demonstrate safe operation manual machines:
    7.8.1. Soldering irons & soldering guns
    7.8.2. Digital Multi-Meters (DMMs)
    7.8.3. Heat shrink and crimping equipment
7.9. Perform in-process and final inspection techniques for electromechanical assembly processes
7.10. Identify and apply electromechanical assembly hardware and processes
    7.10.1. Circuit boards and solid-state hardware
    7.10.2. Wiring harness connectors
    7.10.3. Heat shrinking
    7.10.4. Wire labeling
    7.10.5. Crimping hardware
    7.10.6. Basics of soldering, de-soldering, fluxes, and insulating compounds
7.11. Troubleshoot electrical connections through continuity testing
7.12. Construct projects by interpreting drawings and manufacturing specifications

8. Welding Fabrication (105 hrs.)

8.1. Overview of welding processes
8.2. Identify and apply basic hand tools and deburring techniques associated with welding processes
8.3. Demonstrate the use of welding safety procedures and Personal Protective Equipment (PPE)

8.4. Apply welding set-up and layout techniques
8.5. Apply welding fixture techniques
8.6. Demonstrate safe operation of basic pneumatic and power tools associated with welding fabrication
    8.6.1. Handheld grinders
    8.6.2. Abrasive saws
8.7. Demonstrate safe operation manual machines:
    8.7.1. Oxy/Fuel welding, cutting, and brazing
    8.7.2. Arc welders, MIG, TIG & Stick Rod
    8.7.3. Plasma cutter
    8.7.4. Resistance welders (spot welding)
    8.7.5. Ironworker
8.8. Demonstrate Safe operation of CNC machines:
    8.8.1. CNC Plasma cutter
8.9. Perform in-process and final inspection techniques for welding processes
8.10. Construct projects by interpreting drawings and manufacturing specifications
8.11. Prepare for applicable NIMS and/or AWS certification exam(s)

9. Manual/CNC Turning (105 hrs.)

9.1. Overview of lathe types and configurations
9.2. Basic hand tools and deburring techniques associated with lathe machining
9.3. Review of cartesian coordinate systems as related to the axis of motion of lathes
9.4. Basics of lathe cutting tools, tool holding, and work holding systems
9.5. Calculate speed and feed parameters for lathe operations
9.6. Demonstrate safe set-up and operation manual lathes:
9.7. Demonstrate safe set-up and operation of CNC lathes, including basic G & M codes
9.8. Perform in-process and final inspection techniques for lathe machining processes
9.9. Construct projects by interpreting drawings and manufacturing specifications
9.10. Prepare for applicable NIMS certification exam(s)

10. Manual/CNC Milling (105 hrs.)

10.1. Overview of milling machine types and configurations
10.2. Basic hand tools and deburring techniques associated with milling machining
10.3. Review of cartesian coordinate systems as related to the axis of motion of milling machines
10.4. Basics of milling cutting tools, tool holding, and work holding systems
10.5. Calculate speed and feed calculations for lathe operations
10.6. Demonstrate safe set-up and operation of manual vertical mills:
10.7. Demonstrate safe set-up and operation of CNC mills, including basic G & M codes
10.8. Perform in-process and final inspection techniques for milling machining processes
10.9. Construct projects by interpreting drawings and manufacturing specifications
10.10. Prepare for applicable NIMS certification exam(s)

11. Automation and Additive Manufacturing (40 hrs.)

11.1. Overview of automation processes
- 11.1.1. Demonstrate the safe operation of pick and place robotics

11.2. Overview of additive manufacturing processes and technology
- 11.2.1. Casting
- 11.2.2. Molding
- 11.2.3. SLS
- 11.2.4. SLA
- 11.2.5. FDM
- 11.2.6. LOM

11.3. Demonstrate safe operation of Additive Manufacturing FDM equipment (3D Printing)

11.4. Prepare for the SME Additive Manufacturing certification (AM) exam

12. Capstone Project (105 Hrs.)

12.1. Culminating project demonstrating skills learned in the program

12.2. Select from several pre-determined project options

12.3. Construct project by interpreting drawings and manufacturing specifications

12.4. Students may propose a concept for approval for the capstone project provided:
- 12.4.1. The project reflects elements from each unit in the program
- 12.4.2. Obtain senior faculty approval for the project

Total program hours 1,080

V. INSTRUCTIONAL MATERIALS:

Various instructional techniques are used, including instructor demonstrations, computer-based tutorials, multimedia presentations, and individual and group projects. Software resources for CAD/CAM programming, CNC code editing, shop floor, and material resource management will also be used to provide an authentic real-life experiential learning environment in the lab. Raw materials and components to support lab actives and manipulatives for demonstration.

