



TORO Analysis of Computer Programmers to Computer Software Engineers, Applications

INPUT SECTION:

Transfer	Title	O*NET	Filters		
From Title:	Computer Programmers	15-1021.00	Abilities:	Importance Level: 50	Weight: 1
To Title:	Computer Software Engineers, Applications	15-1031.00	Skills:	Importance Level: 69	Weight: 1
Labor Market Area:	Maine Statewide		Knowledge:	Importance Level: 69	Weight: 1

OUTPUT SECTION:

Grand TORQ:

89

Ability TORQ		Skills TORQ		Knowledge TORQ	
Level	89	Level	86	Level	91

Gaps To Narrow if Possible				Upgrade These Skills				Knowledge to Add			
Ability	Level	Gap	Impt	Skill	Level	Gap	Impt	Knowledge	Level	Gap	Impt
Number Facility	46	34	50	Quality Control Analysis	75	27	74	Engineering and Technology	70	27	71
Speech Clarity	53	16	72	Judgment and Decision Making	74	24	83	Computers and Electronics	92	3	94
Mathematical Reasoning	53	18	59	Troubleshooting	90	20	86				
Speech Recognition	50	13	65	Programming	90	13	98				
Deductive Reasoning	64	5	78	Time Management	70	17	72				
Originality	57	4	56	Speaking	69	12	73				
Problem Sensitivity	53	2	75	Reading Comprehension	81	10	81				
Inductive Reasoning	57	2	75	Systems Analysis	74	10	77				
Category Flexibility	48	2	56	Technology Design	75	9	83				
Written Comprehension	67	1	72	Active Listening	73	8	73				
				Coordination	70	8	71				
				Complex Problem Solving	80	6	90				
				Active Learning	81	4	85				
				Critical Thinking	83	1	96				

LEVEL and IMPT (IMPORTANCE) refer to the Target Computer Software Engineers, Applications. GAP refers to level difference between Computer Programmers and Computer Software Engineers, Applications.

ASK ANALYSIS

Ability Level Comparison - Abilities with importance scores over 50

Description	Computer Programmers	Computer Software Engineers, Applications	Importance
Oral Comprehension	66	66	78
Deductive Reasoning	59	64	78
Problem Sensitivity	51	53	75
Inductive Reasoning	55	57	75
Near Vision	59	57	75
Written Comprehension	66	67	72
Speech Clarity	37	53	72
Oral Expression	62	62	68
Information Ordering	67	60	68
Speech Recognition	37	50	65
Mathematical Reasoning	35	53	59
Originality	53	57	56
Category Flexibility	46	48	56
Selective Attention	42	41	56
Written Expression	66	51	53
Number Facility	12	46	50

Skill Level Comparison - Abilities with importance scores over 69

Description	Computer Programmers	Computer Software Engineers, Applications	Importance
Programming	77	90	98
Critical Thinking	82	83	96
Complex Problem Solving	74	80	90
Troubleshooting	70	90	86
Active Learning	77	81	85
Technology Design	66	75	83
Judgment and Decision Making	50	74	83
Reading Comprehension	71	81	81
Operations Analysis	77	72	79



Systems Analysis	64	74	77
Quality Control Analysis	48	75	74
Active Listening	65	73	73
Speaking	57	69	73
Time Management	53	70	72
Coordination	62	70	71
Learning Strategies	71	66	69

Knowledge Level Comparison - Knowledge with importance scores over 69

Description	Computer Programmers	Computer Software Engineers, Applications	Importance
Computers and Electronics	89	92	94
Engineering and Technology	43	70	71

Experience & Education Comparison

Related Work Experience Comparison			Required Education Level Comparison		
Description	Computer Programmers	Computer Software Engineers, Applications	Description	Computer Programmers	Computer Software Engineers, Applications
10+ years	20%	2%	Doctoral	17%	0%
8-10 years	0%	0%	Professional Degree	0%	0%
6-8 years	2%	5%	Post-Masters Cert	0%	0%
4-6 years	0%	23%	Master's Degree	0%	1%
2-4 years	34%	37%	Post-Bachelor Cert	0%	16%
1-2 years	29%	6%	Bachelors	63%	49%
6-12 months	3%	16%	AA or Equiv	4%	8%
3-6 months	0%	0%	Some College	10%	7%
1-3 months	5%	0%	Post-Secondary Certificate	0%	16%
0-1 month	0%	0%	High School Diploma or GED	0%	0%
None	3%	7%	No HSD or GED	3%	0%

Computer Programmers

Computer Software Engineers, Applications

Most Common Educational/Training Requirement:

Bachelor's degree

Bachelor's degree

Job Zone Comparison

4 - Job Zone Four: Considerable Preparation Needed
A minimum of two to four years of work-related skill, knowledge, or experience is needed for these occupations. For example, an accountant must complete four years of college and work for several years in accounting to be considered qualified.

