** Computer Programming Occupations**

**Labor Market Information Report**

**City College of San Francisco**

Prepared by the San Francisco Bay Center of Excellence

for Labor Market Research

March 2019

# Recommendation

Based on all available data, there appears to be a significant undersupply of Computer Programming workers compared to the demand for this cluster of occupations in the Bay region and in the Mid-Peninsula sub-region (San Francisco and San Mateo Counties). There is a projected annual gap of about 14,048 students in the Bay region and 5,505 students in the Mid-Peninsula Sub-Region.

This report also provides student outcomes data on employment and earnings for programs on TOP 0707.10 - Computer Programming in the state and region. It is recommended that these data be reviewed to better understand how outcomes for students taking courses on this TOP code compare to potentially similar programs at colleges in the state and region, as well as to outcomes across all CTE programs at City College of San Francisco (CCSF) and in the region.

# Introduction

This report profiles Computer Programming Occupations in the 12 county Bay region and in the Mid-Peninsula sub-region for the revision to an existing program at City College of San Francisco. Labor market information (LMI) is not available at the eight-digit SOC Code level for Web Administrators (15-1199.03) or Software Quality Assurance Engineers and Testers (15-1199.01), therefore, the data shown in Tables 1 and 2 is for Computer Occupations, All Other (at the six digit SOC level) and likely overstates demand for Web Administrators and Software Quality Assurance Engineers and Testers. Tables 3, 4, 6, 9, 10 and 11 use job postings data from Burning Glass at the eight-digit SOC Code level for these two occupations.

|  |
| --- |
| * **Web Developers (SOC 15-1134): Design, create, and** modify Web sites. Analyze user needs to implement Web site content, graphics, performance, and capacity. May integrate Web sites with other computer applications. May convert written, graphic, audio, and video components to compatible Web formats by using software designed to facilitate the creation of Web and multimedia content. Excludes “Multimedia Artists and Animators” (27-1014). |
| *Entry-Level Educational Requirement: Associate's degree* |
| *Training Requirement: None* |
| *Percentage of Community College Award Holders or Some Postsecondary Coursework: 25%* |
|  |
| * **Software Developers, Applications (SOC 15-1132):** Develop, create, and modify general computer applications software or specialized utility programs. Analyze user needs and develop software solutions. Design software or customize software for client use with the aim of optimizing operational efficiency. May analyze and design databases within an application area, working individually or coordinating database development as part of a team. May supervise computer programmers. |
| *Entry-Level Educational Requirement: Bachelor's degree* |
| *Training Requirement: None* |
| *Percentage of Community College Award Holders or Some Postsecondary Coursework: 13%* |
|  |
| * **Computer Programmers (SOC 15-1131)**: Create, modify, and test the code, forms, and script that allow computer applications to run. Work from specifications drawn up by software developers or other individuals. May assist software developers by analyzing user needs and designing software solutions. May develop and write computer programs to store, locate, and retrieve specific documents, data, and information. |
| *Entry-Level Educational Requirement: Bachelor's degree* |
| *Training Requirement: None* |
| *Percentage of Community College Award Holders or Some Postsecondary Coursework: 21%* |
|  |
| * **Computer Occupations, All Other (SOC 15-1199):** All computer occupations not listed separately. Excludes “Computer and Information Systems Managers” (11-3021), “Computer Hardware Engineers” (17-2061), “Electrical and Electronics Engineers” (17-2070), “Computer Science Teachers, Postsecondary” (25-1021), “Multimedia Artists and Animators” (27-1014), “Graphic Designers” (27-1024), “Computer Operators” (43-9011), and “Computer, Automated Teller, and Office Machine Repairs” (49-2011). |
| *Entry-Level Educational Requirement: Bachelor's degree* |
| *Training Requirement: None* |
| *Percentage of Community College Award Holders or Some Postsecondary Coursework: 35%* |

# Occupational Demand

**Table 1. Employment Outlook for Computer Programming Occupations in Bay Region**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Occupation | 2017 Jobs | 2022 Jobs | 5-Yr Change | 5-Yr % Change | 5-Yr Open-ings | Average Annual Open-ings | 10% Hourly Wage | Median Hourly Wage |
| Web Developers | 10,306 | 12,242 | 1,937 | 19% | 5,802 | 1,160 | $20.83 | $38.90 |
| Software Developers, Applications | 89,372 | 109,872 | 20,499 | 23% | 51,391 | 10,278 | $38.68 | $62.13 |
| Computer Programmers | 14,333 | 15,083 | 751 | 5% | 5,566 | 1,113 | $27.79 | $48.80 |
| Computer Occupations, All Other | 19,731 | 21,972 | 2,242 | 11% | 9,101 | 1,820 | $26.99 | $53.32 |
| **Total** | **133,741** | **159,170** | **25,428** | **19%** | **71,859** | **14,372** | **$34.42** | **$57.61** |