VI. EQUIPMENT:

The following types of equipment are used throughout the course:

Horizontal and Vertical Bandsaws
Drill Presses
Sheers
Pan Break

Hydraulic press
Sheet metal roll
Ironworker
Notchers
Manual Lathes
Manual Mills
CNC Lathes
CNC Mills
CNC plasma cutters
CNC waterjet
OXY/Fuel Torch
Arc welders
Soldering Irons
3D printers
Laser engravers
Coordinate Measurement Machines
Metrology bench tools
Hand tools for machine shop, assembly, and welding shops
Blasting and finishing equipment
Painting and paint prep. equipment
Home/Industrial/serger sewing machines
Industrial Robotics & automation equipment

VII. METHOD OF PROGRAM EVALUATION:

Students complete online module exams for each online module in the SME ToolingU and have both periodic mid-unit formative assessment and end of unit assessments based on specific unit topics covered by lecture topics. Industry certification exams based on SME, NIMS, AWS, Cal/OSHA, and other industry groups will be offered at appropriate program milestones. Assessments may be in the form of paper or online tests, hands-on skills demonstration activities, and unit signature projects. The last unit in the program is a culminating capstone project that tests the program's skills that simulate an authentic, real-world manufacturing project. Grading is to be 50% based on exams and quizzes and 50% on lab-based activities.

VIII. LEVEL OF SKILLS AND/OR PROFICIENCY REQUIRED FOR COMPLETION:

Each student is required to achieve a score of 75% overall mastery to complete the program successfully. The mastery of individual industry certification exams is governed

by the accrediting organization and may vary by organization, but typically range from 70%-80%. Students are not required to complete the course to be able to sign up for industry certification examinations. However, it is highly recommended that students finish the program designed to prepare them to perform well on the exams.

IX. APPROPRIATE DELIVERY FORMATS FOR THE SUBJECT MATTER BEING TAUGHT:

The delivery formats of content delivered to students is through a hybrid of classroom, laboratory, and computer-based instruction, which students will complete according to a defined schedule. Copies of instructional materials will be made available as requested by each student. Students will also have instructional time applied to hands-on applications in the manufacturing lab environment simulating, including documentation and software typical in a modern manufacturing environment.

To Whom It May Concern:

As representatives of the Sacramento Valley Manufacturing Alliance (SVMA), we hereby express our enthusiastic support for the CAJ Manufacturing Technician program. The mission of SVMA is to enhance and grow the manufacturing workforce through our collaboration with education and workforce development partners in the Sacramento Region.

CAJ has been successfully operating a Manufacturing Pre-Apprenticeship program launched in October 2020 in partnership with SVMA, providing 90 hours of introductory training in manufacturing processes. After consulting with SVMA industry advisory partners, CAJ has designed a new expanded Manufacturing Technician program that will allow students to take a deeper dive into manufacturing processes. The expanded program will include pre-apprenticeship training, plus an additional 990 hours of training in a variety of processes, leading to numerous industry certifications (for a total of 1080 hours of program training). Students completing the Manufacturing Training program will enter the workforce as an entry-level manufacturing technician, earn industry-recognized certifications, and qualify to enter an employer-sponsored apprenticeship program. Successful students will earn a 10-hr Cal/OSHA General Industry training card, Certified Forklift Operator Card, and pass the SME Certified Manufacturing Associate (CMfgA) exam in the program's first units. Students will learn a wide breadth of skills that prepare them for certification through the National Institute of Metalworking Standards (NIMS) and the American Welding Society (AWS) for appropriate processes.