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Most of these occupations require a four - year bachelor's degree, but some do not.

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Employees in these occupations usually need several years of work-related experience, on-the-job training, and/or vocational training.

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Tasks

Computer Programmers

Core Tasks

Generalized Work Activities:

- Interacting With Computers - Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.
- Organizing, Planning, and Prioritizing Work - Developing specific goals and plans to prioritize, organize, and accomplish your work.
- Making Decisions and Solving Problems - Analyzing information and evaluating results to choose the best solution and solve problems.
- Getting Information - Observing, receiving, and otherwise obtaining information from all relevant sources.
- Updating and Using Relevant Knowledge - Keeping up-to-date technically and applying new knowledge to your job.

Specific Tasks

Occupation Specific Tasks:

- Assign, coordinate, and review work and activities of programming personnel.
- Collaborate with computer manufacturers and other users to develop new programming methods.
- Compile and write documentation of program development and subsequent revisions, inserting comments in the coded instructions so others can understand the program.
- Conduct trial runs of programs and software applications to be sure they will produce the desired information and that the instructions are correct.
- Consult with and assist computer operators or system analysts to define and resolve problems in running computer programs.
- Consult with managerial, engineering, and technical personnel to clarify program intent, identify problems, and suggest changes.
- Correct errors by making appropriate changes and rechecking the program to ensure that the desired results are produced.
- Investigate whether networks, workstations, the central processing unit of the system, or peripheral equipment

Computer Software Engineers, Applications

Core Tasks

Generalized Work Activities:

- Interacting With Computers - Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.
- Updating and Using Relevant Knowledge - Keeping up-to-date technically and applying new knowledge to your job.
- Getting Information - Observing, receiving, and otherwise obtaining information from all relevant sources.
- Making Decisions and Solving Problems - Analyzing information and evaluating results to choose the best solution and solve problems.
- Communicating with Supervisors, Peers, or Subordinates - Providing information to supervisors, co-workers, and subordinates by telephone, in written form, e-mail, or in person.

Specific Tasks

Occupation Specific Tasks:

- Analyze information to determine, recommend, and plan computer specifications and layouts, and peripheral equipment modifications.
- Analyze user needs and software requirements to determine feasibility of design within time and cost constraints.
- Confer with systems analysts, engineers, programmers and others to design system and to obtain information on project limitations and capabilities, performance requirements and interfaces.
- Consult with customers about software system design and maintenance.
- Coordinate software system installation and monitor equipment functioning to ensure specifications are met.
- Design, develop and modify software systems, using scientific analysis and mathematical models to predict and measure outcome and consequences of design.
- Determine system performance standards.
- Develop and direct software system testing and validation procedures, programming, and documentation.
- Modify existing software to correct errors,



of the system, or peripheral equipment are responding to a program's instructions.

- Perform or direct revision, repair, or expansion of existing programs to increase operating efficiency or adapt to new requirements.
- Perform systems analysis and programming tasks to maintain and control the use of computer systems software as a systems programmer.
- Prepare detailed workflow charts and diagrams that describe input, output, and logical operation, and convert them into a series of instructions coded in a computer language.
- Train subordinates in programming and program coding.
- Write or contribute to instructions or manuals to guide end users.
- Write, analyze, review, and rewrite programs, using workflow chart and diagram, and applying knowledge of computer capabilities, subject matter, and symbolic logic.
- Write, update, and maintain computer programs or software packages to handle specific jobs such as tracking inventory, storing or retrieving data, or controlling other equipment.

Detailed Tasks

Detailed Work Activities:

- adjust computer operation system
- analyze workflow
- assist co-workers with software problems
- communicate technical information
- configure computers in industrial or manufacturing setting
- consult with customers concerning needs
- consult with managerial or supervisory personnel
- design computer hardware or software interface
- design computer programs or programming tools
- develop computer performance standards
- develop mathematical or computer languages
- develop or maintain databases
- develop records management system
- develop tables depicting data
- direct and coordinate activities of workers or staff
- distinguish details in graphic arts material
- encode equations for processing
- evaluate computer system user requests or requirements
- follow data security procedures
- follow data storage procedures
- identify color or balance

allow it to adapt to new hardware, or to improve its performance.

- Obtain and evaluate information on factors such as reporting formats required, costs, and security needs to determine hardware configuration.
- Recommend purchase of equipment to control dust, temperature, and humidity in area of system installation.
- Specify power supply requirements and configuration.
- Store, retrieve, and manipulate data for analysis of system capabilities and requirements.
- Supervise the work of programmers, technologists and technicians and other engineering and scientific personnel.
- Train users to use new or modified equipment.

