Program Awards in Cybersecurity (and Closely Related Programs) at Postsecondary Institutions in California, Five-Year Trends (continued)

	2012	2013	2014	2015	2016	5-Year Total
Likely Includes Cybersecurity (continued)						
Computer and Information Sciences, General	422	416	528	499	507	2,372
Associate degree	32	21	27	43	81	204
Award of at least 1 but less than 2 academic years	17	6	18	2	16	59
Award of less than 1 academic year	122	142	225	197	116	802
Bachelor's degree	179	140	146	167	190	822
Doctor's degree – research/scholarship	23	28	14	8	13	86
Master's degree	48	79	98	82	91	398
Postbaccalaureate certificate	1	0	0	0	0	1
Computer and Information Sciences, Other	38	57	271	151	150	667
Award of less than 1 academic year		5	195	41	4	245
Bachelor's degree	38	52	76	110	130	406
Master's degree					16	16
Postbaccalaureate certificate					0	0
Computer Engineering Technologies/Technicians, Other					0	0
Award of less than 1 academic year					0	0
Computer Engineering Technology/Technician	4	29	32	24	21	110
Bachelor's degree	4	29	32	24	21	110
Computer Hardware Technology/Technician				4	0	4
Award of less than 1 academic year				4	0	4
Computer Programming, Other		10	56	52	48	166
Award of less than 1 academic year		10	56	52	48	166
Computer Programming, Specific Applications		4	1	7	6	18
Bachelor's degree				0	0	0
Master's degree		4	1	7	6	18
Computer Programming/Programmer, General	519	574	864	804	964	3,725
Associate degree	172	225	236	222	298	1,153
Award of at least 1 but less than 2 academic years	105	74	91	72	109	451
Award of at least 2 but less than 4 academic years	1					1
Award of less than 1 academic year	219	244	480	430	475	1,848
Bachelor's degree	22	31	57	80	82	272
Computer Science	4,094	4,197	4,958	5,800	7,428	26,477
Associate degree	132	164	241	294	450	1281
Award of at least 1 but less than 2 academic years	2	5	3	6	5	21
Award of less than 1 academic year	13	59	88	63	31	254
Bachelor's degree	1,796	2,097	2,789	3,289	4,270	14,241
Doctor's degree – research/scholarship	196	229	256	230	187	1,098
Master's degree	1,955	1,643	1,581	1,918	2,485	9,582
Computer Software and Media Applications, Other	37	32	41	114	82	306
Associate degree	4	24	28	20	8	84
Award of at least 1 but less than 2 academic years	33	5	1	0	1	40
Award of less than 1 academic year			0	59	45	104

Program Awards in Cybersecurity (and Closely Related Programs) at Postsecondary Institutions in California, Five-Year Trends (continued)

	2012	2013	2014	2015	2016	5-Year Total
Likely Includes Cybersecurity (continued)						
Computer Software and Media Applications, Other (continued)						
Bachelor's degree	0	3	12	16	13	44
Master's degree				19	15	34
Computer Support Specialist	428	428	450	430	424	2,160
Associate degree	84	72	77	84	127	444
Award of at least 1 but less than 2 academic years	113	115	95	143	106	572
Award of less than 1 academic year	231	241	276	203	191	1,142
Bachelor's degree				2		2
Computer Systems Analysis/Analyst	3	110	245	202	204	764
Associate degree	1	2	3	1	2	9
Award of at least 1 but less than 2 academic years					1	1
Award of less than 1 academic year	2	4	91	82	90	269
Bachelor's degree		104	151	119	111	485
Computer Technology/Computer Systems Technology	828	457	402	89	114	1,890
Associate degree		2	2	1		5
Award of at least 1 but less than 2 academic years	710	387	275			1,372
Award of less than 1 academic year	118	68	125	88	114	513
Computer/Information Technology Services Administration and Management, Other	103	100	472	181	88	944
Associate degree	0	0	10	5	5	20
Award of at least 1 but less than 2 academic years	0	1	1			2
Award of at least 2 but less than 4 academic years	1					1
Award of less than 1 academic year	21	36	399	98	10	564
Bachelor's degree	40	32	27	57	59	215
Master's degree	39	28	32	21	14	134
Postbaccalaureate certificate	2	3	3	0	0	8
Informatics	39	29	37	49	89	243
Bachelor's degree	39	29	37	48	68	221
Master's degree			0	1	21	22
Information Science/Studies	172	136	179	113	276	876
Bachelor's degree	33	18	55	8	56	170
Doctor's degree – research/scholarship	20	10	7	15	15	67
Master's degree	119	108	117	90	205	639
Postbaccalaureate certificate	0	0	0	0	0	0
Information Technology	1,064	1,122	1,196	1,225	1,304	5,911
Associate degree	259	286	329	334	322	1,530
Award of at least 1 but less than 2 academic years	45	80	85	83	94	387
Award of less than 1 academic year	116	146	272	268	200	1,002
Bachelor's degree	452	438	356	378	363	1,987
Master's degree	192	172	142	150	319	975
Postbaccalaureate certificate			12	12	5	29
Post-master's certificate					1	1

