



Education Report

Computer Engineering, General

California



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Definition of Computer Engineering, General, CIP 14.0901

A program that generally prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of computer hardware and software systems and related equipment and facilities; and the analysis of specific problems of computer applications to various tasks.

Awards

The table below is a list of postsecondary awards in CIP 14.0901 that were granted by institutions located in California in the 2021 academic year.

Schools	Certs & 2yr Awards ¹	4yr Awards ²	Post-Grad Awards ³	Avg Net Price ⁴
San Jose State University		199	152	\$14,603
Santa Clara University		72	156	\$48,469
University of California-Irvine		176	45	\$11,633
University of California-San Diego		139	66	\$15,632
University of California-Merced		198		\$11,586
University of Southern California		55	52	\$26,021
University of California-Riverside		61	41	\$13,502
University of California-Davis		100		\$16,640
California State Polytechnic University-Pomona		99		\$12,942
California Polytechnic State University-San Luis Obispo		97		\$20,708
University of California-Los Angeles		92		\$13,393
San Diego State University		86	1	\$6,867
University of California-Santa Cruz		63	21	\$19,615
California State University-Fullerton		49	30	\$4,939
California State University-Sacramento		64	10	\$7,778
California State University-Long Beach		66		\$9,171
University of California-Santa Barbara		62		\$17,333
California State University-Northridge		44	9	\$8,708
San Francisco State University		41		\$13,641
California State University-San Bernardino		37		\$3,254
California State University-Fresno		17		\$6,336
California State University-East Bay		13		\$12,631
California State University-Bakersfield		11		\$7,368
California State University-Chico		9		\$13,749
University of the Pacific		9		\$21,311
International Technological University			8	
Chapman University				\$40,451
Vista Adult School				
Total	0	1,859	591	

1. Undergraduate certificates and associate's degrees
 2. Bachelor's degrees and post-baccalaureates
 3. Master's, post-master's, and doctorates
 4. Average net price represents full-time beginning undergraduate students who paid the in-state or in-district tuition rate and were awarded grant or scholarship aid from federal, state or local governments, or the institution. Data as of the 2020-2021 academic year.
- Awards data are per the National Center for Education Statistics (NCES) and JobsEQ for the 2021 academic year. Any programs shown here reflect only data reported to the NCES; reporting is required of all schools participating in any federal finance assistance program authorized by Title IV of the Higher Education Act of 1965, as amended—other training providers in the region that do not report data to the NCES are not reflected in the above.

Occupation Crosswalk

The below table lists all occupations linked with the program, Computer Engineering, General, CIP 14.0901.

		Education and Training Requirements			Educational Attainment				
		Typical Education Needed for Entry	Work Experience in a Related Occupation	Typical On-the-Job Training Needed to Attain Competency in the Occupation	No College	Some College, No Degree	Associate's Degree	Bachelor's Degree	Postgraduate Degree
11-9041	Architectural and Engineering Managers	Bachelor's degree	5 years or more	None	2%	3%	3%	48%	43%
15-1241	Computer Network Architects	Bachelor's degree	5 years or more	None	4%	12%	12%	49%	23%
15-1243	Database Architects	Bachelor's degree	Less than 5 years	None	3%	6%	5%	49%	37%
15-1252	Software Developers	Bachelor's degree	None	None	1%	3%	2%	50%	43%
15-1253	Software Quality Assurance Analysts and Testers	Bachelor's degree	None	None	2%	6%	5%	57%	30%
17-2061	Computer Hardware Engineers	Bachelor's degree	None	None	2%	3%	5%	46%	43%
25-1032	Engineering Teachers, Postsecondary	Doctoral or professional degree	None	None	1%	1%	1%	14%	83%

Education and training requirements are from the Bureau of Labor Statistics (BLS); educational attainment mix are regional data modeled by Chmura using Census educational attainment data projected to 2022Q4 along with source data from the BLS

Definition of Architectural and Engineering Managers (11-9041)

Plan, direct, or coordinate activities in such fields as architecture and engineering or research and development in these fields.