Detailed Tasks

Detailed Work Activities:

- adjust computer operation system
- advise clients regarding engineering problems
- analyze technical data, designs, or preliminary specifications
- check hardware or software to determine reliability
- communicate technical information
- conduct performance testing
- conduct training for personnel
- consult with customers concerning needs
- design computer hardware or software interface
- design data processing systems
- design data security systems
- design electronic equipment
- design hardware or software systems
- design systems in cooperation with colleagues
- develop computer performance standards
- develop mathematical or computer languages
- develop mathematical simulation models
- develop or maintain databases
- develop tables depicting data
- evaluate computer system user requests or requirements
- evaluate prototype computer software systems
- follow data security procedures
- follow data storage procedures
- install hardware, software, or peripheral equipment
- make presentations
- monitor computer operation



- identify color or balance
- implement computer system changes
- install computer programs
- maintain client-server database
- maintain or repair computers or related equipment
- monitor computer operation
- prepare instruction manuals
- prepare technical reports or related documentation
- prepare workflow chart
- program computers for electronic engineering applications
- program computers for management analysis applications
- program computers for medical applications
- program computers for social science applications
- program computers using existing software
- program mainframe computer
- provide customer service
- provide technical computer training
- provide technical support to computer users
- recommend software or hardware purchases
- resolve computer program operational problems
- resolve symbolic formulations in data processing applications
- revise or correct errors in computer programs, software, or systems
- supervise programming personnel
- test computer programs or systems
- test data communications hardware or software
- use computer application flow charts
- use computer graphics design software
- use computer programming language
- use computers to enter, access or retrieve data
- use creativity in graphics
- use differential equations in computer programming
- use geographical information system (GIS) software
- use graphic arts techniques
- use interpersonal communication techniques
- use knowledge of mainframe computers
- use object-oriented computer programming techniques
- use project management techniques
- use relational database software

- monitor equipment or machine operation to detect problems
- monitor operating conditions
- prepare technical reports or related documentation
- program computers for electronic engineering applications
- program computers using existing software
- program mainframe computer
- provide technical computer training
- read blueprints
- read schematics
- read technical drawings
- recommend purchase, repair, or modification of equipment
- recommend software or hardware purchases
- resolve engineering or science problems
- revise or correct errors in computer programs, software, or systems
- supervise programming personnel
- test computer programs or systems
- train workers in use of equipment
- understand detailed electronic design specifications
- understand engineering data or reports
- use computer networking technology
- use computer programming language
- use computers to enter, access or retrieve data
- use knowledge of mainframe computers
- use project management techniques
- use scientific research methodology
- use spreadsheet software
- write computer software, programs, or code
- write documentation for computer programming
- write technical specifications for computer systems, software or applications

Technology - Examples

Analytical or scientific software

- Data analysis software
- SAS software

- Simulation program with integrated circuit emphasis SPICE

Application server software

- BEA WebLogic Server
- IBM WebSphere

Backup or archival software



- use spreadsheet software
- use structural analysis techniques to analyze computer systems
- use word processing or desktop publishing software
- write computer software, programs, or code
- write documentation for computer programming

Technology - Examples

Analytical or scientific software

- SAS software
- Simulation program with integrated circuit emphasis SPICE

Application server software

- Application server software
- IBM WebSphere

Charting software

- Microsoft Office Visio

Compiler and decompiler software

- Code generator software
- Command interpreters
- Compilers
- Decompliers
- Incremental compiler software
- Inline code expander software
- Interpreter software
- Just-in-time compiler
- Mixed code generator
- One pass compiler software
- Partial class generator software
- Retargetable compiler
- Stage compiler
- Threaded code compiler
- Xerces2 Java Parser

Configuration management software

- IBM Rational ClearCase
- Revision control software

Content workflow software

- Backup and archival software

Computer aided design CAD software

- Computer assisted software engineering CASE software

Configuration management software

- Automated installation software
- Configuration management software
- Deployment software

- IBM Rational ClearCase

- Patch management software

- Visible Razor

Data base management system software

- Computer Associates integrated data management system CA-IDMS
- Data definition language DDL
- Data manipulation language DML
- Database management software
- IBM DB2
- Microsoft Access
- Microsoft SQL Server
- MySQL software
- Oracle DBMS
- Oracle procedural language/structured query language PL/SQL
- Sybase SQL Server

Data base user interface and query software

- ADO.NET
- IBM Rational ClearQuest
- Structured query language SQL
- Transact-SQL

Development environment software

- A programming language APL
- Activity based costing ABC
- Ada
- Algorithmic language ALGOL
- American National Standards Institute ANSI C



