



**SANTA CLARA COUNTY OFFICE OF EDUCATION  
SANTA CLARA COUNTY REGIONAL OCCUPATIONAL PROGRAM  
Serving Santa Clara and San Benito Counties**



**1. COURSE TITLE – CAREER TECHNICAL EDUCATION PATHWAY/SECTOR**

Applied Networking – Network Communications / Information Technology

**2. CBEDS TITLE**

Telecommunications

**3. CBEDS NUMBER**

4618

**4. JOB TITLES**

<b>O*NET</b>	<b>TITLE</b>
15-1081.00	Network Support Specialist
15-1011.00	Telecommunications and Systems Analyst
15-1041.00	LAN/WAN Technicians
15-1051.00	Computer Systems Hardware Analyst
43-9011.00	Computer Operator

**5. COURSE DESCRIPTION**

This course covers fundamental networking concepts and develops the skills and knowledge to set up and maintain small business/home networks. It helps students prepare for the “CCENT (Cisco Certified Entry-level Technician) certification exam, an industry-wide certification program developed and sponsored by Cisco.

**6. HOURS**

Classroom Theory/Applied	180
Community Classroom/Coop Voc Ed	100
<b>TOTAL HOURS</b>	<b>280</b>

**7. RECOMMENDED PREREQUISITE**

<b>Required</b>	Must be 16 years of age or older, a junior or senior in high school, an out-of-school youth, or an adult.
<b>Recommended</b>	n/a

**8. DATE WRITTEN    March 16, 2005  
                          UPDATED    September 2007  
                          UPDATED    July 9, 2008**



<b>B. Career Technical Skills</b>						
<b>Class Hours</b>	<b>CC/CVE Hours</b>	<b>CONTENT AREA SKILLS</b>	<b>Foundation Standards</b>	<b>Mention - M Reinforced - R Taught - T</b>	<b>CTE Pathway Standards</b>	<b>Mention - M Reinforced - R Taught - T</b>
15		<b>I. Introduction to Networking</b>	* See attached pages that follow			
		<p>Students will be able to:</p> <ol style="list-style-type: none"> <li>1. Identify the characteristics of connectionless and connection-oriented networks.</li> <li>2. Differentiate between a process, a service, and a protocol.</li> <li>3. Explain why protocols are arranged in layers.</li> <li>4. List the ways in which two processes can cooperate in a layered architecture.</li> <li>5. Define the effects of changes to layers within a layered architecture.</li> <li>6. Characterize the differences between data communicated by the lower layers and by the upper layers.</li> <li>7. Explain the flow of data and data encapsulation in a layered architecture.</li> </ol>	R2.3 R2.6 10.0 11.0	T T T T	C1.1  C1.2 C4.3 C2.1  C1.1  C1.1  C1.2	T  T T T  T T  T
15		<b>II. The OSI Model Layers 1-4</b>				
		<p>Students will be able to:</p> <ol style="list-style-type: none"> <li>1. Describe the service that an OSI model layer provides to the layer above it</li> <li>2. Name the lower layers of the OSI model and give their relative position in the stack</li> <li>3. Identify the function and benefit of the multiplexing and parallelization provided by the transport layer.</li> </ol>	R2.3 R2.6 10.0 11.0	T T T T	C4.3  C4.3  C4.3	T  T M
15		<b>III. The OSI Model Layers 5-7</b>				
		<p>Students will be able to:</p> <ol style="list-style-type: none"> <li>1. Explain how the lower four layers, taken collectively; differ from the upper three layers of the OSI model.</li> <li>2. For the Session, Presentation, and Application Layers, name common protocols used by each layer.</li> <li>3. For the Session and Presentation Layers, describe the services that the layer provides to the layer above it.</li> </ol>	R2.3 R2.6 10.0 11.0	T T T T	C4.3  C4.3  C4.3	T  T T

