

Energy, Environment, and Utilities

Adopted 2013

Knowledge and Performance

1 Academics 1

2 Communications 2

- 1 Recognize the elements of communication using a sender–receiver model. 2.1
- 2 Identify barriers to accurate and appropriate communication. 2.2
- 3 Interpret verbal and nonverbal communications and respond appropriately. 2.3
- 4 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format. 2.4
- 5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats. 2.5
- 6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies. 2.6

3 Career Planning and Management 3

- 1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making. 3.1
- 2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success. 3.2
- 3 Explore how information and communication technologies are used in career planning and decision making. 3.3
- 4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure. 3.4
- 5 Integrate changing employment trends, societal needs, and economic conditions into career planning. 3.5
- 6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society. 3.6
- 7 Recognize the importance of small business in the California and global economies. 3.7
- 8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates. 3.8
- 9 Develop a career plan that reflects career interests, pathways, and postsecondary options. 3.9

4 Technology 4

- 1 Use electronic reference materials to gather information and produce products and services. 4.1
- 2 Employ Web-based communications responsibly and effectively to explore complex systems and issues. 4.2
- 3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources. 4.3
- 4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources. 4.4
- 5 Research past, present, and projected technological advances as they impact a particular pathway. 4.5
- 6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task. 4.6

5 Problem Solving and Critical Thinking 5

- 1 Identify and ask significant questions that clarify various points of view to solve problems. 5.1
- 2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate. 5.2
- 3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment. 5.3
- 4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions. 5.4

6 Health and Safety 6

- 1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions. 6.1
- 2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities. 6.2
- 3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies. 6.3
- 4 Practice personal safety when lifting, bending, or moving equipment and supplies. 6.4
- 5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics. 6.5
- 6 Maintain a safe and healthful working environment. 6.6
- 7 Review the responsibility of the Occupational Safety and Health Administration (OSHA) to ensure workplace safety. 6.7
- 8 Identify both potential hazards and accident scenarios in the work environment. 6.8
- 9 Follow established safety procedures (OSHA regulations and utility company procedures). 6.9
- 1 Evaluate changes in the environment with respect to their impact on safety of self and others. 6.1
- 11 Comply with energy industry safety procedures and proper ways to perform work. 6.11
- 12 Use safety equipment as specified by user manuals and safety training. 6.12
- 13 Use personal protective equipment (PPE), including safety glasses, hearing protection, gloves, work boots, and hard hats. 6.13
- 14 Keep personal safety equipment in good working order. 6.14
- 15 Use tools and equipment in compliance with user manuals and training. 6.15
- 16 Recognize potential and actual hazardous conditions as they arise. 6.16

7 Responsibility and Flexibility 7

- 1 Recognize how financial management impacts the economy, workforce, and community. 7.1
- 2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles. 7.2
- 3 Understand the need to adapt to changing and varied roles and responsibilities. 7.3
- 4 Practice time management and efficiency to fulfill responsibilities. 7.4
- 5 Apply high-quality techniques to product or presentation design and development. 7.5
- 6 Demonstrate knowledge and practice of responsible financial management. 7.6
- 7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession. 7.7
- 8 Explore issues of global significance and document the impact on the Energy, Environment, and Utilities sector. 7.8

8 Ethics and Legal Responsibilities 8

- 1 Access, analyze, and implement quality assurance standards of practice. 8.1
- 2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Energy, Environment, and Utilities industry sector. 8.2
- 3 Demonstrate ethical and legal practices consistent with Energy, Environment, and Utilities sector workplace standards. 8.3
- 4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace. 8.4
- 5 Analyze organizational culture and practices within the workplace environment. 8.5
- 6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information. 8.6
- 7 Conform to rules and regulations regarding sharing of confidential information, as determined by Energy, Environment, and Utilities sector laws and practices. 8.7

9 Leadership and Teamwork 9

- 1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders. 9.1
- 2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities. 9.2
- 3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting. 9.3
- 4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities. 9.4
- 5 Understand that the modern world is an international community and requires an expanded global view. 9.5
- 6 Respect individual and cultural differences and recognize the importance of diversity in the workplace. 9.6
- 7 Participate in interactive teamwork to solve real Energy, Environment, and Utilities sector issues and problems. 9.7

