

# *ICT Pathways, State CTE Model Curriculum Standards and*

# Internet Engineering & Cybersecurity



# ICT Skills Are Needed Everywhere

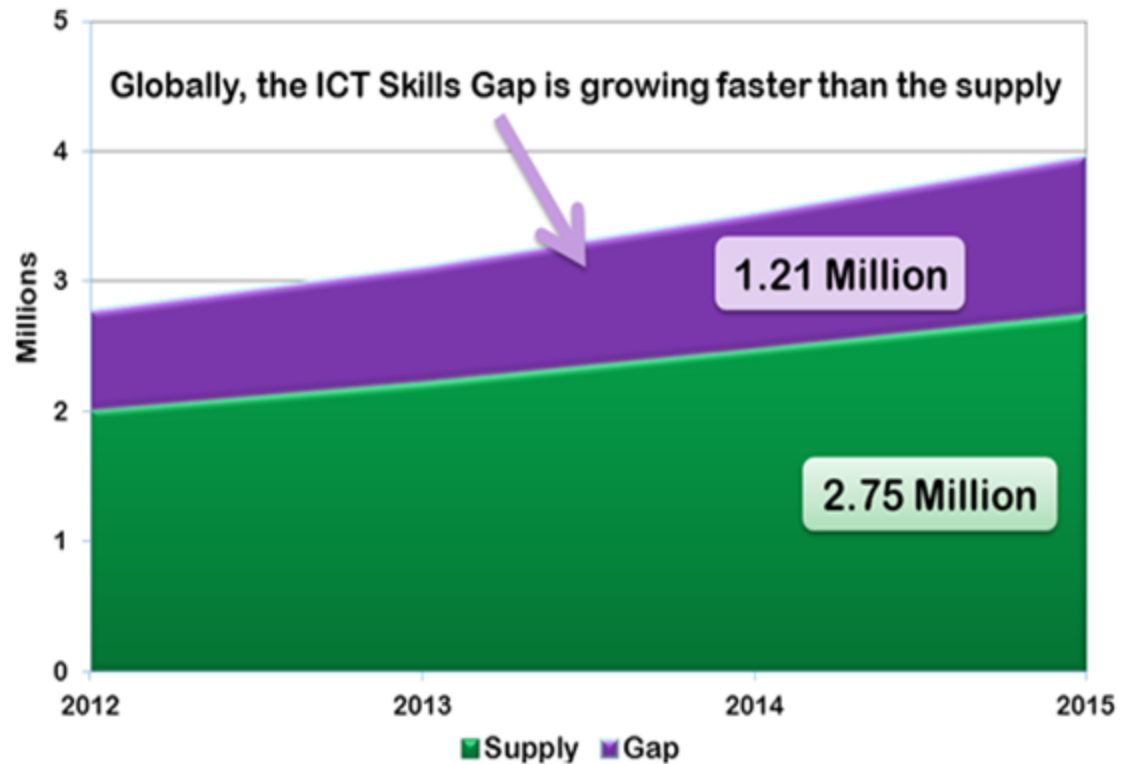
- ICT and networking careers exist in every industry: financial services, fashion, entertainment, healthcare, and more
- Virtually no limits — nearly every organization relies on ICT for success



# Addressing the ICT Skills Gap

93%

of U.S. employers report a gap between current and desired skills of ICT staff



# IT versus Computer Science

## IT

- Users of technology
- Use existing operating systems, software, and applications to solve a business need
- May interact with clients, co-workers
- Study network and database design

## Computer Science

- Focus on the theory of computational applications
- Learn linear and discrete mathematics
- Software design and development
- Understand how and why computer processes operate the way they do

# LMI Data – Bay Area

## 5-Year Projected Occupation Data, Computer & Mathematical Occupations

SOC	Occupation	2015 Jobs	5-Yr Change	5-Yr % Change	5-Yr Replacements	Annual Openings	Median Hourly Earnings	Typical Entry Level of Education (% of Workers with Associate or Some College) <sup>19</sup>
15-1151	Computer User Support Specialists	23,515	5,198	22%	1,773	1,394	\$32.86	Some college, no degree (45%)
15-1142	Network & Computer Systems Administrators	16,985	2,614	15%	1,266	776	\$48.85	Bachelor's degree (40%)
15-1134	Web Developers	10,765	2,777	26%	820	719	\$40.19	Associate (27%)
15-1199	Computer Occupations, All Other	10,723	1,172	11%	832	401	\$52.46	Bachelor's degree (37%)
15-1152	Computer Network Support Specialists	7,972	1,382	17%	582	393	\$39.65	Associate (45%)
15-1143	Computer Network Architects	7,311	1,216	17%	613	366	\$65.03	Bachelor's degree (37%)