*Source: EMSI 2019.1*

**Bay Region** includes Alameda, Contra Costa, Marin, Monterey, Napa, San Benito, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano and Sonoma Counties

**Table 2. Employment Outlook for Computer Programming Occupations in Mid-Peninsula Sub-Region**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Occupation | 2017 Jobs | 2022 Jobs | 5-Yr Change | 5-Yr % Change | 5-Yr Open-ings | Average Annual Open-ings | 10% Hourly Wage | Median Hourly Wage |
| Web Developers | 4,312 | 5,313 | 1,001 | 23% | 2,636 | 527 | $23.13 | $48.17 |
| Software Developers, Applications | 29,464 | 38,139 | 8,675 | 29% | 19,109 | 3,822 | $39.89 | $65.99 |
| Computer Programmers | 4,791 | 5,343 | 552 | 12% | 2,147 | 429 | $27.27 | $49.36 |
| Computer Occupations, All Other | 7,898 | 9,046 | 1,147 | 15% | 3,912 | 782 | $28.37 | $53.70 |
| **TOTAL** | **46,465** | **57,840** | **11,376** | **24%** | **27,804** | **5,561** | **$35.07** | **$60.53** |

*Source: EMSI 2019.1*

**Mid-Peninsula Sub-Region** includes San Francisco and San Mateo Counties

### Job Postings in Bay Region and Mid-Peninsula Sub-Region

**Table 3. Number of Job Postings by Occupation for latest 12 months (Feb 2018 - Jan 2018)**

| Occupation | Bay Region | Mid-Peninsula |
| --- | --- | --- |
| Software Developers, Applications (15-1132.00) | 103,488 | 38,437 |
| Web Developers (15-1134.00) | 24,615 | 10,967 |
| Software Quality Assurance Engineers and Testers (15-1199.01) | 12,186 | 3,915 |
| Computer Programmers (15-1131.00) | 4,574 | 1,460 |
| Web Administrators (15-1199.03) | 358 | 159 |
| **Total** | **145,221** | **54,938** |

*Source: Burning Glass*

**Table 4. Top Job Titles for Computer Programming Occupations for latest 12 months (Feb 2018 - Jan 2018)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Common Title | Bay | Mid-Peninsula | Common Title | Bay | Mid-Peninsula |
| Software Development Engineer | 32,197 | 13,168 | Engineer | 1,514 | 569 |
| Java Developer | 7,281 | 1,845 | Applications Developer | 1,447 | 577 |
| Devops Engineer | 3,733 | 1,303 | Android Developer | 1,409 | 564 |
| Applications Engineer | 2,873 | 750 | Principal Software Engineer | 1,223 | 564 |
| Quality Assurance Engineer | 2,856 | 848 | User Interface (UX)/User Experience (UX) Designer | 1,131 | 481 |
| User Experience (UX) Designer | 2,667 | 1,303 | Senior Engineer | 1,101 | 628 |
| Software Developer | 2,570 | 878 | PHP Developer | 1,063 | 297 |
| Java Engineer | 2,553 | 850 | iOS Developer | 1,055 | 459 |
| Front End Developer | 1,826 | 705 | Senior Devops Engineer | 1,002 | 471 |
| Python Developer | 1,819 | 487 | .Net Developer | 950 | 347 |
| Developer | 1,697 | 571 | Software Engineering Manager | 837 | 387 |
| Senior Developer | 1,623 | 654 | Software Quality Assurance Engineer | 788 | 168 |
| User Interface (UI) Developer | 1,601 | 437 | Quality Assurance Analyst | 745 | 366 |
| Web Developer | 1,587 | 595 | Software Architect | 689 | 247 |