<b>B. Career Technical Skills</b>						
<b>Class Hours</b>	<b>CC/CVE Hours</b>	<b>CONTENT AREA SKILLS</b>	<b>Foundation Standards</b>	<b>Mention - M Reinforced - R Taught - T</b>	<b>CTE Pathway Standards</b>	<b>Mention - M Reinforced - R Taught - T</b>
		4. Name the important network applications and briefly describe the services provided by each. 5. State important characteristics that TCP/IP, SNA, and DNA (DECnet) have in common or that set them apart from one another.			C5.1  C5.3	T  M
25	15	<b>IV. LAN Architectures</b>				
		Students will be able to: 1. Identify important characteristics of baseband and broadband transmission and give the important characteristics of the baseband standards. 2. Contract the characteristics of bus, pure ring, and star ring topologies. 3. Identify the components of the OSI 8802 (IEEE 802 protocol suite, showing their relationship to one another. 4. Explain why collisions occur in a CSMA/CD network. 5. Explain CSMA/CD message transmission logic. 6. Give the types and number of tokens that circulate on a Token Ring. 7. Explain how tokens are inserted onto and removed from a Token Ring and Token Bus. 8. Explain why Token Ring and Token Bus exhibit better performance characteristics than CSMA/CD under conditions of heavy load. 9. Give the rationale for FDDI's dual rings. 10. State the maximum throughput of the Ethernet, Token Ring, Token Bus, and FDDI LAN Standards. 11. Given a user's requirements for a LAN, identify the LAN architecture that best addresses those needs. 12. Understand the frame formats used for the LAN topics discussed.	R2.3 R2.6 8.5 11.0	T T T T	C1.1  C1.1  C5.1  C1.2  C1.2  C1.3  C1.3  C1.3  C1.3  C5.1  C1.1  C2.4	T  M  T  T  M  M  M  T  T  T

Career Technical Skills						
Class Hours	CC/CVE Hours	CONTENT AREA SKILLS	Foundation Standards	Mention - M Reinforced - R Taught - T	CTE Pathway Standards	Mention - M Reinforced - R Taught - T
15		<b>V. Computing Platforms</b>				
		Students will be able to: <ol style="list-style-type: none"> <li>Understand the three major types of computing platforms.</li> <li>Understand the features of Desktop Computers (PCs and Workstations).</li> <li>Understand the usage of Midrange (sometimes called midframe Computers).</li> <li>Understand the usage of Mainframe Computers (also called hosts or host CPUs).</li> </ol>	R2.6 10.0 4.5 10.1 10.6 11.0	T T T T T T	C1.0  C1.1  C1.0  C1.0	T  T  M  M
15	15	<b>VI. Network Operating Systems</b>				
		Students will be able to: <ol style="list-style-type: none"> <li>Name the primary advantages of the client/server model when used in PC network environments.</li> <li>Indicate the advantages of Remote Procedure Call tools to developers of network applications.</li> <li>Identify the generic mapping of PC LAN Network Operating Systems to the OSI model.</li> <li>Identify primary products and product characteristics of the leading PC LAN vendors.</li> <li>Identify major trends in the PC LAN marketplace.</li> </ol>	R2.6 4.1 10.0 11.0	T T T T	C1.0 C2.5  C6.0  C5.0  C1.1  C1.1	T T  M  M  M  M