10 Technical Knowledge and Skills 10

- 1 Interpret and explain terminology and practices specific to the Energy, Environment, and Utilities sector. 10.1
- 2 Comply with the rules, regulations, and expectations of all aspects of the Energy, Environment, and Utilities sector. 10.2
- 3 Construct projects and products specific to the Energy, Environment, and Utilities sector requirements and expectations. 10.3
- 4 Coordinate with industry experts for specific technical knowledge and skills. 10.4
- 5 Maintain and troubleshoot equipment used in the energy, environment, and utilities industry. 10.5
- 6 Identify and evaluate questions that require skilled investigation to solve current problems cited in literature or media, or observed through personal observations. 10.6

11 Demonstration and Application 11

- 1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Energy, Environment, and Utilities sector program of study. 11.1
 - 2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level. 11.2
 - 3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures. 11.3
 - 4 Employ entrepreneurial practices and behaviors appropriate to Energy, Environment, and Utilities sector opportunities. 11.4
 - 5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators. 11.5
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Pathway Standards

. Environmental Resources A.

- 1 Identify energy resources and the effects of these resources on the environment. **A1.0**
 - 1 Classify energy resources by type: depletable, nondepletable, renewable, and nonrenewable. **A1.1**
 - 2 Discover new and emerging energy resources. **A1.2**
 - 3 Compare the advantages and disadvantages of energy resources in terms of the effects on the environment. **A1.3**
 - 4 List jobs in the community that result from, or are influenced by, processing and using energy resources. **A1.4**
- 2 Identify and describe the global interactive systems and elements that create and sustain climate. **A2.0**
 - 1 Describe the natural elements that interact to create climate. **A2.1**
 - 2 Identify world climate patterns and summarize factors that affect climate. **A2.2**
 - 3 Analyze the impact of climate upon human activities and needs. **A2.3**
 - 4 Identify the greenhouse effect and climate change. **A2.4**
 - 5 Explain how greenhouse gases are generated. **A2.5**
 - 6 Assess impacts of greenhouse gases on the environment. **A2.6**
- 3 Evaluate regional interactive systems and elements that create harmful environmental effects. **A3.0**
 - 1 Describe the sources of, and impacts attributable to, pollution and contamination. **A3.1**
 - 2 Recognize the actions that cause resource depletion. **A3.2**
 - 3 Define the causes of erosion and soil depletion. **A3.3**
 - 4 Describe the attributes and proliferation of hardscape. **A3.4**
 - 5 Identify the sources of, and impacts attributable to, habitat alteration. **A3.5**
- 4 Research the environmental implications of energy conversion processes and energy transmission systems. **A4.0**
 - 1 Define the basic terms, characteristics, and concepts of physical and chemical processes related to energy conversion. **A4.1**
 - 2 Identify the basic principles of energy systems, including chemical, hydraulic, pneumatic, electrical, nuclear, solar, wind, and geothermal. **A4.2**
 - 3 Analyze the impacts of energy conversion processes as they relate to activities across the environment. **A4.3**
- 5 Identify the role and impact of waste management systems and their operations on the environment. **A5.0**
 - 1 Understand the role of waste and storm water management systems, their operation, and their impact on the environment. **A5.1**