Program Awards in Cybersecurity (and Closely Related Programs) at Postsecondary Institutions in California, Five-Year Trends (continued)

	2012	2013	2014	2015	2016	5-Year Total
Likely Includes Cybersecurity (continued)						
Information Technology Project Management	1	57	74	72	78	282
Award of less than 1 academic year		0	0	1	2	3
Bachelor's degree	1	52	71	68	75	267
Master's degree		5	3	2	1	11
Postbaccalaureate certificate				1		1
Web Page, Digital/Multimedia and Information Resources Design	601	677	763	702	651	3,394
Associate degree	85	170	168	148	111	682
Award of at least 1 but less than 2 academic years	38	96	173	117	77	501
Award of at least 2 but less than 4 academic years	0		0	0	0	0
Award of less than 1 academic year	172	112	93	89	73	539
Bachelor's degree	237	217	257	259	286	1,256
Master's degree	69	82	72	89	104	416
Postbaccalaureate certificate					0	0
Grand Total	**12,227**	**12,821**	**14,957**	**14,820**	**15,721**	**70,546**

Source: National Center for Educational Statistics, IPEDS Data

IPEDS Award levels

The eleven award levels under which completions can be reported are:

1. Postsecondary award, certificate, or diploma of (less than 1 academic year)

   - Less than 900 contact or clock hours

   - Less than 30 SEMESTER or TRIMESTER credit hours, or

   - Less than 45 QUARTER credit hours

2. Postsecondary award, certificate, or diploma of (at least 1 but less than 2 academic years)

   - At least 900, but less than 1800 contact or clock hours, or

   - At least 30, but less than 60 SEMESTER OR TRIMESTER HOURS

   - At least 45, but less than 90 QUARTER HOURS

3. Associate degree

   - An award that normally requires at least 2 but less than 4 years of full-time equivalent college work

4. Postsecondary award, certificate, or diploma of (at least 2 but less than 4 academic years)

   - 1800 or more contact or clock hours, or

   - 60 or more SEMESTER OR TRIMESTER credit hours, or

   - 90 or more QUARTER credit hours

APPENDIX F: PROGRAM AWARDS IN CYBERSECURITY

5. Bachelor's degree

    - An award (baccalaureate or equivalent degree, as determined by the Secretary, U.S. Department of Education) that normally requires at least 4 but not more than 5 years of full-time equivalent college-level work. This includes all bachelor's degrees conferred in a 5-year cooperative (work-study) program. A cooperative plan provides for alternate class attendance and employment in business, industry, or government; thus, it allows students to combine actual work experience with their college studies. Also includes bachelor's degrees in which the normal 4 years of work are completed in 3 years.

6. Postbaccalaureate certificate

    - An award that requires completion of an organized program of study beyond the bachelor's. It is designed for persons who have completed a baccalaureate degree, but does not meet the requirements of a master's degree.

7. Master's degree

    - An award that requires the successful completion of a program of study of at least the full-time equivalent of 1 but not more than 2 academic years of work beyond the bachelor's degree.

8. Post-master's certificate

    - An award that requires completion of an organized program beyond the master's degree, but does not meet the requirements of academic degrees at the doctor's level.

9. Doctor's degree – research/scholarship

    - A Ph.D. or other doctor's degree that requires advanced work beyond the master's level, including the preparation and defense of a dissertation based on original research, or the planning and execution of an original project demonstrating substantial artistic or scholarly achievement.