Definition of Computer Network Architects (15-1241)

Design and implement computer and information networks, such as local area networks (LAN), wide area networks (WAN), intranets, extranets, and other data communications networks. Perform network modeling, analysis, and planning, including analysis of capacity needs for network infrastructures. May also design network and computer security measures. May research and recommend network and data communications hardware and software.

Definition of Database Architects (15-1243)

Design strategies for enterprise databases, data warehouse systems, and multidimensional networks. Set standards for database operations, programming, query processes, and security. Model, design, and construct large relational databases or data warehouses. Create and optimize data models for warehouse infrastructure and workflow. Integrate new systems with existing warehouse structure and refine system performance and functionality.

Definition of Software Developers (15-1252)

Research, design, and develop computer and network software or specialized utility programs. Analyze user needs and develop software solutions, applying principles and techniques of computer science, engineering, and mathematical analysis. Update software or enhance existing software capabilities. May work with computer hardware engineers to integrate hardware and software systems, and develop specifications and performance requirements. May maintain databases within an application area, working individually or coordinating database development as part of a team.

Definition of Software Quality Assurance Analysts and Testers (15-1253)

Develop and execute software tests to identify software problems and their causes. Test system modifications to prepare for implementation. Document software and application defects using a bug tracking system and report defects to software or web developers. Create and maintain databases of known defects. May participate in software design reviews to provide input on functional requirements, operational characteristics, product designs, and schedules.

Definition of Computer Hardware Engineers (17-2061)

Research, design, develop, or test computer or computer-related equipment for commercial, industrial, military, or scientific use. May supervise the manufacturing and installation of computer or computer-related equipment and components.

Definition of Engineering Teachers, Postsecondary (25-1032)

Teach courses pertaining to the application of physical laws and principles of engineering for the development of machines, materials, instruments, processes, and services. Includes teachers of subjects such as chemical, civil, electrical, industrial, mechanical, mineral, and petroleum engineering. Includes both teachers primarily engaged in teaching and those who do a combination of teaching and research.

Occupation Details

As of 2022Q4, total employment for occupations linked to Computer Engineering, General in California was 416,166. Over the past three years, linked occupations added 116,228 jobs in the region and are expected to need in aggregate approximately 260,702 newly trained workers over the next seven years.

Snapshot of Occupations Linked to Computer Engineering, General in California¹

SOC	Occupation	Current						3-Year History	7-Year Forecast				
		Empl	Mean Ann Wages ²	LQ	Unempl	Unempl Rate	Online Job Ads ³	Ann %	Total Demand	Exits	Transfers	Empl Growth	Avg Ann Growth %
15- 1252	Software Developers	286,186	\$151,400	1.32	3,757	1.4%	10,495	14.8%	187,016	39,382	105,020	42,614	2.0%
15- 1253	Software Quality Assurance Analysts and Testers	40,400	\$121,200	1.35	1,003	2.6%	2,163	14.8%	28,160	7,130	14,880	6,150	2.0%
11- 9041	Architectural and Engineering Managers	34,713	\$195,500	1.47	348	1.0%	6,681	0.6%	17,919	4,921	12,304	694	0.3%
15- 1241	Computer Network Architects	23,792	\$143,900	1.08	363	1.6%	116	1.6%	11,576	2,906	7,692	979	0.6%
17- 2061	Computer Hardware Engineers	19,468	\$179,300	2.00	510	2.7%	784	1.0%	9,181	2,904	5,808	470	0.3%
15- 1243	Database Architects	9,451	\$142,100	1.19	271	3.0%	341	14.0%	5,364	1,658	3,040	666	1.0%
25- 1032	Engineering Teachers, Postsecondary	2,156	\$156,000	0.50	41	1.9%	173	-0.9%	1,485	713	602	171	1.1%
Total - Linked Occupations		416,166	\$152,800	1.32	6,292	1.6%	20,753	11.5%	260,702	59,614	149,344	51,744	1.7%
Total - All Occupations		19,219,968	\$71,900	1.00	797,161	4.1%	549,411	0.6%	17,029,863	6,722,656	9,379,252	927,955	0.7%

Source: [JobsEQ®](#)