- 2 Explore the causes and effects of pollution linked to wastewater treatment facilities. [A5.2](#)
- 3 Identify wastewater treatment processes that lessen environmental impacts and improve water reuse. [A5.3](#)
- 4 Explain the types and sources of hazardous waste and associated safety practices and legal requirements for handling and disposing of such waste. [A5.4](#)
- 5 Design solid waste disposal processes that lessen environmental impacts and improve recycling. [A5.5](#)
- 6 Understand the field of land use management and its potential for environmental impact. [A6.0](#)
 - 1 Describe the need for, and role of, habitat preservation. [A6.1](#)
 - 2 Describe the composition, role, and function of ecosystems, including trends affecting viability. [A6.2](#)
 - 3 Demonstrate the need for, and methods of, land use planning. [A6.3](#)
 - 4 Identify the aspects of land use planning and describe current trends. [A6.4](#)
 - 5 Summarize the relationship between land use planning and energy use and distribution. [A6.5](#)
 - 6 Explain the laws and regulations pertaining to land use planning. [A6.6](#)
 - 7 Develop strategies to maximize the effectiveness of land use planning. [A6.7](#)
- 7 Research the role of air quality management and systems, their operations, and their impact on the environment. [A7.0](#)
 - 1 Understand the elements that create outdoor air quality. [A7.1](#)
 - 2 Summarize the causes of air pollutants and their chemical composition. [A7.2](#)
 - 3 Research air pollutants and their threat to human health. [A7.3](#)
 - 4 Understand U.S. and California laws and regulations related to air pollution control programs and health effects of air pollution. [A7.4](#)
 - 5 Describe the basic U.S. Environmental Protection Agency (EPA) and California Air Resources Board (ARB) roles and regulations. [A7.5](#)
- 8 Implement processes to support energy efficiency. [A8.0](#)
 - 1 Understand the relationship between power and energy efficiency. [A8.1](#)
 - 2 Outline how domestic and industrial appliances and systems affect the environment, such as water units and heating and cooling systems. [A8.2](#)
 - 3 Compare costs of alternate/renewable energy sources, systems, and appliances and traditional energy sources, systems, and appliances. [A8.3](#)
 - 4 Conduct an energy audit. [A8.4](#)
- 9 Research drinking-water sources, systems, treatment, and conservation. [A9.0](#)
 - 1 Understand water reuse: issues, strategies, technologies, and applications. [A9.1](#)
 - 2 Analyze strategies for improving energy efficiencies in water collection and distribution. [A9.2](#)

- 4 Describe the role of environmental engineering and green energy in water systems. [A9.4](#)
- 4 Understand the functions and operations of water storage, reservoirs, aqueducts, and dams. [A9.4](#)
- 10 Evaluate the impact and flow management of storm water, rivers, and groundwater. [A10.0](#)
 - 1 Understand the designs and tools used in water flow management. [A10.1](#)
 - 2 Describe watershed modeling. [A10.2](#)
 - 3 Understand the principles and applications of drainage engineering. [A10.3](#)
 - 4 Use the Hydrologic Engineering Centers River Analysis System (HEC-RAS). [A10.4](#)
 - 5 Analyze and interpret contaminated harbor and river sediment. [A10.5](#)
 - 6 Describe the concerns and strategies for catastrophic storm water events and management. [A10.6](#)
- 11 Prepare an efficient solar heated water design and installation plan. [A11.0](#)
 - 1 Identify the characteristics of solar heated water design and installation. [A11.1](#)
 - 2 Describe the requirements of solar water heaters that meet regulations. [A11.2](#)
 - 3 Describe solar hot water financial support programs and regulations. [A11.3](#)
 - 4 Analyze efficient solar water heating systems. [A11.4](#)
- 12 Identify and analyze issues, legislation, and regulations related to energy and the environment. [A12.0](#)
 - 1 Identify and discuss major environmental laws and policies, including the regulatory and legislative processes used to create such laws. [A12.1](#)
 - 2 Understand current regulations concerning recycling, solid waste, land use management, water quality, and renewable and nonrenewable energy. [A12.2](#)
 - 3 Compare and contrast environmental laws and regulations that may have a positive or negative impact on the environment and the economy. [A12.3](#)
 - 4 Create an environmental law or regulation and explain how it will impact the environment. [A12.4](#)

• Energy and Power Technology B.