# Comparison of Entry & Experienced Wages with Living Wages for Computer & Mathematical Occupations








# California's Career Technical Education:

## Preparing Students for the 21st Century

California's workforce has access to a pool of talent that both attracts the world's leading businesses and hastens the development and success of new ones, creating


every enterprise in California—public and private—has access to a pool of talent that both attracts the world's leading businesses and hastens the development and success of new ones, creating

### INDUSTRY SECTORS



**Engineering and Architecture**

- Architectural Design
- Engineering Technology
- Engineering Design
- Environmental Engineering



**Building and Construction Trades**

- Cabinetry, Millwork, and Woodworking
- Engineering and Heavy Construction
- Mechanical Systems Installation and Repair
- Residential and Commercial Construction



**Transportation**

- Operations
- Structural Repair and Refinishing
- Systems Diagnostics, Service, and Repair



**Fashion and Interior Design**

- Fashion Design and Merchandising
- Interior Design
- Personal Services



**Education, Child Development, and Family Services**

- Child Development
- Consumer Services
- Education
- Family and Human Services



**Arts, Media, and Entertainment**

- Design, Visual, and Media Arts
- Performing Arts
- Production and Managerial Arts
- Game Design and Animation



**Manufacturing and Product Development**

- Graphic Production



**Business and Finance**

- Business Management
- Financial Services
- International Business

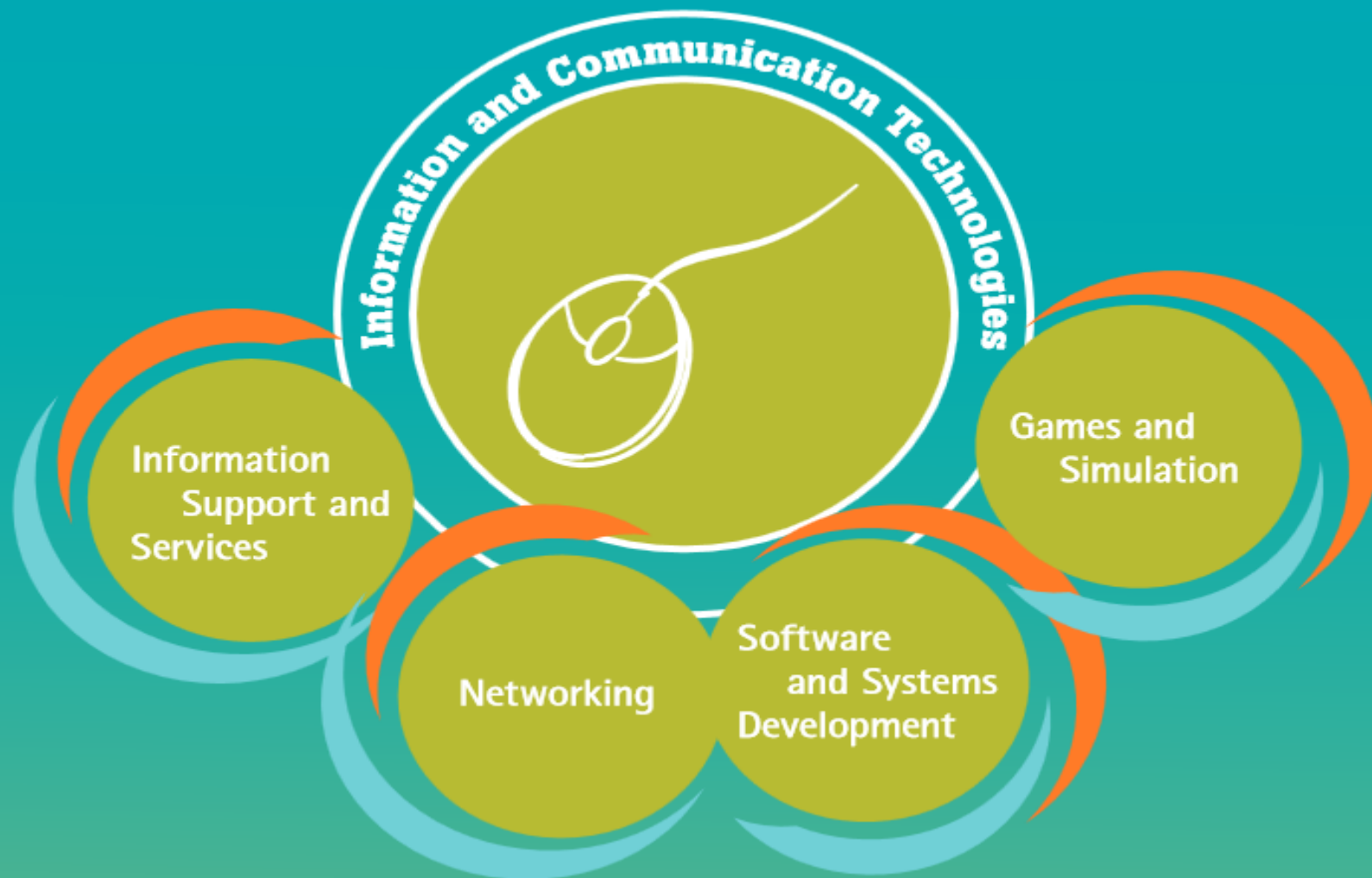


**Information and Communication Technologies**

- Information Support and Services
- Networking
- Software and Systems Development
- Games and Simulation