Career Technical Skills						
Class Hours	CC/CVE Hours	CONTENT AREA SKILLS	Foundation Standards	Mention - M Reinforced - R Taught - T	CTE Pathway Standards	Mention - M Reinforced - R Taught - T
10	15	<b>VII. System Architectures</b>				
		<p>A. Students will be able to:</p> <ol style="list-style-type: none"> <li>1. Identify the TCP/IP layers, their components, and their functions. Name the OSI layer that corresponds to each TCP/IP layer.</li> <li>2. Identify the components of a class B Internet address in the dotted decimal form.</li> <li>3. Give the general form of a hierarchical Internet name.</li> <li>4. Explain how LAN addresses are determined.</li> <li>5. Give the purpose of the ARP cache and state what is stored in it.</li> <li>6. Tell how a gateway node differs from an ordinary node.</li> <li>7. Characterize the delivery service provided by IP and TCP.</li> <li>8. Identify the reasons that an application might use UDP.</li> <li>9. Identify the services that six important TCP/IP applications provide.</li> </ol>	<p>R2.6 10.0</p> <p>1.2 2.2 3.1 13.0</p> <p>10.8</p> <p>10.1</p> <p>10.1</p> <p>10.1</p> <p>10.1</p> <p>10.1</p> <p>10.1</p> <p>10.1</p>	<p>T</p> <p>T</p> <p>T</p> <p>T</p> <p>T</p> <p>T</p> <p>T</p> <p>T</p> <p>T</p>	<p>C2.0 (all)</p> <p>C2.0 (all)</p> <p>C2.0 (all)</p> <p>C2.0 (all)</p> <p>C2.0 (all)</p> <p>C2.0 (all)</p> <p>C2.0 (all)</p> <p>C2.0 (all)</p> <p>C20 (all)</p>	<p>T</p> <p>T</p> <p>T</p> <p>T</p> <p>T</p> <p>T</p> <p>T</p> <p>T</p> <p>T</p>
15	20	<b>VIII. Internetworking</b>				
		<p>Students will be able to:</p> <ol style="list-style-type: none"> <li>1. Identify internetworking components such as repeaters, relays, bridges, routers, switches, hubs and gateways.</li> <li>2. Identify the layer of the OSI model, which corresponds to the different types of internetworking components.</li> <li>3. Identify the types and functions of the various bridging and routing methods.</li> <li>4. Understand when to bridge, route, or switch.</li> <li>5. Understand the functions and uses of a TCP/IP router.</li> </ol>	<p>6.0 (all) R2.6 10.6</p> <p>10.6</p> <p>10.1</p> <p>10.6</p> <p>10.5</p>	<p>T T T T T T</p>	<p>C2.2</p> <p>C2.2</p> <p>C2.2</p>	<p>T</p> <p>T</p> <p>T</p> <p>T</p> <p>T</p>

Career Technical Skills						
Class Hours	CC/CVE Hours	CONTENT AREA SKILLS	Foundation Standards	Mention - M Reinforced - R Taught - T	CTE Pathway Standards	Mention - M Reinforced - R Taught - T
		6. Understand what takes place when routing data over an Internet. 7. Identify the major problems that can be solved using a protocol converter. 8. Understand network management issues and concerns.	10.6  10.8 3.5 4.1 4.5 11.0	T  T  T	C2.2  C2.2  C2.2  C3.1	T  T  M
10	15	<b>IX. Telecommunications Overview</b>				
		Students will be able to: 1. Understand the different types of WAN connections. 2. Understand basic telecommunications services. 3. Identify some of the components used to make the connections. 4. Understand when to use each component. 5. Understand the impacts of line speeds to MAN/WAN performance.	R2.6 10.1  10.2  10.1  10.1  10.5 11.0	T  T  T  T  T	C2.1  C2.1  C2.1  C2.1  C2.1	T  T  T  T  T
15	20	<b>XIII. Troubleshooting Networks</b>				
		Students will develop: 1. The art of Network Support 2. Troubleshooting Tools 3. Troubleshooting Scenarios	4.2 4.3 4.5 5.1 5.3 10.8 11.0	T  T  T	C3.0 (all) C6.0 (all) C6.0 (all)	T  T  T
180	100	<b>Total Hours</b>				

**C. Expected Student Proficiencies****CAREER TECHNICAL SKILLS**

- Explains what a network is and what its goals are
- Describes the OSI model
- Describes the role of the IEEE
- Explains how Ethernet and CSMA/CD work
- Compares and contrasts Ethernet and non-Ethernet networks
- Configures a wireless network
- Explains the role of network protocols and compares several different network protocols
- Explains the IP addressing scheme and demonstrates subnetting a network
- Compares various network operating systems
- Explains the difference between a client and a server
- Explains the role of routers in connecting a network to the internet
- Demonstrates the proper troubleshooting procedure when tracking down common network problems

**ATTITUDE AND WORK HABITS**

- Works both independently and collaboratively
- Attends regularly and on time
- Practices good safety procedures
- Solves problems thinks critically and makes good decisions
- Plans work and takes initiative
- Demonstrates leadership and the willingness to help train others

**CAREER PREPARATION SKILLS**

- Identifies appropriate careers and resources for training
- Identifies job resources
- Demonstrates interview skills
- Demonstrates knowledge of techniques for getting a job