10. Doctor's degree – professional practice

    - A doctor's degree that is conferred upon completion of a program providing the knowledge and skills for the recognition, credential, or license required for professional practice. The degree is awarded after a period of study such that the total time to the degree, including both pre-professional and professional preparation, equals at least six full-time equivalent academic years.

11. Doctor's degree – other

    - A doctor's degree that does not meet the definition of a doctor's degree—research/scholarship or a doctor's degree—professional practice.

Definitions for each of these award levels can be found in the IPEDS Glossary:
https://surveys.nces.ed.gov/ipeds/VisGlossaryAll.aspx

APPENDIX G: CYBERSECURITY-RELATED CIP (CLASSIFICATION OF INSTRUCTIONAL PROGRAMS) CODES

National Center for Education Statistics

Classification of Instructional Programs – 2010

CIP Codes Relevant to Cybersecurity

11 Computer And Information Sciences and Support Services.

Key for Cybersecurity Program Focus:

☐ Cybersecurity Focused

☐ Includes Aspects of Cybersecurity

Otherwise = Likely Includes Cybersecurity

Instructional programs that focus on the computer and information sciences and prepare individuals for various occupations in information technology and computer operations fields.

11.0101 Computer and Information Sciences, General.
A general program that focuses on computing, computer science, and information science and systems. Such programs are undifferentiated as to title and content and are not to be confused with specific programs in computer science, information science, or related support services.

11.0102 Artificial Intelligence.
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 computer modeling of human motor control and motion. Includes instruction in computing theory, cybernetics, human factors, natural language processing, and applicable aspects of engineering, technology, and specific end-use applications.
See also: 14.4201 - Mechatronics, Robotics, and Automation Engineering.

11.0103 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.

11.0104 Informatics.
A program that focuses on computer systems from a user-centered perspective and studies the structure, behavior and interactions of natural and artificial systems that store, process and communicate information. Includes instruction in information sciences, human computer interaction, information system analysis and design, telecommunications structure and information architecture and management.
Examples:
- Social Informatics
See also: 26.1103 - Bioinformatics., 51.2706 - Medical Informatics.

11.0199 Computer and Information Sciences, Other.
Any instructional program in computer science not listed above.

11.0201 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.

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11.0202 Computer Programming, Specific Applications.
A program that prepares individuals to apply the knowledge and skills of general computer programming to the solution of specific operational problems and customization requirements presented by individual software users and organizational users. Includes training in specific types of software and its installation and maintenance.

11.0203 Computer Programming, Vendor/Product Certification.
A program that prepares individuals to fulfill the requirements set by vendors for professional qualification as certified installation, customization, and maintenance engineers for specific software products and/or processes. Includes training in specific vendor-supported software products and their installation and maintenance.

11.0299 Computer Programming, Other.
Any instructional program in computer programming not listed above.

11.0401 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.
See also: 25.0101 - Library and Information Science., 52.1201 - Management Information Systems, General.

11.0501 Computer Systems Analysis/Analyst.
A program that prepares individuals to apply programming and systems analysis principles to the selection, implementation, and troubleshooting of customized computer and software installations across the life cycle. Includes instruction in computer hardware and software; compilation, composition, execution, and operating systems; low- and high-level languages and language programming; programming and debugging techniques; installation and maintenance testing and documentation; process and data flow analysis; user needs analysis and documentation; cost-benefit analysis; and specification design.
See also: 14.2701 - Systems Engineering.

11.0701 Computer Science.
A program that focuses on computer theory, 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, computer development and programming, and applications to a variety of end-use situations.
See also: 14.0901 - Computer Engineering, General.

11.0801 Web Page, Digital/Multimedia and Information Resources Design.
A program that prepares individuals to apply HTML, XML, JavaScript, graphics applications, and other authoring tools to the design, editing, and publishing (launching) of documents, images, graphics, sound, and multimedia products on the World Wide Web. Includes instruction in Internet theory, web page standards and policies, elements of web page design, user interfaces, vector tools, special effects, interactive and multimedia components, search engines, navigation, morphing, e-commerce tools, and emerging web technologies.