ADOPTED BY THE CALIFORNIA STATE BOARD OF EDUCATION, JANUARY 2013





## Information and Communication Technologies Pathway Standards






### A. Information Support and Services Pathway

Students in the Information Support and Services pathway prepare for careers that involve the implementation of computer services and software, support of multimedia products and services, provision of technical assistance, creation of technical documentation, and the administration and management of information and communication systems. Mastery of information and communication technologies is the foundation for all successful business organizations today. Persons with expertise in information and communication technologies support and services are in high demand for a variety of positions in business and industry.

### B. Networking Pathway

Students in the Networking pathway prepare for careers that involve network analysis, planning, and implementation, including the design, installation, maintenance, and management of network systems. The successful establishment, maintenance, and securing of information and communication technologies infrastructure is critical to the success of every twenty-first-century organization. Employment continues to grow for persons with expertise in networking.

Sample occupations associated with this pathway:

-  Computer Security Specialist
-  Network Technician
-  Network Engineer
-  Network Administrator
-  Telecommunication Specialist



# ICT Support and Services Pathway

## Networking Pathway

## Software and Systems Development Pathway

## Games and Simulations



# ICT Support and Services Pathway

## Networking Pathway

## Software and Systems Development Pathway

## Games and Simulations



# College Model Curriculum



# C-ID

COURSE IDENTIFICATION NUMBERING SYSTEM

[Home](#)[Descriptors](#)[Course Review](#)[Courses](#)[TMC](#)[Resources](#)[Art. Officers](#)

## Transfer Model Curriculum Information

In response to Senate Bill 1440 (Padilla, 2010), the Academic Senates for California Community Colleges and California State University decided to develop a faculty-led, state-wide, concerted effort to identify the course content for new **associate degrees for transfer**, which simultaneously award students an associate degree and prepare them for special benefits/guarantees upon transfer to CSU.

## Resources

- [TMC Overview \(pdf\)](#)
- [TMC Development Guidelines \(doc\)](#)
- [TMC Process Flowchart \(doc\)](#)
- [CCC Chancellor's Office TMC Templates for ADTs & Relevant Memos](#)
- [Transfer Degree Task List \(doc\)](#)

# IT - Model Curriculum



## Required Core Courses:

13 units

Title (units)	C-ID Designation	Rationale
Information & Communication Technology Essentials (4)	ITIS 110 (draft)	Essential Preparation
Business Information Systems, Computer Information Systems (3)	ITIS 120	Essential Preparation
Introduction to Programming Concepts and Methodologies (3)	ITIS 130 (draft) or COMP 112	Essential Preparation
Computer Network Fundamentals (3)	ITIS 150 (draft)	Essential Preparation

## Select 6 units or 2 courses from the following:

Introduction to Systems Analysis and Design (3)	ITIS 140 (draft)	Important Preparation
Systems and Network Administration (3)	ITIS 155 (draft)	Important Preparation
Routing and Switching Essentials (3)	ITIS 156 (draft)	Important Preparation
Introduction to Information Systems Security (3)	ITIS 160 (draft)	Important Preparation
Information Assurance and Cybersecurity (3)	ITIS 164 (draft)	Important Preparation
Computer Forensics Fundamentals (3)	ITIS 165 (draft)	Important Preparation
Introduction to Database Management Systems (3)	ITIS 180 (draft)	Important Preparation
Business Communication (3)	BUS 115	Important Preparation

## Select 3 - 4 units or 1 course from the following:

Introduction to Statistics (3)	MATH 110	Also fulfills CSU GE Area B4
Finite Mathematics (3)	MATH 130	Also fulfills CSU GE Area B4
Business Calculus (3)	MATH 140	Also fulfills CSU GE Area B4
Single Variable Calculus I Early Transcendentals (4)	MATH 210	Also fulfills CSU GE Area B4

Home

Descriptors

## Transfer Model

In response to Senate Bill Senates for California Co University decided to dev effort to identify the cour **transfer**, which simulta and prepare them for spe CSU.

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# IT Technician Pathway

## Three Stages Along a Single Pathway to Career Success



### COMPUTER RETAIL SALES & SUPPORT - Basic Skills

Take the first step into the world of information communications by working in retail sales of computers, handheld devices, networking services or cell phones.

