

April 2023

Labor Market Analysis

Electrical Engineering/Robotics



Prepared by Central Valley/Mother Lode Center of Excellence



POWERED BY



Table of Contents

Summary	2
Key Findings	2
Recommendation	3
Introduction	3
Occupational Demand	5
Wages	6
Job Postings.....	7
Top Employers.....	7
Top Occupational Titles	8
Baseline, Specialized, and Software Skills	8
Education, Work Experience, & Training.....	9
Supply	10
Recommendation.....	11
Appendix: Methodology & Data Sources	12

COVID-19 Statement: This report includes employment projection data by Lightcast. Lightcast's projections are modeled on recorded (historical) employment figures and incorporate several underlying assumptions, including the assumption that the economy during the projection period will be at approximately full employment or potential output. To the extent that a recession or labor shock, such as the economic effects of COVID-19, can cause long-term structural change, they may impact the projections. At this time, it is not possible to quantify the impact of COVID-19 on projections of industry and occupational employment. Other measures such as unemployment rates and monthly industry employment estimates will reflect the most recent information on employment and jobs in the state and, in combination with input from local employers, may help validate current and future employment needs as depicted here.

If for any reason this document is not accessible or if you have specific needs for readability, please contact us and we will do our utmost to accommodate you with a modified version. To make a request, contact Nora Seronello by phone at (209) 575-6894 or by email seronellon@mjc.edu.

Summary

The Central Valley/Mother Lode Center of Excellence developed this report for Clovis Community College to determine whether there is demand in the local labor market that is not being met by the supply from community college programs. This report summarizes labor market demand, wages, skills, and postsecondary supply for *Electrical Engineering/Robotics-Related Occupations*, which include:

- Electrical and Electronic Engineering Technologists and Technicians (17-3023)
- Electrical and Electronics Repairers, Commercial and Industrial Equipment (49-2094)
- Electro-Mechanical and Mechatronics Technologists and Technicians (17-3024)
- Engineers, All Other (17-2199)
- Industrial Engineering Technologists and Technicians (17-3026)
- Mechanical Engineering Technologists and Technicians (17-3027)

NOTE: *Electrical Engineering/Robotics-Related Occupations* will hereafter be referred to as *Robotics Occupations*.

Key Findings

- **Occupational Demand** — *Robotics Occupations* have a labor market demand of 245 annual job openings in the South Central Valley/Southern Mother Lode (SCV/SML) subregion; and 337 annual job openings in the Central Valley/Mother Lode region.
 - Within the SCV/SML subregion, between 2021 and 2026, *Electrical and Electronic Engineering Technologists and Technicians* are projected to have the most demand with 92 annual job openings and a projected growth rate of two percent.
- **Wages** — Average entry-level earnings of \$20.77/hour for *Robotics Occupations* are higher than the living wage in the SCV/SML subregion, which is \$11.91/hour for a single adult.¹ *Engineers, All Other* earn the highest entry-level wage, \$36.73/hour.
- **Employers and Job Titles** — Employers in the SCV/SML subregion include Virgin Galactic, Lockheed Martin, and Power Electronics USA. The most common job titles in the subregion are maintenance technicians and electronics technicians.
- **Skills** — The top baseline skill is troubleshooting, the top specialized skill is machinery, and the top software skill is AutoCAD.
- **Education** — An associate degree is typically required for four out of the six occupations of interest.
- **Supply and Demand Analysis** — Based on 337 annual openings (i.e., demand) in the CVML region and 306 postsecondary degrees awarded (i.e., supply), an analysis of supply and demand suggests there is an undersupply of 31 workers in the region.

¹ The term "living wage" in Center of Excellence reports is calculated by averaging the self-sufficiency wages from the Insight Center's California Family Needs Calculator for each county in the subregion: <https://insightccd.org/tools-metrics/self-sufficiency-standard-tool-for-california/>.

Recommendation

Based on a comparison of demand and supply, there is an undersupply of trained workers in the CVML region. The Center of Excellence recommends that Clovis Community College work with the regional directors, the college's advisory board, and local industry in the expansion of programs to address the shortage of Robotics workers.