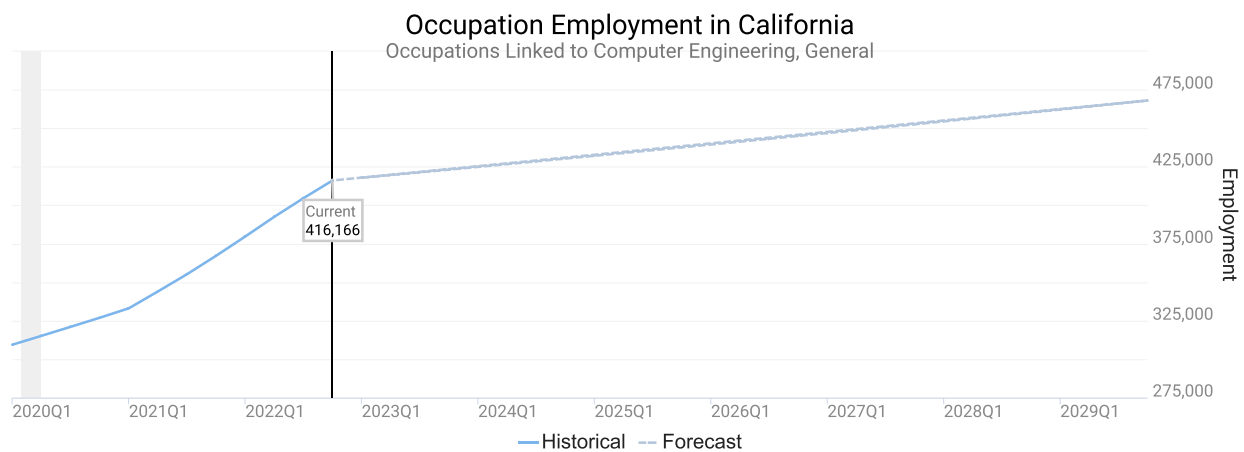
Data as of 2022Q4 unless noted otherwise

Note: Figures may not sum due to rounding.

1. Data based on a four-quarter moving average unless noted otherwise.

2. Wage data represent the average for all Covered Employment

3. Data represent found online ads active within the last thirty days in the selected region. Due to alternative county-assignment algorithms, ad counts in this analytic may not match that shown in RTI (nor in the popup window ad list). Ad counts for ZCTA-based regions are estimates.



Occupation employment data are estimated via industry employment data and the industry/occupation mix. Industry employment data are derived from the Quarterly Census of Employment and Wages, provided by the Bureau of Labor Statistics and currently updated through 2022Q3, imputed where necessary with preliminary estimates updated to 2022Q4. Forecast employment growth uses national projections from the Bureau of Labor Statistics adapted for regional growth patterns. Occupation unemployment figures are imputed by Chmura.

Employment by Industry

The table illustrates the industries in California which most employ occupations linked to Computer Engineering, General. The single industry most employing these occupations in the region is Computer Systems Design and Related Services, NAICS 5415. This industry employs 110,853 workers in the linked occupations—employment which is expected to increase by 29,891 jobs over the next ten years; furthermore, 82,144 additional new workers in these linked occupations will be needed for this industry due to separation demand, that is, to replace workers in this occupation and industry that retire or move into a different occupation.

Industry Distribution for Occupations Linked to Computer Engineering, General in California