- 1 Explore the basic conventional and emerging principles and concepts of the energy industry, including energy production, energy transmission, and alternative energy technologies B1.0
 - 1 Describe the past, present, and anticipated demand for, and use of, energy. B1.1
 - 2 Identify the differences and challenges in energy needs, sources, and uses in developing regions. B1.2
 - 3 Explain the flow of energy from generation through distribution to the customer. B1.3
 - 4 Demonstrate an understanding of basic direct current (DC) electrical-circuit skills. B1.4
 - 5 Identify the role and function of generation, transmission, and distribution organizations. B1.5
 - 6 Explain the different structures of energy companies, including investor-owned utilities, municipalities (and associated utility practices, such as water/wastewater), electric cooperatives, and independent power producers and the different lines of energy business, including electric and gas. B1.6
 - 7 Explain the role of regulatory bodies in the energy industry (Federal Energy Regulatory Commission, Public Utilities Commission [PUC]). B1.7
 - 8 Describe the process of electric metering and billing for energy consumption. B1.8
- 2 Identify various conventional electric power generation fuel sources and the cost and efficiency issues associated with each. B2.0
 - 1 Explain the conventional electric power generation system and process (coal, oil, natural gas, solar, wind, geothermal, and hydroelectric). B2.1
 - 2 Explain how each source was created and is used to produce electricity. B2.2
 - 3 Evaluate and list the advantages and disadvantages for each energy source. B2.3
 - 4 Describe how cost and efficiency rates are determined for each source. B2.4
- 3 Investigate emerging and alternative electric power generation technologies and fuel sources. B3.0
 - 1 Explain biomass conversion, including thermal and chemical processes used to produce electric energy. B3.1
 - 2 Describe the major sources, scale, and impacts of biomass energy. B3.2
 - 3 Define biofuels use and production. B3.3
 - 4 Explain how nuclear power is used to produce electric energy. B3.4
 - 5 Explain the process of nuclear fission. B3.5
 - 6 Explain how ocean wave energy is used to produce electric energy. B3.6
 - 7 Describe how wave power is harnessed in near shore, offshore, and far shore locations. B3.7

- 8 Explain wave energy technologies (terminator devices, oscillating water column, point absorbers, attenuators, and overtopping devices). B3.8
- 9 Compare and contrast the advantages and disadvantages of using ocean wave energy technologies for energy. B3.9
- 4 Understand nonnuclear power generation plant operations (coal, oil, natural gas, solar, wind, geothermal power, hydroelectric, or biofuel). B4.0
 - 1 Explain and use the fundamental laws and principles of electricity and magnetism. B4.1
 - 2 Classify the components of electrical generating systems, including boilers, generators, alternators, turbines, motors, engines, pumps, and switchgear. B4.2
 - 3 Discriminate the differences and similarities of power generation, including use of different fuel types and different power plant uses. B4.3
 - 4 Summarize the basic operating principles of fossil, hydroelectric, and internal combustion systems. B4.4
 - 5 Describe the location of equipment in the plant, how the equipment operates, and normal operating parameters. B4.5
 - 6 Describe the theory, construction, and application of the mechanical components of various types of power generation systems. B4.6
- 5 Understand and apply basic knowledge and skills necessary for nuclear power generation and nuclear power plant personnel. B5.0
 - 1 Use the fundamental concepts associated with electricity (e.g., electric charge, electric current). B5.1
 - 2 Understand the components of electrical systems, including switchyard construction, transformers, relays, circuit breakers, and motors. B5.2
 - 3 Explain the basic atomic and nuclear physics terms, unit, definitions, and basic concepts, including atomic structure, nuclear interactions and reactions, sources of residual heat/decay heat, and reactor operation. B5.3
 - 4 Understand reactor theory and operations. B5.4
 - 5 Explain the general design overview of the basic reactor types. B5.5
 - 6 Demonstrate understanding of reactor startup and shutdown procedures. B5.6
 - 7 Explain the fission process, including the construction of fission product barriers. B5.7
 - 8 Operate, repair, and test machines, devices, and equipment based on electrical or mechanical principles in order to diagnose machine malfunctions, using basic hand and small electric tools and equipment. B5.8
 - 9 Conduct tests and inspections of products, services, or processes to evaluate quality or performance. B5.9
- 6 Research methods of energy procurement, transmission, distribution, and storage. B6.0
 - 1 Describe the electric power transmission principles and processes. B6.1