Based on the success and quality of the CAJ Introduction to Manufacturing course, employers throughout the Sacramento region are very excited about the extended Manufacturing Technician program. The SVMA Apprenticeship program is designed to be competency based and modular enough to accommodate multiple career pathways. Each career path has distinct levels that reflect specific skill gains. Students that complete the extended Manufacturing Technician program will receive credit for multiple levels in at least two career paths. Qualification for higher levels equals a higher starting wage.

We are committed to collaborating with CAJ and are in strong support of the proposal to expand the training program.

Sincerely,

Michael M. Bell
Chair, SVMA Workforce Development Committee
CEO, Synbyo

Dean Peckham
Executive Director, SVMA

Charles A. Jones Career and Education Center – 323100
Request for Program Changes Under 25%

New Program Name to Add	Program Hours	NCES Classification of Instructional Programs (CIP) Code
Manufacturing Technician	**1080**	**15.0613**

The changes herein are approved as noted:

Christina Pritchett, Board President (Trustee Area 3) **Sacramento City Unified School District**	**Date**	**Jorge A. Aguilar, Superintendent**	**Date**

Occupational Outlook - 51-4041 Machinists

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. Machinists who primarily program or operate computer numerically controlled (CNC) equipment are classified in "Computer Numerically Controlled Tool Operators and Programmers" (51-9160).

Industry profile for Machinists: Industries with the highest levels of employment in Machinists:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	92,070	26.84	$ 21.97	$ 45,690
Machinery Manufacturing (3331, 3332, 3334, and 3339 only)	35,200	4.89	$ 22.66	$ 47,140
Metalworking Machinery Manufacturing	24,190	14.49	$ 22.32	$ 46,420
Fabricated Metal Product Manufacturing (3321, 3322, 3325, 3326, and 3329 only)	22,820	5.05	$ 22.06	$ 45,880
Employment Services	21,350	0.67	$ 19.56	$ 40,680

Industries with the highest concentration of employment in Machinists:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	92,070	26.84	$ 21.97	$ 45,690
Metalworking Machinery Manufacturing	24,190	14.49	$ 22.32	$ 46,420
Engine, Turbine, and Power Transmission Equipment Manufacturing	8,590	9.34	$ 22.63	$ 47,070
Other Transportation Equipment Manufacturing	1,990	6.18	$ 24.75	$ 51,480
Fabricated Metal Product Manufacturing (3321, 3322, 3325, 3326, and 3329 only)	22,820	5.05	$ 22.06	$ 45,880

Top paying industries for Machinists:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Natural Gas Distribution	40	0.04	$ 46.38	$ 96,470
Scheduled Air Transportation	380	0.09	$ 42.94	$ 89,320
Local Government, excluding schools and hospitals (OEWS Designation)	1,030	0.02	$ 40.76	$ 84,780
Electric Power Generation, Transmission and Distribution	440	0.11	$ 38.03	$ 79,100
Petroleum and Coal Products Manufacturing	1,230	1.13	$ 33.74	$ 70,180

Metropolitan areas with the highest employment level in Machinists:

Metropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Chicago-Naperville-Elgin, IL-IN-WI	19,650	4.50	1.74	$ 21.90	$ 45,550
Los Angeles-Long Beach-Anaheim, CA	15,220	2.61	1.01	$ 22.95	$ 47,740
Houston-The Woodlands-Sugar Land, TX	9,670	3.26	1.26	$ 24.78	$ 51,530
Detroit-Warren-Dearborn, MI	9,390	5.28	2.04	$ 23.12	$ 48,090
Minneapolis-St. Paul-Bloomington, MN-WI	7,660	4.14	1.60	$ 25.94	$ 53,950
New York-Newark-Jersey City, NY-NJ-PA	6,620	0.75	0.29	$ 25.38	$ 52,800
Dallas-Fort Worth-Arlington, TX	6,150	1.72	0.66	$ 22.17	$ 46,110
Seattle-Tacoma-Bellevue, WA	5,580	2.85	1.10	$ 28.36	$ 58,990
Cleveland-Elyria, OH	5,550	5.65	2.18	$ 20.93	$ 43,530
Cincinnati, OH-KY-IN	5,230	5.09	1.96	$ 24.57	$ 51,110