NAICS Code	Industry Title	Current			10-Year Demand		
		% of Occ Empl	Empl	Exits	Transfers	Empl Growth	Total Demand
5415	Computer Systems Design and Related Services	26.6%	110,853	23,179	58,964	29,891	112,034
5132	Software Publishers	8.8%	36,762	7,375	18,940	6,690	33,005
3341	Computer and Peripheral Equipment Manufacturing	5.1%	21,202	4,296	10,542	2,929	17,768
5417	Scientific Research and Development Services	5.0%	20,698	4,289	10,502	3,766	18,557
5419	Other Professional, Scientific, and Technical Services	4.7%	19,742	3,654	9,400	96	13,149
5192	Web Search Portals, Libraries, Archives, and Other Information Services	4.3%	17,748	3,884	9,948	7,031	20,862
5413	Architectural, Engineering, and Related Services	4.0%	16,507	3,231	8,155	635	12,021
5182	Computing Infrastructure Providers, Data Processing, Web Hosting, and Related Services	3.8%	15,936	3,366	8,449	4,367	16,182
5416	Management, Scientific, and Technical Consulting Services	3.5%	14,746	2,981	7,471	2,257	12,709
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	3.2%	13,130	2,567	6,508	1,128	10,203
5511	Management of Companies and Enterprises	2.7%	11,356	2,258	5,714	1,482	9,455
5613	Employment Services	2.4%	10,180	2,099	5,201	1,867	9,167
5162	Media Streaming Distribution Services, Social Networks, and Other Media Networks and Content Providers	2.4%	9,907	2,002	5,115	1,881	8,998
3344	Semiconductor and Other Electronic Component Manufacturing	2.2%	9,083	1,867	4,394	835	7,096
3364	Aerospace Product and Parts Manufacturing	1.5%	6,414	1,212	3,095	96	4,403
4234	Professional and Commercial Equipment and Supplies Merchant Wholesalers	1.1%	4,489	912	2,304	851	4,067
5241	Insurance Carriers	1.0%	4,157	837	2,109	650	3,596
6113	Colleges, Universities, and Professional Schools	0.9%	3,904	1,258	1,786	588	3,631
5221	Depository Credit Intermediation	0.9%	3,840	787	2,010	868	3,665
5171	Wired and Wireless Telecommunications (except Satellite)	0.8%	3,185	585	1,481	27	2,093
	All Others	15.0%	62,330	12,590	31,422	8,192	52,204

Source: JobsEQ®

Data as of 2022Q4 except wages which are as of 2021. Note that occupation-by-industry wages represent adjusted national data and may not be consistent with regional, all-industry occupation wages shown elsewhere in JobsEQ.

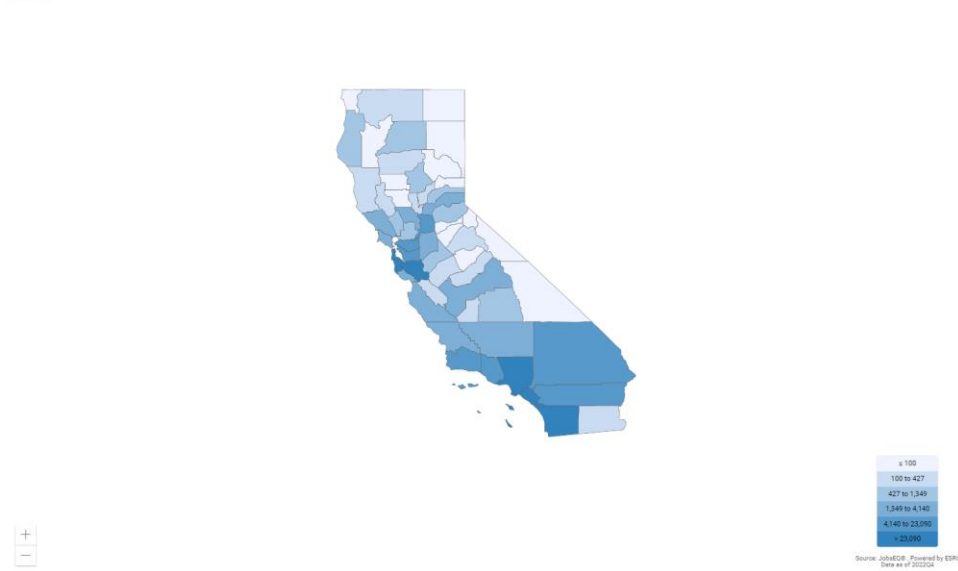
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Geographic Distribution

The map below illustrates the county-level distribution of employed workers in California in occupations linked to Computer Engineering, General. Employment is shown by place of work.