*Source: Burning Glass*

# Industry Concentration

**Table 5. Industries hiring Computer Programming Workers in Bay Region**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Industry – 6 Digit NAICS (No. American Industry Classification) Codes | Jobs in Industry (2017) | Jobs in Industry (2022) | % Change (2017-22) | % in Industry (2017) |
| Custom Computer Programming Services (541511) | 29,762 | 30,646 | 19% | 22.2% |
| Computer Systems Design Services (541512) | 18,413 | 18,685 | 16% | 13.6% |
| Internet Publishing and Broadcasting and Web Search Portals (519130) | 17,182 | 18,208 | 41% | 13.2% |
| Software Publishers (511210) | 15,117 | 15,982 | 26% | 11.6% |
| Electronic Computer Manufacturing (334111) | 7,085 | 7,349 | 12% | 5.3% |
| Data Processing, Hosting, and Related Services (518210) | 4,866 | 5,276 | 39% | 3.8% |
| Other Computer Related Services (541519) | 4,168 | 4,265 | 23% | 3.1% |
| Corporate, Subsidiary, and Regional Managing Offices (551114) | 3,062 | 3,252 | 14% | 2.4% |
| Federal Government, Civilian, Excluding Postal Service (901199) | 1,616 | 1,594 | (2%) | 1.2% |
| Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology) (541715) | 1,477 | 1,547 | (2%) | 1.1% |

*Source: EMSI 2019.1*

**Table 6. Top Employers Posting Computer Programming Occupations in Bay Region and Mid-Peninsula Sub-Region (Feb 2018 - Jan 2018)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Employer | Bay | Employer | Bay | Employer | Mid-Peninsula |
| Apple Inc. | 2,776 | Etouch Systems Corp | 342 | Facebook | 729 |
| Capital Markets Placement | 2,250 | eBay | 342 | Capital Markets Placement | 595 |
| Amazon | 1,659 | Redolent, Inc | 341 | Amazon | 586 |
| Cisco Systems Incorporated | 1,247 | Bayone Solutions | 309 | Scoop Technologies | 487 |
| Scoop Technologies | 1,095 | Infoobjects Inc | 303 | Salesforce | 411 |
| Google Inc. | 1,014 | Redpoint Ventures | 296 | Oracle | 386 |
| Facebook | 765 | Adobe Systems | 292 | IBM | 248 |
| Oracle | 613 | Splunk | 289 | Twitter | 243 |
| IBM | 578 | Xoriant Incorporated | 273 | Sony Electronics Incorporated | 241 |
| Workday, Inc | 572 | Tesla Motors | 269 | Google Inc. | 205 |
| Microsoft Corporation | 520 | Wipro | 264 | Microsoft Corporation | 199 |
| Vmware Incorporated | 447 | Revature | 262 | Redpoint Ventures | 170 |
| Walmart / Sam's | 438 | Accenture | 261 | Autodesk Incorporated | 169 |
| Salesforce | 420 | Sony Electronics Inc | 253 | Uber | 161 |
| Paypal | 403 | Twitter | 253 | Visa | 155 |
| SAP | 383 | Linkedin Limited | 250 | Infoobjects Inc | 153 |
| Techfetch Com | 374 | Palo Alto Networks | 239 | Republic Bancorp | 146 |
| Nvidia Corporation | 371 | Symantec | 230 | Capital One | 142 |
| Intel Corporation | 369 | Cynet Systems | 228 | Informatica Corporation | 141 |
| Amazon Lab126 | 346 | Dell | 228 | Cisco Systems Incorporated | 137 |

*Source: Burning Glass*

# Educational Supply

There are 14 community colleges in the Bay Region issuing 324 awards on average annually (last 3 years) on TOP 0707.10 - Computer Programming. There are two colleges in the Mid-Peninsula Sub-Region issuing 56 awards on average annually (last 3 years) on this TOP code.