Introduction

The Central Valley/Mother Lode Center of Excellence developed this report to provide Clovis Community College with labor market information for Electrical Engineering/Robotics. The geographical focus for this report is the South Central Valley/Southern Mother Lode (SCV/SML) subregion, but regional demand and supply data has been included for broader applicability and use. Analysis of the program and occupational data related to Robotics resulted in the identification of applicable occupations, known as *Robotics Occupations*. The Standard Occupational Classification (SOC) System code and occupational titles used in this report from the Bureau of Labor Statistics and O*NET OnLine are shown below. Please note that there is no data available for Engineers, All Other (SOC 17-2199).

Electrical and Electronic Engineering Technologists and Technicians (17-3023)

- **Job Description:** Apply electrical and electronic theory and related knowledge, usually under the direction of engineering staff, to design, build, repair, adjust, and modify electrical components, circuitry, controls, and machinery for subsequent evaluation and use by engineering staff in making engineering design decisions.
- **Knowledge:** Computer and Electronics, Engineering and Technology, English Language, Design, Mathematics
- **Skills:** Critical Thinking, Reading Comprehension, Complex Problem Solving, Active Listening, Troubleshooting

Electrical and Electronics Repairers, Commercial and Industrial Equipment (49-2094)

- **Job Description:** Repair, test, adjust, or install electronic equipment, such as industrial controls, transmitters, and antennas.
- **Knowledge:** Computers and Electronics, Mechanical, Production and Processing, Customer and Personal Service, Mathematics
- **Skills:** Operations Monitoring, Repairing, Critical Thinking, Equipment Maintenance, Quality Control Analysis

Electro-Mechanical and Mechatronics Technologists and Technicians (17-3024)

- **Job Description:** Operate, test, maintain, or adjust unmanned, automated, servomechanical, or electromechanical equipment. May operate unmanned submarines, aircraft, or other equipment to observe or record visual information at sites such as oil rigs, crop fields, buildings, or for similar infrastructure, deep ocean exploration, or hazardous waste removal. May assist engineers in testing and designing robotics equipment.
- **Knowledge:** Computers and Electronics, Mechanical, Engineering and Technology, English Language, Mathematics
- **Skills:** Operations Monitoring, Troubleshooting, Monitoring, Repairing, Critical Thinking

Industrial Engineering Technologists and Technicians (17-3026)

- **Job Description:** Apply engineering theory and principles to problems of industrial layout or manufacturing production, usually under the direction of engineering staff. May perform time and motion studies on worker operations in a variety of industries for purposes such as establishing standard production rates or improving efficiency.
- **Knowledge:** Design, Engineering and Technology, Mechanical, Mathematics, Production and Processing
- **Skills:** Active Listening, Critical Thinking, Monitoring, Reading Comprehension, Complex Problem Solving,

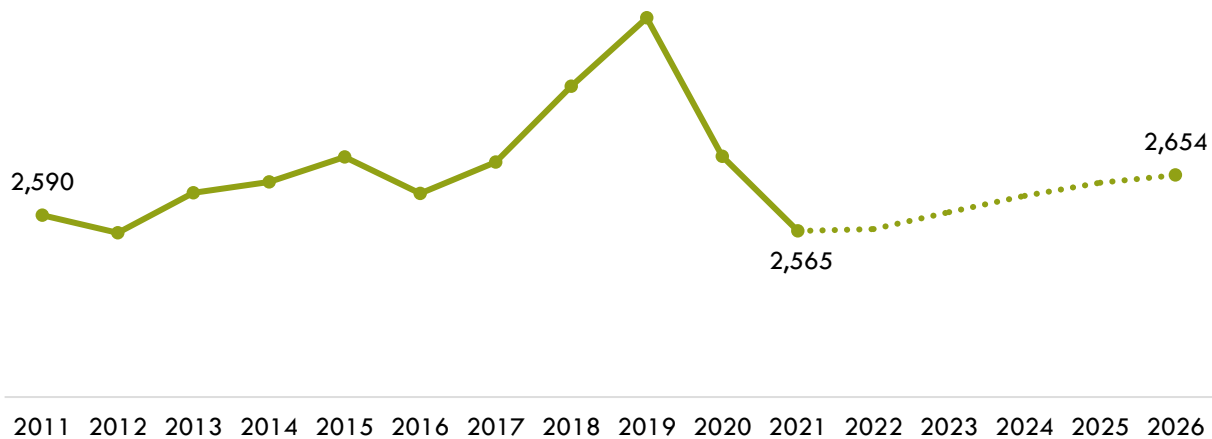
Mechanical Engineering Technologists and Technicians (17-3027)