*Increase your marketability and on-the-job success by taking the first six IT Pathways courses and the A+ Certification exam.*



### HELP DESK / USER SUPPORT - Add Skills

A greater knowledge of computers and networking can lead to employment in Help Desk/User Support. This function can be performed in-store, onsite, or more commonly, online.

*Build on the IT Pathway by completing three additional courses listed.*



### IT TECHNICIAN - Add More Skills

Advancing beyond basic Help Desk/User Support requires greater technical knowledge and specialization, as there are different directions of employment growth.

*The IT Pathways courses listed teach advanced concepts in security, database management, programming, and virtualization.*

[View Pathway Courses & Certifications](#)

While the suggested curriculum can be completed in two years, keep in mind that experience and practice are true keys to success and advancement in IT. Pacing your learning and experience together may be a better long-term investment.

[ITTP Home](#)

[What is ITTP?](#)

[Find Courses](#)

[Connect With Peers](#)

[Get Certified](#)

[Get Hired](#)

[CCC Faculty & Administrators](#)



# IT Technician Pathway (ITTP)

	Course Name or Topic	Relevant 3rd Party Certification
Computer Retail Sales & Support  Stage 1	Introduction to Retail or Business Fundamentals	CompTIA A+
	Customer Service/Human Relations	
	Business Communications	
	Microsoft Office Essentials	
	Information & Communications Technology Essentials	
Help Desk User Support  Stage 2	Business Information Systems, Computer Information Systems	CompTIA Network+ MCSA Server 2012 Microsoft MCTE CompTIA Security+
	Computer Network Fundamentals	
	Systems and Network Administration (Network Operating Systems)	
	Installing, Configuring & Administering a Microsoft OS (Desktop Support Tech I)	
IT Technician  Stage 3	Introduction to Information Security Systems	Cisco CCENT CompTIA Linux+ CEH by E.C.
	Routing & Switching Essentials	
	Installing, Configuring and Administering Linux Operating System	
Further Specialization Options	Certified Ethical Hacker	CompTIA Mobility+ Cisco CCNA CompTIA Cloud+ CompTIA Project+
	Mobility and Mobile Design	
	Preparation for CCNA	
	Cloud Essentials	
	Project Management or Process Improvement	

# Four-Year Pathway Program

- 9<sup>th</sup> Grade Introduction to Computers/Technology

★ 10<sup>th</sup> Grade Cybersecurity ICT Essentials – Cisco IT Essentials (CompTIA A+ certification)

★ 11<sup>th</sup> Grade Internet Engineering I – Computer Introduction to Networks

★ 12<sup>th</sup> Grade Internet Engineering II – Routing and Switching Essentials (CCENT Certification)



# A-G designation

**g - Elective - 1 year required**

One year (two semesters), in addition to those required in "a-f" above.

Course Title	Transcript Abbreviation(s)	Category
Computer Programming C++ (ROP)	Computer Programming C++	Math
Internet Engineering 1 ROP	IntEngr1	Interdisciplinary
Math Programming Pascal (ROP)	Math Programming Pascal	Math

**UC/CSU - Approved Course List**

Pioneer High School

College Board Code: 053861

**College-Preparatory Elective ("g")** 1 year required

*One unit (equivalent to one year) chosen from the "a-f" courses beyond those used to satisfy the requirements of the "a-f" subjects, or courses that have been approved solely in the elective area.*

Title	Transcript Abbreviation(s)	Discipline	Honors Type	Course Notes
Internet Engineering 1 (ROP)	IntEngr1	Interdisciplinary		
Internet Engineering 2 (ROP)	InternetEngineering2	Interdisciplinary		



UNIVERSITY

A-G

OF  
CALIFORNIA

UNIVERSITY  
OF  
CALIFORNIA

A-G  
Course List

UC/CSU

Prior

UC/CSU - Approved Course List

Santa Clara High School

College Board Code: 053280

College

One unit  
required

College-Preparatory Elective ("g") 1 year required

One unit (equivalent to one year) chosen from the "a-f" courses beyond those used to satisfy the requirements of the "a-f" subjects, or courses that have been approved solely in the elective area.

Title

Title	Transcript Abbreviation(s)	Discipline	Honors Type	Course Notes
Internet Engineering 1 (ROP)	Internet Engner	Interdisciplinary		
Internet Engineering 2	InternetEngineering2	Interdisciplinary		

UNIVERSITY A-G

OF UNIVERSITY A-G  
CAL OF Course List

UNIVERSITY A-G  
OF Course List  
CALIFORNIA

UC/CSU - Approved Course List

Culver City High School

College Board Code:050715

College-Preparatory Elective ("g") 1 year required

One unit (equivalent to one year) chosen from the "a-f" courses beyond those used to satisfy the requirements of the "a-f" subjects, or courses that have been approved solely in the elective area.