**10. ADDITIONAL RECOMMENDED/OPTIONAL ITEMS**

A. **Academic credit:** One year or 10 units

B. **Other – n/a**

**ARTICULATION** None

**UC APPROVAL** None

X **INDUSTRY CERTIFICATION** CCENT (Cisco Certified Entry-level Technician)

C. **Instructional Strategies:**

- |                                  |                       |
|----------------------------------|-----------------------|
| • Lecture                        | • Guest presentations |
| • Demonstration                  | • Group projects      |
| • Design problems and vocabulary | • Computer programs   |
| • Critical comparison            | • Field trips         |
| • Readings                       | • Videos              |
| • Project-based learning         | • Internet research   |
| • Work-based learning            | • Peer learning       |
|                                  | • Brainstorming       |
|                                  | • Hands-on Labs       |

D. **Instructional Materials:**

“Network + Guide to Managing and Troubleshooting Networks” by Michael Meyers, **or** other appropriate college level text.

Cisco on-line curriculum—Discovery 1 and Discovery 2

Cisco textbooks including labs as sources of reference

Powerpoint presentations (other Cisco instructors’ presentations)

Packet Tracer (software program designed by Cisco for use in this course)

Internet

**11. FOUNDATION (ACADEMIC) STANDARDS ALIGNED****1.0 Academics**

Students understand the academic content required for entry into postsecondary education and employment in the Engineering and Design sector. *(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, history–social science, and visual and performing arts content standards adopted by the State Board of Education.)*

**Math****Algebra I**

Specific applications of Algebra I standards (grades eight through twelve):

(13.0) Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.

**Science**

Specific applications of Investigation and Experimentation standards (grades nine through twelve):

(1.a) Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.

(1.d) Formulate explanations by using logic and evidence.

**History/Social Science**

Specific applications of United States History and Geography: Continuity and Change in the Twentieth Century standards (grade eleven):

(11.11) Students analyze the major social problems and domestic policy issues in contemporary American society.

(11.11.3) Describe the changing roles of women in society as reflected in the entry of more women into the labor force and the changing family structure.

(11.11.5) Trace the impact of, need for, and controversies associated with environmental conservation, expansion of the national park system, and the development of environmental protection laws, with particular attention to the interaction between environmental protection advocates and property rights advocates.

Specific applications of Principles of Economics standards (grade twelve):

(12.1.1) Examine the causal relationship between scarcity and the need for choices.

(12.2) Students analyze the elements of America's market economy in a global setting.

(12.2.1) Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.

(12.2.2) Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.

(12.2.3) Explain the roles of property rights, competition, and profit in a market economy.

(12.2.4) Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.

(12.2.5) Understand the process by which competition among buyers and sellers determines a market price.

(12.2.6) Describe the effect of price controls on buyers and sellers.

(12.2.7) Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.

(12.2.8) Explain the role of profit as the incentive to entrepreneurs in a market economy.

(12.2.9) Describe the functions of the financial markets.

(12.2.10) Discuss the economic principles that guide the location of agricultural production and

industry and the spatial distribution of transportation and retail facilities.

(12.3) Students analyze the influence of the federal government on the American economy.

(12.3.1) Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.

(12.3.2) Identify the factors that may cause the costs of government actions to outweigh the benefits.

(12.3.3) Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.

(12.4) Students analyze the elements of the U.S. labor market in a global setting.

(12.4.2) Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.

(12.4.3) Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.

(12.5) Students analyze the aggregate economic behavior of the U.S. economy.

(12.6) Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United State's borders.

(12.6.1) Identify the gains in consumption and production efficiency from trade, with emphasis on the main products and changing geographic patterns of twentieth-century trade among countries in the Western Hemisphere.

(12.6.3) Understand the changing role of international political borders and territorial sovereignty in a global economy.

## 2.0 Communications

Students understand the principles of effective oral, written, and multimedia communication in a variety of formats and contexts. *(The standards listed below retain in parentheses the numbering as specified in the English–language arts content standards adopted by the State Board of Education.)*

### Reading

Specific applications of Reading Comprehension standards (grades nine and ten):

(2.1) Analyze the structure and format of functional workplace documents, including the graphics and headers, and explain how authors use the features to achieve their purposes.

(2.2) Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents.