- Workflow software

Data base management system software

- CAST SQL Builder
- Computer Associates integrated data management system CA-IDMS
- Data definition language DDL
- Data manipulation language DML
- dBase Plus
- IBM DB2
- Microsoft Access
- Microsoft SQL Server
- mSQL software
- MySQL software
- Oracle procedural language/structured query language PL/SQL
- Pick software
- Relational database management software
- Sybase SQL Server

Data base reporting software

- ReCrystallize Crystal Reports

Data base user interface and query software

- Structured query language SQL

Development environment software

- A programming language APL
- Activity based costing ABC
- Ada
- Adobe Systems Adobe PostScript
- Algorithmic language ALGOL
- American National Standards Institute ANSI C
- Assembler
- AWK
- B
- Basic combined programming language BCPL
- Beginner's all-purpose symbolic instruction code BASIC
- Borland Delphi software

- AWK

- B

- Basic combined programming language BCPL

- Beginner's all-purpose symbolic instruction code BASIC

- Borland Delphi software

- Borland JBuilder

- C

- Class oriented ring associated language CORAL

- CLU

- Combined programming language CPL

- Common business oriented language COBOL

- Eclipse software

- Embedded systems development software

- Extensible markup language XML

- Flow-Matic

- Formula translation/translator FORTRAN

- FORTH

- Haskell

- IBM Rational Rose XDE Developer

- Icon

- Integrated development environment IDE software

- Interface definition language IDL

- J

- Kernel

- List processing language LISP

- Microsoft Visual Basic

- Microsoft Visual Basic Scripting Edition VBScript

- Microsoft Visual Studio

- ML

- MUMPS M

- National Instruments LabVIEW

- Parlog



- C
- Class oriented ring associated language CORAL
- Clipper
- CLU
- Code munger software
- Combined programming language CPL
- Common business oriented language COBOL
- Eclipse software
- Extensible markup language XML
- Extensible stylesheet language XSL
- Flow-Matic
- Formula translation/translator FORTRAN
- FORTH
- Haskell
- Icon
- Interface definition language IDL
- J
- Kernel
- List processing language LISP
- Logo
- Microsoft .NET Framework
- Microsoft Extensible Application Markup Language (XAML)
- Microsoft Visual Basic
- Microsoft Visual Basic Scripting Edition VBScript
- Microsoft Visual Studio
- ML
- MUMPS M
- Parlog
- Pascal
- Programming language one PL/I
- Prolog
- Restructured extended executor REXX

- Pascal
- Programming language one PL/I
- Prolog
- Restructured extended executor REXX
- Ruby
- Scheme
- String oriented symbolic language SNOBOL
- Sun Microsystems Java 2 Platform Enterprise Edition J2EE
- Symantec Visual Caf
- Web service definition language WDSL
- XML Path Language XPATH

Document management software

- Document management software

Enterprise application integration software

- Enterprise application integration EAI software
- SAP Netweaver

File versioning software

- Version control software

Graphical user interface development software

- Graphical user interface GUI builder software

Object or component oriented development software

- BETA
- C++
- Categorical abstract machine language CAML
- Common extended self-containing prolog CESP
- Component object model COM software
- Distributed component object model DCOM software
- DRAGOON software
- E++
- Eiffel
- Emerald
- Extended self-containing Prolog ESP