Title	Transcript Abbreviation(s)	Discipline	Honors Type	Course Notes
CTE IT Essentials	IT Essentials	Interdisciplinary		



# Cyberpatriots and the Cisco Academy Program

**Building the Pathway**



# Cybersecurity Skills Crisis

## Too Many Threats

 **62%**  
INCREASE  
IN BREACHES  
IN 2013<sup>1</sup>

**1 IN 5**   
ORGANIZATIONS  
HAVE EXPERIENCED  
AN APT ATTACK<sup>2</sup>

**US \$3**  
TRILLION  
TOTAL GLOBAL  
IMPACT OF  
CYBERCRIME<sup>3</sup>

 **8 MONTHS**  
IS THE AVERAGE TIME  
AN ADVANCED THREAT  
GOES UNNOTICED ON  
VICTIM'S NETWORK<sup>4</sup>

**2.5**  
BILLION   
EXPOSED RECORDS AS  
A RESULT OF A DATA BREACH  
IN THE PAST 5 YEARS<sup>5</sup>

## Too Few Professionals

 **62%**  
OF ORGANIZATIONS  
HAVE NOT INCREASED  
SECURITY TRAINING  
IN 2014<sup>6</sup>

 **1 OUT OF 3**  
SECURITY PROS ARE  
NOT FAMILIAR WITH  
ADVANCED PERSISTENT  
THREATS<sup>7</sup>

 **<2.4%**  
GRADUATING STUDENTS  
HOLD COMPUTER  
SCIENCE DEGREES<sup>8</sup>

 **1 MILLION**  
UNFILLED SECURITY  
JOBS WORLDWIDE<sup>9</sup>

**83%**   
OF ENTERPRISES CURRENTLY  
LACK THE RIGHT SKILLS AND  
HUMAN RESOURCES TO PROTECT  
THEIR IT ASSETS<sup>10</sup>

Enterprises are under siege from  
**a rising volume of cyberattacks.**

At the same time, the global demand for skilled professionals sharply outpaces supply. Unless this gap is closed, organizations will continue to face major risk. Comprehensive educational and networking resources are required to meet the needs of everyone from entry-level practitioners to seasoned professionals.

**SOURCES:** 1. Increased Cyber Security Can Save Global Economy Trillions, McKinsey/World Economic Forum, January 2014; 2. M Trends 2013: Attack the Security Gap, Mandiant, March 2013; 3. Increased Cyber Security Can Save Global Economy Trillions, McKinsey/World Economic Forum, January 2014; 4. ISACA's 2014 APT Study, ISACA, April 2014; 5. Increased Cyber Security Can Save Global Economy Trillions, McKinsey/World Economic Forum, January 2014; 6. ISACA's 2014 APT Study, ISACA, April 2013; 7. ISACA's 2014 APT Study, ISACA, April 2014; 8. Code.org, February 2014; 9. 2014 Cisco Annual Security Report; 10. Cybersecurity Skills Haves and Have Nots, ESG, March 2014