(2.3) Generate relevant questions about readings on issues that can be researched.

(2.5) Extend ideas presented in primary or secondary sources through original analysis, evaluation, and elaboration.

(2.6) Demonstrate use of sophisticated learning tools by following technical directions (e.g., those found with graphic calculators and specialized software programs and in access guides to World Wide Web sites on the Internet).

(2.7) Critique the logic of functional documents by examining the sequence of information and procedures in anticipation of possible reader misunderstandings.

Specific applications of Reading Comprehension standards (grades eleven and twelve):

(2.3) Verify and clarify facts presented in other types of expository texts by using a variety of consumer, workplace, and public documents.

### Writing

Specific applications of Writing Strategies and Applications standards (grades nine and ten):

(1.3) Use clear research questions and suitable research methods (e.g., library, electronic media, personal interview) to elicit and present evidence from primary and secondary sources.

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(1.5) Synthesize information from multiple sources and identify complexities and discrepancies in the information and the different perspectives found in each medium (e.g., almanacs, microfiche, news sources, in-depth field studies, speeches, journals, technical documents).

(1.6) Integrate quotations and citations into a written text while maintaining the flow of ideas.

(1.7) Use appropriate conventions for documentation in the text, notes, and bibliographies by adhering to those in style manuals (e.g., *Modern Language Association Handbook*, *The Chicago Manual of Style*).

(1.8) Design and publish documents by using advanced publishing software and graphic programs.

(1.9) Revise writing to improve the logic and coherence of the organization and controlling perspective, the precision of word choice, and the tone by taking into consideration the audience, purpose, and formality of the context.

(2.3) Write expository compositions, including analytical essays and research reports:

a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives.

b. Convey information and ideas from primary and secondary sources accurately and coherently.

c. Make distinctions between the relative value and significance of specific data, facts, and ideas.

d. Include visual aids by employing appropriate technology to organize and record information on charts, maps, and graphs.

e. Anticipate and address readers' potential misunderstandings, biases, and expectations.

f. Use technical terms and notations accurately.

(2.5) Write business letters:

a. Provide clear and purposeful information and address the intended audience appropriately.

b. Use appropriate vocabulary, tone, and style to take into account the nature of the relationship with, and the knowledge and interests of, the recipients.

c. Highlight central ideas or images.

d. Follow a conventional style with page formats, fonts, and spacing that contribute to the documents' readability and impact.

(2.6) Write technical documents (e.g., a manual on rules of behavior for conflict resolution, procedures for conducting a meeting, minutes of a meeting):

a. Report information and convey ideas logically and correctly.

b. Offer detailed and accurate specifications.

c. Include scenarios, definitions, and examples to aid comprehension (e.g., troubleshooting guide).

d. Anticipate readers' problems, mistakes, and misunderstandings.

Specific applications of Writing Strategies and Applications standards (grades eleven and twelve):

(1.1) Demonstrate an understanding of the elements of discourse (e.g., purpose, speaker, audience, form) when completing narrative, expository, persuasive, or descriptive writing assignments.

(1.3) Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples.

(1.6) Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).

(1.7) Use systematic strategies to organize and record information (e.g., anecdotal scripting, annotated bibliographies).

(1.8) Integrate databases, graphics, and spreadsheets into word-processed documents.

(2.5) Write job applications and résumés:

a. Provide clear and purposeful information and address the intended audience appropriately.

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- b. Use varied levels, patterns, and types of language to achieve intended effects and aid comprehension.
  - c. Modify the tone to fit the purpose and audience.
  - d. Follow the conventional style for that type of document (e.g., résumé, memorandum) and use page formats, fonts, and spacing that contribute to the readability and impact of the document.
- (2.6) Deliver multimedia presentations:
- a. Combine text, images, and sound and draw information from many sources (e.g., television broadcasts, videos, films, newspapers, magazines, CD-ROMs, the Internet, electronic media-generated images).
  - b. Select an appropriate medium for each element of the presentation.
  - c. Use the selected media skillfully, editing appropriately and monitoring for quality.
  - d. Test the audience's response and revise the presentation accordingly.