- **Job Description:** Apply theory and principles of mechanical engineering to modify, develop, test, or adjust machinery and equipment under direction of engineering staff or physical scientists.
- **Knowledge:** Engineering and Technology, Mechanical, Design, Mathematics, English Language
- **Skills:** Active Listening, Critical Thinking, Complex Problem Solving, Reading Comprehension

Occupational Demand

Exhibit 1a shows trends for *Robotics Occupations* in the SCV/SML subregion. Between 2021 to 2026, the number of jobs for *Robotics Occupations* is projected to increase by 89 jobs, or three percent.

Exhibit 1a. Occupational projections for *Robotics Occupations* in the SCV/SML subregion



Between 2021 to 2026, demand for *Robotics Occupations* in the SCV/SML subregion is 245 annual openings (Exhibit 1b). *Electrical and Electronic Engineering Technologists and Technicians* are projected to have the most demand with 92 annual job openings and a projected growth rate of two percent.

Exhibit 1b. Occupational projections for *Robotics Occupations* in the SCV/SML subregion

Occupation	2021 Jobs	2026 Jobs	5-Year Change	5-Year % Change	Annual Openings
Electrical and Electronic Engineering Technologists and Technicians	808	822	14	2%	92
Engineers, All Other	1,114	1,142	28	3%	80
Electrical and Electronics Repairers, Commercial and Industrial Equipment	404	431	27	7%	44
Industrial Engineering Technologists and Technicians	107	126	19	17%	15
Mechanical Engineering Technologists and Technicians	107	109	2	2%	12
Electro-Mechanical and Mechatronics Technologists and Technicians	24	24	(1)	(2%)	3
TOTAL	2,565	2,654	89	3%	245

Wages

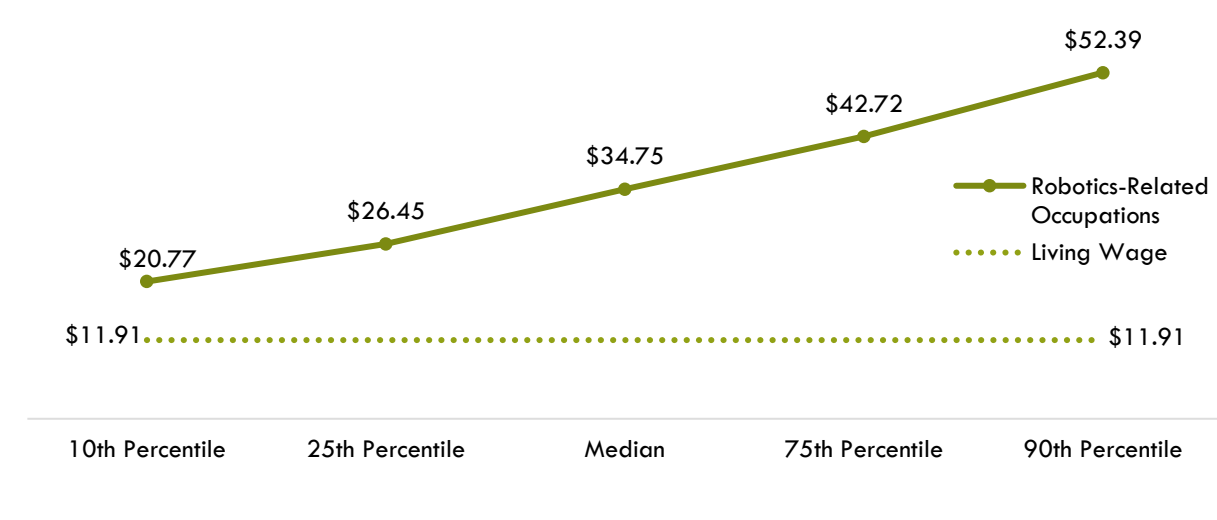
The average living wage for a single adult in the SCV/SML subregion is \$11.91/hour.² Exhibit 2a shows the hourly wages of *Robotics Occupations. Engineers, All Other* earn the highest entry-level wage, \$36.73/hour in the subregion.³ Please note 10th and 25th percentiles are considered entry-level wages while 75th and 90th are considered experienced wages, either by gained by long-term employment, extra training, etc.