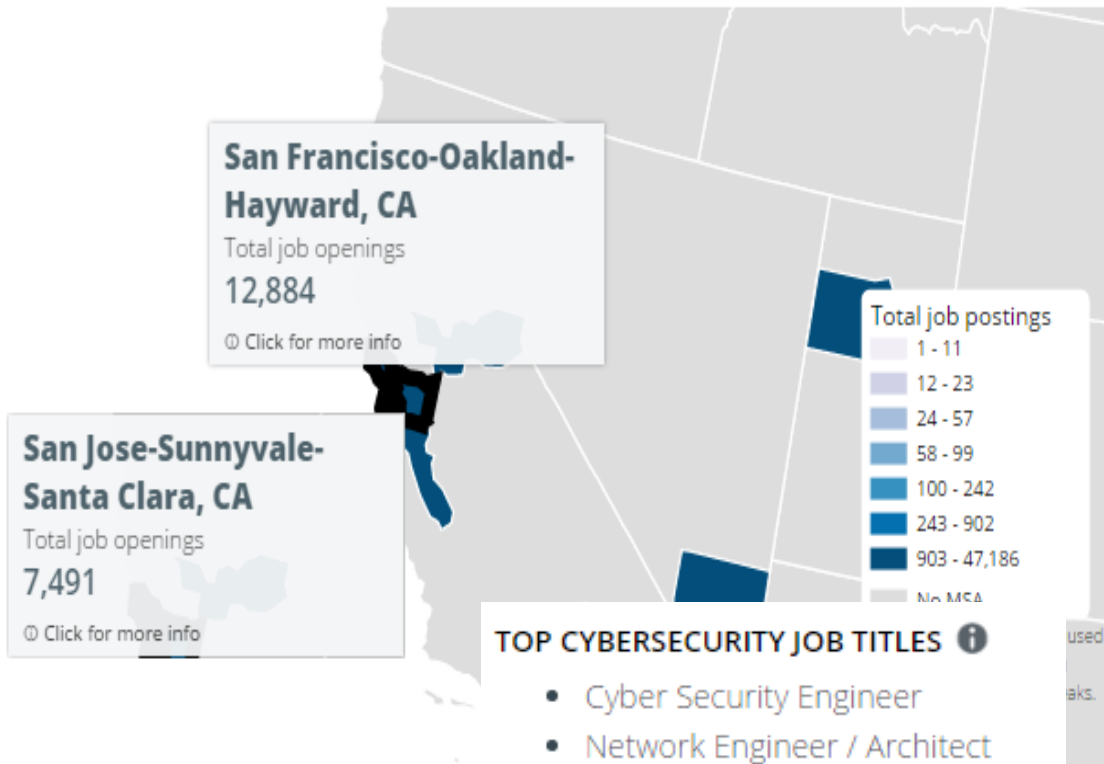
# Cybersecurity Supply/Demand Heat Map

Cybersecurity talent gaps exist across the country. Closing these gaps requires detailed knowledge of the cybersecurity workforce in your region. This interactive heat map provides a granular snapshot of demand and supply data for cybersecurity jobs at the state and metro area levels, and can be used to grasp the challenges and opportunities facing your local cybersecurity workforce.

Total job openings ▾

Search Metro Area 🔍

Filter Metro Area by population

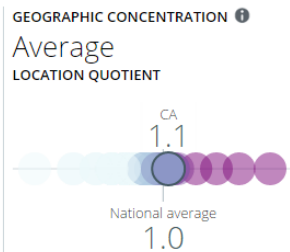
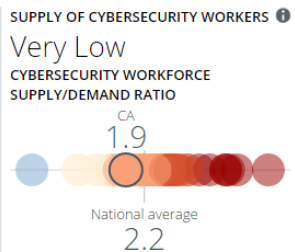


- Zoom out

## California

TOTAL CYBERSECURITY JOB OPENINGS ⓘ  
45,062

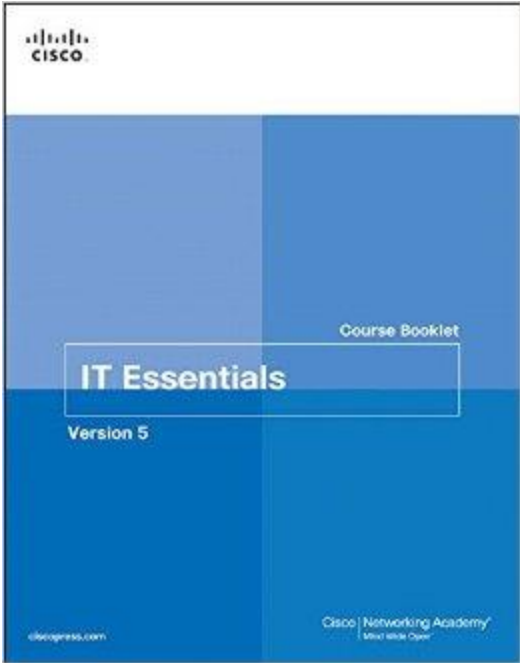
TOTAL EMPLOYED CYBERSECURITY WORKFORCE  
84,415



- TOP CYBERSECURITY JOB TITLES ⓘ
- Cyber Security Engineer
  - Network Engineer / Architect
  - Auditor
  - Software Developer / Engineer
  - Systems Engineer
  - Systems Administrator
  - IT Director
  - Systems Analyst
  - Computer Support Specialist

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- Cyber Security Engineer
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  - Systems Engineer
  - Systems Administrator
  - IT Director
  - Systems Analyst
  - Computer Support Specialist

# IT-Essentials and Cyberpatriots



# CYBERPATRIOT

The National Youth Cyber Education Program



*Securing Networks, Securing Futures*





AIR FORCE ASSOCIATION'S  
**CYBERPATRIOT**  
THE NATIONAL YOUTH CYBER EDUCATION PROGRAM

presented by  
**NORTHROP GRUMMAN**  
Foundation



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CYBERPATRIOT VII IS UNDER WAY! CP-VII National Finals Competition: March 11-15, 2015 [More Info](#)



#### LATEST NEWS

[VIEW ALL](#)



Participant Kits are on the way!  
Check the status of your team's participant kit... [\[More\]](#)

CyberPatriot VII Rules Book Released  
The CyberPatriot VII National Youth Cyber Defense Competition Rules Book is now available... [\[More\]](#)

#### SPONSORS



# Cyberpatriot Competition



**#CyberPatriot #Nationals #Team404**





# Skills Participants Learn

- Leadership and teamwork
- Creative and analytical problem solving
- Non-technical cyber principles (e.g.—social engineering, phishing, vishing, spear-phishing, etc.)
  - “Netiquette”
  - Cyber safety
  - Cyber hygiene
- Computing and networking principles
  - Operating systems
  - Network topologies & cabling
- Foundational cyber security principles
  - Cyber and system vulnerabilities
  - Network security
  - Vulnerability remediation
  - Technical threats





AIR FORCE ASSOCIATION'S

# CYBERPATRIOT

THE NATIONAL YOUTH CYBER EDUCATION PROGRAM

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## ARCHIVED TRAINING MODULES

**NOTE:** These training materials have been archived from the CyberPatriot VII season. Coaches, Mentors, and Parents can access the most recent training materials by logging into their accounts and viewing the "Resources" page.