APPENDIX G: CYBERSECURITY-RELATED CIP (CLASSIFICATION OF INSTRUCTIONAL PROGRAMS) CODES

11.0802 Data Modeling/Warehousing and Database Administration.

A program that prepares individuals to design and manage the construction of databases and related software programs and applications, including the linking of individual data sets to create complex searchable databases (warehousing) and the use of analytical search tools (mining). Includes instruction in database theory, logic, and semantics; operational and warehouse modeling; dimensionality; attributes and hierarchies; data definition; technical architecture; access and security design; integration; formatting and extraction; data delivery; index design; implementation problems; planning and budgeting; and client and networking issues.

11.0899 Computer Software and Media Applications, Other.

Any instructional program in computer software and media applications not listed above.

11.0901 Computer Systems Networking and Telecommunications.

A program that focuses on the design, implementation, and management of linked systems of computers, peripherals, and associated software to maximize efficiency and productivity, and that prepares individuals to function as network specialists and managers at various levels. Includes instruction in operating systems and applications; systems design and analysis; networking theory and solutions; types of networks; network management and control; network and flow optimization; security; configuring; and troubleshooting.

Examples:
- Computer Systems Telecommunications
- Computer Systems Networking

11.1001 Network and System Administration/Administrator.

A program that prepares individuals to manage the computer operations and control the system configurations emanating from a specific site or network hub. Includes instruction in computer hardware and software and applications; local area (LAN) and wide area (WAN) networking; principles of information systems security; disk space and traffic load monitoring; data backup; resource allocation; and setup and takedown procedures.

Examples:
- Network Administration

11.1002 System, Networking, and LAN/WAN Management/Manager.

A program that prepares individuals to oversee and regulate the computer system and performance requirements of an entire organization or network of satellite users. Includes instruction in performance balancing; redundancy; local area (LAN) and wide area (WAN) network management; system migration and upgrading; outage control; problem diagnosis and troubleshooting; and system maintenance, budgeting, and management.

11.1003 Computer and Information Systems Security/Information Assurance.

A program that prepares individuals to assess the security needs of computer and network systems, recommend safeguard solutions, and manage the implementation and maintenance of security devices, systems, and procedures. Includes instruction in computer architecture, programming, and systems analysis; networking; telecommunications; cryptography; security system design; applicable law and regulations; risk assessment and policy analysis; contingency planning; user access issues; investigation techniques; and troubleshooting.

Examples:
- Information Assurance
- IT Security
- Internet Security
- Network Security
- Information Systems Security

See also: 43.0116 - Cyber/Computer Forensics and Counterterrorism.

APPENDIX G: CYBERSECURITY-RELATED CIP (CLASSIFICATION OF INSTRUCTIONAL PROGRAMS) CODES

11.1004 Web/Multimedia Management and Webmaster.

A program that prepares individuals to develop and maintain web servers and the hosted web pages at one or a group of web sites, and to function as designated webmasters. Includes instruction in computer systems and networks, server installation and maintenance, web page design and editing, information resources management, web policy and procedures, Internet applications of information systems security, user interfacing and usability research, and relevant management and communications skills.

Examples:

- Website Development

- Web Development

- Webmaster

11.1005 Information Technology Project Management.

A program that prepares individuals to design, develop, and manage information technology projects in a variety of companies and organizations. Includes instruction in principles of project management, risk management, procurement and contract management, information security management, software management, organizational principles and behavior, communications, quality assurance, financial analysis, leadership, and team effectiveness.

See also: 52.0211 - Project Management.

11.1006 Computer Support Specialist.

A program that prepares individuals to provide technical assistance, support, and advice to computer users to help troubleshoot software and hardware problems. Includes instruction in computer concepts, information systems, networking, operating systems, computer hardware, the Internet, software applications, help desk concepts and problem solving, and principles of customer service.

Examples:

- Technical Support Specialist

- Help Desk Specialist

- IT Support Specialist

11.1099 Computer/Information Technology Services Administration and Management, Other.

Any instructional program in computer/information technology services administration and management not listed above.

See also: 51.0706 - Health Information/Medical Records Administration/Administrator.

11.9999 Computer and Information Sciences and Support Services, Other.

Any instructional program in computer and information sciences and support services not listed above.

15 Engineering Technologies and Engineering-Related Fields.

Instructional programs that prepare individuals to apply basic engineering principles and technical skills in support of engineering and related projects or to prepare for engineering-related fields.

15.1201 Computer Engineering Technology/Technician.

A program that prepares individuals to apply basic engineering principles and technical skills in support of computer engineers engaged in designing and developing computer systems and installations. Includes instruction in computer electronics and programming, prototype development and testing, systems installation and testing, solid state and microminiature circuitry, peripheral equipment, and report preparation.