Exhibit 2a. Robotics Occupations hourly wages in the SCV/SML subregion

Occupation	Pct. 25 Hourly Earnings	Median Hourly Earnings	Pct. 75 Hourly Earnings
Electrical and Electronic Engineering Technologists and Technicians	\$30.12	\$40.21	\$49.11
Engineers, All Other	\$36.73	\$52.48	\$66.71
Electrical and Electronics Repairers, Commercial and Industrial Equipment	\$29.24	\$34.89	\$42.52
Industrial Engineering Technologists and Technicians	\$22.25	\$27.57	\$31.89
Mechanical Engineering Technologists and Technicians	\$21.23	\$27.52	\$33.63
Electro-Mechanical and Mechatronics Technologists and Technicians	\$19.14	\$25.80	\$32.45

Exhibit 2b shows the average hourly wages for *Robotics Occupations*; the 10th percentile wage is nearly 10 dollars higher than the living wage for the SCV/SML subregion.

Exhibit 2b. Robotics Occupations average hourly wages in the SCV/SML subregion



² The term "living wage" in Center of Excellence reports is calculated by averaging the self-sufficiency wages from the Insight Center's California Family Needs Calculator for each county in the subregion: <https://insightccd.org/tools-metrics/self-sufficiency-standard-tool-for-california/>.

³ Entry-level wages are derived from the 25th percentile.

Job Postings

There were 1,881 job postings for *Robotics Occupations* in the SCV/SML subregion from April 2022 to March 2023.⁴ Of these, 239 postings included “Robot*” in the job title.

NOTE: The tables below refer to the original 1,881 job postings.

Top Employers

The top employers with the most job postings are listed in Exhibit 3. The top employers in online job postings were Virgin Galactic, Lockheed Martin, and Power Electronics USA.

Exhibit 3. Top employers of *Robotics Occupations*

Employer
Virgin Galactic
Lockheed Martin
Power Electronics USA
Amentum
State of California
Arctic Slope Regional Corporation
Northrop Grumman
Boeing
JTI Electrical & Instrumentation
California Resources

⁴ Other than occupation titles and job titles, the categories below can be counted one or multiple times per job posting, and across several areas in a single posting. For example, a skill can be counted in two different skill types.

Top Occupational Titles

Exhibit 4 shows the O*NET OnLine occupational titles for *Robotics Occupations* in the SCV/SML subregion. Common job titles in postings include Maintenance Technicians, Electronics Technicians, and Maintenance Workers.

Exhibit 4. Top occupational titles in job postings for *Robotics Occupations*

Occupational Title
Maintenance Technicians
Electronics Technicians
Maintenance Workers
Instrumentation Technicians
Electrical Technicians
Flight Test Engineers
Production Technicians
Automation Technicians
Manufacturing Technicians
Low Voltage Technicians

Baseline, Specialized, and Software Skills

Exhibit 5 depicts the top baseline, specialized, and software skills in job postings. The three most important baseline skills are troubleshooting, communication, and operations. The top three specialized skills are machinery, preventative maintenance, and hand tools. The top software is AutoCAD.

Exhibit 5. In-demand *Robotics Occupations* baseline and specialized skills

Baseline Skills	Specialized Skills	Software Skills
Troubleshooting (Problem Solving)	Machinery	AutoCAD
Communications	Preventive Maintenance	Microsoft Office
Operations	Hand Tools	Inventory Control Systems
Management	Electronics	SAP Applications
Lifting Ability	Electrical Wiring	Python (Programming Language)

Education, Work Experience, & Training

An associate degree is typically required for four out of the six occupations of interest (Exhibit 6).