Are you unsure of how to start training for CyberPatriot? Then this page is for you! These training modules are the ones that all teams will find in each of their virtual machine images, but they are not all-inclusive. After examining the training materials, teams should explore the other topics using the other links on the menu to the left. It is highly recommended that teams use the expert advice and resources to have greater success in the competition.

- **Unit 0: Cyber Ethics** - This module outlines the fundamentals of ethical behavior in the digital world. Topics include:
  - Important definitions
  - Ethical behavior
  - Ethics and cybersecurity
  - Ethics applications
- **Unit 1: Introduction to CyberPatriot and Cybersecurity** - This module contains information about cybersecurity concepts in general. Topics include:
  - CP-VII basics
  - The importance of cybersecurity
  - Cyber careers
- **Unit 2: Online Safety** - This module outlines ways to stay safe on the Internet. Topics include:
  - Cyberbullying
  - Personally identifiable information
  - Social media tips
- **Unit 3: Computer Basics and Virtual Machines** - This module provides information about





AIR FORCE ASSOCIATION'S

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AKA Networking

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Las Positas College



Amador Valley CyberCamp



ASSOCIATION'S  
**CYBERPATRIOT**  
PROGRAM



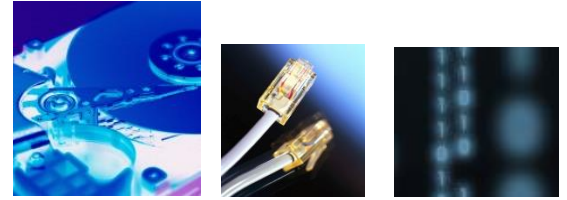
**PT**  
PROGRAM



AIR FORCE ASSOCIATION  
**CYBER**  
THE NATIONAL YOUTH



Align with the new California CTE Model Curriculum Standards



# ICT Support and Services Pathway

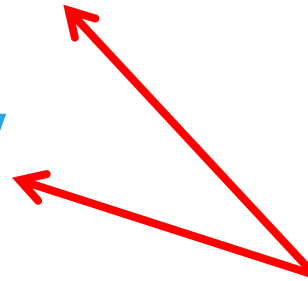
IT Essentials

## Networking Pathway

IE1 (CCNA1) and IE2 (CCNA2)

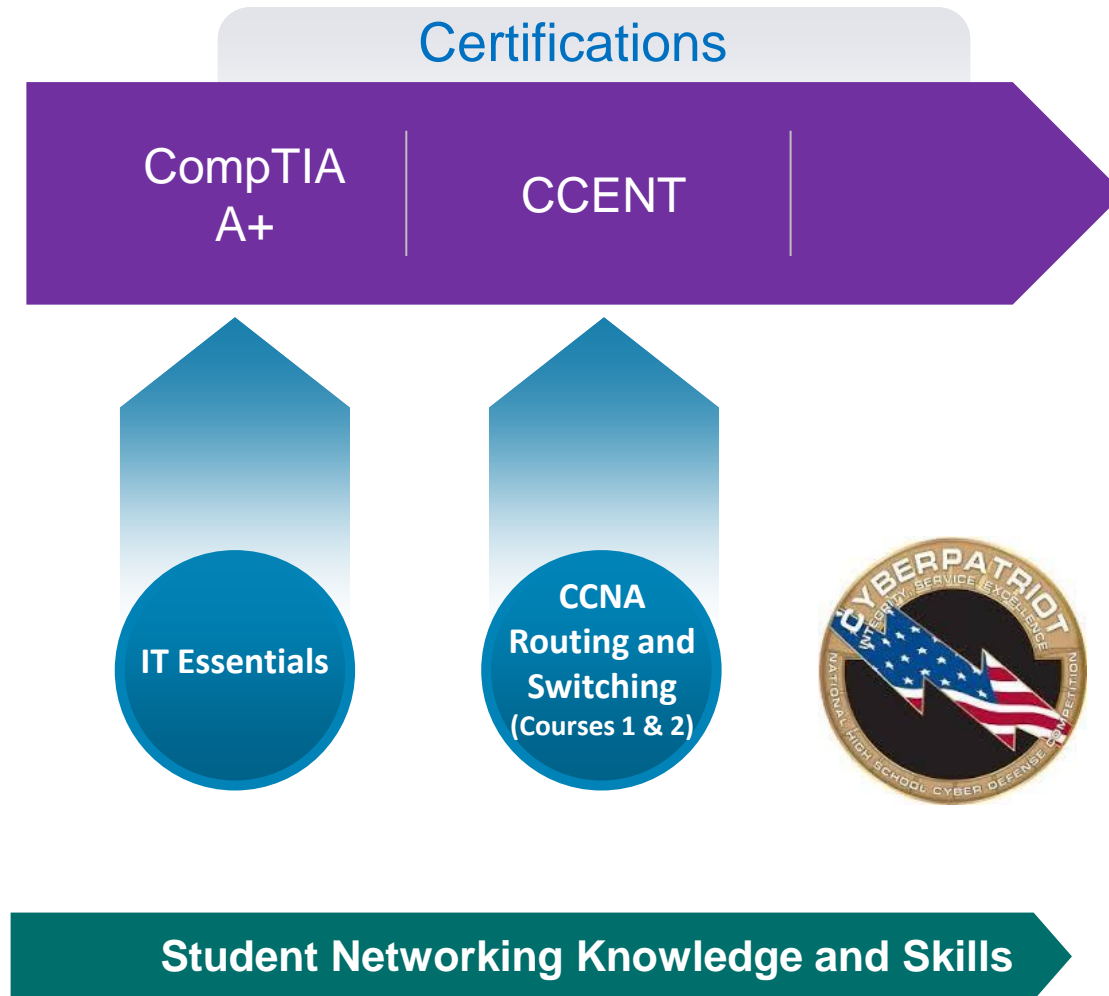
Software and Systems Development Pathway