California, Occupation Concentration by Place of Work for Occupations Linked to Computer Engineering, General



Top Counties with Employment Linked to Computer Engineering, General, 2022Q4

Region	Employment
Santa Clara County, California	82,426
Los Angeles County, California	76,609
San Francisco County, California	41,438
Orange County, California	35,968
San Diego County, California	35,837
San Mateo County, California	23,091
Alameda County, California	22,216
Sacramento County, California	10,400
San Bernardino County, California	7,858
Contra Costa County, California	6,727

Source: JobsEQ®

Occupation employment data are estimated via industry employment data and the industry/occupation mix. Industry employment data are derived from the Quarterly Census of Employment and Wages, provided by the Bureau of Labor Statistics and currently updated through 2022Q3, imputed where necessary with preliminary estimates updated to 2022Q4.

Demographic Profile

The population in California was 39,346,023 per American Community Survey data for 2016-2020.

Of individuals 25 to 64 in California, 35.4% have a bachelor's degree or higher which compares with 34.3% in the nation. Per American Community Survey 2016-2020 estimates, the region has about 576,714 students enrolled in grade 12.

Summary¹

	Percent		Value	
	California	USA	California	USA
Demographics				
Population (ACS)	—	—	39,346,023	326,569,308
Male	49.7%	49.2%	19,562,882	160,818,530
Female	50.3%	50.8%	19,783,141	165,750,778
Median Age ²	—	—	36.7	38.2
Under 18 Years	22.8%	22.4%	8,956,641	73,296,738
18 to 24 Years	9.5%	9.3%	3,724,239	30,435,736
25 to 34 Years	15.3%	13.9%	6,007,913	45,485,165
35 to 44 Years	13.3%	12.7%	5,233,903	41,346,677
45 to 54 Years	12.8%	12.7%	5,039,155	41,540,736
55 to 64 Years	12.0%	12.9%	4,739,675	42,101,439
65 to 74 Years	8.3%	9.4%	3,270,380	30,547,950
Population Growth				
Population (Pop Estimates) ⁴	—	—	39,029,342	333,287,557
Population Annual Average Growth ⁴	0.3%	0.6%	108,479	1,940,990
People per Square Mile	—	—	250.4	94.3
Educational Attainment, Age 25-64				
No High School Diploma	15.2%	10.5%	3,199,850	17,929,220
High School Graduate	20.4%	25.4%	4,282,776	43,289,555
Some College, No Degree	21.0%	20.5%	4,412,172	34,959,338
Associate's Degree	8.0%	9.3%	1,678,082	15,776,790
Bachelor's Degree	22.6%	21.6%	4,741,354	36,888,244
Postgraduate Degree	12.9%	12.7%	2,706,412	21,630,870
Social				
Poverty Level (of all people)	12.6%	12.8%	4,853,434	40,910,326
Households Receiving Food Stamps/SNAP	9.0%	11.4%	1,183,873	13,892,407
Enrolled in Grade 12 (% of total population)	1.5%	1.3%	576,714	4,358,865
Disconnected Youth ³	1.9%	2.5%	38,451	433,164
Children in Single Parent Families (% of all children)	32.8%	34.0%	2,796,858	23,628,508
Uninsured	7.2%	8.7%	2,806,173	28,058,903
Speak English Less Than Very Well (population 5 yrs and over)	17.4%	8.2%	6,432,102	25,312,024

Source: [JobsEQ®](https://www.chmuraecon.com/jobseq)

1. American Community Survey 2016-2020, unless noted otherwise

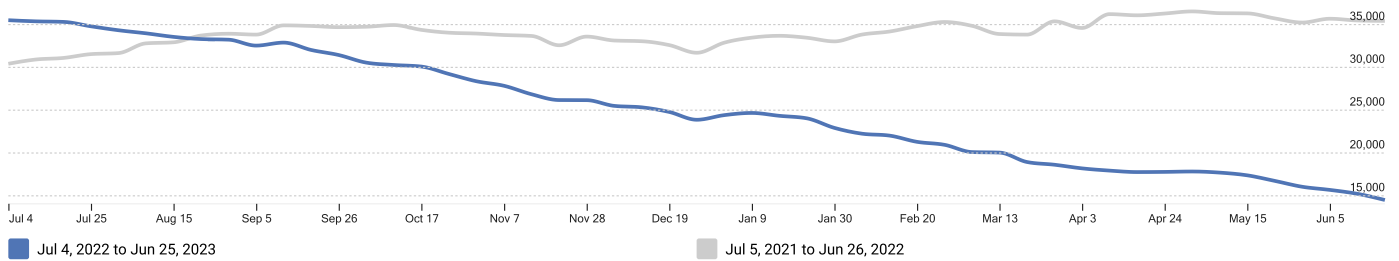
2. Median values for certain aggregate regions (such as MSAs) may be estimated as the weighted averages of the median values from the composing counties.