Exhibit 6. Education, work experience, training, and Current Population Survey results *Robotics Occupations*⁵

Occupation	Typical Entry-level Education	Work Experience Required	Typical On-The-Job Training	CPS
Electrical and Electronic Engineering Technologists and Technicians	Associate degree	None	None	63%
Engineers, All Other	Bachelor's degree	None	None	14%
Electrical and Electronics Repairers, Commercial and Industrial Equipment	Postsecondary nondegree award	None	Long-term on-the-job training	48%
Industrial Engineering Technologists and Technicians	Associate degree	None	None	51%
Mechanical Engineering Technologists and Technicians	Associate degree	None	None	51%
Electro-Mechanical and Mechatronics Technologists and Technicians	Associate degree	None	None	51%

⁵ "Labor Force Statistics from the Current Population Survey," Bureau of Labor Statistics, <https://www.bls.gov/cps/>.

Supply

An analysis of program data from the Integrated Postsecondary Education Data System (IPEDS) for the last three program years shows that, on average, 306 awards were conferred in the CVML region (Exhibit 7 and 8).

Exhibit 7. TOP and CIP codes for *Robotics Occupations*

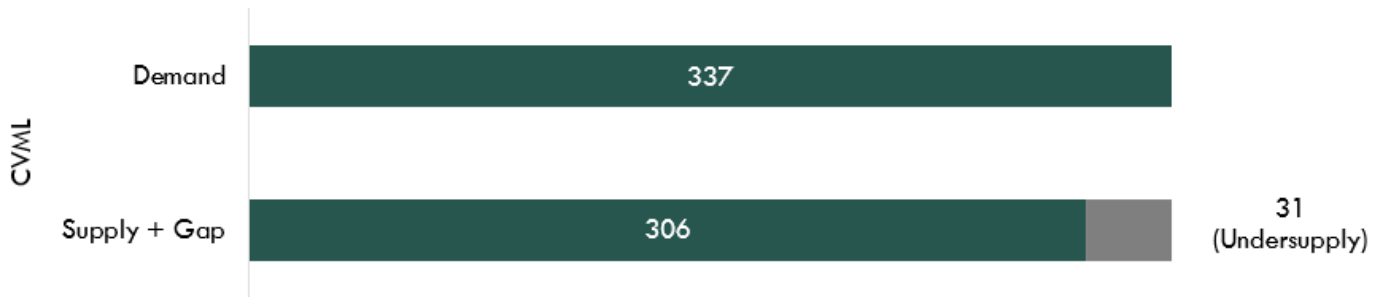
Community College Programs
093500 – Electro-Mechanical Technology
094500 - Industrial Systems Technology and Maintenance
095600 – Manufacturing and Industrial Technology

Exhibit 8. Postsecondary supply for *Robotics Occupations*

TOP/CIP Code	College	Associate Degree	Bachelor's Degree	Certificate 16 < 30 semester units	Certificate 18 < 30 semester units	Certificate 30 < 60 semester units	Certificate 6 < 18 semester units	Credit Award, < 6 semester units	Noncredit	Total
093500 - Electro-Mechanical Technology	Bakersfield	18	13	6	2					38
	Fresno City			1						1
	San Joaquin Delta	1		1						2
094500 - Industrial Systems Technology and Maintenance	Bakersfield	1				0				2
	Clovis	1		1	0					3
	Fresno City			9					22	31
	Merced	1				1				1
	San Joaquin Delta	0		1	0	1				2
	Sequoias	9		6		52		16		84
	West Hills Lemoore			2						2
095600 - Manufacturing and Industrial Technology	Bakersfield	6				1				6
	Fresno City	1				5			21	28
	Modesto			3	1					4
	Porterville			4	5		12			22
	Reedley College	1		54	25	0				81
	San Joaquin Valley College-Madera			1						1
Total CVML		40	13	88	33	61	12	16	43	306

There is an undersupply of 31 *Robotics* workers in the CVML region (Exhibit 9).