Games and Simulations





# High School Curriculum



# IT - Model Curriculum

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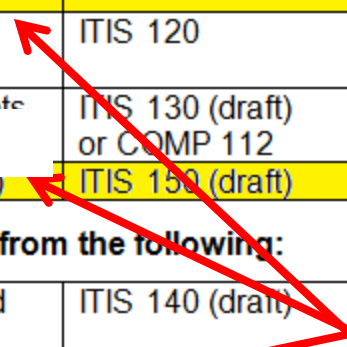
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**IT Essentials**

**CCNA 1**

**CCNA 2**



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Descriptors

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# IT Technician Pathway (ITTP)

	Course Name or Topic	Relevant 3rd Party Certification
Computer Retail Sales & Support Stage 1	Introduction to Retail or Business Fundamentals	
	Customer Service/Human Relations	
	Business Communications	
	Microsoft Office Essentials	
	Information & Communications Technology Essentials	<b>IT Essentials</b>
Help Desk User Support Stage 2	Computer Network Fundamentals	<b>CCNA 1</b>
	Systems and Network Administration (Network Operating Systems)	MCSA Server 2012
	Installing, Configuring & Administering a Microsoft OS (Desktop Support Tech I)	Microsoft MCTE
	Introduction to Information Security Systems	
IT Technician Stage 3	Routing & Switching Essentials	<b>CCNA 2</b>
	Installing, Configuring and Administering Linux Operating System	CompTIA Linux+
	Certified Ethical Hacker	CEH by E.C.
Further Specialization Options	Mobility and Mobile Design	CompTIA Mobility+
	Preparation for CCNA	Cisco CCNA
	Cloud Essentials	CompTIA Cloud+
	Project Management or Process Improvement	CompTIA Project+



# Pathway - Cybersecurity

- 9<sup>th</sup> Grade – Digital Literacy (Cybersecurity 1.1)

**Begin Competing in Cyberpatriots**

- 10<sup>th</sup> Grade – Cybersecurity ICT Essentials (A+)

- 11<sup>th</sup> Grade - Internet Engineering I (CCNA1)

- 12<sup>th</sup> Grade - Internet Engineering II (CCNA2)

include Linux Essentials (10-12)

**Compete in Cyberpatriots all four years**



# Community College Outreach

**Building the Pathway**



# Dual Enrollment – opportunities

- 9<sup>th</sup> Grade Introduction to ICT – ITIS-120 Computer Information Systems (**3 units**)
- ★ 10<sup>th</sup> Grade A+ Course – ITIS-110 Information & Communication Technology Essentials (**4 units**)
- ★ 11<sup>th</sup> Grade Internet Engineering I – ITIS-150 Computer Network Fundamentals (**3 units**) (CCNA1)
- ★ 12<sup>th</sup> Grade Internet Engineering II – ITIS-151 Routing and Switching Essentials (**3 units**) (CCNA2)

★ A-G

# Dual Enrollment - advantages

- Shared apportionment.
- High School teacher serves a college adjunct faculty
- Students earn credit directly from the college – no articulation.
- Provide your high school students with all of the college ICT program benefits:
  - Microsoft Dreamspark – free software
  - Certification Vouchers – deep discounts
  - BACCC ICT Shared Remote Lab access