- Lisp object-oriented programming system



<ul style="list-style-type: none"> • Ruby 	<ul style="list-style-type: none"> • Lisp object-oriented programming system LOOPS
<ul style="list-style-type: none"> • Scheme 	<ul style="list-style-type: none"> • Microsoft Visual Basic.NET
<ul style="list-style-type: none"> • Source code migration software 	<ul style="list-style-type: none"> • Microsoft Visual C# .NET
<ul style="list-style-type: none"> • String oriented symbolic language SNOBOL 	<ul style="list-style-type: none"> • Modula
<ul style="list-style-type: none"> • Symantec Visual Caf 	<ul style="list-style-type: none"> • Oberon
<ul style="list-style-type: none"> • Tier generator software 	<ul style="list-style-type: none"> • Object or component oriented development software
<ul style="list-style-type: none"> • Web service definition language WDSL 	<ul style="list-style-type: none"> • Objective-C
Document management software	<ul style="list-style-type: none"> • Oblog
<ul style="list-style-type: none"> • Virage VS Archive 	<ul style="list-style-type: none"> • Polka
Enterprise resource planning ERP software	<ul style="list-style-type: none"> • Practical extraction and reporting language Perl
<ul style="list-style-type: none"> • Advanced business application programming ABAP 	<ul style="list-style-type: none"> • Python
Graphical user interface development software	<ul style="list-style-type: none"> • Sather
<ul style="list-style-type: none"> • Basis BBx VisualPRO/5 	<ul style="list-style-type: none"> • Self
<ul style="list-style-type: none"> • Graphical user interface GUI development software 	<ul style="list-style-type: none"> • Simulation language SIMULA
Object or component oriented development software	<ul style="list-style-type: none"> • Smalltalk
<ul style="list-style-type: none"> • BETA 	<ul style="list-style-type: none"> • Sun Microsystems Java
<ul style="list-style-type: none"> • C+ + 	Office suite software
<ul style="list-style-type: none"> • Categorical abstract machine language CAML 	<ul style="list-style-type: none"> • Microsoft Office
<ul style="list-style-type: none"> • Common extended self-containing prolog CESP 	Operating system software
<ul style="list-style-type: none"> • DRAGOON software 	<ul style="list-style-type: none"> • Job control language JCL
<ul style="list-style-type: none"> • E+ + 	<ul style="list-style-type: none"> • Linux
<ul style="list-style-type: none"> • Eiffel 	<ul style="list-style-type: none"> • Operating system shells
<ul style="list-style-type: none"> • Emerald 	Platform interconnectivity software
<ul style="list-style-type: none"> • Extended self-containing Prolog ESP 	<ul style="list-style-type: none"> • Migration software
<ul style="list-style-type: none"> • Greatis Object Inspector 	Presentation software
<ul style="list-style-type: none"> • Lisp object-oriented programming system LOOPS 	<ul style="list-style-type: none"> • Microsoft PowerPoint
<ul style="list-style-type: none"> • Microsoft Visual Basic.NET 	Program testing software
<ul style="list-style-type: none"> • Microsoft Visual C# .NET 	<ul style="list-style-type: none"> • Defect tracking software
<ul style="list-style-type: none"> • Modula 	<ul style="list-style-type: none"> • Dynamic analysis software
<ul style="list-style-type: none"> • Oberon 	<ul style="list-style-type: none"> • Functional testing software
<ul style="list-style-type: none"> • Objective-C 	<ul style="list-style-type: none"> • IBM Rational PurifyPlus
<ul style="list-style-type: none"> • Oblog 	<ul style="list-style-type: none"> • Integration testing software
	<ul style="list-style-type: none"> • Interoperability testing software
	<ul style="list-style-type: none"> • Load testing software



- Polka
- PowerSoft PowerBuilder
- Practical extraction and reporting language Perl
- Python
- Sather
- Self
- Simulation language SIMULA
- Smalltalk
- Sun Microsystems Java
- Object oriented data base management software
 - Microsoft Visual FoxPro
- Operating system software
 - Bourne Shell
 - Job control language JCL
- Program testing software
 - Debugging software
 - Low-level debugger software
 - Source code editor software
 - Symbolic debugger software
- Project management software
 - Microsoft Project
- Requirements analysis and system architecture software
 - Unified modeling language UML
- Spreadsheet software
 - Microsoft Excel
- Transaction server software
 - Customer information control system CICS software
- Web platform development software
 - Adobe Systems Adobe Cold Fusion
 - Adobe Systems Adobe Flex
 - Apache Struts
 - Asynchronous JavaScript and XML AJAX
 - Cascading Style Sheets CSS
 - Hypertext markup language HTML

- Mercury Interactive LoadRunner
- Mercury Interactive WinRunner
- Migration testing software
- Mutation testing software
- Recovery testing software
- Regression testing software
- Security testing software
- Source code editor software
- Static analysis software
- Stress testing software
- System testing software
- Test design software
- Test implementation software
- Unit testing software
- Usability testing software
- Project management software
 - Project management software
- Requirements analysis and system architecture software
 - IBM Rational Requisite Pro
 - Requirements management software
 - Unified modeling language UML
- Spreadsheet software
 - Microsoft Excel
- Transaction security and virus protection software
 - Encryption software
- Transaction server software
 - Apache software
 - Customer information control system CICS software
 - IBM Middleware
 - Microsoft Internet Information Service IIS
 - Object Management Group Object Request Broker
 - Web server software
- Web platform development software