Data Source: U.S. Bureau of Labor Statistics & EDD/LMID

2021 California Wage by County: Machinists

Geography	Median Hourly	Median Annually
California	$23.01	$47,845
$22		
$45,421		
Anaheim-Santa Ana-Irvine Area	$21.76	$45,258
Butte County	$18.31	$38,087
East Bay Area	$27.28	$56,743
Eastern Sierra Region	$21.69	$45,113
Fresno County	$18.64	$38,786
Imperial County	$23.53	$48,944
Inland Empire Area	$20.69	$43,038
Kern County	$23.75	$49,407
Kings County	$22.93	$47,691
Los Angeles County	$21.91	$45,567
Madera County	$28.65	$59,596
Merced County	$22.75	$47,311
Monterey County	$24.74	$51,471
Mother Lode Region	$22.84	$47,506
Napa County	$24.09	$50,105
North Coast Region	$24.32	$50,598
Sacramento Metro Area	$21.63	$44,990
San Benito and Santa Clara Counties	$26.55	$55,231
San Diego County	$22.64	$47,095
San Francisco Bay Area	$30.85	$64,148
San Joaquin County	$23.78	$49,458
San Luis Obispo County	$23.67	$49,232
Santa Cruz County	$28.33	$58,928
Santa Maria-Santa Barbara Area	$23.60	$49,088
Shasta County	$28.30	$58,846
Solano County	$20.22	$42,073
Sonoma County	$25.72	$53,495
Stanislaus County	$25.76	$53,577
Sutter and Yuba Counties	$21.39	$44,486
Tulare County	$18.63	$38,745
Ventura County	$23.07	$47,979

Data Source: U.S. Bureau of Labor Statistics & EDD/LMID

Occupational Outlook

51-4121 Welders, Cutters, Solderers, and Brazers

Industry profile for Welders, Cutters, Solderers, and Brazers:

Industries with the highest levels of employment in Welders, Cutters, Solderers, and Brazers:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Fabricated Metal Product Manufacturing (3323 and 3324 only)	68,560	14.48	$ 21.05	$ 43,780
Machinery Manufacturing (3331, 3332, 3334, and 3339 only)	58,760	8.17	$ 21.45	$ 44,610
Fabricated Metal Product Manufacturing (3321, 3322, 3325, 3326, and 3329 only)	22,610	5.00	$ 20.85	$ 43,370
Motor Vehicle Body and Trailer Manufacturing	21,420	14.57	$ 19.80	$ 41,180
Foundation, Structure, and Building Exterior Contractors	14,910	1.61	$ 23.81	$ 49,520

Industries with the highest concentration of employment in Welders, Cutters, Solderers, and Brazers:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Railroad Rolling Stock Manufacturing	3,450	15.99	$ 22.68	$ 47,170
Motor Vehicle Body and Trailer Manufacturing	21,420	14.57	$ 19.80	$ 41,180
Fabricated Metal Product Manufacturing (3323 and 3324 only)	68,560	14.48	$ 21.05	$ 43,780
Other Transportation Equipment Manufacturing	3,040	9.43	$ 23.50	$ 48,880
Ship and Boat Building	12,550	9.15	$ 25.35	$ 52,720

National estimates for Welders, Cutters, Solderers, and Brazers:

Employment estimate and mean wage estimates for Welders, Cutters, Solderers, and Brazers:

Employment (1)	Employment RSE (3)	Mean hourly wage	Mean annual wage (2)	Wage RSE (3)
397,550	0.9 %	$ 22.45	$ 46,690	0.3 %

Percentile wage estimates for Welders, Cutters, Solderers, and Brazers:

Percentile	10%	25%	50% (Median)	75%	90%
Hourly Wage	$ 14.73	$ 17.37	$ 21.25	$ 25.88	$ 31.85
Annual Wage (2)	$ 30,640	$ 36,140	$ 44,190	$ 53,820	$ 66,250