**Table 7. Awards on TOP 0707.10 - Computer Programming in the Bay Region**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| College | Sub-Region | TOP | Headcount | Associates | Certificates | Total |
| **Berkeley City College** | East Bay | 70710 | n/a | 2 | 4 | 6 |
| **Cabrillo College** | Santa Cruz - Monterey | 70710 | 133 | 6 | 20 | 26 |
| **Cañada College** | Mid Peninsula | 70710 | n/a |  |  |  |
| **Chabot College** | East Bay | 70710 | 590 |  |  |  |
| **City College of San Francisco** | Mid-Peninsula | 70710 | 24 |  | 54 | 54 |
| **College of Alameda** | East Bay | 70710 | 105 |  |  |  |
| **College of Marin** | North Bay | 70710 | 39 |  |  |  |
| **College of San Mateo** | Mid-Peninsula | 70710 | 400 | 0 | 2 | 2 |
| **Contra Costa College** | East Bay | 70710 | n/a | 1 | 1 | 2 |
| **De Anza College** | Silicon Valley | 70710 | 1,405 | 8 | 29 | 37 |
| **Diablo Valley College** | East Bay | 70710 | n/a | 43 | 112 | 155 |
| **Evergreen Valley College** | Silicon Valley | 70710 | 678 |  |  |  |
| **Foothill College** | Silicon Valley | 70710 | n/a |  |  |  |
| **Gavilan College** | Santa Cruz - Monterey | 70710 | 414 | 8 | 3 | 11 |
| **Hartnell College** | Santa Cruz - Monterey | 70710 | 662 | 11 | 1 | 12 |
| **Laney College** | East Bay | 70710 | 108 | 1 | 0 | 1 |
| **Las Positas College** | East Bay | 70710 | 471 | 0 | 1 | 1 |
| **Los Medanos College** | East Bay | 70710 | 921 |  |  |  |
| **Merritt College** | East Bay | 70710 | 315 |  |  |  |
| **Mission College** | Silicon Valley | 70710 | 30 |  |  |  |
| **Monterey Peninsula College** | Santa Cruz - Monterey | 70710 | n/a |  |  |  |
| **Napa Valley College** | North Bay | 70710 | 145 |  |  |  |
| **Ohlone College** | East Bay | 70710 | 504 | 1 | 0 | 1 |
| **San Jose City College** | Silicon Valley | 70710 | 459 | 6 | 6 | 12 |
| **Santa Rosa Junior College** | North Bay | 70710 | 606 |  |  |  |
| **Skyline College** | Mid-Peninsula | 70710 | n/a |  |  |  |
| **Solano College** | North Bay | 70710 | n/a | 4 | 0 | 4 |
| **West Valley College** | Silicon Valley | 70710 | n/a |  |  |  |
| **Total Bay Region** | |  | **8,009** | **91** | **233** | **324** |
| **Total Mid-Peninsula Sub-Region** | |  | **424** | **0** | **56** | **56** |

# *Source: IPEDS, Data Mart and Launchboard*

NOTE: Headcount of students who took one or more courses is for 2016-17. The annual average for awards is 2014-17 unless there are only awards in 2016-17. The annual average for other postsecondary is for 2013-16.

# Gap Analysis

Based on the data included in this report, there is a large labor market gap in the Bay region with 14,372 annual openings for the Computer Programming occupational cluster and 324 annual (3-year average) awards for an annual undersupply of 14,048 students. In the Mid-Peninsula Sub-Region, there is also a large gap with 5,561 annual openings and 56 annual (3-year average) awards for an annual undersupply of 5,505 students.

# Student Outcomes

**Table 8. Four Employment Outcomes Metrics for Students Who Took Courses on TOP 0707.10 - Computer Programming**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 2015-16 | Bay  (All CTE Programs) | City College of San Francisco (All CTE Programs) | State (0707.10) | Bay (0707.10) | Mid-Peninsula (0707.10) | City College of San Francisco (0707.10) |
| % Employed Four Quarters After Exit | 74% | 72% | 64% | 65% | 67% | 71% |
| Median Quarterly Earnings Two Quarters After Exit | $10,550 | $10,170 | $10,500 | $13,361 | $14,366 | $14,714 |
| Median % Change in Earnings | 46% | 31% | 51% | 55% | 59% | 65% |
| % of Students Earning a Living Wage | 63% | 65% | 58% | 63% | 65% | 66% |