#### Written & Oral English Language Conventions

Specific applications of English Language Conventions standards (grades nine and ten):

- (1.1) Identify and correctly use clauses (e.g., main and subordinate), phrases (e.g., gerund, infinitive, and participial), and mechanics of punctuation (e.g., semicolons, colons, ellipses, hyphens).
- (1.2) Understand sentence construction (e.g., parallel structure, subordination, proper placement of modifiers) and proper English usage (e.g., consistency of verb tenses).
- (1.3) Demonstrate an understanding of proper English usage and control of grammar, paragraph and sentence structure, diction, and syntax.
- (1.4) Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.
- (1.5) Reflect appropriate manuscript requirements, including title page presentation, pagination, spacing and margins, and integration of source and support material (e.g., in-text citation, use of direct quotations, paraphrasing) with appropriate citations.

#### Listening & Speaking

Specific applications of Listening and Speaking Strategies and Applications standards (grade nine and ten):

- (1.1) Formulate judgments about the ideas under discussion and support those judgments with convincing evidence.
- (1.2) Compare and contrast the ways in which media genres (e.g., televised news, news magazines, documentaries, online information) cover the same event.
- (1.3) Choose logical patterns of organization (e.g., chronological, topical, cause and effect) to inform and to persuade, by soliciting agreement or action, or to unite audiences behind a common belief or cause.
- (1.7) Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations.
- (2.3) Apply appropriate interviewing techniques:
  - a. Prepare and ask relevant questions.
  - b. Make notes of responses.
  - c. Use language that conveys maturity, sensitivity, and respect.
  - d. Respond correctly and effectively to questions.
  - e. Demonstrate knowledge of the subject or organization.
  - f. Compile and report responses.
  - g. Evaluate the effectiveness of the interview.
  - . Anticipate and address the listener's concerns and counterarguments.
- (2.6) Deliver descriptive presentations:

- a. Establish clearly the speaker's point of view on the subject of the presentation.
- b. Establish clearly the speaker's relationship with that subject (e.g., dispassionate observation, personal involvement).
- c. Use effective, factual descriptions of appearance, concrete images, shifting perspectives and vantage points, and sensory details.

Specific applications of Speaking Applications standards (grades eleven and twelve):

(2.4) Deliver multimedia presentations:

- a. Combine text, images, and sound by incorporating information from a wide range of media, including films, newspapers, magazines, CD-ROMs, online information, television, videos, and electronic media-generated images.
- b. Select an appropriate medium for each element of the presentation.
- c. Use the selected media skillfully, editing appropriately and monitoring for quality.
- d. Test the audience's response and revise the presentation accordingly.

2.5 Understand written business communication modes, such as memos, e-mail messages, and one-page executive summaries.

### **3.0 CAREER PLANNING & MANAGEMENT**

Students understand how to make effective decisions, use career information, and manage personal career plans:

- 3.1 Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in careers.
- 3.2 Understand the scope of career opportunities and know the requirements for education, training, and licensure.
- 3.3 Develop a career plan that is designed to reflect career interests, pathways, and postsecondary options.
- 3.4 Understand the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.5 Understand the past, present, and future trends that affect careers, such as technological developments and societal trends, and the resulting need for lifelong learning.
- 3.6 Know important strategies for self-promotion in the hiring process, such as job applications, résumé writing, interviewing skills, and preparation of a portfolio.
- 3.7 Explore career opportunities in business through such programs as virtual enterprise, work experience, and internships.

### **4.0 TECHNOLOGY**

Students know how to use contemporary and emerging technological resources in diverse and changing personal, community, and workplace environments:

- 4.1 Understand past, present, and future technological advances as they relate to a chosen pathway.
- 4.2 Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services.
- 4.3 Understand the influence of current and emerging technology on selected segments of the economy.
- 4.4 Understand effective technologies used in Web site development and the Internet.
- 4.5 Know procedures for maintaining secure information, preventing loss, and reducing risk.

### **5.0 PROBLEM SOLVING & CRITICAL THINKING**

Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques:

- 5.1 Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
- 5.2 Understand the systematic problem-solving models that incorporate input, process, outcome, and feedback components.
- 5.3 Use critical thinking skills to make informed decisions and solve problems.
- 5.4 Understand how financial systems and tools are used to solve business problems.