<ul style="list-style-type: none"> • JavaScript 	<ul style="list-style-type: none"> • Adobe Systems Adobe Flex
<ul style="list-style-type: none"> • Microsoft Active Server Pages ASP 	<ul style="list-style-type: none"> • Apache Struts
<ul style="list-style-type: none"> • Microsoft ASP.NET 	<ul style="list-style-type: none"> • Cascading Style Sheets CSS
<ul style="list-style-type: none"> • Microsoft Silverlight 	<ul style="list-style-type: none"> • Extensible HyperText Markup Language XHTML
<ul style="list-style-type: none"> • Microsoft Visual C# 	<ul style="list-style-type: none"> • Extensible stylesheet language transformations XSLT
<ul style="list-style-type: none"> • PHP: Hypertext Preprocessor 	<ul style="list-style-type: none"> • Hypertext markup language HTML
<ul style="list-style-type: none"> • Ruby on Rails 	<ul style="list-style-type: none"> • JavaScript
<ul style="list-style-type: none"> • Sun Microsystems Java server pages JSP 	<ul style="list-style-type: none"> • Microsoft Active Server Pages ASP
Word processing software	<ul style="list-style-type: none"> • Microsoft ASP.NET
<ul style="list-style-type: none"> • Microsoft Word 	<ul style="list-style-type: none"> • PHP: Hypertext Preprocessor
Tools - Examples	<ul style="list-style-type: none"> • Ruby on Rails
<ul style="list-style-type: none"> • Computer servers 	Word processing software
<ul style="list-style-type: none"> • Desktop computers 	<ul style="list-style-type: none"> • Microsoft Word
<ul style="list-style-type: none"> • Mainframe computers 	Tools - Examples
<ul style="list-style-type: none"> • Serial port cards 	<ul style="list-style-type: none"> • Application servers
	<ul style="list-style-type: none"> • Desktop computers
	<ul style="list-style-type: none"> • Digital cameras
	<ul style="list-style-type: none"> • Flash disks
	<ul style="list-style-type: none"> • In circuit emulators ICE
	<ul style="list-style-type: none"> • Mainframe computers
	<ul style="list-style-type: none"> • Notebook computers
	<ul style="list-style-type: none"> • Personal digital assistants PDA

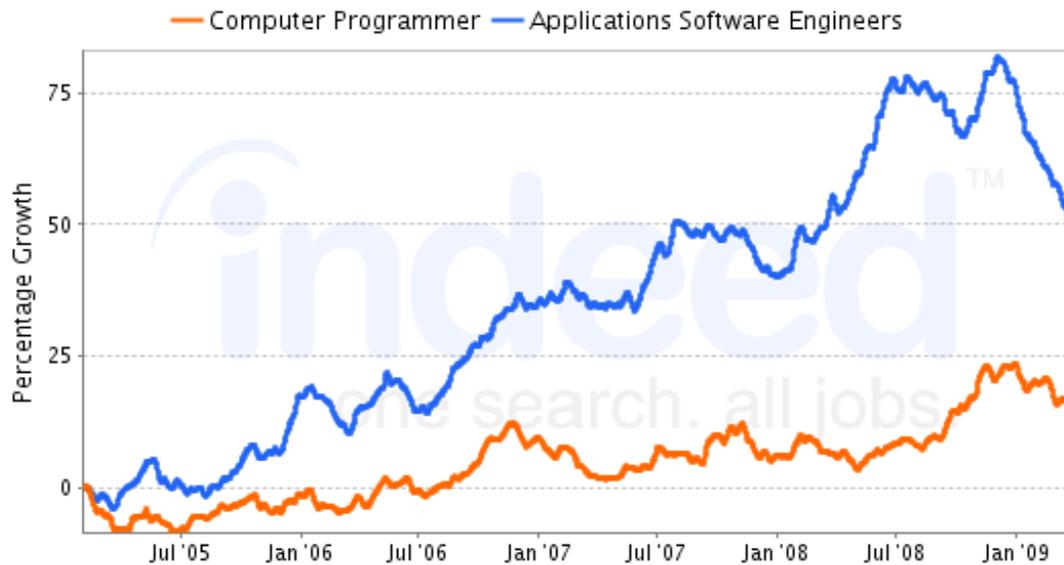
Labor Market Comparison			
Description	Computer Programmers	Computer Software Engineers, Applications	Difference
Median Wage	\$ 58,240	\$ 63,750	\$ 5,510
10th Percentile Wage	\$ 39,650	\$ 39,910	\$ 260
25th Percentile Wage	N/A	N/A	N/A
75th Percentile Wage	\$ 77,420	\$ 74,900	\$(2,520)
90th Percentile Wage	\$ 95,710	\$ 85,260	\$(10,450)
Mean Wage	\$ 62,540	\$ 62,580	\$ 40

Total Employment - 2007	720	1,060	340
Employment Base - 2006	761	1,045	284
Projected Employment - 2016	670	1,360	690
Projected Job Growth - 2006-2016	-11.9 %	30.1 %	42.1 %
Projected Annual Openings - 2006-2016	16	47	31

National Job Posting Trends

Trend for Computer Programmers Trend for Computer Software Engineers, Applications

Job Trends from Indeed.com



Data from [Indeed](http://Indeed.com)

Recommended Programs

Artificial Intelligence and Robotics

Artificial Intelligence and Robotics. A program that focuses on the symbolic inference, representation, and simulation by computers and software of human learning and reasoning processes and capabilities, and the modeling of human motor control and motions by computer-driven machinery. Includes instruction in computing theory, cybernetics, human factors, natural language processing, robot design, and applicable aspects of engineering, technology, and specific end-use applications. No schools available for the program

Information Technology

Information Technology. A program that focuses on the design of technological information systems, including computing systems, as solutions to business and research data and communications support needs. Includes instruction in the principles of computer hardware and software components, algorithms, databases, telecommunications, user tactics, application testing, and human interface design.