- 2 Explain the need for electric distribution systems and how they are designed to operate. B6.2
- 3 Understand the emerging technologies in electric power transmission. B6.3
- 4 Identify electric power transmission equipment and systems. B6.4
- 7 Understand the interrelationships among components of systems. B7.0
 - 1 Understand the components and workings of the electric transmission and distribution network. B7.1
 - 2 Understand the components and workings of the gas transmission and distribution network. B7.2
 - 3 Define and explain voltage, current, resistance, power, and energy. B7.3
 - 4 Measure voltage, amperage, and resistance using a volt-ohm meter (VOM) and a digital volt-ohm meter (DVM). B7.4
 - 5 Explain and apply Ohm's Law. B7.5
 - 6 Design and construct an electrical circuit with a power generation source. B7.6

• Telecommunications c.

- 1 Understand the basic principles and concepts that impact the telecommunications industry, including systems, concepts, and regulations. **c1.0**
 - 1 Understand the relationship between telecommunications and society. **c1.1**
 - 2 Evaluate the effects of telecommunications media and networks (telephone, television, cellular, social networking, etc.). **c1.2**
 - 3 Understand the fundamentals of voice telephony and voice characteristics. **c1.3**
 - 4 Compare analog transmission concepts (bandwidth, voiceband, modulation), analog circuits and sounds, and plain ordinary telephone service (POTS). **c1.4**
 - 5 Understand digital transmission concepts (capacity, bits-per-second), converting sound to digital signals (PCM, CODECS), and compensating for transmission impairments (attenuation, noise, delay, jitter). **c1.5**
 - 6 Define voice over IP (VoIP). **c1.6**
 - 7 Describe public switched telephone network (PSTN) and signaling system 7 (SS7). **c1.7**
 - 8 Understand signaling: pulse dialing and dual tone multiple frequency (DTMF). **c1.8**
- 2 Demonstrate understanding and use of the basic and emerging technologies that impact the telecommunications industry. **c2.0**
 - 1 Describe the differences between analog and digital transmission and the migration to a converged digital/optical network for voice, data, and video. **c2.1**
 - 2 Compare and contrast the components of voice networks, such as carrier switches, routing, PBXs, T1 trunks, switched versus dedicated circuits, and packet and wireless networks. **c2.2**
 - 3 Define the components of data networks, such as modems, virtual circuits, hubs, switches, and routers. **c2.3**
 - 4 Evaluate the differences between the various access methods, including DSL, cable modems, wireless (cellular, WiMax, Wi-Fi), T1, and carrier Ethernet. **c2.4**
 - 5 Compare private voice network design alternatives using tie-lines, Centrex, virtual private networks (VPN), and hosted services. **c2.5**
 - 6 Understand the basics of local, metropolitan, and wide area networks (LANs, MANs, and WANs), including the differences between network bridging/switching and routing. **c2.6**
 - 7 Recognize technologies such as frame relay, ATM, MLPS, Ethernet, and TCP/IP and determine each technology's impact on network design, communication capabilities, and quality of service (QOS). **c2.7**
 - 8 Compare the benefits, drawbacks, and technology behind voice over IP (VoIP) using IP PBXs, IP phones and Internet telephony service providers (ITSP), and IPTV. **c2.8**
 - 9 Obtain a working knowledge of communications protocols and standards with an emphasis on their importance in network engineering and network

operation. [C2.9](#)

10 Understand the uses and effects of new technologies, such as social networking and cloud computing, on the network. [C2.10](#)

3 Examine the role and functions of satellites in telecommunications. [C3.0](#)

1 Understand the evolution of satellite communications. [C3.1](#)

2 Analyze the limitations of terrestrial communications and the advantages and disadvantages of satellites. [C3.2](#)

3 Illustrate and describe the basic elements of satellite communications. [C3.3](#)

4 Describe common types of satellites and their respective functions. [C3.4](#)

5 Learn the vocabulary and acronyms associated with satellite communications. [C3.5](#)

6 Understand satellite orbits, including launch vehicles and the launching of satellites. [C3.6](#)

7 Understand satellite systems, including geo-synchronous earth orbiting (GEO), low-earth orbiting (LEO), medium-earth orbiting (MEO), high-earth orbiting (HEO), and mobile satellite systems. [C3.7](#)