*Source: Launchboard Pipeline (version available on 2/20/19)*

# Skills, Certifications and Education

**Table 9. Top Skills for Computer Programming Occupations in Bay Region (Feb 2018 - Jan 2018)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Skill | Postings | Skill | Postings | Skill | Postings |
| Java | 53,276 | Oracle | 12,256 | JavaScript Object Notation (JSON) | 8,463 |
| Software Engineering | 47,826 | UNIX | 12,111 | Extensible Markup Language (XML) | 8,138 |
| Python | 37,347 | AngularJS | 11,327 | Docker Software | 7,862 |
| JavaScript | 35,493 | Continuous Integration | 10,945 | Product Management | 7,828 |
| Software Development | 35,055 | Scrum | 10,638 | PERL Scripting Language | 7,786 |
| SQL | 25,964 | MySQL | 10,022 | Apache Hadoop | 7,656 |
| Linux | 23,238 | HTML5 | 10,019 | Big Data | 7,636 |
| C++ | 20,386 | React Javascript | 9,945 | Software Architecture | 7,595 |
| Git | 16,932 | NoSQL | 9,842 | Web Development | 7,590 |
| Quality Assurance and Control | 16,665 | Agile Development | 9,662 | Kubernetes | 7,566 |
| Web Application Development | 14,752 | Data Structures | 9,384 | Node.js | 7,505 |
| Object-Oriented Analysis and Design (OOAD) | 14,403 | jQuery | 8,994 | Hypertext Preprocessor (PHP) | 7,418 |
| Debugging | 13,883 | Microsoft C# | 8,910 | Machine Learning | 7,398 |
| DevOps | 13,151 | Ruby | 8,829 | Relational Databases | 7,236 |
| Unit Testing | 12,432 | Scalability Design | 8,745 | Project Management | 7,057 |

*Source: Burning Glass*

**Table 10. Certifications for Computer Programming Occupations in the Bay Region (Feb 2018 - Jan 2018)**

Note: 96% of records have been excluded because they do not include a certification. As a result, the chart below may not be representative of the full sample.

|  |  |  |  |
| --- | --- | --- | --- |
| Certification | Postings | Certification | Postings |
| Security Clearance | 867 | Certified ScrumMaster (CSM) | 103 |
| IT Infrastructure Library (ITIL) Certification | 548 | Certified Information Security Manager | 98 |
| Driver's License | 426 | Microsoft Certified Professional (MCP) | 97 |
| Project Management Certification | 334 | Automation Certification | 88 |
| Certified Information Systems Security Prof. | 293 | Certified Salesforce Platform Developer II | 86 |
| Salesforce Developer | 254 | Java Certification | 83 |
| Cisco Certified Internetwork Expert (CCIE) | 250 | Certified Scrum Professional (CSP) | 80 |
| Cisco Certified Network Associate (CCNA) | 235 | Certified Salesforce Advanced Developer | 75 |
| Cisco Certified Network Professional (CCNP) | 207 | Agile Certification | 74 |
| Certified Salesforce Platform Developer | 194 | Certified Salesforce Advanced Admin | 70 |
| ITIL Certification | 191 | Mbe Certified | 64 |
| Certified Salesforce Administrator | 184 | Certified Novell Administrator | 58 |
| Certified Scrum Trainer (CST) | 178 | Microsoft Certified Solutions Developer | 58 |
| Project Management Professional (PMP) | 140 | Cisco Certified Security Professional | 56 |
| SANS/GIAC Certification | 132 | Salesforce Platform App Builder | 56 |
| Certified Information Systems Auditor (CISA) | 118 | Certified Senior System Architect | 55 |
| CompTIA Security+ | 111 | Red Hat Certified Engineer (RHCE) | 53 |
| Capability Model Maturity Integration | 108 | Certified Salesforce Platform Developer I | 52 |

*Source: Burning Glass*

**Table 11. Education Requirements for Computer Programming Occupations in Bay Region**

Note: 49% of records have been excluded because they do not include a degree level. As a result, the chart below may not be representative of the full sample.

|  |  |
| --- | --- |
| Education (minimum advertised) | Latest 12 Mos. Postings |
| High school or vocational training | 929 (1%) |
| Associate Degree | 497 (1%) |
| Bachelor’s Degree or Higher | 73,720 98%) |

*Source: Burning Glass*

# Methodology

Occupations for this report were identified by use of skills listed in O\*Net descriptions and job descriptions in Burning Glass. Labor demand data is sourced from Economic Modeling Specialists International (EMSI) occupation data and Burning Glass job postings data. Educational supply and student outcomes data is retrieved from multiple sources, including CTE Launchboard and CCCCO Data Mart.

# Sources

O\*Net Online

Labor Insight/Jobs (Burning Glass)

Economic Modeling Specialists International (EMSI)

CTE LaunchBoard [www.calpassplus.org/Launchboard/](http://www.calpassplus.org/Launchboard/)

Statewide CTE Outcomes Survey

Employment Development Department Unemployment Insurance Dataset

Living Insight Center for Community Economic Development

Chancellor’s Office MIS system

# Contacts

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