Institution	Address	City	URL
University of Maine		Orono	www.umaine.edu/



Programming

Computer Programming/Programmer, General. A program that focuses on the general writing and implementation of generic and customized programs to drive operating systems and that generally prepares individuals to apply the methods and procedures of software design and programming to software installation and maintenance. Includes instruction in software design, low- and high-level languages and program writing; program customization and linking; prototype testing; troubleshooting; and related aspects of operating systems and networks.

Institution	Address	City	URL
Wasington County Community College	One College Drive	Calais	www.wccc.me.edu
Northern Maine Community College	33 Edgemont Dr	Presque Isle	www.nmcc.edu

Information Sciences and Systems

Information Science/Studies. A program that focuses on the theory, organization, and process of information collection, transmission, and utilization in traditional and electronic forms. Includes instruction in information classification and organization; information storage and processing; transmission, transfer, and signaling; communications and networking; systems planning and design; human interfacing and use analysis; database development; information policy analysis; and related aspects of hardware, software, economics, social factors, and capacity.

Institution	Address	City	URL
Eastern Maine Community College	354 Hogan Rd	Bangor	www.emcc.edu

Computer Science

Computer Science. A general program that focuses on computers, computing problems and solutions, and the design of computer systems and user interfaces from a scientific perspective. Includes instruction in the principles of computational science, and computing theory; computer hardware design; computer development and programming; and applications to a variety of end-use situations.

Institution	Address	City	URL
Bowdoin College	5700 College Station - President's Office	Brunswick	www.bowdoin.edu
Bowdoin College	5700 College Station - President's Office	Brunswick	www.bowdoin.edu
University of Maine at Farmington	224 Main St	Farmington	www.umf.maine.edu
University of Maine at Farmington	224 Main St	Farmington	www.umf.maine.edu
University of Maine		Orono	www.umaine.edu/
University of Maine		Orono	www.umaine.edu/
University of Maine		Orono	www.umaine.edu/
University of Maine		Orono	www.umaine.edu/
University of Southern Maine	96 Falmouth St	Portland	www.usm.maine.edu
University of Southern Maine	96 Falmouth St	Portland	www.usm.maine.edu
University of Southern Maine	96 Falmouth St	Portland	www.usm.maine.edu
Colby College	Mayflower Hill Drive	Waterville	www.colby.edu
Colby College	Mayflower Hill Drive	Waterville	www.colby.edu

Computer Engineering

Computer Engineering, General. 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.



Institution	Address	City	URL
University of Maine		Orono	www.umaine.edu/
University of Maine		Orono	www.umaine.edu/
University of Maine		Orono	www.umaine.edu/
University of Maine		Orono	www.umaine.edu/
University of Maine		Orono	www.umaine.edu/

Computer Software Engineering

Computer Software Engineering. A program that prepares individuals to apply scientific and mathematical principles to the design, analysis, verification, validation, implementation, and maintenance of computer software systems using a variety of computer languages. Includes instruction in discrete mathematics, probability and statistics, computer science, managerial science, and applications to complex computer systems.

No schools available for the program

Computer Engineering Technologies/Technicians, Other

Computer Engineering Technologies/Technicians, Other. Any instructional program in computer engineering technologies not listed above.

No schools available for the program

Bioinformatics

Bioinformatics. A program that focuses on the application of computer-based technologies and services to biological, biomedical, and biotechnology research. Includes instruction in algorithms, network architecture, principles of software design, human interface design, usability studies, search strategies, database management and data mining, digital image processing, computer graphics and animation, CAD, computer programming, and applications to experimental design and analysis and to specific quantitative, modeling, and analytical studies in the various biological specializations.

No schools available for the program

Medical Informatics

Medical Informatics. A program that focuses on the application of computer science and software engineering to medical research and clinical information technology support, and the development of advanced imaging, database, and decision systems. Includes instruction in computer science, health information systems architecture, medical knowledge structures, medical language and image processing, quantitative medical decision modeling, imaging techniques, electronic medical records, medical research systems, clinical decision support, and informatics aspects of specific research and practice problems.

No schools available for the program

Medical Illustration and Informatics, Other

Medical Illustration and Informatics, Other. Any instructional program in medical illustration and informatics not listed above.