8 Analyze satellite system architecture, including the network configuration, remotes, satellite subsystems, ground stations, and network management. [C3.8](#)

9 Understand frequency bands and those used in satellite communications. [C3.9](#)

10 Understand the importance of modulation, multiplexing, and multiple access. [C3.10](#)

11 Explain propagation and interference, including radio noise, ionosphere effects, troposphere effects, interference between satellite networks, and interference with terrestrial networks. [C3.11](#)

12 Research applications and trends in satellite communications, including personal, commercial, military and government, and global applications. [C3.12](#)

4 Research the components, interaction, and operations of wireless telecommunications systems. [C4.0](#)

1 Understand mobile wireless services and applications. [C4.1](#)

2 Demonstrate device management. [C4.2](#)

3 Describe access technologies, including wireline and wireless end-to-end switching and signaling. [C4.3](#)

4 Identify switching, routing, and security systems and technologies for wireless and Internet networking. [C4.4](#)

5 Understand radio frequency (RF), air interface, and radio access network (RAN). [C4.5](#)

6 Explain code division multiple access (CDMA), wireless technologies, services, and applications. [C4.6](#)

7 Research the different functions and uses of wireless and cable networks. [C4.7](#)

- 8 Describe mobile network components and basic operation, including cellular principles and AMPS (1G), 2G; digital radio voice communications and digital cellular; data communications and spectrum-sharing technologies; frequency division multiple access (FDMA), time division multiple access (TDMA), CDMA, orthogonal frequency division multiplexing (OFDM) and 3G cellular; CDMA and 4G mobile cellular; LTE, wireless local area networks (LANs) and WiFi. [C4.8](#)
- 9 Understand the function and basic operations of communications satellites. [C4.9](#)
- 5 Research the components, interaction, and operations of fixed-wire telecommunications systems. [C5.0](#)
 - 1 Demonstrate and apply safety procedures and practices for traffic control, pole climbing, roadside safety, electrical hazards, and data line safety checks. [C5.1](#)
 - 2 Demonstrate proficiency in making electrical connections, splices, and basic field repair. [C5.2](#)
 - 3 Understand the differences between function and uses of wireless and cable networks. [C5.3](#)
 - 4 Understand access technologies, including wireline and wireless end-to-end switching and signaling. [C5.4](#)
 - 5 Practice troubleshooting and repairing telecommunication system wiring. [C5.5](#)
 - 6 Demonstrate proficiency in basic AC and DC circuits. [C5.6](#)
 - 7 Inspect and demonstrate proficiency in the use of tools, equipment, and test equipment used in the voice and data communications industry. [C5.7](#)
 - 8 Install, repair, terminate, and test network cabling. [C5.8](#)
 - 9 Demonstrate cable repair techniques. [C5.9](#)
 - 10 Prepare work site plans to demonstrate proficiency in site requirements and considerations. [C5.10](#)
 - 11 Understand the theory of twisted pair design and shielding. [C5.11](#)
- 6 Consider privacy and security issues of the telecommunications systems. [C6.0](#)
 - 1 Understand switching, routing, and security systems and technologies for wireless and Internet networking [C6.1](#)
 - 2 Explain the need and strategies for network security and integrity. [C6.2](#)
 - 3 Demonstrate the appropriate applications of network and user data mining and behavior profiling. [C6.3](#)
 - 4 Explain industry code of conduct. [C6.4](#)
- 7 Demonstrate proficiency in customer relations. [C7.0](#)
 - 1 Demonstrate appropriate personal hygiene and professional attire. [C7.1](#)
 - 2 Apply techniques for instilling customer confidence and satisfaction. [C7.2](#)
 - 3 Apply techniques for keeping the customer informed. [C7.3](#)
 - 4 Describe and demonstrate effective follow-up techniques. [C7.4](#)

- 5 Demonstrate discretion in interacting with customers in field and retail environments. [C7.5](#)
- 6 Illustrate basic conflict-resolution practices. [C7.6](#)