California 2021 Wages by County: Welders, Cutters, Solderers, and Brazers

Geography	Median Hourly	Median Annually
California	$22.68	$47,178
$21		
$42,771		
Anaheim-Santa Ana-Irvine Area	$20.20	$42,017
Butte County	$19.83	$41,251
East Bay Area	$27.46	$57,113
Eastern Sierra Region	$24.03	$49,982
Fresno County	$19.78	$41,148
Imperial County	$25.47	$52,991
Inland Empire Area	$20.08	$41,764
Kern County	$20.62	$42,884
Kings County	$17.79	$37,009
Los Angeles County	$20.75	$43,152
Madera County	$21.54	$44,795
Merced County	$18.50	$38,478
Monterey County	$25.85	$53,782
Mother Lode Region	$21.48	$44,671
Napa County	$22.97	$47,763
North Coast Region	$23.10	$48,040
Sacramento Metro Area	$23.73	$49,345
San Benito and Santa Clara Counties	$27.53	$57,254
San Diego County	$26.14	$54,368
San Francisco Bay Area	$27.69	$57,596
San Joaquin County	$22.96	$47,753
San Luis Obispo County	$20.77	$43,192
Santa Cruz County	$25.47	$52,991
Santa Maria-Santa Barbara Area	$25.16	$52,334
Shasta County	$25.58	$53,186
Solano County	$26.32	$54,737
Sonoma County	$23.79	$49,468
Stanislaus County	$23.93	$49,776
Sutter and Yuba Counties	$20.92	$43,521
Tulare County	$19.36	$40,265
Ventura County	$23.28	$48,420

Data Source: U.S. Bureau of Labor Statistics & Career One Local Data

Occupational Outlook- Electro-mechanical Technicians

Summary

Quick Facts: Electro-mechanical Technicians	
2020 Median Pay	$59,800 per year $28.75 per hour
Typical Entry-Level Education	Associate's degree
Work Experience in a Related Occupation	None
On-the-job Training	None
Number of Jobs, 2019	14,600
Job Outlook, 2019-29	3% (As fast as average)
Employment Change, 2019-29	400

What Electro-mechanical Technicians Do

Electro-mechanical technicians operate, test, and maintain unmanned, automated, robotic, or electromechanical equipment.

Work Environment

Electro-mechanical technicians work closely with electrical and mechanical engineers. They work in many industrial environments, including energy, plastics, computer and communications equipment manufacturing, and aerospace.

How to Become an Electro-mechanical Technician

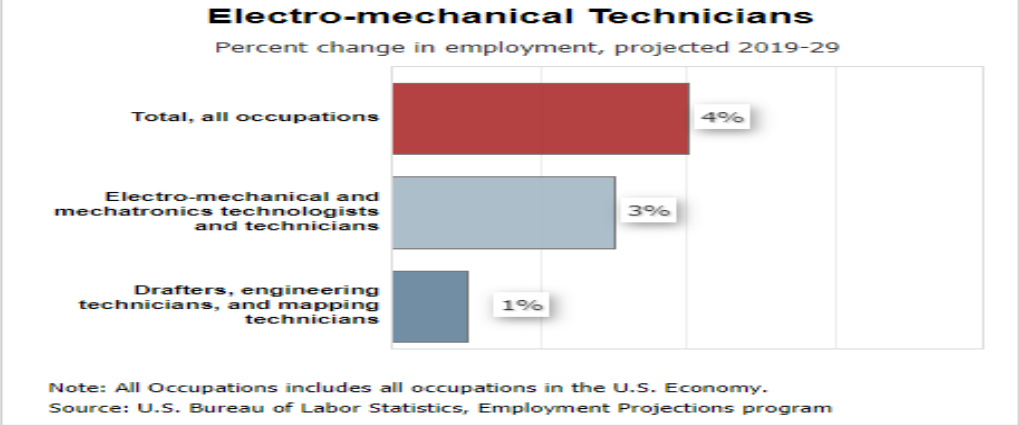
Electro-mechanical technicians typically need either an associate's degree or a postsecondary certificate.

Job Outlook

Employment of electro-mechanical technicians is projected to grow 3 percent from 2019 to 2029, about as fast as the average for all occupations. Many of these technicians are employed in manufacturing industries, for which employment projections vary. Industries in which new jobs are expected for these workers include machinery manufacturing; motor vehicle parts manufacturing; and navigational, measuring, electro-medical, and control instruments manufacturing.