No schools available for the program

Maine Statewide Promotion Opportunities for Computer Programmers

O*NET Code	Title	Grand TORQ	Job Zone	Employment	Median Wage	Difference	Growth	Annual Job Openings
15-1021.00	Computer Programmers	100	4	720	\$58,240.00	\$0.00	-12%	16
15-1031.00	Computer Software Engineers, Applications	89	4	1,060	\$63,750.00	\$5,510.00	30%	47
15-1032.00	Computer Software Engineers, Systems Software	88	4	290	\$73,410.00	\$15,170.00	11%	8



15-1051.00	Computer Systems Analysts	86	4	1,650	\$69,340.00	\$11,100.00	20%	78
15-1061.00	Database Administrators	83	4	300	\$60,260.00	\$2,020.00	20%	11
15-1081.00	Network Systems and Data Communications Analysts	79	3	610	\$59,790.00	\$1,550.00	47%	54
15-2031.00	Operations Research Analysts	78	5	180	\$64,140.00	\$5,900.00	12%	6
11-3021.00	Computer and Information Systems Managers	78	5	870	\$83,130.00	\$24,890.00	8%	21
17-2071.00	Electrical Engineers	77	4	260	\$73,050.00	\$14,810.00	-10%	6
17-2072.00	Electronics Engineers, Except Computer	76	4	210	\$76,420.00	\$18,180.00	-26%	4
13-2051.00	Financial Analysts	76	4	210	\$71,380.00	\$13,140.00	10%	4
13-2052.00	Personal Financial Advisors	74	3	360	\$94,100.00	\$35,860.00	10%	13
17-2112.00	Industrial Engineers	73	4	580	\$68,350.00	\$10,110.00	11%	22
19-1041.00	Epidemiologists	73	5	20	\$58,250.00	\$10.00	20%	1
25-1054.00	Physics Teachers, Postsecondary	72	5	50	\$68,770.00	\$10,530.00	10%	2

Top Industries for Computer Software Engineers, Applications

Industry	NAICS	% in Industry	Employment	Projected Employment	% Change
Computer systems design and related services	541500	31.30%	158,601	256,965	62.02%
Software publishers	511200	7.28%	36,910	57,030	54.51%
Management of companies and enterprises	551100	4.37%	22,123	30,604	38.34%
Management, scientific, and technical consulting services	541600	3.16%	16,005	34,287	114.23%
Data processing, hosting, and related services	518200	2.58%	13,076	21,212	62.23%
Federal government, excluding postal service	919999	2.55%	12,903	14,638	13.44%
Navigational, measuring, electromedical, and control instruments manufacturing	334500	2.52%	12,763	14,663	14.89%
Securities and commodity contracts, brokerages, and exchanges	5231-2	2.42%	12,276	21,910	78.47%
Research and development in the physical, engineering, and life sciences	541710	2.39%	12,110	15,504	28.03%
Professional and commercial equipment and supplies merchant wholesalers	423400	2.39%	12,097	16,922	39.88%



Aerospace product and parts manufacturing	336400	2.28%	11,538	14,101	22.21%
Computer and peripheral equipment manufacturing	334100	2.15%	10,883	8,549	-21.45%
Colleges, universities, and professional schools, public and private	611300	1.81%	9,193	12,341	34.25%
Self-employed workers, primary job	000601	1.59%	8,071	10,318	27.84%
State government, excluding education and hospitals	929200	1.55%	7,869	9,266	17.75%

Top Industries for Computer Programmers

Industry	NAICS	% in Industry	Employment	Projected Employment	% Change
Computer systems design and related services	541500	30.52%	132,767	143,405	8.01%
Software publishers	511200	4.26%	18,545	19,103	3.01%
Management of companies and enterprises	551100	3.78%	16,457	15,177	-7.78%
Colleges, universities, and professional schools, public and private	611300	3.67%	15,950	14,275	-10.50%
Employment services	561300	2.94%	12,805	12,965	1.25%
Professional and commercial equipment and supplies merchant wholesalers	423400	2.83%	12,306	11,476	-6.75%
Self-employed workers, primary job	000601	2.61%	11,368	9,689	-14.77%
Data processing, hosting, and related services	518200	2.38%	10,362	11,206	8.15%
State government, excluding education and hospitals	929200	2.14%	9,330	7,325	-21.50%
Management, scientific, and technical consulting services	541600	1.92%	8,356	11,933	42.82%
Federal government, excluding postal service	919999	1.89%	8,206	6,206	-24.37%
Local government, excluding education and hospitals	939300	1.65%	7,193	6,464	-10.13%
Direct insurance (except life, health, and medical) carriers	524120	1.41%	6,151	5,143	-16.38%
Depository credit intermediation	522100	1.31%	5,698	4,648	-18.44%
Self-employed workers, secondary job	000602	1.31%	5,682	4,525	-20.36%