Exhibit 9. *Robotics Occupations* workforce demand (annual job openings), postsecondary awards (supply), and additional students needed to fill gap in the CVML region



Recommendation

Based on a comparison of demand and supply, there is an undersupply of trained workers in the CVML region. The Center of Excellence recommends that Clovis Community College work with the regional directors, the college's advisory board, and local industry in the expansion of programs to address the shortage of Robotics workers.

Appendix: Methodology & Data Sources

Data Sources

Labor market and educational supply data compiled in this report derive from a variety of sources. Data were drawn from external sources, including the Economic Modeling Specialists, Inc., the California Community Colleges Chancellor's Office Management Information Systems Data Mart and the National Center for Educational Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS). Below is the summary of the data sources found in this study.

Data Type	Source
Labor Market Information/Population Estimates and Projections/Educational Attainment	Economic Modeling Specialists, Intl. (LIGHTCAST). LIGHTCAST occupational employment data are based on final LIGHTCAST industry data and final LIGHTCAST staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates also affected by county-level LIGHTCAST earnings by industry: economicmodeling.com .
Typical Education Level and On-the-job Training	Bureau of Labor Statistics (BLS) uses a system to assign categories for entry-level education and typical on-the-job training to each occupation for which BLS publishes projections data: https://www.bls.gov/emp/tables/educational-attainment.htm .
LaunchBoard	Chancellor's Cal-PASS Plus LaunchBoard. https://www.calpassplus.org/LaunchBoard/SWP.aspx
Labor Force, Employment and Unemployment Estimates	California Employment Development Department, Labor Market Information Division: labormarketinfo.edd.ca.gov .
Job Posting and Skills Data	Lightcast.
Additional Education Requirements/Employer Preferences	The O*NET Job Zone database includes over 900 occupations as well as information on skills, abilities, knowledge, work activities and interests associated with specific occupations: onetonline.org .

Key Terms and Concepts

Annual Job Openings: Annual openings are calculated by dividing the number of years in the projection period by total job openings.

Education Attainment Level: The highest education attainment level of workers age 25 years or older.

Employment Estimate: The total number of workers currently employed.

Employment Projections: Projections of employment are calculated by a proprietary Economic Modeling Specialists, Intl. (LIGHTCAST) formula that includes historical employment and economic indicators along with national, state and local trends.

LaunchBoard (Attained the Living Wage): Among SWP students who exited college and did not transfer to any postsecondary institution, the proportion who attained the district county living wage for a single adult measured immediately following academic year of exit

LaunchBoard (Median Annual Earnings): Among SWP students who exited the community college system and who did not transfer to any postsecondary institution, median earnings following the academic year of exit.

LaunchBoard (Median Change in Earnings): Among SWP students who exited and who did not transfer to any postsecondary institution, median change in earnings between the second quarter prior to the beginning of the academic year of entry and the second quarter after the end of the academic year of exit from the last college attended.

LaunchBoard (Job Closely Related to Field of Study): Among SWP students who responded to the CTE Outcomes Survey and did not transfer to any postsecondary institution, the proportion who reported that they are working in a job very closely or closely related to their field of study.

Living Wage: The cost of living in a specific community or region for one adult and no children. The cost increases with the addition of children.

Occupation: An occupation is a grouping of job titles that have a similar set of activities or tasks that employees perform.

Percent Change: Rate of growth or decline in the occupation for the projected period; this does not factor in replacement openings.

Replacements: Estimate of job openings resulting from workers retiring or otherwise permanently leaving an occupation. Workers entering an occupation often need training. These replacement needs, added to job openings due to growth, may be used to assess the minimum number of workers who will need to be trained for an occupation.

Total Job Openings (New + Replacements): Sum of projected growth (new jobs) and replacement needs. When an occupation is expected to lose jobs, or retain the current employment level, number of openings will equal replacements.

Typical Education Requirement: represents the typical education level most workers need to enter an occupation.

Typical On-The-Job Training: indicates the typical on-the-job training needed to attain competency in the skills needed in the occupation.