### **6.0 HEALTH & SAFETY**

Students understand health and safety policies, procedures, regulations, and practices, including the use of equipment and handling of hazardous materials:

- 6.1 Know the policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities.
- 6.2 Understand critical elements for health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.3 Understand the environmental and ergonomic risks associated with the use of business equipment and the financial impact of an unsafe work environment.

**7.0 RESPONSIBILITY & FLEXIBILITY**

Students know the behaviors associated with the demonstration of responsibility and flexibility in personal, workplace, and community settings:

- 7.1 Understand the qualities and behaviors that constitute a positive and professional work demeanor.
- 7.2 Understand the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to varied roles and responsibilities.
- 7.4 Understand that individual actions can affect the larger community.

**8.0 ETHICS & LEGAL RESPONSIBILITY**

Students understand professional, ethical, and legal behavior consistent with applicable laws, regulations, and organizational norms:

- 8.1 Know the major local, district, state, and federal regulatory agencies and entities that affect the industry and how they enforce laws and regulations.
- 8.2 Understand the concept and application of ethical and legal behavior consistent with workplace standards.
- 8.3 Understand the role of personal integrity and ethical behavior in the workplace.
- 8.4 Understand major local, state, and federal laws and regulations that affect business as well as the procedural requirements necessary for compliance.
- 8.5 Know how to design systems and applications to allow access to all users.

**9.0 LEADERSHIP & TEAMWORK**

Students understand effective leadership styles, key concepts of group dynamics, team and individual decision making, the benefits of workforce diversity, and conflict resolution:

- 9.1 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace settings.
- 9.2 Understand the ways in which preprofessional associations, such as DECA (An Association of Marketing Students) and Future Business Leaders of America, and competitive career development activities enhance academic skills, promote career choices, and contribute to employability.
- 9.3 Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
- 9.4 Know multiple approaches to conflict resolution and their appropriateness for a variety of situations in the workplace.
- 9.5 Understand how to interact with others in ways that demonstrate respect for individual and cultural differences and the attitudes and feelings of others.

**10.0 TECHNICAL KNOWLEDGE & SKILLS**

- 10.1 Know how to use a variety of business- and industry-standard software and hardware, including major proprietary and open standards.
- 10.2 Understand the information technology components of major business functions (e.g., marketing, accounting, and human resource management) and their interrelationships.
- 10.3 Understand the economic effects of technology on a business in the global marketplace.
- 10.4 Know how financial systems and tools are used to perform business transactions through the use of technology.
- 10.5 Use technology and electronic media to manage the work flow and to provide feedback.
- 10.6 Understand the interrelationships between hardware components and supportive software.
- 10.7 Analyze the functions, features, and limitations of different operating systems, environments, applications, and utilities.
- 10.8 Know how to use appropriate help resources (e.g., help desks, online help, manuals) to install, configure, upgrade, diagnose, and repair operating systems, environments, applications, and utilities.

**11.0 DEMONSTRATION & APPLICATION**

Students demonstrate and apply the concepts contained in the foundation and pathway standards.

## 11. C. NETWORK COMMUNICATIONS PATHWAY

Students in the Network Communications Pathway prepare for careers that involve network analysis, planning, and implementation, including the design, installation, maintenance, and management of network systems. The successful establishment and maintenance of information technology infrastructure is critical to the success of almost every twenty-first-century organization. Employment continues to grow for persons with expertise in network communications.

*C1.0 Students understand how to identify and analyze the customer's organizational network system needs and requirements:*

C1.1 Evaluate emerging products, services, and business models in relation to the creation, setup, and management of network communication products and services.

C1.2 Evaluate, create, and process voice, video, and data transmissions.

C1.3 Understand the effective management of human, financial, and communications resources from the standpoints of the user and the provider.

C1.4 Diagram physical and logical layouts of network communication systems.

*C2.0 Students understand and use various types of networking models:*

C2.1 Know the types of networks and their features and applications.

C2.2 Know how to implement a functional wired and wireless network, including the installation and configuration of components, software, and plug-ins.

C2.3 Understand the functions of various network devices, including network connectivity hardware.

C2.4 Distinguish between the topologies and protocols of local area networks and those of wide area networks.