3. Disconnected Youth are 16-19 year olds who are (1) not in school, (2) not high school graduates, and (3) either unemployed or not in the labor force.

4. Census Population Estimate for 2022, annual average growth rate since 2012. Post-2019 data for Connecticut counties are imputed by Chmura.

RTI (Job Postings)

Active Job Ads by Date



Occupations


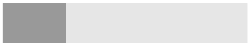
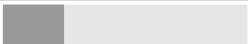
SOC	Occupation	Active Job Ads
15- 1252.00	Software Developers	71,693
11- 9041.00	Architectural and Engineering Managers	36,132
15- 1253.00	Software Quality Assurance Analysts and Testers	9,383
17- 2061.00	Computer Hardware Engineers	3,730
15- 1243.00	Database Architects	1,049
15- 1243.01	Data Warehousing Specialists	669
25- 1032.00	Engineering Teachers, Postsecondary	592
15- 1241.00	Computer Network Architects	385
15- 1241.01	Telecommunications Engineering Specialists	201

Locations

Location	Active Job Ads
San Francisco, California	7,819
San Diego, California	6,131
Sunnyvale, California	4,908
San Jose, California	4,864
Los Angeles, California	4,587
Irvine, California	3,233
Santa Clara, California	3,167

Locations

**Active
Job
Ads**

Location		
Santa Clara Valley (Cupertino), California, United States	2,578	
Palo Alto, California	2,022	
Mountain View, California	1,960	

Employers

Employer Name	Active Job Ads	
Apple	4,335	
Motion Recruitment	3,637	
NORTHROP GRUMMAN	3,226	
Diverse Lynx	3,175	
Jobot	2,684	
Cynet Systems	2,419	
Boeing	2,243	
Amazon.com Services LLC	2,009	
Cybercoders	1,722	
Meta	1,458	

Certifications

Certificate Name	Active Job Ads	
Secret Clearance	3,860	
Project Management Professional (PMP)	1,468	
Licensed Professional Engineer	770	
Driver's License	663	
Engineer in Training (EIT)	212	
Certified Construction Manager (CCM)	175	
Certified Information Systems Security Professional (CISSP)	142	
Certified Quality Engineer (CQE)	141	
Cisco Certified Network Associate (CCNA)	120	
Cisco Certified Network Professional (CCNP)	100	

Hard Skills

Skill Name	Active Job Ads	
Computer Programming/Coding	34,940	
Java	29,977	
Python	29,862	
Agile	21,234	
JavaScript	19,745	
Structured Query Language (SQL)	18,646	
Amazon Web Services (AWS)	17,502	
Linux	14,379	
Git	11,582	
Software Development	10,277	

Soft Skills

Skill Name	Active Job Ads	
Communication (Verbal and written skills)	65,666	
Cooperative/Team Player	56,645	
Problem Solving	23,448	
Project Management	20,433	
Self-Motivated/Ability to Work Independently/Self Leadership	16,177	
Analytical	14,939	
Supervision/Management	12,377	
Ability to Work in a Fast Paced Environment	11,895	
Detail Oriented/Meticulous	10,702	
Leadership	10,653	

Job Titles

Job Title	Active Job Ads	
Project Manager	1,555	
Software Engineer	1,519	
Senior Software Engineer	1,453	
Project Engineer	607	
Java Developer	473	
Full Stack Developer	331	
Quality Engineer	330	
Principal Software Engineer	319	
Software Developer	308	
Python Developer	271	

Job Types

Type	Active Job Ads	
Full-Time	57,861	
Remote	20,849	
Temporary (unspecified)	13,478	
Permanent	8,209	
Temporary (long-term)	3,322	
Part-Time	1,393	
Temporary (short-term)	1,172	
Temp-to-Hire	813	
Remote Not Indicated	102,985	