Employment Projections data for Electro-mechanical technicians, 2019 to 2029

Occupational Title	SOC Code	Employment, 2019	Projected Employment, 2029	Change, 2019-29	
				Percent	Numeric
SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program					
Electro-mechanical and mechatronics technologists and technicians	17-3024	14,600	15,100	3	400



California employment level in Electro-Mechanical and Mechatronics Technologists and Technicians Data:

State	Employment	Employment per thousand jobs	Hourly mean wage	Annual mean wage
California	1,970	0.12	$ 32.13	$ 66,820

Projected employment

California	United States
2,500 2018 Employment	14,600 2019 Employment
2,700 2028 Employment	15,100 2029 Employment
8% Percent change	3% Percent change
270 Annual projected job openings	1,300 Annual projected job openings

Data Source: U.S. Bureau of Labor Statistics & Career One Local Data

California Department of Education

Date: June 4, 2021

To: Susan Lytle Gilmore
A. Warren McClaskey Adult Center
and Charles A. Jones Career and
Education Center

CDS:34 - 67439

From: Cliff Moss
Education Programs Consultant
Adult Education Office
916–327–6378

Subject: Course Approval for 2021-22

Your request for approval of the following 37 courses have been received, recorded, and approved for the 2021 - 2022 school year.

Number	Name	Course Outline Year	Study Date
9980	Advanced ESL	2021	
4412	Apparel Manufacturing, Production, and Maintenance	2021	
2102	Basic English	2021	
2402	Basic Mathematics	2021	
9982	Beginning ESL	2021	
4245	Biotechnology I	2021	
4622	Business Support and Services	2021	
5532	Cabinetmaking	2021	
9997	Community Access Skills and Functional Academics	2021	
5860	Court Reporting I-A	2021	
5862	Court Reporting I-B	2021	
5861	Court Reporting Lab I-A	2021	
5863	Court Reporting Lab I-B	2021	
4250	Diagnostic Services	2021	
5632	Emerging Technologies in Manufacturing and Product Development	2021	
9986	ESL MultiLevel	2021	
5633	Exploration of Manufacturing Occupations	2021	
5940	Exploring Technology (General Industrial Arts)	2021	
9983	General ESL	2021	
5634	Graphic Production Technologies	2021	
5516	Heating, Ventilation, and Air Conditioning (HVAC) Systems	2021	
9981	Intermediate ESL	2021	
5501	Introduction to Building and Construction Trades	2021	
4260	Introduction to Pharmacy	2021	
9998	Life Skills and functional Academics	2021	

5635	Machining and Forming Technologies	2021	
5955	Manufacturing Technology (Metal Shop)	2021	
5636	Manufacturing/Materials/Processing/Production	2021	
5637	Manufacturing—Comprehensive	2021	
4275	Medical Office	2021	
4604	Network Engineering	2021	
4279	Nursing Service	2021	
9969	Test Preparation	2021	
4024	Veterinary Science	2021	
5639	Welding Technologies and Fabrication	2021	
5619	Welding Technology	2021	
9996	Workplace Skills and Functional Academics	2021	

You are authorized to expend California Adult Education Program funds for the above courses. It is recommended that you use these Course Titles with additional supporting classes listed when communicating program offerings to the public.

Course Outlines for all apportionment classes shall be on file and available for review at the adult school or the district office (5 CCR 10508).
To meet optimum educational standards, these course outlines should contain:

- Goals and purposes
- Performance objectives or competencies
- Instructional strategies
- Units of study, with approximate hours allotted for each unit
- Evaluation procedures
- Clear course completion requirements of established goals and objectives

Career Technical Education: Before establishing a Career Technical Education or Occupational Education Program, a job market study of your region must be conducted and reviewed every two years to justify the need for the program being offered. Refer to the Job Market Study in EC 52519; 52520 for more information.

Education Codes: 1900; 41976; 52506; 52515; 52518; 52570.

For Vocational Education courses:
Before establishing a Vocational or Occupational Education Program, you must conduct a job market study in your market area and have it reviewed every two years to justify the vocational program. Refer to the Job Market Study in EC 52519; 52520 for more information.