C2.5 Understand the differences between various network environments (e.g., peer-to-peer, client-server, thin client, n-tier, internetworks, intranets, and extranets).

C2.6 Evaluate, select, and deploy a variety of network architectures and protocols.

C2.7 Apply appropriate technologies to improve network performance.

C2.8 Identify, analyze, and evaluate emerging communications technologies for use in organizations.

*C3.0 Students understand network maintenance and user-support services:*

C3.1 Know common customer policies and procedures, including those for management of incidents.

C3.2 Understand the security procedures necessary to maintain and support a network.

C3.3 Know the functions of common help-desk tools and resources, such as incident tracking, knowledge database, and staffing.

C3.4 Understand effective methods of disseminating information and instruction to users.

*C4.0 Students understand network project management:*

C4.1 Analyze network system interdependencies and constraints.

C4.2 Understand the processes used in managing and maintaining various types of electronic networks.

C4.3 Understand the implications of major protocols and international standards and their impact on data transmission.

*C5.0 Students understand network communication applications and infrastructure:*

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- C5.1 Know the appropriate uses of communication services, products, and applications.
- C5.2 Use a variety of online services (e.g., purchasing, selling, tracking, communicating, banking, investing).
- C5.3 Evaluate the features of communications software products in terms of their appropriateness to organizational tasks.
- C5.4 Configure compatible systems across various platforms and types of media.

*C6.0 Students understand network administration through the monitoring of the information and network systems:*

- C6.1 Understand the importance of classifying appropriate monitoring devices and procedures for quick identification and prevention of security violations.
- C6.2 Know policies and procedures for routine administration (e.g., user agreement, incident reporting, recovery for users).
- C6.3 Know common potential risks and entrance points, including internal and external risks, and the tools used to neutralize them (e.g., firewalls; monitoring; antivirus, spyware, and spam protection).
- C6.4 Know common techniques for disaster prevention and recovery.
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## LEGEND FOR REFERENCE OF ACADEMIC STANDARDS

Parenthetical notation preceding the content standard item refers to the grade level for the standard. i.e. (8) refers to grade 8, (9-10) refers to grades 9 & 10.

Example: (8) W2.1 refers to the Eighth Grade Writing Standard Item 2.1

### English-Language Arts:

R Reading  
W Writing  
WOC Written & Oral Conventions  
LS Listening & Speaking

CRP: Connections, Relationships,  
Proficient

CRA: Connections, Relationships,  
Advanced

### Mathematics:

NS Number Sense  
AF Algebra & Functions  
SDP Statistics, Data Analysis & Probability  
MR Mathematical Reasoning  
MG Measurement & Geometry  
AI Algebra I  
G Geometry  
AII Algebra II  
P&S Probability & Statistics  
APP&S Advanced Placement Probability &  
Statistics  
C Calculus

### ELA: English-Language Arts with in VPA

ELA- LRA: Literary Response and Analysis

ELA-WSA: Writing Strategies &  
Applications

ELA-WOELC: Written & Oral English  
Language Conventions

### Sectors

AME Arts, Media and Entertainment  
BTC Building Trades and Construction  
ECDFS Education, Child Development &  
Family Services  
EU Energy & Utilities  
ED Engineering & Design  
FID Fashion and Interior Design  
FAB Finance and Business  
HSMT Health Science & Medical Technology  
HTR Hospitality, Tourism & Recreation  
IT Information Technology  
MPD Manufacturing and Product  
Development  
MSS Marketing, Sales, & Services  
PS Public Services  
T Transportation

### Science:

PH Physics  
CH Chemistry  
ES Earth Science  
I&E Investigation and Experimentation

### History-Social Science:

WH World History, Culture and Geography  
USH United States History and Geography  
AD American Democracy  
ECON Economics

### Visual and Performing Arts:

APP: Artistic Perception Proficient Level  
APA: Artistic Perception Advanced  
CEP: Creative Expression Proficient  
CEA: Creative Expression Advanced  
HCCP: Historical & Cultural Proficient  
HCCA: Historical & Cultural Advanced  
AVP: Aesthetic Valuing Proficient  
AVA: Aesthetic Valuing Advanced