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15.1202 Computer Technology/Computer Systems Technology.

A program that prepares individuals to apply basic engineering principles and technical skills in support of professionals who use computer systems. Includes instruction in basic computer design and architecture, programming, problems of specific computer applications, component and system maintenance and inspection procedures, hardware and software problem diagnosis and repair, and report preparation.

See also: 47.0104 - Computer Installation and Repair Technology/Technician.

15.1203 Computer Hardware Technology/Technician.

A program that prepares individuals to apply basic engineering principles and technical skills to support engineers in designing computer hardware and peripheral systems. Includes instruction in computer systems design, computer architecture, computer electronics, processors, peripherals, testing equipment, and computer manufacturing processes.

15.1204 Computer Software Technology/Technician.

A program that prepares individuals to apply basic engineering principles and technical skills to support engineers in developing, implementing, and evaluating computer software and program applications. Includes instruction in computer programming, programming languages, databases, user interfaces, networking and warehousing, encryption and security, software testing and evaluation, and customization.

15.1299 Computer Engineering Technologies/Technicians, Other.

Any instructional program in computer engineering technologies not listed above.

29 Military Technologies and Applied Sciences.

Instructional programs that prepare individuals in specialized and advanced subject matter for the armed services and related national security organizations, including intelligence operations, military applied sciences, and military technologies.

29.0207 Cyber/Electronic Operations and Warfare.

A program that focuses on the technological and operation aspects of information warfare, including cyber attack and cyber defense. Includes instruction in computer and network security, cryptography, computer forensics, systems security engineering, software applications, threat and vulnerability assessment, wireless networks and satellite communications, tactical and strategic planning, legal and ethical issues, and cyber warfare systems development and acquisition.

Examples:
- Cyberspace Operations
- Electronic Warfare
- Information Warfare

APPENDIX G: CYBERSECURITY-RELATED CIP (CLASSIFICATION OF INSTRUCTIONAL PROGRAMS) CODES

43 Homeland Security, Law Enforcement, Firefighting and Related Protective Services.

Instructional programs that focus on the principles and procedures for providing homeland security, police, fire, and other safety services and managing penal institutions. Note: this series is titled "Security and Protective Services" in the Canadian CIP.

43.0116 Cyber/Computer Forensics and Counterterrorism.
A program focusing on the principles and techniques used to identify, search, seize and analyze digital media and to conduct cyber investigations against criminal and terrorist activity. Includes instruction in computer boot processes and drives, jumper setting, file access and reconstruction, hacking, network systems, cryptography, programming, investigative techniques, forensic imagery, web-based investigation methods, cyberterrorism, and applicable laws and administrative procedures.
Examples:
- Internet Investigation
See also: 11.1003 - Computer and Information Systems Security/Information Assurance.

43.0301 Homeland Security.
A program focusing on security policy, planning and operations dedicated to the protection of U.S. territory, assets, infrastructure, institutions and citizens from external threats. Includes instruction in national security policy, government relations, intelligence, law enforcement, security technology, communications and information technology, homeland security planning and operations, disaster planning and applications to specific threat scenarios.

43.0303 Critical Infrastructure Protection.
A program focusing on the design, planning and management of systems and procedures for protecting critical national physical and cyber infrastructure from external threats, including terrorism. Includes instruction in homeland security policy, critical infrastructure policy, information security, matrix vulnerability assessment, threat assessment, physical security, personnel security, operational security, contingency planning, case analyses of specific industries and systems, redundancy planning, emergency and disaster planning, security systems, and intelligence operations.

52 Business, Management, Marketing, and Related Support Services.

Instructional programs that prepare individuals to perform managerial, technical support, and applied research functions related to the operation of commercial and non-profit enterprises and the buying and selling of goods and services.

52.1201 Management Information Systems, General.
A program that generally prepares individuals to provide and manage data systems and related facilities for processing and retrieving internal business information; select systems and train personnel; and respond to external data requests. Includes instruction in cost and accounting information systems, management control systems, personnel information systems, data storage and security, business systems networking, report preparation, computer facilities and equipment operation and maintenance, operator supervision and training, and management information systems policy and planning.
See also: 11.0401 - Information Science/Studies.