Programs

Program Name	Active Job Ads	
Computer Science	36,565	
Engineering	18,423	
Electrical Engineering	7,991	
Computer Engineering	7,703	
Mathematics	6,210	
Technical	5,154	
Mechanical Engineering	3,960	
Physics	3,679	
Science	3,245	
Software Engineering	2,297	

Education Levels

Minimum Education Level	Active Job Ads	
Bachelor's degree	63,579	
Master's degree	5,722	
High school diploma or equivalent	1,991	
Associate's degree	1,839	
Doctoral or professional degree	757	
Unspecified/other	49,946	

California Regional Map



FAQ

What is CIP?

The 2010 Classification of Instructional Programs (CIP) is taxonomy of instructional program classifications and descriptions. It was developed and has been updated by the U.S. Department of Education's National Center for Education Statistics (NCES).

What is SOC?

The Standard Occupational Classification system (SOC) is used to classify workers into occupational categories. All workers are classified into one of over 804 occupations according to their occupational definition. To facilitate classification, occupations are combined to form 22 major groups, 95 minor groups, and 452 occupation groups. Each occupation group includes detailed occupations requiring similar job duties, skills, education, or experience.

What is the source of the job ads?

Job ads data are online job posts from the Real-Time Intelligence (RTI) data set, produced wholly by Chmura and gleaned from over 40,000 websites. Data reflect ads active during the last twelve month period ending 06/29/2023 and advertised for any Zip Code Tabulation Area in or intersecting with the region for which this report was produced. Historical ad volume is revised as additional data are made available and processed. Since many extraneous factors can affect short-term volume of online job postings, time-series data can be volatile and should be used with caution. All ad counts represent deduplicated figures.

What is the program-to-occupation crosswalk?

Training programs are classified according to the Classification of Instructional Programs (CIP codes). For relating training programs, this report uses a modified version of the CIP to SOC crosswalk from the National Center for Education Statistics (NCES). While this is a very helpful crosswalk for estimating occupation production from training program awards data, the crosswalk is neither perfect nor comprehensive. Indeed, it is hard to imagine such a crosswalk being perfect since many training program graduates for one reason or another do not end up employed in occupations that are most related to the training program from which they graduated. Therefore, the education program analyses should be considered in this light.

As an example of the many scenarios that may unfold, consider a journalism degree that crosswalks into three occupations: editors, writers, and postsecondary communications teachers. Graduates with a journalism degree may get a job in one of these occupations—and that may be the most-likely scenario—but a good number of these graduates may get a job in a different occupation altogether (the job may be somewhat related, such as a reporter, or the job may be totally unrelated, such as a real estate agent). Furthermore, a graduate may stay in school or go back to school for a degree that will lead to other occupation possibilities. Still another possibility includes the graduate not entering the labor market (maybe being unemployed, being a non-participant, or moving to another region).

What is separation demand?

Separation demand is the number of jobs required due to separations—labor force exits (including retirements) and turnover resulting from workers moving from one occupation into another. Note that separation demand does not include all turnover—it does not include when workers stay in the same occupation but switch employers. The total projected demand for an occupation is the sum of the separation demand and the growth

demand (which is the increase or decrease of jobs in an occupation expected due to expansion or contraction of the overall number of jobs in that occupation).

What is a location quotient?

A location quotient (LQ) is a measurement of concentration in comparison to the nation. An LQ of 1.00 indicates a region has the same concentration of an occupation (or industry) as the nation. An LQ of 2.00 would mean the region has twice the expected employment compared to the nation and an LQ of 0.50 would mean the region has half the expected employment in comparison to the nation.

What is NAICS?

The North American Industry Classification System (NAICS) is used to classify business establishments according to the type of economic activity. The NAICS Code comprises six levels, from the “all industry” level to the 6-digit level. The first two digits define the top level category, known as the “sector,” which is the level examined in this report.

About This Report

This report and all data herein were produced by JobsEQ®, a product of Chmura Economics & Analytics. The information contained herein was obtained from sources we believe to be reliable. However, we cannot guarantee its accuracy and completeness.